Characterising Action Potential in Virtual Game Worlds Applied With the Mind Module

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Declaration

While registered as a candidate for the degree of Doctor of Philosophy the author has not been registered for any other award with any other university or institution.

No part of the material in this thesis has been submitted for any degree or other qualification at any other institution by the author or, to the best of her knowledge and belief, by any other person. The thesis describes the author’s original work. Other persons assisted in transcribing interviews, conducting experiments and proof reading.
Abstract

Because games set in persistent virtual game worlds (VGWs) have massive numbers of players, these games need methods of characterisation for playable characters (PCs) that differ from the methods used in traditional narrative media. VGWs have a number of particularly interesting qualities. Firstly, VGWs are places where players interact with and create elements carrying narrative potential. Secondly, players add goals, motives and driving forces to the narrative potential of a VGW, which sometimes originates from the ordinary world. Thirdly, the protagonists of the world are real people, and when acting in the world their characterisation is not carried out by an author, but expressed by players characterising their PCs. How they can express themselves in ways that characterise them depend on what they can do, and how they can do it, and this characterising action potential (CAP) is defined by the game design of particular VGWs.

In this thesis, two main questions are explored. Firstly, how can CAP be designed to support players in expressing consistent characters in VGWs? Secondly, how can VGWs support role-play in their rule-systems? By using iterative design, I explore the design space of CAP by building a semiautonomous agent structure, the Mind Module (MM) and apply it in five experimental prototypes where the design of CAP and other game features is derived from the MM. The term semiautonomy is used because
the agent structure is designed to be used by a PC, and is thus partly controlled by the system and partly by the player. The MM models a PC’s personality as a collection of traits, maintains dynamic emotional state as a function of interactions with objects in the environment, and summarises a PC’s current emotional state in terms of ‘mood’. The MM consists of a spreading-activation network of affect nodes that are interconnected by weighted relationships. There are four types of affect node: personality trait nodes, emotion nodes, mood nodes, and sentiment nodes. The values of the nodes defining the personality traits of characters govern an individual PC’s state of mind through these weighted relationships, resulting in values characterising for a PC’s personality. The sentiment nodes constitute emotionally valenced connections between entities. For example, a PC can ‘feel’ anger toward another PC.

This thesis also describes a guided paper-prototype play-test of the VGW prototype World of Minds, in which the game mechanics build upon the MM’s model of personality and emotion. In a case study of AI-based game design, lessons learned from the test are presented. The participants in the test were able to form and communicate mental models of the MM and game mechanics, validating the design and giving valuable feedback for further development. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that for game design the ‘mental physics’ of the MM may open up new possibilities.

The results of the play-test influenced the further development of the MM as it was used in the digital VGW prototype the Pataphysic Institute. In the Pataphysic Institute the CAP of PCs is largely governed by their mood. Depending on which mood PCs are in they can cast different ‘spells’, which affect values such as mental
energy, resistance and emotion in their targets. The mood also governs which ‘af-fective actions’ they can perform toward other PCs and what affective actions they are receptive to. By performing affective actions on each other PCs can affect each others’ emotions, which - if they are strong - may result in sentiments toward each other. PCs’ personalities govern the individual fluctuations of mood and emotions, and define which types of spell PCs can cast. Formalised social relationships such as friendships affect CAP, giving players more energy, resistance, and other benefits. PCs’ states of mind are reflected in the VGW in the form of physical manifestations that emerge if an emotion is very strong. These manifestations are entities which cast different spells on PCs in close proximity, depending on the emotions that the manifestations represent. PCs can also partake in authoring manifestations that become part of the world and the game-play in it. In the Pataphysic Institute potential story structures are governed by the relations the sentiment nodes constitute between entities.
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Abbreviations

AA  Affective Action
AOE  Area of Effect
AI  Artificial Intelligence
CAP  Characterising Action Potential
CGI  Common Gateway Interface
CM  Compound Manifestation
DLL  Dynamic-link library
DPE  Dynemotion People Engine
XP  Experience Points
EIS  Expressive Intelligence Studio
XML  Extensible Markup Language
FFM  Five Factor Model
GM  Game Master
GED  Garden of Earthly Delights
GK  Gate Keeper
HR  Human Resource
HGO  Högskolan på Gotland (Gotland University)
IRB  Institutional Review Board
IPeRG  Integrated Project for Pervasive Gaming
IPIP-NEO  International Personality Item Pool Representation of the NEO PI-R
LARP  Live-Action Role-Playing
MMO  Massively Multi-player Online
MMORPG  Massively Multi-player Online Role-Playing Game
MMRO  Massively Multiplayer Reaching Out
ME  Mind Energy
MMS  Mind Magic Spell
MM  Mind Module
MR  Mind Resistance
MUD  Multi User Dungeon
MIDI  Musical Instrument Digital Interface
NPC  Non-Playable Character
GLUT  OpenGL Utility Toolkit
OCC  Ortony, Clore, and Collins
PI  Pataphysic Institute
PC  Playable Character

NEO PI-R  Revised NEO Personality Inventory

RP  Role-Playing

RPG  Role-Playing Game

SWIG  Simplified Wrapper and Interface Generator

SSM  Single Sentiment Manifestation

TTRPG  Table-Top Role Role-Playing Game

TCGL  The Confused Guest Lecturer

TGE  Torque Game Engine

UML  Unified Modeling Language

UCSC  University of California Santa Cruz

VE  Virtual Environment

VGW  Virtual Game World

VR  Virtual Reality

WoM  World of Minds

WoW  World of Warcraft
## Contents

Declaration ii  
Abstract iii  
Acknowledgements vi  
Abbreviations ix  

1 Introduction 1  
1.1 Virtual Game Worlds 1  
1.2 Research Questions and Main Concepts 6  
1.3 Research Approach 7  
1.4 Structure of the Thesis 11  

2 Story Construction in Virtual Game Worlds 15  
2.1 Introduction 16  
2.2 Fundamental Terms and Concepts 18  
  2.2.1 Story, Narrative and Discourse 18  
  2.2.2 Narrative Potential, Agency and Story Construction 18  
  2.2.3 Constructors and Realisers of Narrative Potential 19
3 Characterising Action Potential

3.1 Introduction ........................................... 44
3.2 The Playable Character - focus, focaliser and concentrated mirror of a world. ........................................... 46
3.3 Characterisation and True Character ........................................... 46
3.4 Role-play and Game-play ........................................... 48
3.5 Second Selves and Identity ........................................... 50
3.6 Immersion, Presence and Persona ........................................... 52
3.7 Characterising Action Potential ........................................... 56
3.8 Characterisation in VGWs ........................................... 57
   3.8.1 Character Creation ........................................... 58
   3.8.2 Observable Characteristics ........................................... 59
   3.8.3 Expression through Dialogue and Emotes ........................................... 61
   3.8.4 Observation of Behaviour ........................................... 63
3.9 True Character in VGWs .................................................. 64
  3.9.1 Faces of a Thousand Heroes ..................................... 65
  3.9.2 The Player’s Journey as a Route to Self-Knowledge ......... 66
  3.9.3 True Character ..................................................... 67
  3.9.4 Supporting Expression of True Character via Game Mastering 68
  3.9.5 Supporting Expression of True Character via the Framework of
        Game Rules .......................................................... 70
  3.10 Summary ............................................................... 72

4 Challenges in the Design of Virtual Game Worlds ............... 73

5 The Mind Module ......................................................... 78
  5.1 History ................................................................. 79
  5.2 Related Work .......................................................... 81
  5.2.1 Believability and Expressive AI ................................. 81
  5.2.2 Emotion Modelling ............................................... 82
  5.2.3 Narrative ........................................................... 83
  5.2.4 Personality Traits ............................................... 84
  5.3 The Mind Module ...................................................... 88
  5.3.1 Spreading Activation Network .................................. 88
  5.3.2 Affect Nodes ...................................................... 89
  5.3.3 Personality Trait Nodes .......................................... 92
  5.3.4 Emotion Nodes ................................................... 95
  5.3.5 Mood Nodes ....................................................... 100
  5.3.6 Sentiment Nodes - Emotional Attachments ................... 103
5.3.7 The Mind Module Compared to the Dynemotion People Engine 104
5.3.8 The Mind Module compared to Ortony et al.’s Model . . . . . 106
5.4 Summary . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 108

6 Early Experimental Prototypes 110

6.1 Ouroboros . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 111
  6.1.1 Early Sources of Inspiration for the MM . . . . . . . . . . . . 113
  6.1.2 The Playable Character Greyhowl . . . . . . . . . . . . . . . . 116
6.2 Garden of Earthly Delights . . . . . . . . . . . . . . . . . . . . . . . 119
  6.2.1 Game Design . . . . . . . . . . . . . . . . . . . . . . . . . . . 121
  6.2.2 Play testing . . . . . . . . . . . . . . . . . . . . . . . . . . . . 127
  6.2.3 Guided Paper Prototype Play-Test . . . . . . . . . . . . . . . . 128
6.3 Mind Music - The Soundtrack of your Mind . . . . . . . . . . . . . . 134
  6.3.1 Background and Related Research . . . . . . . . . . . . . . . . 135
  6.3.2 Design Considerations . . . . . . . . . . . . . . . . . . . . . . 137
  6.3.3 Requirements . . . . . . . . . . . . . . . . . . . . . . . . . . . 139
  6.3.4 Implementation . . . . . . . . . . . . . . . . . . . . . . . . . . 140
  6.3.5 Adaptation of the Mind Module for the Mind Music Application 141
  6.3.6 Mind Music Composition . . . . . . . . . . . . . . . . . . . . . 142
  6.3.7 The Composition for the Mood Scales . . . . . . . . . . . . . . 142
  6.3.8 The Composition for the Emotions . . . . . . . . . . . . . . . . 143
  6.3.9 System Integration . . . . . . . . . . . . . . . . . . . . . . . . 144
  6.3.10 Conclusions on Mind Music . . . . . . . . . . . . . . . . . . . 145
6.4 Later Experimental Prototypes . . . . . . . . . . . . . . . . . . . . . 147
  6.4.1 World of Minds 1 . . . . . . . . . . . . . . . . . . . . . . . . . 147
7 Game Design

7.1 Background ............................................. 153
7.2 Game Design Overview ................................. 155
7.3 Core Game Mechanics ................................. 157
  7.3.1 Mind Energy and Mental Resistance .............. 157
  7.3.2 Summary of Mind Magic .......................... 158
  7.3.3 Mind Magic Spells ............................... 159
  7.3.4 Affective Actions ................................ 160
  7.3.5 Mood Aura ....................................... 161
  7.3.6 Formalised Social Relationships ................. 161
  7.3.7 Character Creation .............................. 162
  7.3.8 Character Development .......................... 164
  7.3.9 Entity Types .................................... 165
  7.3.10 Display of Mind Module Information .......... 166
  7.3.11 An Example Event and Possible Consequences 168
7.4 Back-story of the Pataphysic Institute ............ 170
  7.4.1 Introducing the Back-story to Players .......... 173
  7.4.2 Non-Playable Characters ........................ 173
  7.4.3 Dialogue ......................................... 175
7.5 Formalised Social Relationships .................... 176
  7.5.1 Friends .......................................... 177
7.9.3 Free Form Manifestation of CM .......................... 207
7.9.4 Manifestations of Curses and Blessings ................. 208
7.10 Characterising Action Potential ............................ 212
    7.10.1 Summary of Interrelated Elements Governing the Characteris-
            ing Action Potential ................................ 213
7.11 Summary .................................................... 215

8 Play-Test of World of Minds ............................... 217
    8.1 Rationale ............................................... 218
    8.2 Research Questions and Aims ........................... 219
    8.3 Method .................................................. 221
        8.3.1 Research Ethics .................................... 222
        8.3.2 Play-Test and Survey Design ....................... 223
        8.3.3 Participants ....................................... 226
        8.3.4 Materials .......................................... 227
        8.3.5 Procedure ......................................... 233
        8.3.6 Data Analysis ...................................... 234
    8.4 Discussion: Player’s mental models of the system ........ 236
        8.4.1 Effects of Personality Factors ...................... 238
        8.4.2 Extraversion and the design risks of Five Factor Model .... 240
        8.4.3 Emergent Game-Play ................................ 241
    8.5 Discussion: Individual Differences ....................... 243
    8.6 Discussion: Implementation Focused Design Evaluation .... 244
        8.6.1 Sentiments in the Play-Test Scenarios ............. 244
        8.6.2 Survey and Interview Results Regarding the Sentiments .... 247

xviii
D Publications

D.1 Eladhari 2003 .............................................. 457
D.2 Lindley and Eladhari 2003 ............................... 464
D.3 Eladhari and Lindley 2003 ............................... 481
D.4 Eladhari and Lindley 2004 ............................... 496
D.5 Lindley and Eladhari 2005 ............................... 514
D.6 Eladhari et al. 2006 ........................................ 524
D.7 Koivisto and Eladhari 2006 ............................... 533
D.8 Brusk and Eladhari 2006 .................................... 542
D.9 Eladhari 2007 ............................................... 559
D.10 Eladhari and Sellers 2008 ............................... 589
D.11 Eladhari and Mateas 2008 ............................... 598
D.12 Eladhari 2009 ............................................... 607
List of Tables and Figures

2.1 Creation of Narrative Potential in VGWs. ........................................... 20
2.2 Text Levels in Virtual Game Worlds ....................................................... 22
2.3 The Code Level ....................................................................................... 23
2.4 Story Level .............................................................................................. 26
2.5 Greimas’ actants ..................................................................................... 27
2.6 An actant model in simple scenario ......................................................... 28
2.7 Character arc adapted from Freeman ...................................................... 32
2.8 Discourse Level ....................................................................................... 35
3.1 Choosing heritage group and profession in Asheron’s Call ........................ 58
3.2 Character Description Screen in Star Wars Galaxies. ............................... 60
3.3 Screen from Star Wars Galaxies showing the user interface for choice of mood for the PC. .......................................................... 62
3.4 Two PCs taking a break while doing a quest in Star Wars Galaxies. ......... 63
5.1 Traits from IPIP-NEO used by the Mind Module. ..................................... 86
5.2 Affect Node Types ................................................................................ 89
5.3 Moffat’s illustration of how emotion may relate to personality. ............... 90

\footnote{In this thesis, figures and tables share the same list and its enumeration.}
6.9 Screens of play modes in the digital prototype of GED. Note. From
the left: dreaming (3-D client on computer), mirror (cell phone client)
and astral projection (cell phone client). . . . . . . . . . . . . . . . . . 125
6.10 Physical prototype used for play testing a simplified version of the MM. 126
6.11 Functional test of GED using a physical prototype. . . . . . . . . . 128
6.12 From left: a player, storyteller, and ‘computer’. The ‘manual’ is taking
the picture. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 129
6.13 The paper prototype of the virtual play mode. . . . . . . . . . . . . 130
6.14 Participants in the play-test. . . . . . . . . . . . . . . . . . . . . . . 132
7.1 Fluctuations of Mind Energy and Mind Resistance . . . . . . . . . . . 157
7.2 Regeneration of Mind Energy and Mind Resistance . . . . . . . . . . 158
7.3 Mood co-ordinate system, MR and ME regeneration rates, and usable
spells . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 159
7.4 Mood Aura in PI. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 161
7.5 IPIP NEO in the Pataphysic Institute. . . . . . . . . . . . . . . . . . 163
7.6 Screen in PI for choosing to either take a personality test or to pick a
personality template. . . . . . . . . . . . . . . . . . . . . . . . . . . . . 163
7.7 Entity types and abilities in PI. . . . . . . . . . . . . . . . . . . . . . . 166
7.8 Display of Mind Module information in the PI client . . . . . . . . . 167
7.9 An example of how an amusing action is interpreted by the MM . . 169
7.10 PI Login Page . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 173
7.11 Screen of dialogue in PI when Karl tells the PC Emil that he can Dull
Pain. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 176

xxiv
7.12 To the left: The PC Emil's friend list. To the right: The PC Neurotica's friend list.

7.13 The mind window of the PC Emil in PI when he is standing next to his friend Neurotica, which gives him a proximity effect of Belonging.

7.14 Protectors, Protégés and Departments.

7.15 Spells affecting the values of emotion nodes in targets.

7.16 Spells affecting mind energy or mind resistance of target.

7.17 Mood spaces in the mood co-ordinate system governing availability of MR-ME spells.

7.18 MR-ME spells that are available when the caster is in neutral mood. In the figure, text in the neutral mood-space signifies that the spell is available for use.

7.19 Availability of MR-ME spells vary with mood. From the left: Glad mood, Cheerful mood and Jubilant mood. The text in mood-spaces is the same as in Figure 7.17.

7.20 MR-ME area of effect spells.

7.21 The PC Emil unsuccessfully performs the AA Calm Down on the PC Neurotica.

7.22 Spaces in the mood co-ordinate system used by the AA system.

7.23 Affective Actions.

7.24 Affective Actions continued.

7.25 Threshold values in SSM emotion nodes that trigger exclamations.

7.26 Threshold values of MR and ME of SSMs and the exclamations triggered.

7.27 Concept art for the SSM Sail of Sorrow.
7.28 The SSM Sail of Sorrow in the PI client. .......................... 202
7.29 Spells that the SSM Sail of Sorrow casts, and a spell it is vulnerable to. 203
7.30 Exclamations that the SSM Sail of Sorrow makes at certain threshold
values of its emotion node Sorrow. .......................... 203

8.1 Mind Sheet used in play-test of WoM. .......................... 222
8.2 End state of the Mind Sheet of a PC in a WoM play-test session. 224
8.3 When all five scenarios were traversed most game-play elements were
visible on the table. .......................... 230
8.4 Windows in the video analysis tool Transana. .......................... 235
8.5 Participants assumptions about effects of personality on other elements. 237
8.6 Participants hypothesising about personality factors. .......................... 239
8.7 In the fourth scenario players pick up the spell Laser Pen of Clarity to
help Teresa overcome the Colossus of Confusion. .......................... 242
8.8 The board with a goal and sentiment objects that players navigated in
the third scenario of the play-test. .......................... 246
8.9 Guided paper prototype play-test. A player is using an AA by pointing
the note representing the AA at the paper figure representing Teresa. 253
8.10 The first set of AAs introduced to participants of the WoM play-test. 254

9.1 Semiautonomy .......................... 278
Chapter 1

Introduction

Contents

1.1 Virtual Game Worlds ........................................ 1
1.2 Research Questions and Main Concepts .................. 6
1.3 Research Approach ......................................... 7
1.4 Structure of the Thesis .................................... 11

1.1 Virtual Game Worlds

The first virtual game world (VGW), Multi User Dungeon (MUD), was text-based (Bartle & Trubshaw, 1978).\(^1\) In the eighties, smaller communities developed and inhabited VGWs, but it was not until the mid-nineties, when worlds with 3-D graphics became available, that VGWs reached larger audiences (Meridian 59, 1996; Ultima Online, 1997; EverQuest, 1999; Asheron’s Call, 1999).

\(^1\)VGWs are often called Massively Multiplayer Online (MMO) games or Massively Multiplayer Online Role Playing Games (MMORPGs), but in this thesis the expression VGW is used. The term VGW is considered more representative because not all VGWs feature role-playing elements, nor always cater for several thousands of players, which is what is meant by ‘massive’.
VGWs are realised by networked computers that simulate environments. In these worlds, players have graphical representations, playable characters (PCs), often called avatars or player characters, that represent them in the world. All interaction with the world and with other players is done through the PC. The interaction in the world is in real time and the world is persistent, that is, the world is still there even though a particular PC is not active in the world. Currently, the most popular VGW in the US and in Europe is World of Warcraft, which in the end of 2008 had 11.5 million subscribers (Blizzard Entertainment, 2008); this figure illustrates how widespread the inhabitation of VGWs is at present.

As a genre, VGWs have a set of more or less general features that control the types of game activity that are available. In 2003 I described these features based on a study of 172 VGWs (Eladhari, 2003). There are a few aspects that are striking about VGWs that make them unique and different from other forms of art. One of these aspects is how the openness of the story structures inherent in VGWs makes it possible for players to add their own goals, which results in added narrative potential in the world. Another aspect concerns characterisation, the core of good story telling. In VGWs players characterise their own PCs. This may be compared with how literary authors sometimes see their characters ‘come to life’, driving the story in new directions; in VGWs there is a similar situation, but the stories are driven by real people rather than authored characters. How players can contribute to the narrative potential and how they can characterise their PCs in VGWs depend on the action potential of their PCs, that is, what they can do in the VGW at a given moment.

Despite the large resources and effort spent in designing and producing contemporary VGWs the experience of the narrative is seldom the main source of enjoyment
for players. In story-driven single-player games, such as the Final Fantasy series of games, players experience a narrative. The motivating factor is for many players to experience the next part of the story, to get an answer to the question ‘What happens next?’. In this type of game, the story is already there, embedded in the artefact, pre-authored and ready for players’ discovery and interpretation.

In table-top role-playing games (TTRPGs), such as Call of Cthulhu, a game master together with a small group of players uses the rule set and the pre-written backstory, provided by the role-playing game book, to drive a sequence of events that emerges from their application of the rule set and of their narration.

In both single-player computer role-playing games and in TTRPGs there are other motivating factors, besides answering the question ‘What happens next’, that define if the game is played and how it is played. Perhaps the most important of these is character development, in other words, individual courses of actions and choices that let players define the skills and properties of their PCs in ways that lead to possibilities for players not only to refine the PCs in terms of how efficient they are within the rule set and possibly identify with them, but also incrementally to choose and refine play style within the specific rule set. Character development is paramount for players dwelling in VGWs - generally much more so than immersing in epic narratives or creating their own narratives through role-play with others. VGWs can initially be disappointing to players experienced with other game genres. Players favouring single-player story-driven games might say: ‘I somehow found myself not caring about the back story.’ The live action role-player and the table top role-player might say: ‘I signed on to a role-playing server, but there was no role-play going on!’

One reason regarding the perceived lack of back story is that most VGWs apply
CHAPTER 1. INTRODUCTION

the same format for story telling as single-player role-playing games do. All players go on the same quests and the environment does not change as a result of their actions. Once a villager is saved from an evil foe, the world state immediately goes back to the state it had before the quest. The foe resurrects, and the villager is again in peril, ready for being saved by the next PC who passes by. Furthermore, on a VGW server populated with some thousands of PCs it is impossible to have them all as the main protagonists — it would be like having several thousands of Luke Skywalkers in Star Wars.

For the lack of role-playing (RP) there is a similar issue. RP in commercial VGWs is seldom supported by the game mechanics. The game-play is based on rule-sets following design paradigms established in the 1970s (Gygax & Arneson, 1974; Bartle & Trubshaw, 1978), which encourage instrumental game-play rather than RP. RP in VGWs mostly rely on meta-game rules since RP is hard to capture in a system. In fact, Copier (2007) described a specific MMORPG play-style as characterised by negotiation of principles of these meta-game rules. The typical game mechanics of contemporary VGWs, which - in turn - date from the MUDs of the eighties, do not generally support RP where players weave their own stories together. Dedicated role-players do use commercial VGWs as platforms for play, but it requires dedication and effort which only a small percentage of close-knit groups keep up on a regular basis. It is an exception rather than a rule. It is common that groups for their role-playing sessions choose to ignore the core game-play mechanics of the world. The VGW is used as a platform that allows for embodied representations of the characters rather than played as a game, a play strategy described by Sveinsdottir (2006).

Players of VGWs may expect two types of narrative: the impositional type, where
the player is told a story through the narrative cues given by the environment, or the emergent collaborative type of narrative where players co-create, weaving story-lines and enacting scenarios by role-playing together. Neither of these types of narrative are generally supported by VGWs to date.

These shortcomings have, however, not hindered the growth of the genre, neither in the number of VGWs developed and technical platforms for VGW development, nor in the number of players spending time in the VGWs. It can be argued that the ‘lack of narrative’ and lack of role-playing elements are perceived problems, not actual ones, that the ‘problems’ have instead sprung from expectations imposed on the VGW genre to be something that it is not. As Bartle (2003) stated, VGWs are not narratives, instead they are places where narratives may exist. As mentioned, one of the driving factors for play in VGWs is players’ development of their PCs. The PCs are the players’ representations in a VGW, and often become, in Bartle’s words, ‘an extension of a player’s self, a whole personality that the player dons when they enter the virtual world.’ (p. 155)

Caillois (1958, 2006) distinguished between playing in the mode paida, characterised by ‘fun, turbulence, free improvisation and fantasy’ without computable outcome, as opposed to in the mode of ludus which dominates sports, board games and other achievement oriented activities. Ryan (2006, p. 198) makes the observation that ‘It is perhaps the major contribution of the computer to human entertainment to have allowed a combination of ludus and paida within the same game environment — a combination that Caillois thought impossible: for him games were either rule-based or invitations to make-believe’. Ryan recognises the domain of textual architecture and users’ involvement as the domains that ‘open truly new territories
CHAPTER 1. INTRODUCTION


1.2 Research Questions and Main Concepts

The driving force of the research reported in this thesis has not been to solve a perceived lack of narrative in VGWs, but to explore how PCs can be built in ways that enrich the experiences for players in VGWs. I approach questions regarding role-playing and the construction of narrative potential from the perspective of what VGWs ‘could’ be rather than what they ‘should’ be. Since interesting and complex characters are essential for the creation of good stories in media such as novels and screen-plays it could be assumed that this might be the case for VGWs as well.

A starting point for this research was the assumption that characterisation of ‘round’ PCs is essential for creating emergent narratives in VGWs. The expression ‘round characters’ (Forster, 1927) concerns characters who are complex and realistic, representing a depth of personality which is imitative of life. A PC in a VGW can be seen as a combination of a person playing a game and a fictive person whose identity is continuously developed. Bartle (2003) suggests that the player and the PC become one when a player is deeply immersed in a VGW: ‘One individual, one persona: identity.’ According to Bartle the importance of PCs and their identities cannot be underestimated (p. 159): ‘The celebration of identity is the fundamental, critical, absolutely core point of virtual worlds.’ Another central concept in this work is story construction, which is to provide players with building blocks and functionalities that form the narrative potential in the world, and can be used by players for creating experiences and traversals of events that are individually potentially meaningful and
In VGWs the protagonists of the world are real people, and when acting in the world their characterisation is not carried out by an author, but expressed by players characterising their PCs. The action potential of a character is what it can do at a given moment with it all the circumstances inherent in the context taken into account. The characterising action potential (CAP) defines what a character can do at a given moment that characterise it, both in terms of observable behaviour and in expression of true character as defined by McKee (1997) — a character’s essential nature, expressed by the choices a character makes.

In research reported in this thesis PCs are considered to be semiautonomous agents, partly controlled by their players, and partly controlled by context-sensitive action potential and expression possibilities as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW they inhabit.

Two main questions are explored in this thesis. Firstly, how can CAP be designed to support players in expressing consistent characters in VGWs? Secondly, how can VGWs better support role-play in their rule-systems?

1.3 Research Approach

Mateas and Stern (2005, p. 8) have described game design as a wicked problem:

For a wicked problem such as game design, exploring design space consists of navigating the complex relationships and constraints among individual design features, while at the same time discovering or inventing new features and approaches that expand the design space. All existing games
form tiny islands of partially understood regions of design space; all around these islands lies a vast ocean of unexplored potential design space waiting to be brought into existence through the invention of new features and approaches, and mapped out through the hard empirical work of exploring a variety of designs.

The phrase ‘wicked problem’ is used in social planning to describe problems where every attempt at producing a solution changes the understanding of the problems. Mateas and Stern (2005) further argued that even though studying existing games can lead to deeper understanding it is essential to also build them (p. 2):

[...] if game studies is limited to analysing existing games and design spaces, it can be problematic to imagine or theorise about potential game features outside of these design spaces. Models about the nature of games and their features run the risk of being incomplete or wrong, simply because certain design spaces have not yet been explored.

In relation to the questions addressed in this thesis this quotation is particularly relevant. Many identity-related questions can be studied through observing existing VGWs and players’ behaviour in these, but for experimenting with techniques not present in existing games independent development efforts are required.

Experimental research and evaluations of rules and game mechanics in VGWs are rare in the academic realm due to the large effort required for the development. Researchers are often constrained to using existing platforms that enforce traditional game mechanics. One example is the level-design tools of Neverwinter Nights (Bioware, 2002) that enforce the D&D rule set, used for research projects by
among others Castranova (2008) and Tychesen (2007). For exploration of truly innovative game mechanics it is essential to take into consideration type of game-play to which an underlying engine and framework lends itself. Choices that seem convenient in the development process are risky for the design of innovative (digital) game experiences — the conventions in the rule sets can ‘kill’ the innovation.

The wicked design space explored in this thesis is the CAP of PCs in VGWs. The aim of the navigation of the space has been to find ways to facilitate players’ characterisation of consistent characters and role-play in VGWs. The main method used for exploration of this space is iterative design as described by Salen and Zimmerman (2001, p. 11):

Iterative design is a play-based design process. Emphasising play-testing and prototyping, iterative design is a method in which design decisions are made based on the experience of playing a game while it is in development. In an iterative methodology, a rough version of the game is rapidly prototyped as early in the design process as possible. This prototype has none of the aesthetic trappings of the final game but begins to define its fundamental rules and core mechanics. It is not a visual prototype but an interactive one. This prototype is played, evaluated, adjusted and played again, allowing the designer or design team to base decisions on the successive iterations or versions of the game. Iterative design is a cyclic process that alternates between prototyping, play-testing, evaluation, and refinement.
I built a semiautonomous agent architecture, the Mind Module (MM), that can be used as part of PCs in VGWs. The MM gives PCs personalities based on the Five Factor Model (McCrae & Costa, 1987), and a set of emotions that are tied to objects in the environment by attaching emotional values to these objects, called sentiments. The strength and nature of a PC’s current emotion(s) depends on the personality of the PC and is summarised by a mood. The MM consists of a spreading-activation network of affect nodes that are interconnected by weighted relationships. The values of the nodes defining the personality traits of characters governs an individual PC’s state of mind through these weighted relationships, resulting in values characterising a PC’s personality.

Among the most challenging tasks in this work has been to design and build experimental prototypes in which the MM has been used. The prototypes were necessary for seeing to what extent the MM adds to the playing experience. The MM has been used in five experimental prototypes. Each prototype in which the MM has been used has given pointers towards what can be explored and improved for the next iteration.

Early in the process of the work reported in this thesis I was curious to establish what effect the MM could have, if added as an extra feature to a ‘typical’ VGW. As the research developed it seemed more meaningful to create VGW prototypes where the game mechanics were increasingly based on the MM. Having started out with the aim to find general solutions to questions regarding story construction and characterisation for typical VGWs with the use of psychology-inspired AI-applications this research has developed towards more and more specific solutions.

The mechanics of the MM would not have any effect unless the VGW mechanics accommodated the MM. For each new VGW prototype that has been developed,
the game design and the MM has been reiterated to address the refinement of the questions that the results of the previous prototype have yielded. From this work, which can be labelled AI-centred game design, the ‘mental physics’ of the MM has emerged.

1.4 Structure of the Thesis

In Chapter 2, VGWs are discussed as spaces for construction of narrative potential. Terms used in this thesis are introduced, including story, narrative, discourse, narrative potential, agency and story construction. Expressive agents and semiautonomous agents, created and controlled by developers, in-game creators and players, are introduced as constructors and realisers of narrative potential. A four-layered model of text levels in VGWs is described, which has been useful during the development of the prototypes described in this thesis. The open story structure of VGWs is discussed by providing examples showing that the narrative potential is affected by a multitude of goals, many of which are derived from motivations outside the narrative potential authored by the worlds’ creators.

In Chapter 3, the importance of the PC is stressed, and the concept of CAP is described in detail. Role-playing, self-playing and identity construction in VGWs is discussed as well as immersion, presence and Bartle’s concept of persona. Also, tools available for players for characterisation of PCs in contemporary VGWs are discussed.
Chapter 4 serves as a bridge between the theoretical discussions in the previous chapters and the later chapters, which focus on the development of the MM and the prototypes it is used in. The concept of the bleeding circle is introduced as the situation where strong interpersonal relationships seep between VGWs and the ordinary world. A number of design questions which I find important for the evolution of VGWs are presented, with the reservation that some of them may be ‘holy-grail questions’, that is, questions that there may be no answer to but are important to ask because they provide the driving force to navigate wicked problem spaces.

Chapter 5 describes the MM, giving an account of the sources of inspiration that have been used in its construction: spreading-activation theory, trait theory, affect theory and Moffat’s model (1997) of how emotion can relate to personality. The approach used in the design of the MM is compared to the approach of Dynemotion People Engine (Eladhari & Sellers, 2008) and to that of the OCC model (Ortony et al., 1988). Chapter 5 also provides a brief history of the development of the MM as well as an overview of related work in the areas of believable agents and expressive AI, emotion modelling, applications for story construction and related work which uses trait theory when constructing autonomous agents.

Chapter 6 describes early prototypes, where the MM was used as part of the implementations. In Ouroboros an important focus was to explore the use of expressive gestures of 3-D characters. Different gestures were available for use depending on the state of mind of the PCs and were consistent with their personalities. In relation to this, early sources of inspiration for the implementation of the MM are described.
Ouroboros was developed at the Zero Game Studio, part of the Interactive Institute in Sweden.

Garden of Earthly Delights (GED) was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO) of the Integrated Project for Pervasive Gaming (IPeRG). The focus of MMRO was to explore ways to integrate massively multiplayer gaming with the play via cell phones with geographical location data. A guided paper prototype play-test was conducted where issues of player-control of the semiautonomous PC was discussed and which showed that players with live-action role-playing experience were particularly positive towards the MM derived game-play in the test. The Mind Music application, also a part of MMRO, focused on how music can be used to express complex states of mind to players, communicating mood and emotions of their own PC.

In Chapter 7, the game design of the prototypes World of Minds (WoM) and the Pataphysic Institute (PI ) is described. A background to the practical work of developing the prototypes and an overview of the game design is given and the main features of the design are described in detail. While the Ouroboros prototype focussed on expression of character performed to other players through gestures, and the Mind Music prototype explored expression of their own PC to players themselves, the focus of PI and WoM is on expression of character — to both self and others — through fluctuations of CAP and of manifestations of a PC’s mental state that become part of the game world.

Chapter 8 describes a guided paper-prototype play-test of WoM, in which the game
mechanics build upon the MM’s model of personality and emotion. In a case study of AI-based game design, lessons learned from the test are reported. The participants in the test were able to form and communicate mental models of the MM and game mechanics, validating the design and giving valuable feedback for the digital prototype PI. Despite the constrained scenarios presented to test players, they discovered interesting alternative strategies, indicating that the ‘mental physics’ of the MM may open up new game design possibilities.

The last chapter concludes this thesis by a summary of the previous chapters and a concluding discussion. Also, limitations and future areas of research are identified and described.
Chapter 2

Story Construction in Virtual Game Worlds

Contents

2.1 Introduction ............................................. 16
2.2 Fundamental Terms and Concepts .................. 18
   2.2.1 Story, Narrative and Discourse .................. 18
   2.2.2 Narrative Potential, Agency and Story Construction ... 18
   2.2.3 Constructors and Realisers of Narrative Potential .... 19
2.3 Text Levels in Virtual Game Worlds ............... 22
   2.3.1 Code Level ........................................ 23
   2.3.2 Story Level ....................................... 25
   2.3.3 Discourse Level ................................... 35
   2.3.4 Narrative Level ................................... 36
2.4 The Open narrative Structure of Virtual Game Worlds 37
   2.4.1 Goals and Motivations ............................. 38
   2.4.2 Enlarging the Paradigm of Virtual World Game Design to Accommodate Varieties of Goals ............... 40
2.5 Summary ................................................ 41
This chapter concerns virtual game worlds (VGWs) as spaces for construction of narrative potential. Terms used in this thesis are introduced, and a four-layered model of text levels in VGWs is presented.

### 2.1 Introduction

A lot has been written about narrative in interactive media. In the area of games, classification spaces have been offered. Comparisons have presented similarities to other media and differences have been pointed out (e.g. analyses of interactive media from a cultural-studies perspective, including Aarseth (1997), Murray (1997), Juul (1999), and Ryan (2001)). Publications by authors with backgrounds in screenwriting and film-making often refer to the Hero’s Journey (Campbell, 1949; Vogler, 1993), and to the restorative three-act structure of drama, described by Danzyger and Rush (1995). Texts published by game designers frequently refer to the Koster-Vogel Cube (Koster & Vogel, 2002), while publications in more technical venues on the issue of narrative often refer to The Oz Project (1989 - 2002) and to the Façade Project (Mateas & Stern, 2002 - 2005). Prominent traditions of narrative analysis include the structuralist perspective beginning with Propp’s morphology of the folk tale (1968) and Greimas’ actant theory (1966), as well as the tradition of hypertext theory (Bolter, 1991; Landow, 1992), that is, systems for causal interactive relationships between story elements in multi-linear stories. In the light of these different traditions that have had an impact on the field of interactive narrative, Richard Bartle (2003, p. 1)

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1An early version of the text in this chapter was published in the paper ‘Story Construction and Expressive Agents in Virtual Game Worlds’ at the conference ‘Other Players’ (Eladhari & Lindley, 2004).
Virtual worlds are places, not stories. You can have a story about New York, or a story set in New York, and New York can have a history, but New York is not itself a story. [...] Trying to impose a story on the inhabitants of a virtual world is as sensible as trying to impose a story on the inhabitants of New York. You can impose events, but not stories; people make their own stories.

Virtual worlds are places and narrative elements are part of those places. On the scale of authorship ranging from single to shared authorship the full scale coexists in these worlds, from pre-scripted story lines to narrative arcs that are entirely created by players, more or less despite the world’s mythos and the original intentions of the world’s creators. When Lisbeth Klastrup (2003) presented a possible poetics of virtual worlds, she introduced the concept of ‘worldness’ as a metric of the particular traits that constitute the experience of a virtual world.

In these worlds a more pressing issue than ‘Who is the author?’, a common exercise in literary studies, is who owns the world (Bartle, 2003; Reynolds, 2003). Who has the right to create content, and how persistent is this created content? Does it become a part of the world’s history? The world’s history is in some cases created outside the game world, for example by guild leaders who document the story of their guild on web sites.

Another intriguing question is that of the role of players: are players a part of the world, designed into it, becoming a part of the creation of the game design teams, or should players be viewed as artists within an artwork, expressing themselves through the tools given by the designers?
2.2 Fundamental Terms and Concepts

2.2.1 Story, Narrative and Discourse

When the word *story* is used in this text it means a fixed temporal sequence of events and the actors that take part in these, that is, the content that a narrative is about.\(^2\) Events in narratives are not necessarily told about in the order in which they have happened. In multi-linear narratives readers or players can often choose when to be told about a certain event, but the order in the sequence of events as such does not change — only the sequence of experiencing them, or being told about them. A *narrative* is a story the way it is told. *Narration,* or the art of story telling, concerns how to tell a story.\(^3\) As players do one thing after another in a world the sequence of events that emerge is what I, in this text, call the character’s *discourse,* a concept borrowed from Seymour Chatman (1978).

2.2.2 Narrative Potential, Agency and Story Construction

In multi-user virtual game worlds (VGWs), being places, there is generally little to no story telling in the design of the world in the traditional sense. Instead, there are elements in the world that have *narrative potential,* a term used by Laurel (1994) and described by Fencott (2001) as the integration of agency and narrative. Fencott

\(^2\)The use of the terms story and narrative in this text conforms to Genette’s theoretical framework for narrative analysis. Genette’s definition of histoire, or in the English translation, story, reads as follows (1983, p. 27): ‘I propose [...] to use the word story for the signified or narrative content’. Slomith Rimmon-Kenan uses Genette’s definition in her book Narrative Fiction, but accentuates the chronological aspect of the concept: ‘Story’ designates the narrated events, abstracted from their disposition in the text and reconstructed in their chronological order, together with the participants in those events.’

\(^3\)When Genette uses the word narrative he means ‘the signifier, statement, discourse or narrative text itself’ (1983, p. 27). The French word Genette uses for narrative is récit.
elaborates on narrative potential in (2003) as the ‘accumulation of meaningful experience as a result of agency — allows participants to construct their own appropriate narratives. Narrative potential thus arises from agency but is not determined by it.’ The term *agency* was defined by Murray in (1997, p. 126) as ‘the satisfying power to take meaningful action and see the results of our decisions and choices’.

Koster (Meadows, 2003) distinguishes between impositional and expressive forms of interactive narrative in VGWs. The impositional form is used in choose-your-own adventure books, adventure games and other fixed multilinear narratives. The expressive form relies less on a sequence of events and behaves more like an architecture. The view of story construction as a type of architecture in VGWs is shared by Jenkins (2003): ‘in the case of emergent narratives, game spaces are designed to be rich with narrative potential, enabling the story-constructing activity of players. [...] it makes sense to think of game designers less as storytellers than as narrative architects.’

The act of creating narrative potential in a VGW, whether it is done by the team of world designers, members of a live team (developers maintaining a VGW when it is populated by players), game masters, guild leaders or ordinary players is an act of *story construction*, not story telling. That is, a story is constructed by game-play where the VGW and its inhabitants are providing material for potential narratives as tellings of the story.

### 2.2.3 Constructors and Realisers of Narrative Potential

Figure 2.1 outlines possible roles that the story constructors of a VGW may have; in the top of the figure the roles outside the game world are noted; players, the game developers as world creators, and in-game creators, which is persons who have the
authority to make more persistent marks on the game world than players, but less than the developers.

The authority to affect the game world can either be given by the developers through a role of moderator or game master, or can be a result of being trusted by other players to the degree that one person’s actions resonate through the world via a multitude of actions taken by others as a result of it. Independent of role outside the game, inside
the game world, ‘in-game’ everyone communicates and expresses via signifiers which can be either static objects or dynamic entities and through performing actions. Actions affect other entities, which in turn can lead to the performance of further actions. In such a manner narrative potential in VGWs is both constructed and realised.

Mateas (2003, p. 1) coined the expression expressive artificial intelligence:

AI-based art and entertainment constitutes a new interdisciplinary agenda linking games studies, design practice, and technical research. I call this new interdisciplinary agenda expressive AI. In the context of game analysis and design, expressive AI provides a language for talking about ‘readable’ behaviour, that is, behaviour that a player can read meaning into.

Following Mateas, the term expressive agents is in this text used to refer to dynamic entities in virtual game worlds that in their functional set-up carry possibilities for creating narrative potential. In this sense, they embody foundational narrative potential in their design. This term encompasses non-playable characters (NPCs), playable characters (PCs) and other dynamic entities.

Playable characters are expressive agents but also semiautonomous agents. They are partly controlled by their players, and partly controlled by context-sensitive action potential and expression possibilities as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW they inhabit.4

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4For example, in World of Warcraft (2004), a PC who is afflicted by the spell ‘Fear’, runs for a few seconds while it is impossible for a player to stop the PC running, do anything else, or even control the direction of the running. The triggering of the fear-reaction in a PC may be done by another PC or by an autonomous character in World of Warcraft.
2.3 Text Levels in Virtual Game Worlds

When discussing story construction in the context of computer-based systems such as VGWs, it is useful to divide story and narration into different levels as shown in Figure 2.2. This way it is easier to communicate where in the structure something may be implemented, and what implications a new feature may have, e.g., for authoring rights and persistence. For instance, few designers would give creation rights to players on the code level because a change on that level would change the rules of the whole game world. Note that these levels refer to different layers of text, not to software architecture design.

<table>
<thead>
<tr>
<th>Designed narrative potential</th>
<th>Played narrative potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code level</strong></td>
<td><strong>Story level</strong></td>
</tr>
<tr>
<td>Engines, framework and</td>
<td>The overall story or</td>
</tr>
<tr>
<td>game programming</td>
<td>back story</td>
</tr>
<tr>
<td>These together manifest</td>
<td>The deep structure</td>
</tr>
<tr>
<td>the geographic structure</td>
<td>consisting of the</td>
</tr>
<tr>
<td>as well as the conditions</td>
<td>individual expressive</td>
</tr>
<tr>
<td>for the deep structure of</td>
<td>agents and static</td>
</tr>
<tr>
<td>the narrative, the overall</td>
<td>story elements. At the</td>
</tr>
<tr>
<td>story and its construction.</td>
<td>discourse level manifest</td>
</tr>
<tr>
<td></td>
<td>the overall story, possible</td>
</tr>
<tr>
<td></td>
<td>side-stories and separate</td>
</tr>
<tr>
<td></td>
<td>independent stories.</td>
</tr>
<tr>
<td><strong>Discourse level</strong></td>
<td><strong>Narrative level</strong></td>
</tr>
<tr>
<td>The continuum of play.</td>
<td>The narratives</td>
</tr>
<tr>
<td>The current dynamic</td>
<td>told about the actions</td>
</tr>
<tr>
<td>states, experienced</td>
<td>and events in the</td>
</tr>
<tr>
<td>events, movements and</td>
<td>game world. The narratives</td>
</tr>
<tr>
<td>actions of the expressive</td>
<td>are told both in-game and</td>
</tr>
<tr>
<td>agents that result in</td>
<td>out-of-game.</td>
</tr>
<tr>
<td>sequences of events: the</td>
<td>actual story, or discourse.</td>
</tr>
<tr>
<td>actual story, or discourse.</td>
<td></td>
</tr>
</tbody>
</table>

Practically, these different text levels, and thus the narrative potential of the world are usually created by persons having different roles as shown in Figure 2.1: the code level is written by software engineers, the story level by game designers and
writers, while the discourse level and the narrative level are performed by players, game masters and sometimes live teams.

2.3.1 Code Level

The code level itself can generally be divided into three software layers as shown in Table 2.3. The bottom layer is the engine which consists of very general functions such as network and communication systems, the rendering of the system's interface, the sound system, the interface for animation, the handling of the terrain, the dialogue system, the media storage, and the physics system, which governs gravitation, forces, collisions and collision response.

<table>
<thead>
<tr>
<th>Scripting</th>
<th>Detailed programming/scripting of individual objects specific to a game.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framework</td>
<td>- Abstracted model of a game world and system.</td>
</tr>
<tr>
<td></td>
<td>- The glue between scripting and engine(s.)</td>
</tr>
<tr>
<td>Engine</td>
<td>May include:</td>
</tr>
<tr>
<td></td>
<td>- physics system;</td>
</tr>
<tr>
<td></td>
<td>- graphic rendering system;</td>
</tr>
<tr>
<td></td>
<td>- dialog system;</td>
</tr>
<tr>
<td></td>
<td>- media storage;</td>
</tr>
<tr>
<td></td>
<td>- communication layer.</td>
</tr>
</tbody>
</table>

Above this there is the framework of the game, a layer of abstract representations of the game’s structures such as classes of game agents, classes of behavioural control and systems for action control and communication. The engine is usually general and may be used in various game genres, but the framework tends to be more specific for its genre, implementing a generic game system.

Above the framework there is the scripting, that is the specific game programming,
which mostly consists of data and the instantiated definitions specific to the given
game. These layers are co-ordinated to bring forth the media that become visible
and audible to players, such as environments, characters, dialogues, music, sound
effects and graphical user interfaces. In terms of MUD-based virtual worlds, the
engine layer, the framework and the scripting layers are often called driver, mudlib
and world model (Bartle, 2003, p. 44). There are a number of major code-bases that
have been developed for creating textual virtual worlds. Each of these represent a
certain game-play paradigm and has historically provided both game designers and
players with norms of how a virtual world is ‘supposed to function’. Bartle (2003)
describes the code-bases and what types of game-play they may result in, in terms of
combat, common mythos and persistence of player-created content. It is important
to be aware of the implications that a certain code base have for resulting game-play
and the conditions for creating narrative potential in a game world.

The divisions of layers within the code level are very general, the details being
different from architecture to architecture. Sometimes the layers can be derived from
the production team structure: a game-engine group is assigned to create the engine
layer, another group writes the framework and undertakes game programming. In
many virtual worlds, players take an active part in game programming by scripting
behaviours for objects they are responsible for. This is the case in many text-based
virtual worlds, one of the most famous of these being LambdaMOO. Cherny (1994)
shows an early example from LambdaMOO of how players program personal and char-
acteristic behaviours for their avatars that can be triggered by keywords typed by
other players. This is usually referred to as scripting, which has been developed much
further in later graphical virtual worlds, most notably in the social virtual world Second Life (Linden Lab, 2003) and the VGW Star Wars Galaxies (Lucas Arts, 2003). In text-based VGWs, players are in many cases granted more freedom to script, that is, they are able to build features that have a larger impact on the rest of the virtual world. This happens because many of these worlds are non-commercial and build upon common efforts from players and developers (which may be the same persons) for survival. To illustrate the relationships between the different layers in the code layer one can compare the building of virtual game worlds with the construction of the physical world. Game engines are then the equivalent of the physical laws that are common to different planets. On each planet the framework is analogous to local conditions providing the foundation for the biotope on that planet. The individual classes in the framework or in the descriptions of the object types are the equivalent of genetic codes. At the level of programming games these genetic codes are combined with data specific to individuals, comparable to individual DNA sequences.

2.3.2 Story Level

At the story level, summarised in Table 2.4, are the deep structures of the potential stories. At this level, the individual expressive agents as well as the dynamic and static story elements are designed. This can include driving forces, goals and specific abilities under certain circumstances for each individual entity. At the discourse level, these entities manifest actual stories via performed actions.

The story level also includes back-story, the explicit storytelling by the game designers. The back-story often has a branching structure where parts of it can be mandatory for the player to traverse through in order to progress in the game world.
The sometimes mandatory nature of what a player needs to experience is in Koster’s terms a type of impositional narrative, which was juxtaposed towards the expressive narrative. The impositional stance is used most strongly in single-player adventure games and hypertext narratives, where the overall story and its content is fixed, even though, when experienced, there can be variations in the chronology and quantity of the sequences that make up the story. In VGWs there is often a mix of different story construction techniques. Both Asheron’s Call 2 (2002) and Star Wars Galaxies (2003) are good examples of game worlds that contain mixed strategies, from the totally linear to the emergent, that is, from the impositional to the expressive.

In Asheron’s Call 2 there is a linear story arc which is mandatory for players to go through in order to be able to get to new geographic areas in the game world. The VGW Star Wars Galaxies is an example of a world where players can perform quests that are implemented as linear narratives, but they are not mandatory for the development of PCs. In general, VGWs mix impositional and expressive story construction, the expressive stance being inherent, deriving from the code level and implemented in the story level, giving dependencies, constraints and affordances in the world that govern what agents and PCs are allowed to do depending on their states. It is in this way that expressive agents are inhabitants in the world.
The Deep Structure

Even if not all games contain a story as films, plays and novels do, they all contain a deep structure. Games like chess and solitaire contain deep structures; there are goals, driving forces and constraining rules for achieving the goals. In these examples though, the goals that drive the mechanics of game-play are part of the predefined conception of the game. This is not always the case in VGWs, where the players may define their own goals that are not always be foreseen by the designers.

The concepts of deep structure and surface structure are used by Greimas (1966) and summarised by Rimmon-Kenan(1993):

> Whereas the surface structure of the story is syntagmatic, that is, governed by temporal and causal principles, the deep structure is paradigmatic, based on static logical relations among the elements.

Greimas’ Actant Theory models static relations as relations among actants. Actants are entities that accomplish or submit to an act. The number of actants is six in Greimas’ model, see Figure 2.5.

![Figure 2.5: Greimas’ actants](image)

In a story where a PC meets a wizard who wants a scale from a dragon, the actants would be divided as shown in Figure 2.6. The model is presented from the PC’s perspective, who thus becomes the subject of the model. The PC receives a quest
to bring the scale of a dragon to the wizard, who is an NPC. The PC asks a friend (another PC) for help to slay a nearby dragon, and the pair sets out to defeat it. When the dragon is slain the PC grabs a scale from the body and gives it to the NPC Wizard. The PC is rewarded with a small sum of money and experience points. The overall game design paradigm of virtual game worlds — to receive points to develop their own PC might be the goal of the player. The player helping out though might have different reasons for partaking in the activity; it can be altruistic, to return a favour, or maybe the expectation that the helpful act may be reciprocated in the future. The goal of the wizard is scripted into the scenario, that is, to receive a dragon’s scale, while for the dragon it would be not to be killed. These ‘goals’ of the NPC and the dragon are not as faceted as those of the PCs, and from a systemic point of view they are rather programmed conditions that facilitate the actions by the players. Actants can, just as expressive agents, include non-human beings, but actants can also be what can be called static story elements, such as inanimate objects (e.g., a magic ring) and abstract concepts such as ‘destiny’.

![Figure 2.6: An actant model in simple scenario](image)

In *Fundamentals of Story Logic*, Therese Budniakiewicz (1992) points out that the position of the object in the model has a double function:

> The positional value of the Object is doubly defined by the convergence
of the actantial axes: both as an ‘object of desire’ and as an ‘object of communication’.

Budniakiewicz reminds us that for Greimas the actant model and the actant grammar are foremost ways to extrapolate syntactic structure.

How can this be of use when discussing story construction in VGWs? Actant theory is a conceptualisation that breaks down the parts of a story into the force fields that make it possible for the narrative to come into existence. By applying this way of looking upon expressive agents and static story elements it is possible to more clearly define the forces that, in Greimas words, make up ‘the semantic syntax’ or the micro universe that a game world and the overall narrative consist of.

This perspective becomes especially interesting when applied to live-action role-play (LARP) and VGWs. In LARPs and VGWs the discourse is made up of an execution of these interacting forces. This can also be said about BRUTUS, a storytelling machine, a system which functions as a sophisticated narrator and uses a formal model of betrayal; this system does, however, not accept user-input (Bringsjord & Ferrucci, 1999). Starting with this model it is possible to break the larger units into smaller components with clearly defined functions. Budniakiewicz writes of two large classes:

The two big classes which make up the ‘semantic syntax’ are the actants and the predicates; they combine with each other to form the semantic and thematic kernel or nucleus of a textual micro-universe. The predicates are divided along the static vs. dynamic binary opposition: Function [...] designates the dynamic predicate and Qualification [...] the static predicate.
In terms of story construction for VGWs the semantic syntax would be translated into what functions are possible for a certain class, or type of agent, and what state or states the agent must be in to execute each function. If this way of thinking is applied to the text layers previously sketched in Section 2.3.1 at the code level, it would be manifested in the framework layer as well as in the scripting layer. In the framework, agent-type properties and functions are defined. The conditions for use of the functions can be defined both in the framework layer and in the scripting.

Typical for a story-driven computer game is that players perform a series of quests which are added one by one to the PC’s story discourse when it has been performed. Most single-player story-driven games that have an overall story have a similar structure to that of the folk tales systematised by Vladimir Propp (1968). Usually a story starts with something in the game’s microcosm being out of balance. The hero of the story, or the subject, is given a quest and is thereby contracted to either solve the overall lack of balance in the world, or to take the first step on that path. Usually the hero is also put through a qualifying test to prove his worth in recreating balance. After this, the hero may perform a number of minor quests before finally performing the main quest that restores the balance. In many story-driven games this last quest consists of defeating the main antagonist in the fictional world, the entity threatening the balance. This is often called the final boss-fight, where ‘boss’ is a powerful enemy that is difficult to defeat. After the final fight the microcosm of the game world is saved, the hero has succeeded in performing the overall quest and the PCs, and supposedly also the player’s, motivations are neutralised.

Vladimir Propp’s pioneer work *Morphology of the Folktale* explains that the typical Russian folk tale is built around seven types of person (or more specifically; spheres
of action corresponding to performers), namely:

- The Villain
- The Donor
- The Helper
- The Princess (and her father)
- The Dispatcher
- The Hero
- The False Hero

The names of the people who contain these functions differ from tale to tale, but the actions they perform are always the same. A function can, in Propp’s words, be ‘understood as an act of a character, defined from the point of view of its significance for the course of the action.’ The fixed number of possible functions is thirty-one. Not all of these are necessary in the same story, but where they occur they always have the same sequential order.

The restorative three-act structure used in motion pictures also follows a chronological sequence of events, focussed around the main character in the tale (Danzyger & Rush, 1995). The narrative is seen to be divided into three acts, where the first is the set-up of the drama, the second contains a confrontation and the third involves a resolution. Each act rises to a point of crisis, a plot point. It is the central character who gets into conflict and needs to make a choice. The restorative model is based upon the Hero’s Journey. Also, here is a strict chronological sequence of events, and a concentration around the main character, the hero. The true character and development of the hero are shown by a series of situations where the hero is acting under
pressure. The hero is said to have a character arc, which corresponds with the expression individual story discourse. Figure 2.7 shows Freeman’s interpretation (2003, p. 121) of Luke Skywalker’s character arc in the screen play Star Wars, Episode IV.

![Character arc adapted from Freeman](image)

**Figure 2.7: Character arc adapted from Freeman**

The other characters in the narrative also have character arcs, but their main functions are to have a function for the hero, not for themselves. The roles are called character archetypes and are as follows:

- The Hero
- The Mentor
- The Higher Self
- The Allies
- The Shape Shifter
- The Threshold Guardian
- The Trickster
- The Shadow
- The Herald

In multiplayer games it is not possible to have meaningful game-play for all participants if they all have the role of the hero, nor if they are all merely functions for a single hero. This is discussed further in Section 3.9.
CHAPTER 2. STORY CONSTRUCTION IN VIRTUAL GAME WORLDS

Action, Event, State and Antecedent Driving Forces

In the context of story construction it is necessary to make clear distinctions between action, event and state, and in this way to be able to distinguish what implications an action has for one or several states. What states are affected depends upon an action’s direction and sender. Greimas (1990) defines the distinction between action and event in the following way:

Whereas action is dependent only on the subject concerned with the organisation of his activity, event can be understood only as the description of this activity by an actant external to action.

An action is, according to these terms, dependent on the subject that performs the action or activity. An event, on the other hand, is a description of the same event when the description is performed by an actant standing outside of the performed action. A state is held by an agent and is a result of all actions performed by the agent itself and by the actions performed by other agents aimed directly or indirectly at the first agent.

Budniakiewicz (1992) asks what it means when someone says that ‘we do’ something. She means that verbs are ‘unpacked’ to make descriptions of antecedent states when someone contemplates an expression of ‘something done’. Even though Budniakiewicz, just as Greimas, primarily studies syntactical structures, this terminology is useful in the current context. Budniakiewicz puts it in the following way:

These antecedent states are the wants, the goals, and plans of the agent which are interconnected in a peculiar pattern of reasoning used by the agent both before and during the performance of action, when the agent
is said to ‘be doing’ something. The reasoning has been named in traditional Aristotelian commentary a practical syllogism or inference.[...]

Let us look at what a schema of this kind works out:
Major premise: N wants to do O / bring about O.
Minor premise: N considers that he cannot do O unless he does P.
Conclusion: Therefore, N sets himself to do P / does P.

It is worth noting what an application of the example with the wizard and the dragon would look like in these terms. The reward from the wizard is experience points that a player can use to further develop and refine the PC - an overall goal in the generic VGW. N (the player) wants O (reward from wizard). N realises that he cannot get O if he does not do P (kill the dragon). Therefore N decides to do P.

The PC’s antecedent driving-force consisting of a will to get further in the game results in a quest structure where he or she decides to kill the dragon. The concept of antecedent driving-force differs from the current state in that the antecedent driving-force represents the expressive agent’s initial driving-force, while what is generally called state is a result of the conditions stored in the agent during the progression of the game that limits, gives freedom to act and possibly adds new driving-forces to the agent.

Ragnhild Tronstad (2001) discusses what constitutes a quest and how only after its completion it becomes a story. For her, what constitutes the motivation for solving a quest is the search for its meaning:

To do a quest is to search for the meaning of it. Having reached this meaning, the quest is solved. The paradox of questing is that as soon as
meaning is reached, the quest stops.

In a VGW the PCs who perform quests within the rules of the game are governed by the antecedent driving-force constituted by their long-term goals, plan or will. Tronstad argues that when the goal is reached, or the plan is carried out, or its will is satisfied, the driving-force of the agent is neutralised.

### 2.3.3 Discourse Level

Discourse, in the context of virtual game worlds, is the sequence of experiences (expressed by signifiers in the game world) that an expressive agent, whether it is a PC or an autonomous agent, goes through. The individual story discourse emerges simultaneously with an agent’s activity and movement in the world.

<table>
<thead>
<tr>
<th>Table 2.8: Discourse Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual Story Discourse</strong></td>
</tr>
<tr>
<td><strong>State</strong></td>
</tr>
</tbody>
</table>

It is in the discourse level, summarised in Table 2.8, that the state of the expressive agent evolves. A class (in terms of software) describing the type of the agent also describes what types of action are possible for the agent to perform and the possible basic obstructions against performing them. This constitutes the action potential
of the agent. When the agent is instantiated for the first time, it contains its first conditioned state. The state of the agent changes depending on its own actions, what actions are aimed at it by other agents and objects. The state can also change depending on influences by other elements specific to a VWG.

2.3.4 Narrative Level

The narrative level consists of tales told about events and actions in the world. An example would be a player telling someone about something that has happened during play. This narrative does not necessarily need to be told in the VW. In fact most of these tales can be found through channels that support the game, such as web forums. Most VGWs’ live teams write regular newsletters about what is happening in the world and have official web sites where this history is gathered and edited. It is common that the official web sites of VGWs have sections dedicated to players’ narratives that in some cases are fictional or narratives about what a player has experienced via her character, told from the character’s point of view. The most massive resource of documentation of the history of a world is the players’ diaries and forums on the web sites of different guilds. It is also common for whole guild histories to be written by the most active players in a guild, highlighting marriages, wars that have been won and other important happenings.

The developers of the social virtual world Second Life, Linden Labs, hired the journalist James Wagner, who since 2003 has reported on trends and happenings that were taking place in the virtual environment (Wagner, 2003 - 2009). Lisbeth Klastrup has in her project ‘The Death Stories Project’ (2006) chosen one of the most dramatic events that can happen to a game character: death. Through a web form
she gathers narratives from players where death experiences are described. Part of the goals of the project is to find suggestions that may help designers to ‘become better at designing worlds which give players experiences they want to tell stories about.’

In some virtual worlds it is possible to leave individual marks which become part of the world’s history. One example is A Tale In The Desert (2003) where players of the first version of the game built monuments that will bear the players’ marks in the second version of the world.

2.4 The Open narrative Structure of Virtual Game Worlds

In comparison to single-player story-driven games, VGWs have a more open narrative structure because players are more free to act according their own motivations and formulate their own goals. Single-player adventure and role-playing games, movies, novels, and multilinear interactive narratives have in common that they are closed narrative systems in the meaning that the plot, the goals, and the antecedent driving forces are fixed, their nature having been decided by the creator(s) of each work. This is also the case for systems that generate narratives, such as BRUTUS, the story-telling machine described by Bringsjord and Ferrucci (1999); the antecedent goals and driving forces are set before story generation starts.

VGWs are different by being open narrative systems in the sense that players can add external goals and driving forces to the world. These goals can be both inspired from the world fiction, or have another origin, such as personal preferences.
2.4.1 Goals and Motivations

It can be argued though that goals can also be seen as motivations. I want money. Therefore, I have the goal to earn 10 million credits in Star Wars Galaxies that I can sell on Ebay. Or, I want to go travelling to participate in tournaments. Therefore, I have the goal to become very skilled at playing a particular game. Motivation is a broader and more intangible concept than goals deriving from motivations. Richard Bartle’s (1996) four player-types (the achiever, the socialiser, the killer and the explorer) and Nick Yee’s (2002a) five facets of player’s motivations (relationship, immersion, grief, achievement and leadership) provide guiding principles for major player-motivations that can be regarded as sources that define goals for individual players and groups of players. There is a risk of mixing up motivation, preferred type of activity and goal-setting. Taylor (2003) shows that dynamic goals set by an individual player often lead to a very diverse set of activities. For example, it is difficult to be successful in a massively multiplayer game as a lone achiever or explorer — a high level of success is dependent on a large social network and good reputation. One cannot take for granted that goals are achieved by in-world achievement. For instance, suppose that a motivation is to have the status of a hero and the goal is to be a Jedi in Star Wars Galaxies. To be a Jedi in Star Wars Galaxies means true hero status and as such it also has monetary value. Without going into issues of meaning, value or cheating, clearly the goal of becoming a Jedi can be achieved by out-of-game activities that provide money, which in turn can be used for instant achievement in a virtual world. The remainder of this section gives a few examples of common goals that are not derived from the fictional content of a VW.
Power levelling

Taylor (2003) proposes the power gamer as a specific player type. Based on ethnographic studies and interviews done in EverQuest she describes dynamic goal-setting as one of the distinguishing features of the power gamer. For example, a player might aim to reach level 50 in three weeks.

Guilds with a cause

Sometimes guild leaders and players who organise other players formulate, together with a larger group of players, more long-term goals, such as waging wars on another guild. This is the case in Lineage, for example. In Star Wars Galaxies it is not uncommon for a guild to decide to help one player to become a Jedi, which is a more powerful type of PC (in terms of the game rules in the world) than the PC that all players create when they start playing a game. In order to acquire a Jedi-type character a lot of effort and time needs to be invested. In World of Warcraft (2004) a common goal for guilds is to successfully do raids. Groups of up to 40 players enter an instance, to face difficult challenges. The term instance comes from each group or party having a separate copy or instance of an area, complete with their own enemies to defeat and their own treasure or rewards.

These goals, formulated by individuals, are most often inspired by the fiction and the rules of the specific game world, but indirectly. When these goals are being formulated, agreed upon and striven for they are adding to the narrative potential in the world.
Real Money Trading

The goals of individual players are not always inspired by the game world itself. High-level PCs, rare items and game specific currencies (‘game money’) are possible to sell and buy using real money. For some players it is a purely economic interest in achieving certain goals.

Professional Gaming

Another type of goal inspired by circumstances outside VGWs is that of professional gaming in the form of competing in tournaments. This occurs mostly in multi-player games in the first person shooter genre. Pedersen (2002) shows that one of the dreams of being a professional gamer is to travel and compete in tournaments.

Bartle’s and Yee’s player and motivation types are mostly concerned with activities that are within the domain of the VWs, but those motivations and goals - depending on factors outside the VGWs - are just as important, because the actions performed achieving them become part of a VGW just as all other actions.

2.4.2 Enlarging the Paradigm of Virtual World Game Design to Accommodate Varieties of Goals

No matter what comes first for players when they dynamically sets goals, preferred activity or motivation, no matter if those derive from the world design or from motivations outside the game world, it can be argued that narrative systems in a VGW are open to goals defined by other persons than the originators of the worlds. This is, from the aspect of story structure, the feature that most distinguishes virtual game
worlds from other types of media where narrative is a prominent aspect. Virtual worlds as places support the emergence of stories. Emergence in this context means the emergence of a higher-level structure from the interaction of many simpler, lower-level primitives. In this case, emergent narrative can be understood as a system in which lower-level elements interact to result in the emergence of a pattern of events that may be told about in ways conforming to a specific higher-level pattern of narrative structure. The originators of the high-level narrative in these cases are people active within the world, especially those who take part in planning long-term goals or plans that result in sequences of events that lead to the achievement of the goal or fulfilment of plans, such as players, live teams, game masters and guild leaders.

VGWs are also open to narratives in different forms in the way that the history of the world is told in various ways and from many perspectives as mentioned in Section 2.3.4. Examples include accounts from journalists participating in the world, developers’ additions to the back-story of the world, and diaries of PCs, written by their players.

2.5 Summary

In this chapter VGWs have been discussed as spaces for construction of narrative potential. Terms used in this thesis have been introduced; story, narrative, discourse, narrative potential, agency and story construction. Expressive agents and semiautonomous agents, created and controlled by developers, in-game creators and players, were introduced as constructors and realisers of narrative potential. A four-layered
model of text levels in VGWs was described, where the Code Level and the Story Level were recognised as the levels where the designed, or authored, narrative potential is created. The played narrative potential is created at the Discourse level and the Narrative level. The story construction is performed at the Story level and the Discourse through persons using expressive agents for signification. Finally, the open story structure of VGWs was discussed by providing examples showing that the narrative potential is affected by a multitude of goals of which many are derived from motivations outside the narrative potential authored by the worlds’ creators.
Chapter 3

Characterising Action Potential

Contents

3.1 Introduction ............................................. 44
3.2 The Playable Character - focus, focaliser and concentrated mirror of a world. ................. 46
3.3 Characterisation and True Character ............... 46
3.4 Role-play and Game-play ............................ 48
3.5 Second Selves and Identity .......................... 50
3.6 Immersion, Presence and Persona ................... 52
3.7 Characterising Action Potential ................. 56
3.8 Characterisation in VGWs ......................... 57
   3.8.1 Character Creation ............................ 58
   3.8.2 Observable Characteristics ................... 59
   3.8.3 Expression through Dialogue and Emotes ........ 61
   3.8.4 Observation of Behaviour ...................... 63
3.9 True Character in VGWs ........................... 64
   3.9.1 Faces of a Thousand Heroes .................. 65
   3.9.2 The Player’s Journey as a Route to Self-Knowledge .... 66
   3.9.3 True Character .................................. 67
   3.9.4 Supporting Expression of True Character via Game Mastering 68
   3.9.5 Supporting Expression of True Character via the Framework of Game Rules .............. 70
3.10 Summary .............................................. 72

43
This chapter discusses characterisation in games with a special focus on the conditions for character and identity development in virtual game worlds (VGWs), of the type massively multiplayer online role-playing games (MMORPGs). Also, the concept of characterising action potential is discussed.

### 3.1 Introduction

As mentioned in the introduction of this thesis, there are a few aspects that are striking about VGWs, making them unique and different from other forms of art. The previous chapter discussed how the openness of the story structures inherent in the form makes it possible for players to add their own goals to game worlds, which results in added narrative potential in the world. This chapter focuses more closely upon characterisation — the core of good storytelling. In a VGW, playable characters (PCs) are in effect characterised by different persons who play. This may be compared with how, in fiction literary authors describe how their characters when ‘come to life’ driving the story; in VGWs there is similar situation, but the characters are alive, controlled by real people — players.

Characterisation is one of the tools that students in any narrative art form learn about in the very start. This, however, is about describing other characters to an audience, viewer, player or reader. In VGWs it is different — all players characterise their own PC, that is, in-game representations of themselves, or of authored characters performed through role-playing.

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1. An early version of this text was published as the chapter The Player’s Journey in the anthology Digital Gaming Cultures and Social Life (Eladhari, 2006).
While much has been written about development of identity in virtual game worlds (e.g., Bruckman (1992), Turkle (1995)) there is so far not much material approaching the development of own fictional identities - PCs - from a poetic-aesthetic perspective. It is necessary to recognise not only the creation of VGWs as an art, but also that playing is an art in itself, providing performances both for individual players and for the virtual society of the specific game world.

Can one talk about characterisation at all if it is not a performed identity or role, but instead a real identity expressed within a fictional setting? Can one talk about ‘true character’ when the character in question is a real person, set in a fictional world, expressing an identity which may or may not be fictional, who may or may not be role-playing while performing it? This chapter draws upon thoughts from Bartle about the concept of persona (2003), from McKee about the notion of true character (1997), from Campbell’s concept of the Hero’s Journey (1949), from Fine’s thoughts on role-playing versus gaming (1983) and of Schubert’s (2001) approach to presence for exploration of these questions. Particular focus is set upon possible ways to use characterisation to create more meaningful dramatic experiences and to deepen the possible immersion into a game world via closer identification with a player’s PC. Methods for game-mastering may be one way, and evolved rule-sets and possibly autonomous functions for PCs may be another.
3.2 The Playable Character - focus, focaliser and concentrated mirror of a world.

In a VGW, PCs are not only vehicles for movement or characterisation of the PCs, they are also the functional cores of each individual play experience. PCs are both the focus and the focalisation point, that is, the point to focus from.

Players see the world through the ‘eyes’ of their PCs - their focalisation point. When other players look upon a PC it is the representation of a player they focus on. Furthermore, the state and nature of a PC that controls what a player can or cannot do at any given moment. From a design and engineering point of view, a PC represents all effort to build the whole game world system, all of its functionality boiled down to be used by one super- or base class that is the one the player will use. For players, the properties of their own PCs set the perspective on the execution of the whole piece, how the world is set into moving, living, changing, to add to its society, its dramas, its norms, its webs of social networks, its layout and architecture and to the world soul that is the synthesis of all pieces functioning together.

A PC is a concentrated mirror of the world — a small mirror that reflects the whole world. It is not only an interface; the whole action potential of the PC is a reflection of the game world system. How PCs are engineered and what possible states, abilities and properties they can have is wholly dependent on a VGW’s mechanics.

3.3 Characterisation and True Character

Characters and characterisation are central in VGWs. But what is characterisation in VGWs? McKee (1997, p. 100) distinguishes between characterisation and true
**CHAPTER 3. CHARACTERISING ACTION POTENTIAL**

(character) in screen plays, defining characterisation as what is merely observable:

Characterisation is the sum of all observable qualities of a human being, everything knowable through careful scrutiny: age and IQ; sex and sexuality; style of speech and gesture; choices of home, car, and dress; education and occupation; personality and nervosity; values and attitudes—all aspects of humanity we could know by taking notes on someone day in and day out.

All these things mentioned in McKee’s text applied to a game would be what there is to see and note about another PC or about a non-playable character (NPC) fairly easily by having a few conversations and perhaps teaming up once or twice for common causes, like hunting or questing. True character, on the other hand, would not be perceived so easily. According to McKee (p. 101):

> [...] true character is revealed in the choices a human being makes under pressure—the greater the pressure, the deeper the revelation, the truer the choice is to the character’s essential nature.

In order to see the true character of another PC inhabiting a VGW, a deeper long-term relationship is needed. In most cases these are friendships, but they can also be love relations, curious obsessive enmities, or other relationships that are more than acquaintances. In relation to us as humans it is not uncommon to ask oneself what one would do in a critical situation. Would I deceive my friends under pressure of losing my own life? If I am in an immediate life-threatening situation, would I panic or would I act with rational urgency? Persons who have been in critical situations often reflect upon their behaviour afterwards and feel that they gain more knowledge about
themselves when they know how they have reacted. It is not uncommon to receive information about this via media in the reporting of dramatic and tragic events such as when the ship Estonia sank in the Baltic Sea, when the Titanic sank or when the twin towers in New York were destroyed.

3.4 Role-play and Game-play

In the context of VGWs, a question that arises is whether the true character shown in a VGW is the true character of a PC or of a player. At most times what is shown is probably the true character of a player. The reason for this is that most players of VGWs do not role-play, they rather play themselves in another world than playing a fictive character.

Gary A. Fine conducted a sociological study of players of pen-and-paper role-playing games in the early eighties (1983). Fine distinguished between two types of players: gamers and role-players. A gamer plays the game as himself, while a role-player plays a character, wishing to lose himself in the fictional fantasy.

According to Fine, the gamer uses gaming as an extension of self, motivated by the question ‘Would I survive under these circumstances?’ A role-player makes a conscious effort to characterise the character he or she is performing, in a similar way that an actor would, except that there is no audience to make an impression on apart from fellow role players. This conscious act of characterisation of the PC is by role-players seen as a vital part of the experience role-players create together.

A gamer, as defined by Fine, does not make a conscious act of characterising his PC, but from a systemic point of view uses the same tools for expression as a role-player. The gamer’s play tends to be more oriented to succeeding in the game
scenario than in the role-playing. In Fine’s study it was younger, less experienced players who played as ‘themselves’. For role-players the emphasis on the role was much greater, to the point of players claiming to be ‘another person’ or ‘schizoid’.

Players of contemporary VGWs mostly play as ‘themselves’. This does not mean, as it was in Fine’s study, that they are less experienced as players. VGW players often use places in VWGs as local pubs, or in Oldenburg’s sense ‘third places’ (1989), spending on average 20 hour per week (Yee, 2002b) in their VGW of choice, in company with other players. Role-playing requires a conscious effort from the player, and few have the energy to role-play all the time, unless they only enter the VGW for that specific purpose. Players who wish to role-play in a VGW usually do it in ‘sessions’ — that is, a group of players plan for times and locations in the VGW where they meet to role-play, often in line with a theme or a story-line written by members of the group (Sveinsdottir, 2006).

In VGWs the act of role-playing and characterisation of a fictional PC is part of a shared agenda agreed upon by a group of players. If the shared agenda and agreement of creating a common role-playing experience would be taken away, and a player would role-play, this might be seen as acting with pretence and even lying. Player who are not role playing still make impressions via their PCs and are probably conscious of how other individuals perceive them.

Copier (2007) noted that role-play in current VGWs mostly relies on meta-game rules because role-play is hard to capture in a system. In fact, Copier described a specific VGW role-play style as characterised by negotiation of principles of these meta-game rules.
3.5 Second Selves and Identity

We may in the real world, in Goffman’s (1959) sense, consciously create certain appearances to make a certain impression, but we do not talk about characterisation. Characterisation is a concept strongly tied to pre-authored fiction. Methods for characterisation are taught in contexts of learning to characterise characters in screen plays, novels and games. It is possible to argue that VGWs are fictional, and therefore all types of expression of information about a certain PC must be seen as characterisation. However, many players see the time that they spend in a VGW as a parallel reality. Especially the relations with other players are perceived as ‘real’.

For many players spending time in a VGW becomes a part of their everyday life. Oldenburg (1989) describes three types of social place, where the home is number one, work is number two and the local pub or village square is ‘the third place’. People go to the third place to socialise with other people. According to Oldenburg, this has many good effects for the individual and the community, but the primary reason for going to ‘the third place’ is not to do something useful, but to have fun and relax. In contemporary societies not everyone has a natural place such as a local pub or village square to go to. For many, VGWs contain such third places.

How different is it to get to know someone in a VGW compared getting to know someone in the real world? In the real world, people are constrained and defined by the properties they were born to, such as gender, appearance, health and conditioning by social class, culture, environment, family and numerous other circumstances. In VGWs players are instead constrained by rules and mechanics and of the norm systems that have emerged in them. It is possible to compare this to moving to another
country in the real world. Old constraints can be exchanged for new ones. In *Life on the Screen* (1995) Sherry Turkle describes how she felt like a different person when she lived in France. She became the ‘French-speaking Sherry’ who (p. 209):

 [...] was not unrecognizable, but she was her own person. In particular, while the English-speaking Sherry had little confidence in being able to take care of herself, the French-speaking Sherry had to and got on with it.

Fine (1983) stated that a role-player aspires to ‘lose himself to the fantasy’, and that this great emphasis on the role leads to a point where the player can claim to be ‘another person’.

VGWs have for a long time been considered as arenas for experimentation with one’s own identity. In the early 1990s Turkle (1994) studied how players could use MUDs for identity construction, stating that (p. 158):

There is an unparalleled opportunity to play with one’s identity and to ‘try out’ new ones. MUDs are a new environment for the construction and reconstruction of self.

Bartle, co-author of the first MUD (1978), stated that ‘Virtual worlds enable you to find out who you are by letting you be who you want to be’ (2003, p. 160). In Bartle’s view, which I share, development of identity is the core point of VGWs (2003, p. 159):

Celebration of identity is the fundamental, critical, absolutely core point of virtual worlds.
In VGWs, characterisation of one’s own PC and development of identity are interconnected. Identities - the concept of identity means ‘one’ — is in VGWs often expressed through several roles, through several virtual bodies. Just as the multitude of roles we have in the off-line reality due to differentiation in contemporary society the online roles and second selves of players can be many.

### 3.6 Immersion, Presence and Persona

The level of immersion and presence in a game world is an important aspect of the identity via which the world is experienced. Bartle has described the representation of a PC in terms of levels of immersion from avatar, to player character, to the highest level of immersion where the representation is a persona — a state where the player does not make a difference between himself and the character (Bartle, 2003). In Bartle’s taxonomy players would have avatars if they only use them as puppets to control as their representatives in the world. Players who regard the objects that they control as their representations in the world would have characters. The characters are extensions of players’ selves, whole personalities for players when they enter the game. According to Bartle, most players play at this level and often have several characters. In the most extreme state of immersion the object that a player controls is not seen as a representation; the player has the experience of being the object (Bartle, 2003, p. 155):

> A persona is a player, in a virtual world. That’s in it. Any separate distinction of character is gone—the player is the character. You’re not role-playing a being, you are a being; you’re not assuming an identity,
you are that identity; you’re not projecting a self, you are that self. If you’re killed in a fight, you don’t feel that your character has died, you feel that you have died. There’s no level of indirection, no filtering, no question: You are there.

Players who have a sense of really *being there*, in the game world have, in Bartle’s terms a *persona*.

Whether players role-play or play as themselves does not necessarily have any bearing on whether they develop a persona or not. For example, a role-player may develop a persona, and a player who plays herself can sometimes experience having a persona or role-playing. Common for these modes of play is that *players* are the ones who carry out both the characterisation of and the expression of the true characters of their avatar/PC/persona in a VGW.

The concept of immersion is tightly connected to that of presence. These terms are central in the research field of virtual reality (VR). As a psychological phenomenon *presence* is defined by Slater and Wilbur (1997, p. 605) as ‘a state of consciousness, the (psychological) sense of being in the virtual environment.’ *Immersion* is in this field described as ‘the extent to which the computer displays are capable of delivering an [...] illusion of reality to the senses of a human participant’ (Slater & Wilbur, 1997, p. 604). In studies of players’ experiences of digital games the term immersion is often used in a meaning close to that of presence; Ermi and Mäyrä, for example, prefer it ‘because it more clearly connotes the mental processes involved in gameplay’ (2005, p. 18).
Schubert et al. (2001) state that presence often is seen as a direct function or outcome of immersion. Immersion is in VR research often measured by making user tests in laboratory settings and retrieving feedback from the users by the use of questionnaires. By the use of common categories for measurements immersion is seen to be objectively quantifiable. The more ‘real’ the environment appears to users, the higher degree of immersion the user would experience. Schubert et al. stress (2001) that presence is, compared to immersion, a subjective experience, and not always in a one-to-one relationship to the degree of immersion.

By conducting several studies Schubert were able to show that presence involves (at least) two components: the sense of being located in and act from within the VE, and the sense of concentrating on the VE and ignoring the real environment. The experience of presence results, according to Schubert, ‘from the interpretation of the mental model of the VE, which is the outcome of the cognitive processes’ (2001, p. 268). Schubert argues, following Glenberg (1997), that ‘a virtual environment, like every other environment, is perceived and understood by mentally combining potential patterns of actions’ (p. 268) The representation of users is understood by what actions are possible to perform in the environment. Glenberg and Schubert call this process the construction of meshed sets of patterns of actions. Two types of pattern are distinguished: projections from the environment, and memory. The first type, the projections from the environment, are actions that follow the bodily constraints afforded by a virtual environment (VE). Schubert offers the example of walking over a narrow bridge, a bridge that the user is told can break. The act of walking over a narrow bridge is provided by the VE, while the potential act of walking carefully is provided by the prior knowledge, the memory, of having been told that the bridge
can break.

In VGWs, the action patterns projected from the environment are realised mostly through work done in the engine layer, and to some extent of that in the scripting layer in the code level described in Section 2.3.1. The action patterns projected from memory may be derived from the game-play mechanics affording potential actions based on the nature of individual PCs, something which in VGWs mostly is defined in the framework layer of the code level, but also to some extent in the scripting layer.

Schubert notes that ‘When users are present in a VE, the outcome of the cognitive processes can be conceptualized as a special type of mental model of the virtual space [...]’ (2001, p.267). In VGWs, where the nature of the action potential is based on the nature of PCs, the mental models of the world are likely to be highly individualised.

I propose that the nature of the action potential of PCs, as constructed meshed patterns of actions resulting in individual mental models of the VGW, is crucial for characterisation and the expression of true character in VGWs. Perhaps the expression of true character would help players to develop a persona — and thereby get a deeper and more meaningful experience of playing in and inhabiting a VGW.

Persona development could be considered as a desirable goal for virtual world design. An important step in this process is the first identification with the PC. The fact the PC creation is done by players themselves creates a sense of ownership from the beginning, comparable with an initiation ritual. Ideally, there is a deepening of the bond and the sense of identification of players with their PC.
3.7 Characterising Action Potential

The action potential of a character is what it can do at a given moment with it all the circumstances inherent in the context taken into account. The characterising action potential (CAP) defines what a character can do at a given moment that characterise it, both in terms of observable behaviour and in expression of true character — a character’s essential nature, expressed by the choices a character makes. The observable characteristics include visual appearance, what body language it uses, what sounds it makes, what is says, and most importantly, what it does and how it behaves.

Normally in VGWs the foundation of the CAP of PCs is chosen by players in the very beginning of the game, at the character-creation stage, where players choose gender, visual appearance, class and skills for their PCs. It is the choice of class and skills which will limit what the player can do in terms of game-play and what the PC may become particularity good at doing in the VGW. These skills normally define which roles players take in groups where players co-operate. A PC’s role in co-operation with others is important since it impacts other players’ interactions with a particular PC. Interactions with others become part of the player’s journey while creating the identity, possibly second self or persona, that the PC represent.

CAP is the means players have for expressing their personalities, or the character of their PCs, to other players, but it is also via CAP the players gets to know and develop their own PCs - a process which is an interplay between players and the game system. The design and architecture of CAP for PCs in VGWs is crucial for game-playing experience from many angles. The nature of the CAP defines what role and what impact a PC can have in the creation and realisation of the narrative potential in a VGW. It is also defining for the progress of the PC in terms of achievement.
and role-differentiation in a VGW, as well as for how this process is interpreted by players while potentially constructing alternate identities or second selves. How a PC and its CAP are integrated in the underlying story-construction system of a VGW determines to what extent PCs can make truly dramatic choices as part of the deep story structure of the VGW. If they can, the PCs truly are protagonists in the world. Furthermore the CAP has a profound impact on the role-playing possibilities provided to players — to what extent the role-playing activity is supported. In the next section characterisation in VGWs is discussed, followed a discussion of the expression of true character in VGWs.

### 3.8 Characterisation in VGWs

The characterisation (as what is observable) in VGWs of PCs is done by players within the game-play framework, that is the game mechanics and rule-set, provided by the developer of a particular VGW.

In this section, the characterisation of a PC is described using the following steps.

1. **Character creation**: a player’s configuration of a PC before entering a particular VGW and possibly also formulation of a fictional background story for the PC
2. **Observable characteristics provided in the VGW**
3. **Expression through dialogue and emotes**
4. **Observable behaviour**
3.8.1 Character Creation

How a character is created depends on the details of the specific game-play framework, but most virtual game worlds let a player choose between a range of different character types, referred to as classes. These are often of different races. An example of choice of profession and heritage group from the VGW Asheron’s Call (1999) is shown in Figure 3.1.

![Figure 3.1: Choosing heritage group and profession in Asheron’s Call](image)

After having picked a class, most MMOGs let players choose a main profession or skill type. Players may also choose a gender (often there is a neutral gender as one of the options for certain classes) and customise the appearance (e.g., skin-, eye-, and hair colour, height and build). Often different classes are better for certain professions, but usually the choice is free (a freedom that sometimes has a less efficient result for achievement within the game system if a sub-optimal race is chosen for a particular functional class; players refer to ‘gimped’ characters). The main skills chosen for a PC determine what the PC is especially good at. In a game this gives players a certain role in groups that are formed to do something specific, like a quest or a hunting
session. The groups usually need to be put together so that the group as a whole has the necessary skills and properties to succeed at a certain task. In many games, players can also change the properties of their characters. The properties are the game-specific properties that, for example, define how strong and fast the character is, and this is often combined with skill levels to determine how efficient a certain action is. For instance, if a player creates a character that is going to use a dagger as a weapon in *Asheron’s Call*, (1999) he or she will probably choose a high value for the property Quickness. If the player intends to create a character that will use magic in some form he or she will probably put high values on all properties that are related to the mind. These specific examples of using magic and daggers apply to VGWs in the fantasy fiction genre (e.g., *Asheron’s Call*, (1999); *Asheron’s Call 2*, (2002); *EverQuest*, (1999); and *Final Fantasy XI*, (2003)), but similar types of set-up are found in worlds having other genres, such as sci-fi (e.g., *Anarchy Online*, (2001); and *Star Wars Galaxies*, (2003)). A flaw of the character-creation stage is that players often need to decide on important properties before they have entered the game world, so at the moment of creation they do not know what will be important to them during game-play.

### 3.8.2 Observable Characteristics

When a player has entered into a game by controlling his or her PC, there are two dimensions to characterisation: firstly, how the PC can be perceived by other players, and, secondly, how the player perceives his or her own player PC. Other players can usually not see all of the properties of another player’s PC.
Suppose a PC (A) approaches another PC (B). Things that are visible and audible in close spatial proximity are usually the other character’s class, gender, specific physical appearance, motions and possible sound effects. In many VGWs it is also possible to target the character and receive a display of more information. Figure 3.2 is an example from Star Wars Galaxies, showing the screen representing the PC Rhales that is displayed when another player examines him.

![Character Description Screen in Star Wars Galaxies.](image)

Figure 3.2: Character Description Screen in Star Wars Galaxies.
In some games, the targeted PC (B) receive a text message that another PC (A) is accessing their information. In some games, the amount of information that can be retrieved is dependent on skills in getting information (as in Asheron’s Call). Usually, information is available about the character’s main skill type, level of advancement and the currently wielded weapon. In many cases (as in Final Fantasy Online) it is also possible to see whether the PC is interested in joining a group. Based on this information a player can, considering her PC’s needs, goals or preferred types of activities, evaluate whether it is worthwhile to interact with the other PC.

### 3.8.3 Expression through Dialogue and Emotes

Suppose that PC A starts a conversation with the other PC, B. First of all, as in all media, dialogue is a powerful tool for characterisation. Cherny (1994) shows an early example from the text-based VGW LambdaMOO of how players program personal and characteristic behaviours into their PCs that can be triggered by keywords typed by other players. Besides pure dialogue, in conversation it is also possible to use emotes, that is, to add gestures and other type of information about non-verbal expressions the conversation. How much of this that can be animated differs from game to game. For instance, if a player (PC A) types ‘/smile’ in a text-based VGW, generally the result of the action would be that the players in geographical proximity of PC A receive the message ‘A smiles.’ If PC A would have done the same in a VGW using 3D and facial animations, the PC would instead have displayed a facial animation of a smile.

Emotes are generally available in VGWs. Text-based VGWs often give more freedom of expression to players by allowing them to program behaviours of their
PCs. This is usually referred to as *scripting*, and is something that has become more sophisticated also in later graphical VGWs, most notably in *Second Life* (2003) and *Star Wars Galaxies*.

![Figure 3.3: Screen from Star Wars Galaxies showing the user interface for choice of mood for the PC.](image)

Scripting is often used to put together personal and characteristic sequences of emotes that can be triggered by the player in appropriate social situations. In *Star Wars Galaxies* it is possible to set a mood for the character. Figure 3.3 shows a screen where the player has chosen the mood ‘vengeful’ which is reflected through the character’s facial expression. The dialogue system adds comments in addition to the typed dialogue. For example, if PC A has the mood set to ‘wounded’ and types ‘oh’ the
output in the form of text is the following: “oh’ A says, dismay in her eyes’. An-
other expressive feature in Star Wars Galaxies is that certain words that the player
types triggers a PC’s animation sequence. For example, if the player types ‘yes’, an
animation shows the PC nodding.

3.8.4 Observation of Behaviour

Suppose that PC A decides to do something together with PC B and that they both
have just joined the game world. They decide to do a delivery quest together. A
quest of this type has the objective of delivering an item from one NPC to another,
a type of quest often given to low-level characters in many VGWs.

![Figure 3.4: Two PCs taking a break while doing a quest in Star Wars Galaxies.](image)
Such quests are simple and give players opportunities to see more of the game world while getting used to the interface. While playing together, the players get to know the other characters by interacting — they get an idea about how a specific PC behaves. Figure 3.4 shows two PCs in Star Wars Galaxies taking a break while doing a quest.

Character classes — the types of characters players can create as PCs — are similar to each other in different VGWs. There is a large combination space of character properties in VGWs, but within similar rule sets building on a low variety of fictional themes. The variety is greater in terms of tools for the players to express themselves — as themselves playing in another world, or as fictional roles they perform. The similarity of the character classes depends likely on inherited design traditions from the classic D&D system (Gygax & Arneson, 1974) and the different VGW code bases that tend to permeate the designs. Classes are also often similar to each other due to the publishing companies and developers favouring the use of fictional content from the fantasy and science fiction genres (Eladhari, 2003). Nevertheless players are provided with a large range of tools for characterisation in the sense of what can be seen, including a large variety of static properties as well as behaviour and styles of play and expression.

3.9 True Character in VGWs

Development of identity, where part of the process is to change and mature, comes with challenges. We learn about ourselves all the time, but especially in situations that are comparable to those situations where fictional characters show their ‘true
character’ — under pressure, in conflict situations, and in situations that involve difficult choices. Is there a ‘player’s journey’ just as there is a ‘hero’s journey’ (Campbell, 1949; Vogler, 1993) in which such a true character is revealed? And is this the true character of the player’s character, or of the player’s in-game persona?

As described in Section 2.3.2, in the hero’s journey, just as in Propp’s *Morphology of the Folktale* (1968), there is a strict chronological sequence of events, and a concentration around the main character, the hero. The hero is said to have a character arc that is the path of growth that a character undergoes, and the character’s choices in difficult situations reveal his or her true character. The other characters in the narrative also have character arcs, but their main functions are to function for the hero, not for themselves.

### 3.9.1 Faces of a Thousand Heroes

In multiplayer games it is not possible to have meaningful game-play for all participants if they all have the role of the hero at all times, nor if they are all merely functions for a single hero. This is a recognised fact in live-action role playing contexts, and clearly expressed in the Dogma 99 manifesto (Fatland & Wingård, 2003, p. 20):

3 No character shall only be a supporting part.

It is a challenging for VGW designers to find ways to accomplish heroship for all PCs, while also allowing PCs to play other functional roles for other PCs in their functions as heroes.

The concept of heroism builds upon some central concepts. One concept is that of *singularity*, to ‘be the one’ (who saves the world), that is, to be chosen. Another
central concept is that a particular individual does something admirable and good according to a specific norm system. A third central concept is that heroes are the ones whom songs and stories are written about. For a hero’s sake, this is not anything that happens while the adventure goes on; the hero becomes a hero when the story is told. There is no heroism if there is no scribe, or writer of ballads, and an audience to whom the story is later told. The songs are sung in contexts where the hero is seldom present. There is a part of this happening in virtual worlds — visible on players’ pages and guild pages on the Internet, but it is in most cases secondary to the play.² What is probably most important to players is the journey, not the tale about the journey.

3.9.2 The Player’s Journey as a Route to Self-Knowledge

Richard Bartle (2003) compares an online player’s journey with the ‘hero’s journey’, step-by-step along the route Campbell described. Bartle interprets the hero’s adventurous journey as the player’s journey towards mastering two worlds, where the player’s goal in the journey within a virtual world is that the virtual self and real self become the same. The player’s journey begins in real life, with getting hold of an account that lets the player log on to a virtual world. That is the ‘departure’. The ‘initiation’ stage takes place wholly within the virtual world, while in the ‘return’ the player is separated from the virtual world but has learned a lot about him- or herself along the journey. There are early documented examples of players expressing their gaming experience as a way to know themselves better. Bruckman (1992, p. 35) gives a transcript from a conversation with the PC Tao. He tells her that he has

²These narratives are part of the narrative layer as described in Section 2.3.4 in Chapter 2.
learned a lot about himself when spending time in the virtual world, for example how to organise people, give orders and going through the difficult experience to serve as a defence council for a friend. ‘These experiences have helped me to know myself better’ Tao concludes.

Bartle’s conjecture is that ‘Playing virtual worlds is a kind of hill climbing activity through identity space’ (2003, p. 440). This is indeed different from the task we are used to heroes doing: saving the world — even though they make characterising choices along the way.

3.9.3 True Character

Suppose that PC A gets along well with PC B who she went on a delivery quest with, that they start doing more things together, and eventually end up joining the same guild, a permanent grouping of players, and thus develop a social network together within the VGW.

There are a lot of tools in current VGWs that provide players with the means to characterise their PCs through visual appearance, information about properties of the PC and expressive emotes, but what about the expression of true character, the, in McKee’s terms ‘the character’s essential nature’? How does A see the true character of B, and how is A’s own true character expressed?

I see two main approaches for supporting expression true character in VGWs: (a) by game mastering and (b) by implementing potential for it in the game-play framework. These two approaches are now discussed.
3.9.4 Supporting Expression of True Character via Game Mastering

In table-top role-playing games the role of the game master (GM) is to weave the player’s PC stories together, to create environments in which the players can interact and to control the non-player aspects of the game. The GM also provides interpretations of the rules and moderation. In single-player role-playing computer games there seldom is any similar function present because the game itself provides the stories, rule sets and environments. In VGWs there are sometimes game masters present who organise happenings, but most of the effort of these GMs is to help solving conflicts between players and to provide in-game support.

A controversial example of game mastering in a VGW is the event of the Trader Malaki that was game mastered in A Tale in the Desert (eGenesis, 2003). The trader Malaki was said to trade valuable goods, but he ‘would not trade with women, and made references to trading /for/ some of them as slaves. This did not go over well at all, and he was eventually hounded out of Sinai, by a small revolt led by the PC Logicritus, after peddling one or two of his wares for some expensive items. He later turned up in Karnak to do the same, with the same result. The event stirred up a lot of emotions and discussions in online forums. To players this was a challenging situation that called for reactions. Some players with male PCs did trade with Malaki, while others refused. Andrew Tepper, creator and owner of A Tale in the Desert, commented on the event with the following on the website Slashdot:4

Along comes a foreign trader, with shiny new goods, and an attitude that’s

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3URL: http://wiki.atitd.net/tale2, revision 8, verified September 8, 2008
totally offensive, totally out of line with the culture that has developed in our Ancient Egypt. Would you trade with him? Would you put aside your morals, if it meant you’d get an advantage that many people don’t have? In real-life, would you patronize a store that had a ‘no jews allowed’ policy? What if they had *really* good prices? Would you do it and hope nobody saw? Maybe feel guilty?

The best books, movies, television — can provoke a range of emotions. I like books that make me feel happy, enraged, triumphant, guilty, enlightened, sad. I want to have all of those emotions available in an MMO, and emotions occur in players, not characters.

In this particular instance, the riot and the negative reaction *does*, as Tepper says in the quote above, come from the players. Had it been pure NPCs having a norm system as in ancient Egypt, or players strictly role playing to have the norms of the fictional historic society, there would have been nothing strange or notable about the trader’s behaviour in that women were discriminated against. The reactions to the event indicate a test of players’ true character. In role-playing it is common to discuss strong emotional reactions to game events after a playing session and let the in-game events run their course. However, if a player who plays him- or herself is suddenly transported to ancient Egypt, the strong emotions are more understandable. It may be argued though that the players were indeed role-playing considering that the norm system that has evolved in this particular fictional version of old Egypt does not tolerate discrimination of women, supposing that the community of players has such a common norm system. If so, this serves as an example of how game mastering can bring out expressions of true character not only by players, but also PCs.
Even though the world is virtual and the setting is a game, it is not possible to trivialise the emotional impact of events involving players’ own characters - Dibbell’s story about the rape committed by MrBungle in the text-based virtual world LambdaMOO clearly showed this (1993). Our virtual personas are vulnerable. An even earlier example is van Gelder’s (1991) ‘The strange case of the electronic lover’ which takes up issues of mind-to-mind encounters, gender swapping, deceit and construction of alternative personas, first published in 1985.

### 3.9.5 Supporting Expression of True Character via the Framework of Game Rules

Besides game mastering, another way of supporting the expression of true character and development of persona might be to extend the functionalities of the PC to reflect an actual personality. The personality would be the distinctive and characteristic patterns of thought, emotion, and behaviour that define an individual’s style and influence on his or her interactions with the environment. As an example, a character has a phobia for a certain type of object in the world — how shall a player handle that if an object creates an involuntary reaction of fear for the character? Let us also suppose that this phobia is either chosen by the player him- or herself, or that it is caused by a previous traumatic event within the game world. The reaction to this would also be dependent on the PC’s personality — different characters may respond differently to a situation involving specific emotions. There is a danger in implementing systems that make a PC behave or be inclined to behave in a certain way — that too large an amount of control over the PC is taken away from the player, thus alienating the player. But, for the sake of the argument, suppose that it
is possible to modify the design in a way that does not take away control from the
player, but that it instead poses a challenge. There are many ways of implementing
personality-specific behaviour depending on what types of personality models and
game-play framework that are used. There are a number of models derived from
research in psychology. Personality is a specialist area in of psychology and there are
many specialist psychology journals in this area. Of course it is also possible to define
game-specific personality models from scratch.

Considering the vast field of theories around personality, affect and temperament,
this is a field that allows many different ways of experimenting with concepts of mind,
identity and personality in VGWs. The prevalent game-play paradigms derived from
previous games are by no means mandatory — even though they have formed both
players’ and developers’ expectations of what a massively multiplayer game should
be like. Games having different game-play paradigms, such as A Tale in the Desert
(2003), which is a non-combat game featuring political violence (metaphoric back
stabbing) rather than physical violence (actual stabbing), has still been able to find
a stable community of players. A system incorporating the personality modelled and
developed by a player into his/her PC may well support both creating and experienc-
ing situations more dramatic and individualised than most VGWs currently provide.
Together with game mastering this might be a tool that both expresses the true char-
acter of the PC or the persona, and leads to experiencing more presence in the game
via closer identification with the PC that the player controls. It may also be a basis
for the creation of individual dramatic story arcs. However, it is crucial to bear in
mind that even though the creation of VGWs can be an art, playing within them and
inhabiting them can also be a performative art form in itself. VGWs may in future
provide systems that support the emergence of true individual story arcs, game mastering that can bring out the true character, and more sophisticated support for the development of personas, but it is the players' task to inhabit them, play them, and maybe develop within them. That is the player's journey.

3.10 Summary

In this chapter the importance of the playable character (PC) was stressed. The concept of character action potential (CAP) was introduced, encompassing both characterisation and true character as defined by McKee, designating what a player can do in a given moment in a VGW that characterises her PC. Role-playing, self-playing and identity construction in VGWs was discussed as well as immersion, presence and Bartle's concept of persona. It was stated that current VGWs have elaborate tools for characterisation of PCs, but few for bringing out their true character. The expression of true character in game worlds could lead to deeper and more meaningful dramatic experiences as well as supporting a higher degree of immersion or presence in a game world via closer identification with a particular PC, which in turn could support the development of a persona. It was suggested that expression of true character in VGWs may be achieved partly by game mastering and partly by developing more sophisticated architectures for CAP.
Chapter 4

Challenges in the Design of Virtual Game Worlds

During the work with the experimental prototypes reported in this thesis there are a number of questions that have motivated my work.

Before listing the motivating questions I would like to point out that the relevance of the questions rely on several assumptions. One assumption is that interesting, complex and surprising characters who undergo dramatic development expressing their very essence are crucial for good storytelling. A second assumption is that this also is the case in virtual game worlds (VGWs) where it is desirable that playable characters (PCs) can be such characters. A third assumption is that identity development is pivotal for VGWs and that the development of persona in Bartle’s sense where a player is so deeply immersed that she has the experience of ‘being’ the PC is desirable for the experience of inhabiting a VGW. A fourth assumption is that the possibility of co-creating and realising the narrative potential of a VGW where one’s own character plays a part is important to one’s experience. These assumptions are implied in the work presented in Chapters 2 and 3.
An assumption not yet expressed is the importance of interpersonal relationships between players for the experience of inhabiting a VGW. I have, as a player in VGWs, just as most other players, seen countless cases where relationships have become so important to players that they have become part of their ordinary life outside the game world too. Most of the time these relationships are friendships, but sometimes they are enmities for various reasons, and sometimes romantic relationships.

Occasionally, players become so heavily invested and immersed in the VGW and the relationships in it that the ‘real’ world for them seems less real, and bleak in comparison.¹ It is in the VGW they have felt able to be fully themselves, free from the roles they are allotted in the real world and how they habitually are perceived by those around them. It is in the VGW they have felt free to express the true essence of themselves — not as characters, but as humans. Many are the cases when new families have been started, where the partners have met under in VGWs where they have experienced learning to know each other as they ‘really are’.² It is also common that VGW-players play with family members and romantic partners (Yee, 2003a).

I call this situation, where relationships move between the real world and virtual worlds, the bleeding circle. I draw from Huizinga’s (1938, 2006) description of the magic circle of play (p. 113): ‘We found that one of the most important characteristics of play was its spacial separation from ordinary life. A closed space is marked out for it, either materially or ideally, hedged off from the everyday surroundings. Inside

¹A survey conducted by Yee (2003c) illustrates this, where 27 percent of the players reported that the most satisfying event they had experienced the past month had occurred in a game environment. Thirty-three percent of the players felt that the most infuriating event they had experienced the past month had occurred in a game environment.

²Yee (2003b) reports that almost half of the players in VGWs form close friendship relations with people they meet in VGWs, and that it is also common to start romantic relationships. In the same study, 40 percent of the participants stated that they feel that their online friendships are comparable or even closer (‘better’) than their friendships in the ordinary world.
this space the play proceeds, inside it the rules obtain.’

Through bleeding circles relationships seep between ordinary and virtual worlds. I use the word bleeding because it is the very heart blood that is flowing over the borders. The dramatic associations to the expression are appropriate for the type of processes involved in the situations.

It seems to me that the immense power of interpersonal relationships in VGWs is not used to its full potential in the design of mechanics and systems for story construction. Perhaps the power of interpersonal relationships can be harnessed in order to enhance the game mechanics in VGWs.

The following design challenges are those questions that I find most important to pursue in order to further evolve the design of VGWs:

- In what ways can VGWs be designed to facilitate situations that involve challenges, conflicts and choices that would express the true character — the very essence of a person’s nature — of a player — or a playable character (PC)?

- In what ways can VGWs by their system design and game-play rules further support players’ development of personas to — as Bartle described it — reach the ‘final level of immersion’?

- In what ways can means be provided for all players to be heroes, protagonists, in their own drama, that is, integrated in the very story construction and deep structure of VGWs?

- The role-playing in current VGWs relies on meta-game rules since role-play is poorly supported by rule-sets and game mechanics. In what ways can VGWs
support role-play in their rule systems?

- How can characterising action potential (CAP) be designed to support players in expressing consistent and interesting characters in VGWs?

- Players in VGWs often develop strong interpersonal relationships. Identity construction is affected by individuals’ relationships to and mirroring of each other. How can the power of these relationships be harnessed by design of the CAP to make the game mechanics more interesting?

In being so bold as to formulate design challenges for the whole field of VGWs, I feel an immediate need to add a few disclaimers. First of all, there are probably as many lists of important design challenges as there are researchers, developers and designers in the area — this list is just my take on it, dependent on the assumptions mentioned previously. Secondly, to many of the questions there already are good answers in the form of existing VGWs and in VGWs under development. Thirdly, to some of these questions there might be no answer, to others there may be a multitude of answers. Especially the questions of true character, how to help players develop a persona, and how to enable all players to be protagonists (the ultimate story construction system!) seem to me to be holy-grail questions. With holy-grail questions I mean the type of philosophical questions where one, to use a game analogy, goes on a quest for the holy grail. One does not know whether it really exists, or if it is one’s strong wish that it should exist. Since it is so difficult to find, one does not get proof that it does not exist and thus the search can continue in new directions, where one finds more clues. This is what makes the holy-grail questions so important. They fuel the navigation of the wicked problem spaces mentioned in Chapter 1.
CHAPTER 4. CHALLENGES IN THE DESIGN OF VIRTUAL GAME WORLDS

My personal experience is that in my questing for my holy grail I have ventured on several interesting side-quests, finding valuable treasure and clues on the way. Even if I know that the grail might not exist, the main quest of searching for it goes on, with the glowing mental image of the grail changing nature over time.

It is my firm belief that in pursuing the questions listed here it is necessary to build and test the systems that seem to glow like grails in order to get good clues for further pursuit. I also believe that clues to many of the questions listed above can lay in the design of the characterising action potential (CAP) as outlined in Chapter 3.

I built a semiautonomous agent system to explore the CAP of playable characters which I call the Mind Module (MM), described in Chapter 5. In Chapter 6, 7 and 8 I describe the five prototypes I have been involved in developing in order to experiment with design of CAP using the MM in order to further explore the six questions presented here.
Chapter 5

The Mind Module

Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>History</td>
<td>79</td>
</tr>
<tr>
<td>5.2</td>
<td>Related Work</td>
<td>81</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Believability and Expressive AI</td>
<td>81</td>
</tr>
<tr>
<td>5.2.2</td>
<td>Emotion Modelling</td>
<td>82</td>
</tr>
<tr>
<td>5.2.3</td>
<td>Narrative</td>
<td>83</td>
</tr>
<tr>
<td>5.2.4</td>
<td>Personality Traits</td>
<td>84</td>
</tr>
<tr>
<td>5.3</td>
<td>The Mind Module</td>
<td>88</td>
</tr>
<tr>
<td>5.3.1</td>
<td>Spreading Activation Network</td>
<td>88</td>
</tr>
<tr>
<td>5.3.2</td>
<td>Affect Nodes</td>
<td>89</td>
</tr>
<tr>
<td>5.3.3</td>
<td>Personality Trait Nodes</td>
<td>92</td>
</tr>
<tr>
<td>5.3.4</td>
<td>Emotion Nodes</td>
<td>95</td>
</tr>
<tr>
<td>5.3.5</td>
<td>Mood Nodes</td>
<td>100</td>
</tr>
<tr>
<td>5.3.6</td>
<td>Sentiment Nodes - Emotional Attachments</td>
<td>103</td>
</tr>
<tr>
<td>5.3.7</td>
<td>The Mind Module Compared to the Dynemotion People Engine</td>
<td>104</td>
</tr>
<tr>
<td>5.3.8</td>
<td>The Mind Module compared to Ortony et al.’s Model</td>
<td>106</td>
</tr>
<tr>
<td>5.4</td>
<td>Summary</td>
<td>108</td>
</tr>
</tbody>
</table>
The Mind Module (MM) is a semiautonomous agent architecture built to be used in a multiplayer environment as a part of playable characters (PCs). The term *semiautonomy* is used because the agent structure is designed to be used by a PC, and is thus partly controlled by the system and partly by the player. It can also be used with autonomous characters provided that functionality for automated behaviour is added. The MM models the PC’s personality as a collection of traits, maintains dynamic emotional state as a function of interactions with objects in the environment, and summarises a PC’s current emotional state in terms of ‘mood’.

The MM provides a game world system with emotional output from an individual character. The MM performs computational operations on input values from a game world, which come from virtual sensors. The MM produces outputs in the form of updated values for emotions and moods. These outputs in turn become inputs to the sensors of the MMs of surrounding entities.

### 5.1 History

Previous work on the current version of the Mind Module was done in the Zero Game Studio. The Zero-Game Studio was part of the Interactive Institute and was established in 2001 for the purpose of conducting applied research in the area of games. During my work on the thesis *Object Oriented Story Construction in Storydriven Computer Games* (Eladhari, 2002), I started to focus on the importance of the PC in games that include narrative elements. Within the research theme ‘The Player Entity’ I started to explore how story construction could be improved by the use of semiautonomous agents, combining the structuralist story-construction approach (Lindley & Eladhari, 2002) with methods for creating believable agents (Bates, 1994;
Bates *et al.*, 1989 - 2002), but focusing on PCs rather than fully authored independent characters (‘non-playable characters’ (NPCs) or autonomous believable agents). The work was realised in the Ouroboros Project during 2002 and 2004 as described in Eladhari and Lindley (2003). The main focus of the Ouroboros project regarding PCs evolved around the visual expression of characters using animations of expression via gestures, facial expressions and postures. The postures, gestures and the walk cycles (animations of characters walking) were produced with motion-capture technology while the facial expressions were animated ‘by hand’. At the time, I also modelled a prototype for audible expressions of the emotional states of PCs, but this was not realised until 2006 as described in Eladhari et al. (2006).

In 2004 I moved from the Zero-Game Studio to Gotland University in order to do the PhD project reported in this thesis. In 2004, the work on the MM was set into the context of story construction in massively multi-player games, (see Eladhari and Lindley, (2004); Eladhari, (2004). The design of the MM was reiterated, and the ideas of how to use sentiment-objects were deepened.

In 2005, the work exploring how a semiautonomous PC can be used for the purpose of deeper characterisation and story construction in multi-player games continued in the Integrated project on Pervasive Games (IPerG), a large-scale EU project where several research institutes and companies studied various aspects of games (2004 - 2008). The design of a game called Garden of Earthly Delights (GED), where I had the role of lead-designer, relied heavily on game mechanics where the MM was used. GED was a concept for the extension of conventional massively multiplayer online role-playing game (MMORPG) mechanics to integrate pervasive, mobile and location-based game mechanics. In this project, there was a stronger focus on game
mechanics supporting interacting play modes, where one mode was played via a cell phone and the other mode via a client on a personal computer. In addition to the concept of sentiment objects, the notion of ‘affective actions’, as described in Brusk and Eladhari (2006) was explored. The design methodology relied on Wizard of Oz techniques, focus group discussions and paper prototype testing as described in Koivisto and Eladhari (2006a). The work on prototypes done between 2002 and 2006 is further described in Chapter 6. Between 2006 and 2009 the MM was reiterated for use in the prototypes World of Minds and the Pataphysic Institute, where the entire game design was derived from the MM. These are described in Chapter 7 and 8.

5.2 Related Work

5.2.1 Believability and Expressive AI

When Bates (1994) and his colleagues coined the expression believable agents, the idea took a stance in arts, generally in literature, theatre, film and radio drama, but especially in character animation for Disney characters. Bates described the agents as ‘an interactive analog of believable characters discussed in the Arts’ and argued that artists hold similar goals to AI researchers, wanting to create seemingly living creatures where the illusion of life permits the audience’s suspension of disbelief. He argued that emotion is one of the primary means to achieve believability. The area of believable agents has mostly been approached by making applications that, to varying degrees, create believability by using graphics showing facial expressions and gestures, and by using language, spoken dialogue and dialogue in text, most notably within the OZ Project (1989 - 2002) and the NICE project (2002 - 2005).
As noted in Section 2.2.3, expressive AI provides a language for talking about ‘readable’ behaviour in the context of game analysis and design, that is, behaviour that a player can ‘read meaning into’ (Mateas, 2003). Mateas discusses the characterisation of the ghosts in the game Pac Man, expanding the discussion of characterisation of non-player characters (NPCs) to encompass dynamic entities which do not have a humanoid form.

5.2.2 Emotion Modelling

Since Minsky’s *Society of Mind* (1986) was published several implementations of ‘minds’ with personalities and emotions have been made, for example by Egges, Kirschagar and Magnenat-Thalmann at MIRALab (2003; 2004). They primarily made implementations where the emotions were expressed through dialogue and animations. Another notable example is a virtual-reality training environment tool for firemen (El Jed et al., 2004). The Mind Module (MM) described here is yet another model in the same tradition. It builds, as many other applications in this field, upon a personality model derived from the Five Factor Model (FFM) popularly called ‘The big five’ (McCrae & Costa, 1987), on affect theory inspired by Tomkins (1962; 1963), and on the research by Frijda (1994) and Moffat (1997).

Emotion modelling has during the past decades emerged as a separate field of study, where the theory presented by Ortony et al. in 1988 proved to be a landmark, now often referred to as the OCC model where the abbreviation is derived from the authors’ names (Ortony et al., 1988). OCC is a purely theoretical psychological model, but several applications in the fields of AI and cognitive science have used it as an inspiration for frameworks for autonomous agents that simulate human emotion.
Work in the area of virtual characters that use both the FFM and the OCC as conceptual frameworks include Guoliang et al. (2006), Klesen et al. (2000), Kshirsagar and Magnenat-Thalmann (2002a), and El Jed et al. (2004).

An excellent discussion of the field of virtual characters with personality, emotions and mood can be found in the State of The Art Report *Building Expression into Virtual Characters* by Vinayagamoorthy (2006). Emotion modelling is also used as an approach in contemporary games such as The Sims 2 (2004), where the characters act according to a personality model inspired from astrology and have a summarising state of mind described as mood, which summarises how well a character’s needs, such as ‘hunger’ or ‘social’ have been fulfilled.

The distinguishing features of the MM is that it is specially designed for use for characters in role-playing games, and that the sentiments, described in Section 5.3.6 can be used to create preferred individual responses made by characters, depending on immediate circumstances in a game world. The sentiments are potentially useful for creation of individual narrative discourses for PCs.

### 5.2.3 Narrative

An overview of related work touching upon narrative from a theoretical angle was given in Section 2.1. Practical related work includes The Oz Project (Bates *et al.*, 1989 - 2002) and the Façade Project (Mateas & Stern, 2002 - 2005). Brisson’s and Paiva’s (2007) system I-Shadows used affective characters to, through interactions inspired by improvisation theory, explore the natural conflict between participants’ freedom of interaction and the system’s control as the participants collaboratively develop a story. Another related project is Scheherazade (Elson & McKeown, 2007).
CHAPTER 5. THE MIND MODULE

As it draws upon theoretical work on the morphology of the narrative, semantics are modelled such as time lines, states, events, characters and goals. The system can detect thematic patterns in both the deep structure of the story as well as in the manner of the story’s telling. However, maybe the most closely related work is that of Ian Horswill who argues, from a hypothetical perspective, that AI Characters should be ‘just as screwed-up as we are’ (Horswill, 2007), thus tying in the notion of believable agents (Bates, 1994), and ways of building these (Mateas & Stern, 2002; Klesen et al., 2000; Swartout et al., 2006; Pynadath & Marsella, 2007). Also the work conducted by Marsella et al. (Marsella et al., 2004; Rickel et al., 2002), and that done at Miralab (Kshirsagar & Magnenat-Thalmann, 2002b; Magnenat-Thalmann et al., 2005) on the subject of virtual humans have been an important source of inspiration.

5.2.4 Personality Traits

Adopting the FFM, the MM employs a trait-based theory of personality. In analyses of rich and complex characters in novels and screenplays, scholars have argued for the usefulness of defining characters’ personalities via traits. Chatman, for example, argues for a ‘conception of character as a paradigm of traits’, where a trait is a ‘relatively stable or abiding personal quality’, noting that in the course of a story, a trait of a character may unfold or change (Chatman, 1978). Complex trait descriptions make the difference between flat and round characters:

[...] the behaviour of the flat character is highly predictable. Round characters, on the contrary, possess a variety of traits, some of them conflicting or even contradictory [...] We remember them as real people. They seem
strangely familiar. Like real-life friends and enemies it is hard to describe what they are exactly like.

In psychology, trait theory has been developed to describe personality. Trait theory, pioneered by Allport in the 1930s (Allport, 1961), is one of several major branches of theories of personality, where the other branches can roughly be categorised as type theories, psychoanalytic theories, behaviourist theories, cognitive theories, humanistic theories and biopsychological theories. Trait theory mined English language dictionaries for all the adjectives that describe personality. Over the years, an initial list of 17,953 adjectives was eventually distilled into 45 personality traits. Personality tests were developed to rate people along these 45 traits; through factor analysis, five high-level factors organising the traits were identified (Cattell, 1945; Tupes & Christal, 1992). The FFM is now the standard personality trait model in psychology; the clustering of traits via factor analysis into five factors has been repeatedly empirically validated. The most prominent assessment test for the FFM is the NEO PI-R questionnaire, which uses 30 traits (see Table 5.1) (McCrae & Costa, 1987). While the Table 5.1 contains the traits, the five factors can be described as follows.

- **Openness** - appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity.
- **Conscientiousness** - a tendency to show self-discipline, act dutifully, and aim for achievement.
- **Extraversion** - energy, positive emotions, and the tendency to seek stimulation and the company of others.
• Agreeableness - a tendency to be compassionate and co-operative rather than 
suspicious and antagonistic.

• Neuroticism - a tendency to experience unpleasant emotions easily, such as 
ger, anxiety, depression.

Table 5.1: Traits from IPIP-NEO used by the Mind Module.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Facet</th>
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<tbody>
<tr>
<td>Extraversion</td>
<td>Friendliness, Gregariousness, Assertiveness, Activity Level,</td>
</tr>
<tr>
<td></td>
<td>Excitement-Seeking, Cheerfulness</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>Trust, Morality, Altruism, Cooperation, Modesty, Sympathy</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving,</td>
</tr>
<tr>
<td></td>
<td>Self-Discipline Cautiousness</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>Anxiety, Anger, Depression, Self-Consciousness, Immoderation,</td>
</tr>
<tr>
<td></td>
<td>Vulnerability</td>
</tr>
<tr>
<td>Openness</td>
<td>Imagination, Artistic Interests, Emotionality, Adventurousness,</td>
</tr>
<tr>
<td></td>
<td>Intellect, Liberalism</td>
</tr>
</tbody>
</table>

While the FFM was originally developed to describe the personality of individuals in real life, it has been applied to a number of autonomous characters and conversational agents (Egges et al., 2004; El Jed et al., 2004; Mairesse & Walker, 2007). Like the MM, many of these implementations build upon the FFM, and draw inspiration from theories of emotion modelling such as the OCC model (Ortony et al., 1988) and affect theory (Tomkins, 1962). It is important to acknowledge that by choosing what model of personality to use as bases for constructing agents one makes an implicit statement to the users of the systems about what a personality is. While the extensive use of the FFM may result in an unfortunate uniformity, it is beneficial in that it is easier to compare the result of the work conducted in the field of virtual humans than if each
researcher used a different theory of personality as inspiration for the architecture of personality. The MM has been designed flexibly so that the traits of FFM can be replaced with the base of another trait-based model.

Anders Drachen (formerly Tychsen) and his colleagues (Tychsen et al., 2007) used the game engine of NeverWinter Nights (Bioware, 2002) to experiment with combining the FFM with a traditional D&D system (Gygax & Arneson, 1974). Personality traits were not implemented as part of the computational system itself but integrated into the personalities of the characters of the players as part of their descriptions. Additionally, personality traits were activated via inter-character relationships and through the game story-lines. Drachen et al.’s study supports the idea that players’ engagement in a PC is important for enjoyment in a multiplayer computer role-playing game and that highly complex PCs are not necessarily a problem for players. In fact, players tended to use all the features of the PC, despite the complexity. Furthermore, the study showed a strong pattern (in a sample of 51 players) of that likeness between players’ own personality and their PCs does not have impact on the gaming experience: based on more than 150 player combinations, it was found that both characters with a personality very similar and very different to their own were equally fun to play and not statistically significantly different.

If these findings are general they may have implications for the design of a game world where the MM is used. Drachen et al.’s findings indicate that a system using personality traits from the FFM might be enjoyable for players whether they prefer to play as themselves (self-play) or playing an invented character different from themselves (role-play).
The first iteration of the MM was developed in parallel, but separately, from the first game world it was used in. Though this first iteration got an enthusiastic reception from test players (Koivisto & Eladhari, 2006b), the user-tests showed that a tighter connection was needed between PCs' affordances given by the MM and the game mechanics. The prototype game worlds *World of Minds* and *Pataphysic Institute*, also described in the thesis, were specifically designed to explore the tight coupling between game AI and the game design.

5.3 The Mind Module

5.3.1 Spreading Activation Network

The MM is implemented as a spreading activation network as defined and described by Quillian (1968), Collins and Loftus (1975), and Anderson (1983). The network consists of interconnected affect nodes. The traits, the emotions, the moods and the sentiments described below are all different types of affect nodes that affect each other. When a particular node is activated, nearby nodes are activated as well. As one node is processed, activation spreads out along the paths of the network, but its effectiveness is decreased as it travels outwards. Experimentally, this model can be assessed with run-time studies based on the assumption that ‘spreading’ of activation takes time – less associated concepts take longer to get to and more associated ones take less time. For highly individualised game-play experiences this type of architecture is particularly appropriate. As Anderson (1983) concluded:

Because activation can sum and varies with associative distance and strength, level of activation of a node is sensitive to the particular configuration of
activation sources.

In the case of the MM, the activation sources are gathered from the individual settings of a particular character’s personality as well as by events perceived from the game world.

### 5.3.2 Affect Nodes

The MM consists of a weighted network of interconnected nodes of four types: traits, emotions, sentiments and moods as shown in Figure 5.2. More details about the architecture of the MM is available in Appendix A which contains a class diagram of the MM expressed in Unified Modelling Language (Fowler, 2003). The documentation of the MM application programming interface is available in html-format on a CD which is provided with this thesis.

![Figure 5.2: Affect Node Types](image)

According to Moffat (1997) emotions can be regarded as brief and focused (i.e., directed at an intentional object) dispositions, while sentiments can be distinguished as a permanent and focused disposition. Similarly, moods can be regarded as a brief and global dispositions, while personality traits can be regarded as a permanent and
global dispositions. Moffat clarifies with examples:

An example of an emotion might be feeling a gush of affection for someone; while loving someone would be a longer term emotion, or sentiment. One could be in a generous affectionate mood all day, and if that mood lasts a lifetime, we call it personality.

Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other. Moffat’s model (1997, p. 136) is illustrated in Figure 5.3.

![Figure 5.3: Moffat’s illustration of how emotion may relate to personality.](image)

The categories of affect nodes of the MM are inspired by Moffat’s model, both in duration (persistence and briefness) and focus (whether a value of an affect node is dependent of another object in a context or not). The sentiments are not in all cases regarded to be permanent, but certainly long lived, that is, their decay rate is very slow compared to the quick emotions. A value of an affect node in the MM with a fast decay rate, such as an emotion, is non-zero for only a short period of time after a stimulus that causes the value of the node to change, and thus affects the value of other nodes in the network for only a short period of time. The two-dimensional affect plane of the MM is illustrated in Figure 5.4.

If an agent receives information about something happening, for instance that an
CHAPTER 5. THE MIND MODULE

Figure 5.4: The two-dimensional affect plane of the MM.

object is approaching, the following process cycle takes place.

1. The agent retrieves the identity and the type of the entity approaching. Suppose it is a PC named Lena.

2. The agent searches its list of sentiments to see whether it has an emotional attachment towards entities of the type PC, and whether it has an emotional attachment towards the entity Lena. Suppose that the agent has no sentiment towards PCs in general but a sentiment of amusement towards Lena, perhaps due to listening to a fun joke at a prior occasion.

3. The agent looks at its emotion node to see which personality traits may impact the change of the value of the emotion node. The emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression (for connections between trait nodes and emotion nodes please see Figure 5.5).

4. The new value for the emotion node is calculated and the value of the node is changed accordingly.
5. The mood nodes check at each cycle of processing whether a significant change in any emotion node connected to them has happened since the last cycle. In this case this would be true in the case of mood node Outer Mood which is connected to the Amusement node with the positive weighting 2.0 (for connections between mood nodes and emotion nodes please see Figure 5.8).

6. The mood node calculates the change of its value based on the change in the emotion and the weight from the emotion and changes its value. In this example the mood node in question is the Outer Mood, calculating it’s new value based on the change in the emotion node Amusement and the weight between them.

Each node has a value, that is defined as a norm value; a value that the node changes to over time. For each cycle of the processing of the MM each node, if it is not already at its norm value, moves towards this value. The amount of movement towards the norm value is defined by the decay rate of the node.

5.3.3 Personality Trait Nodes

The personality of a character defines the nature and strength of the emotions a character feels in different situations. The MM gives each PC 30 trait nodes, inspired by the FFM, as shown in Table 5.1. The traits are grouped into five factors, with the value of a factor being a weighted linear combination of the values of the traits. In a role-playing setting for instance this system of traits can define how likely a PC is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily respond with anger than a character who has a low value. Each personality trait node is weighted towards the emotion nodes with the weights shown in Table 5.5.
Moffat (1997) compared Freud’s, Skinner’s, Maslow’s and Allport’s theories of personality with the aim to formulate a definition of personality that would be applicable to autonomous agents. Moffat favoured the behavioural theories as well as social learning theorists, specifically the theory of Rotter (1972; 1975) which included a model for how to calculate potential behaviour according to certain situations and what reinforcement certain actions would have in these.
Moffat’s definition of personality, which is intended for use by modellers of autonomous agents with personalities, reads as follows:

Given an agent with certain functions and capabilities, in a world with certain functionally relevant opportunities and constraints, the agent’s mental reactions (behaviour, thought and feeling) will be only partially constrained by the situation it finds itself in. The freedom it has in which to act forces any action to reveal choice or bias in the agent, that may or may not be shown in other similar situations. Personality is the name we give to those reaction tendencies that are consistent over situations and time.

Inspired by Rotter, Moffat constructed a prototype emotion model that he compared with several major theories of personality to evaluate it as if it were originally intended to be a personality model. Moffat’s prototype, called Will, was an autonomous agent, whom a user could play the mathematical game Prisoner’s Dilemma with. The architecture of Will consisted of five modules (Perceiver, Emotor, Predictor, Planner and Executor) which run in parallel, all connected to a central workspace called Memory. In Will the relation of personality to emotion was considered, as well as mood and sentiment, as shown in Figure 5.3. The FFM was the model Will compared least favourably to; Moffat estimated that only 50 percent of the trait theory could be claimed to be implemented in the model. According to Moffat, Will did much better against Rotter’s social learning theories, implementing and accounting a greater part of them. Moffat assumes that the results can be explained by the lack of social awareness in Will:

The most obvious weakness in the model is its lack of social awareness,
making those aspects of personality that are to do with how people relate to each other impossible to model.

In the case of the MM, the context of the prototype differs from that of Moffat. The behaviour of the semiautonomous agent that the MM is part of is chosen by the player who uses it, while the social multiplayer aspect of the prototype worlds the MM is used in makes it possible to use game-play mechanics that emphasise social aspects. Through game mechanics such as ‘affective actions’, and ‘mind magic spells’ (described in Chapter 7) emotions are affected by the full range of traits of the FFM. In the prototypes where the MM is used the characterising action potential of the semiautonomous agents is constrained. These constraints depend on both the context and the values of the personality trait nodes of an agent. Within the constrained action potential that governs the potential behaviour, a particular player may choose the behaviour, thus expressing a two-layered personality, where one layer is provided by the agent and the other layer is provided by the player.

5.3.4 Emotion Nodes

In certain situations, events that a particular PC experiences will invoke emotions. What emotions are invoked and how strong they are depends upon personality and on the character’s likes, dislikes, and previous experiences (sentiments). The first iteration of the MM used the emotions listed in Table 5.6.
Table 5.6: Emotions/Affects used in the first iteration of the MM.

<table>
<thead>
<tr>
<th>Positive</th>
<th>Neutral</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amusement</td>
<td>Confusion</td>
<td>Distress – Anguish</td>
</tr>
<tr>
<td>Interest - Excitement</td>
<td>Surprise</td>
<td>Fear – Terror</td>
</tr>
<tr>
<td>Enjoyment – Joy</td>
<td></td>
<td>Anger – Rage</td>
</tr>
<tr>
<td>Relief</td>
<td></td>
<td>Shame – Humiliation</td>
</tr>
<tr>
<td>Satisfaction</td>
<td></td>
<td>Sadness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Guilt</td>
</tr>
</tbody>
</table>

Through a mapping of weightings between emotion nodes and trait nodes, the MM defines how much the value of an emotion node fluctuates for each PC. For example, the emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression. Systematic information about the effects of personality on emotion from psychological research applicable for the MM is scarce. The weightings between traits and emotion is experimental and is evaluated with the goal to create interesting game-play experiences rather than simulating a set of beliefs of about the workings of the human mind.

The choice of emotions was based on research into affects and affect theory by Tomkins, (1962; 1963); Ekman, (1994); and Nathansson, (1992). The emotions collected by Ekman and others builds upon studies of facial expressions. The emotions, so called ‘basic emotions’, are not only similar across cultures, but also among primates. Design-wise I considered this a benefit. It could mean that a PC or an NPC
which is not given a humanlike graphical representation still might be seen as believable by a player. Choosing a set of emotions to use for the MM has been delicate. Research into basic emotions has shown what emotions that primates and humans express, but not necessarily what they feel. Definite knowledge of how and individual ‘really’ feels might be beyond the capability of current research in general. Regarding knowledge about someone’s ‘actual’ feelings, the information is limited to active areas (visible in MRI scans for example) of the brain and subjective narrative reports. However, as mentioned, the aim of the work with MM is not to simulate the actual workings of the human brain, but for use as a tool for the creation of interesting game-play experiences. It is the aim of believability that governs what parts from psychological research to use as inspiration for the building blocks of the MM.

In the second iteration of the MM the same emotions as in the first iteration were used, but the emotion Surprise - Startle was then, in terms of the MM, defined as positive. The choice was motivated by the design of the prototype WoM. Design-wise the types of surprise which can have a ‘starling’ quality were problematic to use since the architecture of neither the MM or the WoM included a layer of knowledge that could be used to define whether something would be startling to a PC. That is, if there had been information about what type of objects and/or concepts a PC already knows, it would also be possible to assume that a previously unknown type of event or entity might be ‘startling’, especially if it was presented in a sudden way. In the second iteration, the node ‘Surprise - Startle’ was changed to ‘Surprise’. The emotion Confusion was classified, again motivated by design, as negative. The reason for the change was that in the first iteration of MM the Confusion node was still under evaluation (to be used or not), and had not received any weighing towards any other node.
Table 5.7 shows the emotions used in the second iteration of the MM. The values in the columns showing the weights to the mood nodes define whether an emotion has a positive or a negative value affecting the mood.¹

In the third iteration of the MM, three emotion nodes were added: desire, belonging and pride. However, only pride will be added to the original 13 to be part of a possible reaction layer that uses gestural and facial expression thorough graphical

---

¹The reader may have noted that the weights between trait nodes and emotion nodes presented in Table 5.5 all are positive, ranging between 0 and 2, while the weights between emotion nodes and mood nodes also include negative values. The impact of the weights between traits and emotions affect to what degree the value of an emotion is increased if the emotion node is activated. A weighting with a value lesser than 1.0 result in an increase that is lower than the mid-value (or norm-value) of an increase, while a weight larger than 1.0 results in a higher increase. The weights between mood nodes and emotion nodes governs how the values inner and outer mood are affected. A positive weight results in that the value of a mood node is increased, while a negative value results in a decrease of a mood-node value.
CHAPTER 5. THE MIND MODULE

means. Pride is one of the ‘basic’ emotions and would thus be believable as an expression through body language.

Figure 5.8: Emotions/Affects used in the third iteration of the MM, and their relations to the Mood Nodes

The reason for adding pride and belonging was that the later prototypes, PI and WoM, to a higher degree than earlier prototypes used features inspired by social situations as part of the game-play mechanics. The emotion node Belonging is in PI activated in situations where several players co-operate. The sentiment node Pride is used in situations where players help each other, especially when a more experienced player helps a new player. In those cases, the helping player may get positive emotions of ‘Pride in another’s achievement’ when the player she is helping manage to do something successfully via her PC. Desire was added for use together
with the emotion node Satisfaction. Satisfaction as an emotion proved to be useful in settings of social interactions where Affective Actions are used. This can be regarded as beneficial in those situations, but has the effect that the lack of satisfaction does not become a motivator for players to do other actions where Satisfaction could be a reward for an accomplishment. Therefore, the emotion node Desire was added. This node was added in order to be used for the construction of story-driving sentiment objects, in other words, creations of ‘objects of desire’. Figure 5.8 is an illustration of the emotion nodes used in the third iteration of the MM, and their relations to the mood nodes.

5.3.5 Mood Nodes

While trait theory from personality psychology and affect theory have been used as inspirations for systems that give agents emotions and personality, there is no obvious theory in psychology or cognitive science for modelling what, in daily speech, we call mood. In this text, I use the word mood in this everyday sense, to mean an overall state or quality of feeling at a particular time. Mood changes faster than personality, but typically more slowly than individual emotions. The mood of a person in real life is a complex state. It is temporary and highly contextual, but can linger even if the context changes. It is also individual, in other words, the way mood changes and fluctuates depends on an individual’s personality and internal psychology, not just the context of the moment.

In the MM mood is a state that can be seen as ‘the tip of the iceberg’ of underlying emotions. Characters’ mood depends on their personality and on what they have experienced in particular contexts.
A summarising display of a character’s state of mind is useful both from an au-thorial perspective and from a user’s perspective. In design, readily understanding a character’s mood is useful for understanding the character’s motivations and interactions. From a user’s point of view, a representation of mood is useful for viewing a concise display of the current state of mind that otherwise might be too complex to understand in a multi-tasking game-world environment.

In the MM, mood is a computed summary of the current state of a character’s mind. The mood of a character is measured on two scales that are independent of each other, an inner and an outer. Each scale ranges from -50 to +50; this corresponds to the range from Depressed to Bliss on the inner scale, and from Angry to Exultant on the outer scale as shown in Figure 5.9. The reader perhaps associates to Russell’s circumplex affect space (Russell, 1980) that just as the mood scales of the MM
represent polarities on several axes. Russell’s circumplex affect space is a representation of humans’ conceptualisations of emotional experience comprising two bipolar dimensions of perceived activation/deactivation and pleasure/displeasure. The MM and Russell’s model should not be confused. The mood is an implementation-specific interpretation for games on how the emotions in the affect theory may be used in junction to the FFM, and functions along the lines of the research by Frijda (1994) and Moffat (1997), while Russell’s affect space representation is a model constructed for understanding of the nature of human affect. Furthermore, the MM’s and Russell’s dimensions are different.

The inner mood node represents the private sense of harmony that can be present even if the character is in an environment where events lead to a parallel mood of annoyance. Reversely, a character in a gloomy mood can still be in a cheerful mood space if events in the context give that result. The nature of the outer mood is social, and tied to emotions that are typically not only directed towards another entity but also often expressed towards an entity, such as anger or amusement. The two scales for mood nodes open up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out.

The weightings in table 5.7 were used in the second iteration of the MM, in the prototype World of Minds. Just as with the mapping between traits and emotion, there are few sources in psychology to guide the choice of weighting, and because the purpose of the implementation is to facilitate game-play experiences rather than a true simulation of the human mind, this aspect of the MM was tested and reiterated accordingly. The third iteration of the MM was used in the prototype Pataphysic Institute, where the additions of emotion nodes (see Figure 5.8) were done to better
suit the socially oriented game mechanics. The prototypes are described in detail in later chapters in this thesis.

The real-time, or current, mood of a character is dependent on the nature and strength of the emotions the character has experienced the past hours. The strength of the emotions is different for different characters depending on their personality traits, which are weighted towards the emotions. The nature of the emotions differs, depending on what sentiment nodes the characters have towards other entities in the context. Hence, two characters going through a similar series of events potentially have different emotional experiences and therefore end up in different moods.

5.3.6 Sentiment Nodes - Emotional Attachments

A PC can have emotions associated with game objects. For example, a character with arachnophobia would have the emotion Fear associated with objects of type Spider. Such associated emotions are called sentiments. These are represented in the MM via sentiment nodes that link emotion nodes to specific objects or object types. Thus, if a player’s PC has a sentiment of Fear towards Spiders, and a Spider comes within perceivable range, there will be an immediate change in the value of the Fear node; the exact value of the change will be a function of the strength of the sentiment as well as the values of the traits that modulate the value of Fear.

The MM allows several sentiments of different emotions to be directed towards another entity, thus creating compound sets of sentiments. For example, a character having a sentiment of Fear towards Spiders could also have a sentiment of Anger.

---

2How far back in time different emotion stirring events have an effect on the current mood depends on the strength of the emotion and the decay rate. The effects of an emotional event can linger between half an hour and several days, but typically it lingers for one or two hours.
towards them. In a game world sentiments can be created several ways. The emergent
sentiments originate from interactions with other entities in the world, thus creating
emotional memories. The authored sentiment sets have certain pre-set combinations.
For example Infatuation is a combination of Interest/Excitement/Amusement and
Joy towards another character. The authored sets of sentiments have a longer decay
rate than the one’s emerging from interaction.

The intensity of the sentiment is in the MM different for each PC depending on
the context since the intensity is defined not only by the context in form of sentiment
objects in proximity but also via weightings between personality trait nodes and
emotion. Thus the intensity of an emotion depends upon the PC’s personality, and
the nature of the emotion is defined partly by events, objects and agents in the game
world and partly by the individual PC’s interpretation of her environment in term of
sentiments.

5.3.7 The Mind Module Compared to the Dynemotion People Engine

The application which is closest to MM in terms of both functionality and application
area is the Dynemotion People Engine (DPE) developed by Online Alchemy. Just as
the MM, DPE is developed for use in virtual worlds, and supports characters with
personality, emotions and a summarising state of mind comparable with the mood of
the MM. The DPE is not primarily a research project and is as such not documented
in sources available publicly. However, in co-operation with Mike Sellers at Online
Alchemy a comparison between the DPE and the MM was made (Eladhari & Sellers,
2008).
When comparing our systems — the Dynemotion People Engine (DPE) and the Mind Module (MM), we found striking similarities though the systems had been developed without knowledge of each other: both systems are agent-based architectures for characters in multi-player games, and use the Five Factor Model (FFM) as a framework for the personality of the characters. While the emotional system of the MM is inspired by affect theory (Tomkins, 1962) and the OCC model (Ortony et al., 1988) and the DPE uses an original model based on an underlying Maslovian system, neither of us had found applicable theories to draw upon for modelling the summarising state of mood, but both saw the need for such a feature. For this reason, we focused the comparison of our systems on the aspects of mood.

In both systems a character’s mood depends on their personality and on what he or she has experienced in its current context. Additionally, DPE and MM have similar solutions for displaying mood: both use the concept of a colour coded co-ordinate system where the mood fluctuates along two axes that allow a high granularity of what the ‘mood’ is, expanding beyond the binary notions of ‘good’ and ‘bad’ mood.

Another application which uses a summarising state similar to mood is an agent structure developed by Guoliang (2006). Guoliang’s work includes a factor for an agent’s mood, where mood is briefer than a trait, but longer lasting than an emotion (this work also highlights the lack of unified definitions of mood in the literature). In the game The Sims 2 (2004) characters have a mood represented as a diamond over the head of the character, which changes in colour depending on the mood. The mood in this case is a state that summarises how well a character’s needs, such as ‘hunger’ or ‘social’ have been fulfilled.
The two scales of the mood co-ordinate systems of DPE and MM are similar despite many differences in the details in the underlying systems. Both create a spatial representation with the extremes of anger, despair, exultation and bliss, though each organises the underlying axes differently. MM differentiates between inner and outer mood, while DPE puts both internal and social emotions in the same mood-space. The DPE’s x-axis is called ‘Outlook’ and measures the overall positive valence to how a character is feeling. ‘Affect’ is the y-axis of the DPE and depicts the energy of a character. One aspect of modelling emotions and moods that is clear in both cases, and which was pervasive in our discussions, is the lack of clear terminology for referring to qualitative emotion and mood states. This hinders literature comprehension, design, and comparison between models.

5.3.8 The Mind Module compared to Ortony et al.’s Model

In this section the features of the MM are compared with the framework of the OCC model in the hope of clarifying the approach to emotion modelling taken in the development of the MM. Ortony et al. (1988) argued that the notion of ‘basic emotions’ was vague. They presented 14 theories of basic emotion that all list different emotions as basic, each theory with different bases for selection. Some of these theories use the concept of having mixed states (Plutchik, 1962) or compounds (Averill, 1975). Ekman opposed the notion of the definitions of basic emotions being ‘vague’ in 1990 (Ekman, 1992) and successfully defended his standpoint of defining certain emotions as ‘basic’. When discussing emotion modelling, it is, however, important to bear in mind that what is referred to as emotions and sets of emotions are based on the
expression of emotion. This is because there to date is little other data to rely on, which makes it problematic to refer to a ‘definite’ set of emotions in an absolute sense, as discussed in Section 5.3.4.

Ortony et al. proposed a hierarchical structure of emotion where the top level is a distinction of positive/negative valence and where the in total 22 emotions are valenced towards either an event, an action committed by self or another agent, or towards an object. The emotions vary in intensity depending on different factors, among them the sense of reality, proximity, unexpectedness and arousal. The appraisal of objects, events and actions is done in terms of desirability, praiseworthiness and appealingness. Desirability depends on the goals of the actor.

The sentiment nodes of the MM use a mixed approach, allowing for several sentiments, in other words, different emotions, to be attached towards another entity, thus creating a compound set of sentiment. A sentiment set does not distinguish between types of entity in the world. The same type of sentiment can be directed towards objects as it can be towards characters or towards abstract principles.

As mentioned, sentiments in WoM are created in two ways. First, some emerge from interactions with other entities in the world, thus creating emotional memories of the entity. Second, there are authored sets of sentiments, that are similar to the emotions in the OCC model because they contain constraints on the type of object they can be set toward, and have specific combinations as described in Section 5.3.6.

The MM provides players with information about PCs’ feelings towards other entities in the world. Proximity to objects or characters affect the emotions, and thus the mood of a PC, functioning as information the player can use when deciding what to
do in the game world.

5.4 Summary

This chapter described the Mind Module (MM), a semiautonomous agent architecture built to be used in a VGW as a part of playable characters (PCs). The MM gives PCs personalities based on the Five Factor Model, and a set of emotions that are tied to objects in the environment by attaching emotional values to these objects, called sentiments. The strength and nature of a PC’s current emotion(s) depends on the personality of the PC and is summarised by a mood. The MM consists of a spreading activation network of affect nodes that are interconnected by weighted relationships. There are four types of affect nodes: personality trait nodes, emotion nodes, mood nodes, and sentiment nodes. The values of the nodes defining the personality traits of characters govern an individual PC’s state of mind through these weighted relationships, ideally resulting in values characterising for a PC’s personality. Figure 5.10 displays summarising information about the node types of the MM.

Describing the MM an account was given for which sources of inspiration have been used in the construction: spreading activation theory, trait theory, affect theory and Moffat’s model of how emotion can relate to personality. The approach used in the design of the MM was compared to the approach of Dynemotion People Engine and to that of the OCC model.

This chapter also provided brief history of the development of the MM as well as an overview of related work in the areas of believable agents and expressive AI, emotion modelling, applications for story construction and related work which use trait theory when constructing autonomous agents.
CHAPTER 5. THE MIND MODULE

Figure 5.10: Mind Module Summary.
Chapter 6

Early Experimental Prototypes

Contents

6.1 Ouroboros ................................................. 111
   6.1.1 Early Sources of Inspiration for the MM .......... 113
   6.1.2 The Playable Character Greyhowl ................. 116

6.2 Garden of Earthly Delights ............................. 119
   6.2.1 Game Design ....................................... 121
   6.2.2 Play testing ....................................... 127
   6.2.3 Guided Paper Prototype Play-Test ................. 128

6.3 Mind Music - The Soundtrack of your Mind .......... 134
   6.3.1 Background and Related Research ................... 135
   6.3.2 Design Considerations ............................... 137
   6.3.3 Requirements ....................................... 139
   6.3.4 Implementation ..................................... 140
   6.3.5 Adaptation of the Mind Module for the Mind Music Application ................................. 141
   6.3.6 Mind Music Composition ............................ 142
   6.3.7 The Composition for the Mood Scales ............ 142
   6.3.8 The Composition for the Emotions ................. 143
   6.3.9 System Integration .................................. 144
   6.3.10 Conclusions on Mind Music ...................... 145
This chapter describes the early prototypes where the mind module was used: Ouroboros, Garden of Earthly Delights and Mind Music.

### 6.1 Ouroboros

The first implementation the MM was part of was Ouroboros, an experimental prototype produced at the Zero Game Studio of the Interactive Institute in 2002 and 2003 (Zero Game Studio, Interactive Institute, 2003). In this project the foremost use of the MM was at a conceptual level. It was used for the design of a gesture system to ensure that the range of gestures available to characters reflected their emotional state. One of the prototype’s main purposes was to help players to perform emotional expressions that were consistent with a particular character’s personality and interpretation of the current context.

In conjunction with Ouroboros, a set of components constituting the open-source Purgatory Engine was developed. Purgatory Engine used the NEL Engine, developed by the French company Nevrax. In 2001, when the Ouroboros project started, NEL was the only engine providing full-fledged 3-D as well as a network layer accommodating thousands of players where all libraries used were either open source or under the GNU license.
As the following list of planned components illustrates the Purgatory Engine was an ambitious project:

- **Contextual Gesture System**: Based upon the state of the mind of a particular character, other characters in the context, and various aspects of the state of the world, a particular subset of dramatic and emotive character gestures were made available to the player.

- **Story Daemon System**: This was a planned method for orchestrating narrative experiences.

- **MM**: A model of a PC’s (or NPC’s) mind would influence what a character could or could not do, affect other characters within intersecting zones of presence and reception, and provide goals to the player within the VGW.

- **Metaphysics System**: This was the world-level equivalent of the MM for a character, representing thematic states of the total game world.

- **Language Characterisation System**: The free inter-player chat was going to be enhanced by an adaptive discourse system.

- **Social Grouping and Influence System**: Rule-sets were going to encourage group actions such as ‘group magical rituals’.

Due to limited resources the Zero Game Studio could not develop all components mentioned above. The Contextual Gesture System was given the highest priority in the development process. Figure 6.1 shows a screen image from the Ouroboros prototype. Gestures were recorded using motion capture equipment and modified for
use in the system. Though all components were not developed, the discussions in the
Zero-Game development team provided valuable directions of further research.

Figure 6.1: Screen image from the Ouroboros prototype.

6.1.1 Early Sources of Inspiration for the MM

While co-designing Ouroboros, at an early stage of the development of the MM, I
wanted to try different architectures for the MM in order to experiment with dif-
ferent views of cognition and personality models. I contemplated a series of imple-
mentations that would address the ultimate question ‘What is it to be human?’ For
such a project an already existing world was required — a VGW whose nature would
accommodate, through game-play and mechanics, the types of contextual qualities
interpreted and understood by the agents. Only then would it be possible to try out
different architectures for semiautonomous PCs and compare them.
The early conceptual version of the MM, described in (Eladhari & Lindley, 2003), was inspired by several theories not mentioned in Chapter 5, which describe the most recent iterations of the MM: Freud’s distinctions of the id, ego and super-ego (1923), Maslow’s being-values (1968) as well as Grof’s notion of COEX structures (1986). These theories were not used in the iterations of the MM that I built later, but it might still be interesting to consider these theories in further work. In this section, three of these approaches and their possible implications for the MM are briefly summarised.

Psychodynamic models of the mind are based upon the following three components following Freud:

- the id, which is a basic and biologically based level of drives and needs;
- the ego, which modifies desires arising from the id and directives from the superego in the light of the current situation for the sake of self-preservation;
- the super-ego, which is a set of internalised goals, directives, values and behavioural rules that have been learned from authority figures such as parents.

The psychodynamic model functioned as an inspiration for the MM; the id, the ego and the superego were not explicitly modelled as components in themselves. As Bellman writes, there is a danger of postulating a homunculus inside each brain as if there is a ‘little seat of self’ sitting there and controlling all the rest (Bellman, 2002).

The instantiated mind, as well as our biological minds, operates with so many parallel processes that a centralised view of the ego is not applicable. It can be added
that a homunculus provides no explanatory utility for the mind, since it recursively suggests a homuncular account of the mind of the homunculus itself (to infinity).

Nevertheless, the Freudian model can be conceptually interesting for distinguishing PCs’ goals, drives and social norms guiding behaviour into layers, and also for showing what is left out. Figure 6.2 is a conceptual sketch from 2003 showing how the Freudian concepts of id, ego and super-ego can be mapped to PCs in VGWs.

Figure 6.2: Freudian concepts of id, ego and super-ego conceptually mapped to a PC in a VGW.

Another potentially interesting psychodynamic model is what Grof refers to as COEX structures, or constellations of condensed experience (Grof, 1986). COEX structures are patterns of emotive and affective response to people, objects, events and situations, developed as an individual’s ego defence mechanisms for resolving and managing conflicts within and between the id and the super-ego.

Maslow is well known in the phenomenological psychological tradition mostly because of his work on the hierarchy of needs (Maslow, 1943). In his later work he built upon
this, developing the concept of being-values which focus on a sense of purpose rather than on needs (Maslow, 1968). The being-values Maslow writes about include wholeness, perfection, completion, justice, aliveness, richness, simplicity, beauty, goodness, uniqueness, effortlessness, playfulness, truth and self-sufficiency. These values could be used contextually for character-goals, tied to types of action or objects in a VGW in order to simulate types of actions that could give characters a sense of these being-values. These could be mapped to personality definitions or perhaps actively chosen by players in order to give differentiation in possible play-styles.

6.1.2 The Playable Character Greyhowl

One of the PCs created for Ouroboros by the team in the Zero Game Studio was Greyhowl, who appears in Figure 6.3 as modelled by Marcus Gezelius using concept art by Sri Elkins. In Ouroboros the players were intended to inhabit characters that had distinct personalities, relationships and goals that a particular player could enact by role-playing.

The concrete characters authored for Ouroboros, mainly by Martin Ericsson, provided me with a design context from which I could draft the first architecture for the MM. In the Ouroboros game design document Greyhowl is described as

[...]a hedonist of epic proportions and his ballroom parties are legendary. Greyhowl is found at the centre of debauchery, always with a pained look on his bored face. He plays his games of sedition and seduction listlessly, ever hoping for something that will touch his cold soul.

Greyhowl is of the undead Bysing breed. Bysing are beings present in the Gotlandic mythos of the Ouroboros project. These are shadowy figures crying in fear and hate
in the midwinter night. In the old days they haunted and hurt humans, feeding on their fear of the unknown.

Greyhowl had the following values set in his trait nodes (span 50 to 50): friendliness= -30.0, gregariousness= -20.0, assertiveness=10.0, activity level=10.0, excitement seeking= -25.0, cheerfulness= -45.0, trust= -30.0, morality= -40.0, altruism= -30.0, cooperation= -10.0, modesty= -10.0, sympathy= -30.0, self efficacy=10.0, orderliness=-10.0, dutifulness=0.0, achievement striving= -20.0, self discipline=0.0, cautiousness=10.0, anxiety=35.0, anger=10.0, depression= 35.0, self consciousness=30.0, immoderation=30.0, vulnerability = 40.0, imagination= 10.0, artistic interests= 15.0, emotionality= -25.0, adventurousness= -20.0, intellect= 25.0, and liberalism= 20.0.
Greyhowl was designed to strive for a single being-value: Aliveness. This could be justified by his undead nature. A designed long-term story-deamon would hold a story premise and plot point knowledge for the scenario in which Greyhowl’s love for Jorme, his servant, could make it possible for Greyhowl to stop being undead. Figure 6.4 is the one of the concept-art pictures drawn by Sri Elkins which illustrate Jorme, Greyhowl, and their relationship. Initially one sentiment was to be instantiated for Greyhowl: the PC Jorme was associated with the emotion Satisfaction. If the PC Jorme was near Greyhowl, the emotion node Satisfaction would increase its value. Greyhowl’s mood would change as a result of the increased satisfaction. This would change the body posture of Greyhowl and free up the possibility of performing certain gestures.
6.2 Garden of Earthly Delights

The second implementation in which the MM was used was the Garden of Earthly Delights (GED). GED was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO), which was part of the Integrated Project for Pervasive Gaming (IPeRG). The GED prototype was designed, tested and implemented in 2004 and 2005.

Figure 6.5: Conceptual picture used for presentation of the MMRO work package

In MMRO, the focus was on ways to integrate the massively multiplayer gaming, which is mostly done at home by a personal computer, with modes to play outdoors, via a cell phone, as Figure 6.5 by Christian Wenninger aims to illustrate. The development work in the MMRO work package of IPeRG was done by researchers and
developers from five organisations; Nokia Research and Tampere University in Finland, Sony Network Services in Germany, Gotland University and Daydream (the company who made the location-based game BotFighters) in Sweden. The game design document for GED (Eladhari et al., 2005) was produced by a team of 13 researchers and game designers.

Garden of Earthly Delights (GED) was a pervasive VGW prototype, that could be played both in a VGW and in the physical world, a concept illustrated in Figure 6.6. The game design document (Eladhari et al., 2005) states:

In a parallel, mirror world fuelled by the dreams and nightmares of people in the physical world, the order has been thrown off balance. Now, a battle for dominance takes place in both worlds.
In the physical world, players build social relations, affect each other’s mood, find out secrets about players close by and fight phobias. In the mirror world, phobias are manifested as surreal creatures, and battling them becomes hands-on. Players in the physical world can project their fantasies into the mirror world, creating minions to help them.

GED was staged in a surreal fantasy world, where fantasy is understood in the sense of having a primary physical world and a secondary magical world (Nikolajeva, 1988). The primary target group for GED was dedicated players of commercial VGWs. Secondary target groups were players of location-based multiplayer mobile games such as BotFighters from Daydream, and players of downloadable mobile Java games in general.

6.2.1 Game Design

In the design of GED PCs and NPCs were equipped with MMs. Characters’ personalities, moods, emotions and sentiments were to be simulated, and played an important part in the game. The semiautonomous agent architecture of the MM was used for the design of the core game-play mechanics, where important properties such as mind energy that was used for casting spells was directly derived from the MM.

The GED design included game-play uniquely facilitated by the co-presences of a physical and a virtual game world (i.e., parallel reality), including five possible play modes for players based upon their relationship with the virtual game space:

1. *Virtual*: playing the game with a PC in a conventional VGW.

2. *Mobile*: location-based game-play in the real world. The VGW has 1-1 mapping
with the real-world game area.

3. **Astral**: the players playing the game in the Mobile mode go to the Astral mode, and instead of moving physically to a place, move their presence virtually. This too can be used for going to places that could not be physically reached.

4. **Dormant**: players who are not playing can choose to be in the Dormant mode. In this mode they are represented by their aura balls and receive notifications from the game to their mobile phone when someone interacts with their aura ball.

5. **Offline**: the players can log off completely from the game. Other players cannot interact with a player who is in the Offline mode.

Players in different modes could see each other in the game world, with some exceptions, as illustrated in Table 6.7. The players who were offline could not see anyone else and could not be seen by the other players. The players who were in dormant mode could not see other players but could still receive notifications about game events. Players in the Dormant mode were visible to the other players as aura balls. Players in the Astral mode saw the PCs in the other modes similarly as the players in the Mobile mode. The colour of the aura ball represented the mood of a PC.
Table 6.7: The visual presentation of the players who are in different play modes. 

Note. The rows state the mode in which the player is and the columns state the mode in which the other players are.

<table>
<thead>
<tr>
<th></th>
<th>Virtual</th>
<th>Mobile</th>
<th>Astral</th>
<th>Dormant</th>
<th>Offline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual</td>
<td>![3D avatar]</td>
<td>![2D avatar]</td>
<td>![Aura ball]</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mobile</td>
<td>None</td>
<td>![3D avatar]</td>
<td>![2D avatar]</td>
<td>![Aura ball]</td>
<td>None</td>
</tr>
<tr>
<td>Astral</td>
<td>None</td>
<td>None</td>
<td>![3D avatar]</td>
<td>![2D avatar]</td>
<td>![Aura ball]</td>
</tr>
<tr>
<td>Dormant</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>![3D avatar]</td>
<td>![2D avatar]</td>
</tr>
<tr>
<td>Offline</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>![3D avatar]</td>
</tr>
</tbody>
</table>

The ultimate long-term goal of the game was for the players to win a territorial battle fought between two factions. The players chose their side from either of the factions. The power relationships between these factions depended on the presence of players and NPCs who belonged to the factions. This was intended to encourage players to leave their aura ball in the game world, even if they were not actively playing the game (i.e., choosing the dormant mode instead of the offline mode).

The game design encouraged collaboration between players in the virtual and mobile modes. The players in different modes could see different pieces of information. For example, the players who were in the virtual mode could see what weaknesses other PCs had. The players in the mobile mode needed this information when they chose which spells to cast on other PCs. The players in the mobile mode could see which faction the other PCs belonged to. The players in the virtual mode did not see this information even if it was needed by all the players. The reason for this is that play tests (see Section 6.2.2) showed that it was necessary to add more incentives for
players to use the mobile mode in order to balance the game.

Figure 6.8: Different information is provided about the GED game world depending on whether the player uses the virtual world client or the cell phone to play in the physical world.

In the geography Comfort zones and Danger zones were used, see Figure 6.8, where players could see dark areas (danger zones) populated by hostile entities, and light areas (comfort zones) populated by friendly entities, where characters could recuperate. The geography in the mirror world was isomorphically mapped to the physical world (i.e., adjacency relationships in the real world are preserved between corresponding positions in the virtual world), but in the mirror world the distances are smaller and the nature of specific location representations were non-realistic. Figure 6.9 shows three different play modes as they looked during the development of the digital prototype.
CHAPTER 6. EARLY EXPERIMENTAL PROTOTYPES

Figure 6.9: Screens of play modes in the digital prototype of GED. Note. From the left: dreaming (3-D client on computer), mirror (cell phone client) and astral projection (cell phone client).

Design Notes

The main design challenge in GED was to design and implement game-play activities that would be enjoyable on both types of platform and complement each other. Much focus was put into designing for co-operative game-play. On special occasions team work would be required where some players performed tasks in the virtual world, and where some in the group performed tasks outdoors. Given the technical set-up where the players would learn new ways of using technology to participate in the game, we settled for a traditional fantasy setting, in order to use a familiar fictional code and style that would let players use their existing mind models, or preconceptions, and thus hopefully making it easier for players to understand the game-play.

For the digital prototype of GED I built a simplified version of the MM. The purpose of the simplified version was, through user test, to start with testing a smaller set of values, and perhaps in later iteration increase the complexity, depending on the results
of the tests. This simplified version of the MM contained only five personality nodes, which were the facets of the MM, thus called facet nodes. These were connected to two emotion nodes, joy and fear, through weighted relationships. The relations between the emotion nodes and the mood nodes, and potential sentiment nodes were the same as in the full version. This version of the MM is illustrated by the physical prototype test sheet in the lower part of Figure 6.10.

Figure 6.10: Physical prototype used for play testing a simplified version of the MM.
6.2.2 Play testing

Focus Test

During the development of GED three tests were conducted. The first was a focus test in which groups of participants of the intended target groups were asked about their attitude towards game features that would reach out from the magic circle of the virtual world into their every day lives via their cell phones. The focus test was conducted by Elina Koivisto and Christian Wenninger and is described in (Koivisto & Wenninger, 2005).

Function Test of Physical Prototype

The second test was a functional paper prototype test where the main development team made sure that the most obvious design flaws would be resolved before the first digital prototype was produced. This test, illustrated in Figure 6.11, was conducted by Gustav Stenmark, Peter Kullgard, Tom Söderlund and me. For the purpose of trying out features where several players co-operate using the two different game modes, the virtual and the physical, we designed a board game mock-up with turn-based game mechanics where two boards with grids on maps of Stockholm represented the virtual and the physical world of GED. The test provided us with details useful for the implementation of the digital prototype. The main finding from these sessions was concerned with game balance: players needed more incentives to play in the physical mode using cellphones. The results from these tests were used to enhance the game design before software implementation began. In the digital prototype, strategical information about opponents could only be retrieved while using the physical mode, as described in section 6.2.1
6.2.3 Guided Paper Prototype Play-Test

The third test was a guided paper prototype play-test organised with eight players in September 2005 where each session was video-taped. The test was conducted by Elina Koivisto, Christian Wenninger and me, and is described in detail in (Koivisto & Eladhari, 2006b). The test explored subject matters of usability, game-play (the core mechanics of the game) and pervasive features.

This section is concerned with the results related to the MM, that is, core game-play and characterisation. The testing took two days, and three researchers were needed for moderating and facilitating the test sessions. Each testing session lasted 1.5 hours on average. The test method was a modified version of a typical paper prototype testing method for testing utility applications (Nielsen, 1994). One of the researchers was an interactive storyteller who guided the player through the game
objectives and reacted to the players’ actions (similar to a game master in tabletop role-playing games), one simulated the computer and kept the game interface of our paper prototype updated, and the other was the observer who also acted as a game manual when needed, as illustrated in Figure 6.12. In addition to explaining what happened in the game, the storyteller posed various questions about supposed situations to players, for instance, about what they would think about getting a message from the game when partying with friends.

Figure 6.12: From left: a player, storyteller, and ‘computer’. The ‘manual’ is taking the picture.

Scenarios

Five scenarios were part of the play-test, of which two are relevant to game mechanics and characterisation. In the first scenario, a player had just bought the game and started playing it in virtual game mode. The player’s first quest to kill spiders introduced the concept of mind energy (that is used for casting spells) and the battle system as illustrated in Figure 6.13. The aim of the scenario was to find out how well the core game mechanics worked.
In the fifth scenario the feature of affective actions was tested. The player was presented with a situation where a friend was sad because of an insult from another PC. The player could pick up one of the actions as shown in Figure 6.10, and point it towards a character in the scenario. The result of the action in terms of mind energy and mood was simulated in the character sheet shown in the lower part of the same figure. The aim of the scenario was to find out how well the feature of affective actions might work. Affective actions are described in detail in Section 7.7.

**Demographics in the third test**

The game was tested individually with eight players. All of the players were VGW players (who had played VGWs for 2 years on average). Many of the players had played World of Warcraft, but there were also players of other VGWs. Five of the players had only some or no experience of live-action role-playing (LARP) games,
three had played LARP games for several years and also organised LARP games. All of the players in the LARP group also had a strong table-top role-playing game background, and about half of the players in the non-LARP group stated that they had only sometimes played table-top role-playing games. All of the players in the non-LARP group were university students while the LARP group had mixed backgrounds. There was one female in both groups, and the percentage of females in the testing was 25 percent. The test players were all Swedish and they were 24-35 years old, with the average age being 26.

Observations and lessons

The positive observations regarding the game-play were related with learnability and characterisation. For the majority of the players, the game was not difficult to understand, even if it included different playing modes. The players with role-playing experience especially liked the detailed way the characters personality was defined at the beginning of the game. Most of the players enjoyed playing the game (see Figure 6.14) and all of them were interested to play a software version of the same game in the future.

Each character had a MM which reflected the character’s mind and had an effect on its behaviour in certain situations. For instance, if the character had phobia for spiders and saw one, the MM could take over and the character might run away in fear. About half of the players considered losing control of one’s character to be an interesting feature. However, there were also strong comments against this feature, with one player noting: ‘Lack of control is no good if you realise it’. This is quite
understandable because having control is usually a guideline for a good game design (Höysniemi et al., 2004). Most of the players liked the idea that the player would not actually lose control but the MM would affect how the character looked (for instance, happy when among friends). The results indicate that to, for short periods, override players’ control of the PC can be an interesting feature, but the degree of player-control versus control from the semiautonomous agents needs to be carefully tuned to a VGWs game mechanics to suit the specific game-play. Features that temporarily take the control away from the player have been successfully used in for example World of Warcraft (WoW) where a character affected by the spell of fear runs in the environment outside the control of the player. Perhaps experience of this type of game-play among the participants influenced their opinions of the issue — the fear spell of WoW was discussed by a few of the participants.

The play-testing also revealed that the design of only one pool for health and magical energy can be difficult to balance. In the design of the WoM and PI prototypes
PCs have two properties important for conflict situations, mental energy and mental resistance, as expanded upon in Chapter 7. Play tests (described in Chapter 8) using both these properties as part of the game mechanics proved to be more successful in terms of understanding the core mechanics derived from the MM.

The test of the affective-action features was the last of the scenarios, which unfortunately had resulted in that, in a few cases, tests were incomplete due to lack of time. Thus the results of the scenario are not as comprehensive as the remainder of the play-test. However, the test results did indicate that players enjoyed the feature where affective actions had a direct effect on other PC’s emotions. Normally in VGWs social actions such as emotes does not affect the game-play. The players’ positive attitude to the affective-actions feature indicated that further development of the feature could be interesting.

The group that also had LARP experience were particularly enthusiastic about the personality-based game-play that was the result of integrating the MM into the overall design. It was, however, clear that the generic theme of fantasy in some ways hindered the perception of the MM derived game-play features, even if it was useful because players did not need to learn about a new mythical world but could use existing mind models regarding how entities are normally constituted in fantasy role-playing games. The simplified version of the MM proved to be easy to understand for the participants in the test, indicating that a more complex model would be feasible to use.

The MMRO work package of IPeRG came to an end before a second prototype could be produced. The lessons from the development were considered as discussed above in later prototypes: WoM and PI.
More detail about the game design of GED is available in Eladhari et al. (2005) and in Becam and Kullgard (2006). The technical documentation is available in Becam et al. (2005), and the internal evaluation of the phase of MMRO described in this section is available in Koivisto et al. (2006).

6.3 Mind Music - The Soundtrack of your Mind

The third implementation involving the MM was done in the winter 2005/2006 and was much smaller than the previous ones, Ouroboros and GED. It focussed on a single aspect: how music can be used to express the internal emotional state of a PC. In Ouroboros the expression of the PC’s own emotional state was shown to others through postures and gestures. However, what is shown visually might not necessarily give the full picture of the fine-grained emotional state provided by the MM. Additionally, it could be a desired feature in a game that a player might choose to not be entirely transparent to other players about the emotional state of her PC. The traditional way of conveying the current state of a PC to a player is through numerical values that might or might not have a visual representation in the form of a set of bars or another type of diagram. The third implementation, Mind Music, instead used the energy level of the PC, derived from the mood nodes of the MM via the game mechanics of GED, as rhythm and groove. An emotion gave a melodic sound, and the encounter of a sentiment played a leitmotif. The mood gave the music varieties in harmony. These aspects resulted in different orchestral soundtracks for the players.
A simple demonstrator in the form of an arcade game was built by Mikael Fridenfalk, where hitting different objects resulted in emotional events, which in turn triggered the interpretation of personality traits, moods, personal sentiments and formed the base for the music. Rik Nieuwdorp composed the music. The Mind Music was originally designed as a feature for GED.

6.3.1 Background and Related Research

Just as games often borrow narrative structures from films, musical structures are also borrowed. For music this creates the same problem as for the narrative: the games are interactive and usually not linear. The area of music needs similar research and design goals as narrative: adapting the composition to the media.

A shared property of music for film and of music for digital games is that it is functional. Cohen has described eight functions of music in multimedia (Cohen, 1999). The functions that are of particular interest to games include that music can be used to direct attention to important features of the screen, to induce mood (this is supported by several experiments; Pignatiello et al. (1986)), to communicate meaning to further the narrative, to enable the symbolisation of past and future events through the technique of leitmotiv, to heighten the sense of presence, and to add to the aesthetics.

Research into believable agents is often concerned with the expression of emotion. Because a fundamental aspect of music is its ability to express emotions research in believable agents can benefit from exploring how music can be used. When Bates (1994) coined the expression believable agents, the idea took a stance in arts, literature, theatre, film, radio, and drama, but especially in character animation for Disney
characters. Bates described a believable agent as ‘an interactive analog of believable characters discussed in the Arts’ (p. 5), and argued that artists hold similar goals to AI researchers, wanting to create seemingly living creatures where the illusion of life permits the audience’s suspension of disbelief. He proposed that emotion is one of the primary means to achieve believability. Study of believable agents has mostly been approached by making applications that to varying degrees create believability by using graphics showing facial expressions and gestures, and by using language, spoken dialogue and dialogue in text, most notably within the OZ Project (Bates et al., 1989 - 2002) and the NICE project (NICE, 2002 - 2005). The Mind Music prototype aimed to widen the field of expression of believable agents to also encompass music. The approach might not be as relevant for environments where the approach is aimed solely at NPCs, but it could prove useful for semiautonomous PCs to express the states of the player’s own character.

Regarding how music can affect emotions of listeners there seems to be a consensus around the crucial need for further research in the area (Jusling & Sloboda, 2001). Nevertheless there is some empirical evidence as a basis for experiments in the field. Gabrielsson and Lindström (2001) reviews different factors in musical structure that affect perceived emotional expressions. Recent implementations in the area include Berg and Wingstedt’s studies with the REMUPP tool (2005), showing how musical parameters can contribute to expressing the emotions of ‘happiness’ and ‘sadness’ (Wingstedt & Berg, 2005). Taylor, Torres and Boulanger recently presented a real-time system that allows musicians to interact with synthetic virtual characters as they perform (Taylor et al., 2005), and Livingstone and Brown proposed a dynamic music environment where music tracks adjust in real-time to ‘the emotion of the in-game
state’ (2005).

In game development the term ‘adaptive audio’ is normally used to describe music and audio that reacts appropriately to game-play. Adaptive audio is more closely tied to the implementation of the game-play than the traditional pre-composed music and audio that often is tied to certain locations in the virtual geography of the game, or tied to certain events and/or actions. Just as Livingstone and Brown notes (2005), the event-based approach with looped audio tracks leads to music that is repetitive. This has the effect that players become adept at determining the game-state on basis of the track, and the music is reduced to serving as a mild distraction. Adaptive audio is currently under-utilised in games (Withmore, 2003), but there are several exceptions, such as Castlevania: Dawn of Sorrow (2005), Fahrenheit (2005), GUN (2005) and the VGW Star Wars Galaxies (2003).

6.3.2 Design Considerations

Because music, with some philosophical reservations, see, for example, Davies (2001), can be seen as ‘the language of emotion’ (Pratt, 1952) I believe that experiments with adaptive audio could benefit research into believable agents. Music can be used to give players an idea of what a character is like by hearing its affective processes, while the audio output depends on how a particular character with a particular personality and history interprets a particular context. To quote Cohen (2001, p. 267):

Real life entails multiple emotions, simultaneously and in succession. Miraculously, yet systematically, these complex relations — this ‘emotional polyphony’ — can be represented by the musical medium.
Normally in digital role playing-games the characteristics of a PC is shown to the player via symbols on the screen. These can for example be numerical figures, text or icons. The more abilities and properties that a particular player needs to see during game-play, the more complex the user interface becomes. An illustrative example is the number of add-ons that players of the VGW World of Warcraft (2004) develop and share in order to enhance and personalise the user interface of the game to fit their needs.\(^1\)

There are several benefits to using music to represent affective processes of a character in a role-playing game. One benefit is that complex states, an ‘emotional polyphony’, actually can be represented by the musical medium. If music is used instead of visual symbols players do not need to keep track of a set of changing symbols on the screen in order to get information about affective states. A second benefit is the possibility to have different representations of the affective state and the affective reactions. The design of the GED and Ouroboros prototypes included features for expression of emotional state via posture and facial expression if the player used the 3-D client for the PC. For example, if a player character experienced fear, the posture and the facial expression would change when a certain threshold value was reached. This would be visible to not only to players themselves, but also to any players within the range of visibility. A small change, however, would only be communicated to the player experiencing the state — via music. A third benefit of using music to reflect the affective processes is a potential positive effect on the immersive qualities of a game. Tests show that music indeed can induce mood to a

\(^1\)The 12th of March 2006, 137 applications could be downloaded from the category Interface Addons at the URL http://ui.worldofwar.net. In July 2009, the number of applications for customised interfaces for WoW was several thousands, and categorised more narrowly; see for example the URL http://wow.curse.com/downloads/wow-addons/.
listener (Pignatiello et al., 1986). In game genres such as role playing there is a heavy focus on drama and immersion (Ermi & Mäyrä, 2005), something that has been a challenge to digital role-playing games. Using music and adaptive audio to support immersion, presence and drama may be one way of enhancing the quality of digital role playing games. A fourth possible benefit could be that the believability of the character whose affective state is represented in fine granularity is increased.

While it might not be so difficult to envisage a system that plays a leitmotiv illustrating fear or sadness in situations that the system can identify as ‘scary’ or ‘sad’ the issue of more compound affective states is more demanding. The MM (described in Chapter 5) caters for compound states, where for example a character in a gloomy mood could experience mixed feelings such as combinations of joy, guilt and confusion.

6.3.3 Requirements

The Mind Music application is an attempt to create a musical soundtrack expressing the individual moods and feelings of each PC. Such a soundtrack would express and represent the affective processes of a PC to players, where each player would hear a different soundtrack.

In order to achieve this in a virtual world the following is required:

- an implementation of a model of mind that can give a PC a personality, moods, likes and dislikes, and feelings that are connected to the context of the PC;

- a mapping between the individual PC and the ontology, or domain, of the game world;
an adaptive music implementation that can express the different affective states of the PC.

6.3.4 Implementation

State of mind can for example be expressed through emotionally loaded ambient musical compositions, situation specific melody themes and variations in the rhythm. In the design for the GED prototype a particular player would be exposed to three main musical elements:

- ambient music composition for description of mood states of a PC based on input from the MM;

- situation-specific melody themes, such as leitmotivs for objects that have the same meaning for all players, or players parts of larger groups. An example of a leitmotiv is when the shark comes close in the movie Jaws. In this system a scary leitmotiv would be played when something that the PC fears comes close;

- variations in the rhythm expressing the level of energy/excitement.

As sketched above, the musical experience of players would be individual, but given the personal creative style of the composer writing music for the elements it would be possible to have united ‘sound’ for the game that expresses the aesthetics of the particular game. In the test application, we only experimented with musical features in relation to the MM. We implemented a simple game application in arcade style. The test application used modules originally designed to be used in the full blown virtual world of GED, the MM, and compositions for adaptive audio, see Section 6.3.6. The test application was only intended as an experiment for the adaptive
music, and therefore only the parts of the system relevant to this were used. The PC was represented by a simple dot that the player could move in order to touch icons of 13 types, each representing an emotion. A short sound or melody was played when the player-dot was touched by an icon. The mood of a PC changed depending on what ‘emotion icons’ it was touched by and the music changed according to this.

6.3.5 Adaptation of the Mind Module for the Mind Music Application

The application Mind Music used thirteen emotion nodes and on two mood nodes. The application used the emotions listed in the Table 5.6 in Section 5.3.4. A generic personality with norm values was used for the test applications, and only 13 sentiments were instantiated. These sentiments were tied to classes, not specific objects, where in the game each sentiment were tied to a type of icon that the player can ‘touch’. This simplistic setting gave a very constrained mapping between the separate entities in the world, in this case the dot representing the player and game objects of thirteen different kinds.

The personality of a character with a MM defines how it is likely to react in different situations. In a role-playing setting the MM’s system of traits defines how likely a PC is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily react with anger than a character who has a low value. In our test application, however, where only one player was active as a ‘dot’, the personality settings have a different meaning. Depending on the traits of the ‘character’ that starts the game, the music which is played tend to play...
along different parts of the mood co-ordinate system (see Section 6.3.6).

The personality can be changed by the player via a XML file which is provided with the application. If it is not changed norm values are used. In the test application, the relations between the emotion and mood nodes, expressed in terms of weight, were used as explained in Table 5.7.

6.3.6 Mind Music Composition

Empirical research concerning the influence of different factors in musical structure on perceived emotional expression (reviewed by Gabrielsson and Lindström (2001)) gives a solid base of information which was possible to use as an inspiration for the composition of the Mind Music application. The most studied factors are harmony, rhythm, tempo, loudness, pitch and mode. Because the Mind Music application played several tracks simultaneously that in many cases were independent of each other, the number of factors were narrowed down, in order to decrease the level of complexity, to two factors: harmony and time signature. The results of a study by Berg and Wingstedt (2005), was inspiring. In Berg’s and Wingstedt’s study mode and tempo (among several other factors), were studied in respect to how musical parameters can express happiness and sadness to listeners. In their study, listeners could adjust musical parameters to best express a given emotion.

6.3.7 The Composition for the Mood Scales

In the Mind Music application, the inner mood was represented by harmony, while the outer mood was represented by time signature. The design intention was to let the inner mood represent the private, inner mood of the character, while the outer were
representing the more extroverted side of the mood, how the character emotionally was relating to the game world and to other characters. A challenge for the composer was to compose segments that would sound ‘good’ in all possible combinations in the mood co-ordinate system (illustrated in Figure 5.9). The sounds were manifestations of the different modulations that could occur within the mood co-ordinate system. For the inner and outer mood, there were 25 different modulations as the mood scales have 5 hard segments each (that is, musical tracks). These were created as MIDI files using DirectMusic Producer (Microsoft, 2001).

The outer mood was represented by the time signature of the music, because this characteristic did not interfere with the harmonic qualities of the inner mood music. Time signatures also were consistent with the extrovert nature of outer mood scale. Time signature controlled, to use a popular expression, the ‘groove’ of the music — it is often visible in how a listener ‘bobs’ his or her head. A change in time signatures is possibly more profound than a harmonic change, since the listener need to adapt to the new ‘groove’. The notes used for each segment of the mood, scales of inner and outer mood, are available in (Eladhari et al., 2006).

6.3.8 The Composition for the Emotions

Musically, the co-ordinate system of the two mood scales was the very foundation. Inner and outer mood controlled the fundamental elements within the soundtrack, the way it felt and developed through time. When short melodies for the emotions are composed, they must not interfere with the structure of harmony and time signature; therefore they have to be represented in another element of the musical composition. Even though harmony and time signature were set by the mood scales, this did not
limit how the composition was ‘filled in’, that is, the amount of notes, instruments, sound effects or sound altering effects (like reverb or delay for example) were still open to the will of the composer. Direct translations like linking the inner mood scale to the harmony of the soundtrack can just as easily be used in the integration of the emotions into the composition; chaos can be represented by fast, random notes within the spectrum of the harmony, alienation can be expressed by the amount of reverb on the percussive instruments. In this case, the emotions were simply represented by short leitmotivs that could announce a fast change in the PC’s emotional state. DirectMusic Producer (Microsoft, 2001) was an appropriate tool for working with these extra melodies, as they needed to function with the musical result of all possible modulations of the mood co-ordinate system. Via DirectMusic Producer certain melody parts could be programmed to follow the rules of any set harmony, which resolved the potential problem of matrical adaptive composing, that is, having to make every emotion multiple melodic modulations for any possible harmony that could occur.

6.3.9 System Integration

The software systems platform consisted of an experimental 2-D game engine that was developed for the purpose of integrating the MM with the music system. It further incorporated a simple game client for analysis of the performance and the correct functionality of the system. The platform consisted of GLUT, OpenGL on Windows, and was developed in C++.

The game items consisted of a PC (the ‘dot’) and a number of sentiment objects, representing 13 different emotions. The positive sentiment objects moved in a scripted
way and the negative ones moved in formations and tended to chase the player. The role of the player was to hit the positive sentiment objects and to avoid getting hit by the negative ones if the player wanted to hear music that is ‘happy’ on the inner mood scale and ‘exultant’ on the outer mood scale. If the player instead wanted to hear ‘depressed’ and/or ‘angry’ music the game-play strategy would be reversed. As a result, the inner and outer moods were changed depending on which objects the player hit and the frequency of hits. The music system was implemented by mapping 25 possible emotional states (a grid consisting of five outer and five inner modes) to an equal number of pre-composed audio loops, waiting for each loop to terminate before the next started.

The MM is written in C++ and for use with this systems platform it was made available as a DLL with the necessary functions exported. Input data, specific to this implementation, was read from XML files. These input data gave the MM the necessary information required for activation of the affect nodes. These files also provided a convenient way of experimenting with setting different weights on the sentiment nodes in order to try out different paces of change in the music on the two mood scales, and for changing the personality trait settings.

6.3.10 Conclusions on Mind Music

The work with the Mind Music was challenging in many ways, and in retrospect I could see a number of issues that need to be addressed. For example, the larger the combination space is that the different elements of the audio operates in, the more difficult it is to ensure that the music sounds ‘good’ or ‘appropriate’ to game-play in all possible combinations. On the other hand, a smaller combination space may lead
to predictability. If players are fully adept at determining the game state information based on the music, the music ceases in its functional role and thus becomes less interesting (Meyer, 1956).

Another issue is that the music and sounds played for illustration may not have the meanings that the composer has intended for the individual player. If there is a large mismatch between intended meaning in the representation and what is perceived by the player the intention of the application is lost.\(^2\) Even though there is much empirical research showing how to use musical structures and factors to have the intended meaning, the quality and nature of a composition, for each application, rely on aesthetic decisions made by a composer. A possible, but not necessarily feasible, approach for achieving musical expression that matches subjective interpretations of emotional meaning for listeners could be to ask players in the beginning of the game what emotions they perceive that certain musical elements convey. These musical elements could be stored as activation data used by the application to combine the musical elements for the individual player. This would give a character a personal music setting, a ‘music personality’.

In Section 6.3.2 I outlined the following four main possible benefits of using music

\(^2\)Mind Music was not used and tested as part of GED, due to the premature ending of the project, but the mood co-ordinate system has been used by Stockholm in the application Eavesdropping where this is addressed (Stockholm, 2008; Stockholm & Pasquier, 2008). Eavesdropping is an Internet-based audio composition system, designed for public spaces where several computer users are gathered. In Eavesdropping, compositions are created from abstract mood objects rather than musical structures. Stockholm writes (2008, p. 56): ‘This research attempts to resolve issues raised in prior multi-user, collaborative mood-ecologies (Eladhari et al., 2006) by applying a situation-aware, server-based Conductor to adjust the audio based on the number of participants. The composer uploads a variety of audio to represent the moods in the composition and the Conductor chooses which files to play to address issues of sound density, stream segregation and acoustic ecology.’ In Eavesdropping, composing users can project music projecting moods, and listeners can evaluate whether the audio matches the mood. Eavesdropping is accessible online at [http://www.oddible.com/cafe](http://www.oddible.com/cafe).
to represent affective processes of a character in a role playing game:

1. the ability to express complex relations of the affective processes — an ‘emotional polyphony’ — through music instead of through visual symbols;

2. the ability to induce mood to players as a means to increase the level of immersion or presence in a game;

3. the possibility to differentiate between the expression of affect that a PC expresses through facial expressions, postures and gestures to other players from the affective states and processes that are represented by the music. The music represents affective states and processes of the character rather than reactions, and these are private to a player;

4. possibly increase the believability of the character by a finely granulated representation of its affective processes.

The first and the second benefit in the list above are supported by research in that is referenced in this chapter, especially (Gabrielsson & Lindström, 2001; Wingstedt & Berg, 2005). Even so, further research where the applications are geared towards CAP in games is necessary.

6.4 Later Experimental Prototypes

6.4.1 World of Minds 1

The fourth implementation is a virtual world prototype where the game design entirely builds upon the features of the MM and utilise the aspects relevant to characterisation
and story construction. The first implementation had the working name ‘World of Minds’ (WoM) and was done in 2006 as a text-based world, using the code base BetterMUD (Penton, 2004). The MM was integrated as a SWIG module. It was useful for trying out some of the game-play features in an environment that did not require any media assets such as graphics and audio, but left a lot to be desired in terms of usability. It did not render good enough responses from early functional tests to motivate further development on that particular platform, but did give enough material for the second game design iteration done in 2007.

6.4.2 World of Minds 2

The second digital prototype of WoM was done in 2008 using the Torque Game Engine (TGE) by GarageGames together with Prairie Games open source TMMOKit which provide an MMO game frame work and network layers, written in Python. The MM was rewritten in python and added to TMMOKit as a python module. In parallel, scenarios suitable for guided paper prototype play tests were designed. The purpose of these was to test game-play features before they were implemented in the prototype, and to get indications of the potential success or failure of the design in regard to game-play features using mood, personality traits and sentiments as means for characterisation and story construction. The guided play tests were video taped and transcribed. Additional material in relation to the tests were gathered through video taped interviews and a series of surveys. These tests yielded relevant results and are described in Chapter 8.
6.4.3 Pataphysic Institute

Despite the feasibility of TGE and TMMOKit as development platforms the task of finishing the WoM prototype turned out to be too large for a single developer. Therefore a partnership was sought, and found in the game company Pixeltamer, who during 2009 assisted in developing the prototype using an engine developed in-house. At this point the prototype was ready for leaving the working name WoM and receive its real name: Pataphysic Institute (PI). The design of PI and WoM is described in Chapter 7.

6.5 Summary

This chapter has described the early prototypes where the MM was used as part of the implementations.

In Ouroboros an important focus was to explore the use of expressive gestures of 3-D characters. Different gestures were available for use depending on the state of mind of the PCs and were consistent with their personalities. In relation to this, early sources of inspiration for the implementation of the MM were described. Ouroboros was developed at the Zero Game Studio, part of the Interactive Institute in Sweden.

Garden of Earthly Delights (GED) was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO) of the Integrated Project for Pervasive Gaming (IPeRG). The focus of MMRO was to explore ways to integrate massively multiplayer gaming with the play via cell phones with geographical location data. Five organisations in Europe co-operated in MMRO. A guided paper prototype play-test was conducted where issues of player control of the semiautonomous PC was
discussed and which showed that players with live action role playing experience were particularly positive towards the MM derived game-play in the test.

The Mind Music application, also a part of MMRO, focussed on how music can be used to express complex states of mind to players, communicating mood and emotions of the own PC via leitmotivs and groove. By using a model of mind such as the MM that provide a character with personality, emotions, mood and sentiments, the development team attempted to generate music that reflects the affective processes of a character. An aim with the test application, a simple game in arcade style, was to illustrate how affective processes could be represented in real-time to a player via music.

The development and design of the early prototypes were useful for the work with the later prototypes, where the entire design builds upon the MM, described in Chapter 7 and 8.
Chapter 7

Game Design

Contents

7.1 Background ........................................ 153
7.2 Game Design Overview ............................ 155
7.3 Core Game Mechanics .............................. 157
  7.3.1 Mind Energy and Mental Resistance .......... 157
  7.3.2 Summary of Mind Magic ........................ 158
  7.3.3 Mind Magic Spells ............................. 159
  7.3.4 Affective Actions .............................. 160
  7.3.5 Mood Aura .................................... 161
  7.3.6 Formalised Social Relationships ............... 161
  7.3.7 Character Creation ............................. 162
  7.3.8 Character Development ......................... 164
  7.3.9 Entity Types ................................... 165
  7.3.10 Display of Mind Module Information ......... 166
  7.3.11 An Example Event and Possible Consequences 168
7.4 Back-story of the Pataphysic Institute ........... 170
  7.4.1 Introducing the Back-story to Players ........ 173
  7.4.2 Non-Playable Characters ........................ 173
  7.4.3 Dialogue ....................................... 175
7.5 Formalised Social Relationships ........................................... 176
  7.5.1 Friends ................................................................. 177
  7.5.2 Protectors, Protégés and Departments ............................... 181
  7.5.3 Acquaintances ......................................................... 183
  7.5.4 Authored relationships ............................................... 183
  7.5.5 Design Notes about Social Relationship Features ................. 183
7.6 Mind Magic Spells .......................................................... 184
  7.6.1 Spell Types ............................................................ 184
  7.6.2 Emotion Spells ......................................................... 185
  7.6.3 Mind Energy and Mind Resistance Spells .......................... 186
  7.6.4 Mood Requirement for Casting Spells .............................. 186
  7.6.5 Personality-based Area of Effect Spells that Affect Mental
       Energy and Resistance .................................................. 190
7.7 Affective Actions .............................................................. 191
  7.7.1 Prerequisites and Success Criteria .................................. 191
  7.7.2 Design and Test Process of the Affective Actions Feature ... 194
  7.7.3 Specific Affective Actions .......................................... 195
  7.7.4 Design Consideration of Affective Actions Economy ............ 197
  7.7.5 Learning Affective Actions and Spells ............................. 198
7.8 Single-Sentiment Manifestations ........................................... 199
  7.8.1 SSM Properties ....................................................... 199
  7.8.2 Exclamations ......................................................... 201
  7.8.3 Specific SSMs ........................................................ 202
7.9 Compound Manifestations .................................................. 203
  7.9.1 Properties .............................................................. 204
  7.9.2 Example of an Authored Compound Manifestation ............... 205
  7.9.3 Free Form Manifestation of CM ................................... 207
  7.9.4 Manifestations of Curses and Blessings .......................... 208
7.10 Characterising Action Potential .......................................... 212
  7.10.1 Summary of Interrelated Elements Governing the Characterising
         Action Potential ...................................................... 213
7.11 Summary ................................................................. 215
This chapter describes the game design for the prototypes Pataphysic Institute and World of Minds. The chapter is organised in the following way: First, a brief background to the development is given, followed by a summary of the design work. Then a brief description of the core game mechanics is given. Next the back-story of the world and sections which describe relevant features of the game mechanics are presented in detail. Finally, the characterising action potential of PCs given the presented design is summarised.

7.1 Background

The work on the early prototypes presented in Chapter 6 gave me the opportunity to start to map out game design that could use the functionality of the MM and provide a game system where issues of characterisation and semiautonomy could be explored.

This chapter describes the game design that is the base for the World of Minds (WoM) and the Pataphysic Institute (PI). In the text, PI is the game named, since this is the latest iteration. The game design is presented before the pen-and-paper play-test of WoM in Chapter 8 in order to give necessary background to the research question explored in the WoM play-test, even though some design choices presented in this chapter build on results from that very test.

WoM was developed both as a MUD, a text-based VW during the autumn 2006, as a 3-D graphic VGW using the Torque Engine and Prairie Games’ open source

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1Not all design- and implementation-related issues are considered relevant to this thesis, such as design and development methodology, the specifics of the dialogue system or spacial design considerations. The list of discarded issues is long. The design features presented in this chapter are those that may have a bearing on the questions listed in Chapter 4.
MMOKit during 2007 and 2008. For both these iterations the Mind Module, which
is written in C++, was wrapped with SWIG so that it is accessible via Python,
the scripting language of the MMOKit and of the engine for the text-based world.
Neither of these digital prototypes were developed to a stage where they were mature
enough to test. The reason for this was that the platforms were not stable enough
for a single developer (me) to be able to make a testable prototype in given the
time frame of the project. Also, my skills in 3-D graphics programming, databases
and network programming were insufficient. In 2008 in parallel with development
using the MMOKit I conducted guided prototype play tests which are described in
Chapter 8. In the winter 2008/2009 it became obvious that I would not manage
to finish the prototype during the spring on my own in parallel with teaching and
writing this thesis. The Department for Game Design at Gotland University, my
home-department, came to my rescue at this point and helped me to establish a co-
operation with the German game company Pixeltamer. PI is built in Pixeltamer’s
framework for web-based multiplayer games and is played in a web browser through
a Java applet. The game design described in this chapter was written during the
spring 2009 and is the product of design experience of previous prototypes and tests
of these.

The PI prototype was built during the spring of 2009. Christoph Pech, managing
director at Pixeltamer in Germany, did the development at the engine and framework
level (as defined in Section 2.3.1), according to the design document provided to him.
My part time assistant at Gotland University (HGO), Musse Dolk, did the develop-
ment required at the scripting level. Ola Persson, a masters student in graphics for
games at HGO whom I supervised, worked with Musse on the level design, and made
the 3-D graphics required for the prototype advised to use paintings by Hieronymus Bosch as his main source of inspiration. During the spring we had weekly meetings.

7.2 Game Design Overview

Pataphysic Institute (PI) is a prototype game world where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters the potential emotional reactions depend upon PCs’ current mood and personality.

Players are introduced to the back story of PI before they log on, by reading the diary of Katherine, an investigator who was sent in to PI to investigate the consequences of a mysterious event called the Outbreak. In PI, reality has been replaced by the inhabitants interpretation of reality, and their mental states are manifested physically in the environment. The head of human resources at PI has taken upon himself the task of understanding the new and unknown world by applying personality theories. He forces everyone in PI to take personality tests, and studies what types of abilities these persons get, abilities he calls Mind Magic Spells. Another inhabitants in PI, Teresa, focuses on the finding that social interactions between people suddenly result in acutely concrete emotional reactions. She calls these Affective Actions (AAs), and tries to understand her changed environment by studying the patterns of these.

The basic game-play is simple: players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar’s personality, her current mood, and how far the avatar has progressed in learning new abilities. Each avatar has mind
energy (mana) and mind resistance (health points). Each spell costs mind energy to use, and attacks reduce mind resistance. The experience of the character defines how large the possible pool of energy and resistance is at a given moment. The regeneration rate of resistance depends on the inner mood, while the regeneration rate of the energy depends on the outer mood.

Players can affect each other’s moods by using AAs, thus controlling the selection of spells available. AAs are actively chosen by the players, they are not effects of other social actions. If a player targets another avatar they can choose from a selection of AAs. For example, the AA Comfort can be used successfully on targets that have an active emotion node of Sadness, but only if the player’s own avatar is not in the area of Furious on the mood co-ordinate system. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character.

The core game-play draws upon the Mind Module as described in Chapter 5, a semi-autonomous agent architecture built to be used in a multiplayer environment as a part of the player’s avatar. All characters in Pataphysic Institute are equipped with Mind Modules, both playable characters (PCs) and non-playable characters (NPCs).
7.3 Core Game Mechanics

7.3.1 Mind Energy and Mental Resistance

A character has a pool of Mind Energy (ME) and Mind Resistance (MR). The maximum amount of possible MR and ME increases with the level of the character. Levels are gained for a PC as it gains experience points (XP). Mind Energy is used when the character performs action, as a cost. Mind Resistance is lost if the character is attacked by another entity. Figure 7.1 illustrates the fluctuations of MR and ME.

MR and ME is regenerated over time. The rate of the regeneration depends on the mood of the character. Inner Mood is tied to the generation of mind resistance while Outer Mood is tied to the regeneration of Mind Energy as illustrated in Figure 7.2.
CHAPTER 7. GAME DESIGN

The regeneration of mind resistance corresponds to the negative and positive values of the inner mood, meaning that the higher the value is of the inner mood, the quicker the resistance of the character is regenerated over time. In the case of the mind energy the regeneration is the slowest when the character is in the middle of the scale. The quickest regeneration of energy is achieved at the extremes of the outer mood scale, in the jubilant and furious moods.

7.3.2 Summary of Mind Magic

Mind Magic can be performed in two ways: through social interaction with the use of AAs, and through spells. The AAs mimic the way humans affect each other emotionally through interactions such as encouragements or insults. The mind magic spells are more traditional from a game history perspective where the target of a spell not necessarily needs to have chosen this interaction. From a social interaction perspective a simile could be to use a love potion bought from a witch-doctor, in the belief that emotions can be forced. In PI they can be.
7.3.3 Mind Magic Spells

Mind Magic spells (MMSs) can help or damage (in terms of MR and ME) characters that the spells are used on. There is a standard set of spells. Benevolent spells can be used on Self, on other characters, and on Manifestations. Harming spells can be used on Manifestations. The spells characters can learn depend on their personality traits.

![Mood co-ordinate system, MR and ME regeneration rates, and usable spells]

Figure 7.3: Mood co-ordinate system, MR and ME regeneration rates, and usable spells

The types of spells that affect the pools of MR and ME which can be used differ with the mood of the spell-caster. The action potential regarding these spells reflect the mood of the casting character, as illustrated in Figure 7.3. For example, a character in a furious mood can cast aggressive spells, while a character in a harmonic mood can cast benevolent spells helping her friends. Mind Magic Spells are described further.
7.3.4 Affective Actions

Players can perform a social/affective action towards other characters in order to change their mental state in both positive and negative ways. By affecting others mood’s the selection of their available spells is changed. AAs are actively chosen by the players, they are not effects of other social actions. If a player targets another avatar she can choose from a selection of AAs. For example the AA ‘Comfort’ can be used successfully on targets that have an active emotion node of Sadness, but only if the player’s own avatar is not in the area of Furious on the mood co-ordinate system. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character.

In order to use an AA in PI players choose it from a menu in the interface while targeting the character that is to receive the AA.

An example of an AA is Flaunt Big Secret. This AA increases the Interest of the target (i.e., the value of the emotion node Interest which increases according to individual weighting toward personality trait nodes). AAs are described further in Section 7.7.

Both AAs and spells affect the emotion nodes of the targets, while spells also can diminish or increase to pool of MR and ME. Spells are typically used in situations of combat with NPCs and other autonomous expressive agents.
7.3.5 Mood Aura

In PI, PCs can see what mood other PCs are in by the colour of the mood aura, which is a transparent half-bubble displayed on the head of PCs as shown in the middle picture of Figure 7.4. The colour and shade of the colour reflects the current position in the mood co-ordinate system. In the picture to the left the white dot in the middle in the mood co-ordinate system is the position of the PC Emil’s mood, which was neutral at the time when the screen dump was taken. In the figure to the right the white dot shows the PC Neurotica’s mood, which was in the blissful space of the mood co-ordinate system.

![Figure 7.4: Mood Aura in PI.](image)

7.3.6 Formalised Social Relationships

Characters in PI have several available types of formalised social relationships. Formalised in this context means that the relationships are part of the game mechanics, as opposed to non-formalised relationships where the players can have relationships independent of the game system.
PCs and NPCs can have friends, where the number of possible friends vary depending on values in the character’s personality trait nodes. Friendship relations increase the MR and ME, and if friends are in proximity of each other in the VGW they get an increase in the emotion node Belonging. PCs can also have one friend relationship defined as a special friendship which give the same effect as other friendships, but with higher increases of the affected properties.

PCs may define relationships of protection, where one character can be protected by two characters, becoming their Protégé, and protect two others, becoming their Protector. These relationships also define the permanent grouping system in PI, further described in Section 7.5.2. The role of the Protector, who typically is a more experienced player is the help the Protégé. As a reward, the Protector receives a percentage of the experience points of the Protégé, and increases in the emotion node Pride when the Protégé ‘levels up’. PCs in the same permanent group belong in PI to the same Department, and if they are in proximity of each other in the VGW the value in their emotion node Belonging increases. The formalised social relationships in PI are described in more detail in Section 7.5.

### 7.3.7 Character Creation

When a player logs on to PI the first time she can take an IPIP NEO test consisting of 120 rating scale items in order to create a personality for her PC (Johnson, 2001). Figure 7.5 shows a screen of the IPIP NEO in PI. In order to rate all items players need to scroll down in the dialogue window in the PI client.
Players can also choose a quicker route and chose either a randomised personality or select one of five ready-made personality templates. Figure 7.6 shows a screen from PI where the player can choose a personality template or to take a test. The personality templates each have one of the FFM facets dominating, and have specific personality traits set so that they give different abilities in terms of available personality based
mind magic spells. The personality templates are provided in Appendix B.2 along with specifications of the spells available for each template.

The scoring system and report routines of the IPIP NEO test was kindly provided by John A. Johnson, Professor of Psychology at Penn State University. The perl CGI scripts provided by Prof. Johnson was rewritten in C++ by Mr Pech at Pixeltamer for use in the PI VGW.

### 7.3.8 Character Development

Character development in PI uses the well-proven system of levels and experience points (XP) used in most role playing games (RPGs), both table-top RPGs and computer-based RPGs. Generally in RPGs, XP are given to PCs as rewards for performed actions in the game world. When a certain amount of XP are gathered the character gains a level, that is ‘levels up’. When a character gains a level she can learn new abilities and often specialise the character’s properties according to the game mechanics of the specific game. The specialisation and learned skills define the types of actions the character can perform. The level of the character signals how experienced and powerful (in terms of the properties of the game world) she is. Normally PCs start at level 1 or 0. In many games there is a limit on how many levels a character can gain. This limit is often called ‘level-cap’.

In the current design of PI there are 30 levels, which I consider enough for the play-testing of the prototype. Gaining levels in PI give PCs:

1. an increase of maximum amount of mental energy (at each level);
2. an increase of maximum amount of mental resistance (at each level);
3. the possibility of learning new spells (at specified levels);
4. the possibility of learning new AAs (at specified levels).

The levels where players are introduced to new AAs and spells are summarised in Section 7.7.5 and specified in detail in Appendix B.1.

7.3.9 Entity Types

In PI there are entities of four types; Playable Characters (PCs), Non-Playable Characters (NPCs), Single Sentiment Manifestations (SSMs), and Compound Manifestations (CMs). The role of the NPCs is to provide information and challenges to the players. This is done via dialogue. SSMs and CMs are entities which can cast benevolent or harmful spells on PCs. CMs can also perform AAs. The entities in PI are or instantiated in the VGW in different ways. PCs are created by players, and instantiated whenever a player logs on to the VGW with her PC. NPCs are created by the world developers, and are in the VGW permanently. SSMs are also created by the game developers, but most of them are born as results of emotion nodes of other entities (PCs, NPCs and CMs) reaching their maximum value. As such, they are manifestations of the state of mind of the inhabitants of the world. For example, if a PC ‘feels’ a Joy intensely the SSM Joy Jumbo is instantiated in proximity to the PC. An example involving an ‘amusing’ action that potentially can give birth to an SSM is illustrated in Figure 7.9 in the following Section.

CMs can be created by the developers of the VGW, but also by players. The players can author a CM if their PC is affected by a sentiment curse or blessing, giving it a strong sentiment. Players can externalise the sentiment of their PCs by creating CMs representing it, as such manifesting emotions of the PC, authored by players. CMs become part of the VGW as threats or helpers to its inhabitants, in
ways that can call for collective action taken by the PCs.

Entities in PI have different abilities as specified in Table 7.7. All types of entities can cast Mind Magic Spells, but only PCs, NPCs and CMs can perform AAs. NPCs may communicate with PCs via pre-written dialogue, while CMs and SSMs exclaim lines of dialogue which are shown as speech bubbles in the PI client.

![Table 7.7: Entity types and abilities in PI.](image)

7.3.10 Display of Mind Module Information

In PI players can open a window displaying mind module (MM) information of their PCs by clicking the button which has a blue symbol of a human head shown Figure 7.8 in the top left part of the picture. The window displaying MM information is transparent, overlaid on the landscape shown in the PI client. In the screen from PI shown in Figure 7.8 the MM information of the PC Emil is displayed.

In the top left column the values of Emil’s personality trait nodes are displayed. In order to see the whole list it is necessary to scroll down in the list using the grey
In the bottom left column a list of sentiments are shown, where first the entity that the sentiment is directed toward is named, and then the emotion of the sentiment. The numerical value to the right of the text shows the strength of the emotion. Emil has a sentiment of Belonging toward Neurotica, and in proximity of her the value of his emotion node Belonging increases.\footnote{In PI the effect scales by proximity — the nearer the object, the stronger the effect. The effect increases with 0.1 multiplied with the relative distance to the sentiment object per second.}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{mind-module.png}
\caption{Display of Mind Module information in the PI client}
\end{figure}

In the middle column the values of Emil’s emotion nodes are displayed. The pink high-lighted dot next to the emotion Distress/Anguish signals that it is clickable. If Emil’s player hovers the mouse over the dot the text ‘Dull Pain’ is displayed.
Emil’s first personality based emotion spell. If the player clicks the dot the spell is cast on a targeted entity, reducing Distress in that target.

The column to the top right shows Emil’s mood, displaying the value of the inner and outer mood nodes as well as the mood co-ordinate system. The white dot in the mood co-ordinate system shows which mood space Emil currently is in; Jubilant. The green dots in the right of the mood co-ordinate system are clickable spells of the type Resistance Aid, available when Emil is in the jubilant mood space (this is described further in Section 7.6.4).

In the column to the lower right effects of recent actions are displayed. Emil has performed the AA Squeeze hand on the PC Neurotica, who has performed the same AA on him. The number to the right tells for how long the effect of the action persists. At the time when the screen was taken the effect of the Squeeze hand Emil performed on Neurotica will be active for a few more seconds.  

7.3.11 An Example Event and Possible Consequences

Sentiments for characters in WoM are generally instantiated results of their actions, both of those performed by themselves and of actions performed by others with themselves as targets. In the current implementation sentiments are instantiated when an emotion node reaches a threshold value, in most cases set as 90 percent of its maximum. Figure 7.9 is an illustration of how either a spell or an AA causing amusement is interpreted by the MM. The values on the arrows between the nodes are weights.

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3The value of the remaining AA is the remaining strength. An AA begins with the strength 1, and decrease once per second with the decrease value specified for the AA.
Suppose that the PC A in Figure 7.9 performs the AA Joke on PC B, and that B selects to laugh as a reciprocal AA. (If a CM was supposed as the target of A she could have chosen to cast the spell Amusement Shower.) The increase of the emotion node amusement of B is calculated by the MM using the values of B’s trait nodes Cheerfulness, Emotionality, Depression and Imagination. When the value of B’s emotion node is calculated the value of B’s outer mood node is updated.

If the value of B’s emotion node exceeds 90 percent of its maximum value a sentiment of amusement toward A is created. This means that when A is in proximity of B the value of B’s emotion node amusement will increase slightly. Metaphorically B senses an emotional memory of amusement.

If the value of B’s emotion node exceeds the maximum value of the node an SSM is born, an Amusement Article. The Amusement Article casts the spell Amusement Shower on any PC who happens to pass by. Metaphorically, B is so amused that he
cannot keep the emotion to himself anymore, it ‘goes out of bounds’ and manifests in the VGW. When the SSM is born, B’s emotion node Amusement is set to its mid value.

7.4 Back-story of the Pataphysic Institute

At the Pataphysic Institute no conflicts surfaced. Bullies were left to bully. No one dared confront them out of fear of becoming a target. Victims learned to keep quiet. Because of the lack of vents for expressing emotions the behaviour of the staff got stuck in vicious circles of passive aggression. Boundaries were twisted, roles deformed, and responsibilities abandoned. Conflicting rule sets were propagated. Victims became perpetrators.

In the minds of the staff, paranoia became the normal state. Each person developed a different interpretation of the situation ‘real’ in order to function. A lot of energy was spent on maintaining mental pictures and projections supporting individual world views. These also served to justify actions that in other contexts would be defined as crimes.

This situation was maintained for many years.

The first death at PI that was impossible to classify as an accident at PI caused the central committee to instigate an inquiry. The Lead Investigator sent three psychologists under oath of professional secrecy to interview the staff. The report was presented in the main conference room. As point by point was projected in the PowerPoint presentation the mental pictures of each person were challenged. In order to protect the pictures, their personal versions of reality, the audience individually strengthened their mental pictures.
Point by point the results of the investigation were rejected. Not a single person on the staff let the facts of the situation alter their interpretation of the situation.

The Lead Investigator, not succeeding in reaching her audience, grew desperate. On an impulse, she suddenly pulled up a photograph of the deceased from the police investigation on the projection screen. In that moment, when the collected staff was confronted with the brutal evidence of the suicide, the membrane between reality as we know it and the projections of mind was ripped apart.

The Lead Investigator fled. In the confidential report she filed she speculated:

In that moment, it was as if they collectively chose to reject reality, and that reality in response shunned them. Or maybe the manifestations became too strong. This event is unprecedented. Irrespective of the reason for this sequence of events the consequence for the staff of the Pataphysic Institute is they can continue to avoid understanding the consequences of their actions and in actions. On a personal note, I think they made a devil’s bargain. They sentenced themselves to live with the manifestations and projections from their own minds. If just one of them had reached out for the other, dared to trust, maybe this would not have happened.

The emergency response group sent from the central committee sealed off the building and established channels to continuously provide the remaining staff at PI with food and other necessary supplies. The first field agents returning from a reconnaissance mission reported:

As we entered the facilities of PI we encountered several unexpected phenomena. The man known as Karl Sundgren had gone through a most peculiar transformation and acted as some kind of gate keeper. He only
let us in if he got to run his personality tests on us. He used to be head of the Human Resource Department and claimed ‘it was for our own good’. Karl was, despite the obvious trauma and his transformation, a valuable informant. As he expressed it, when inside PI it is as if all that was inside our minds are suddenly on the outside. There is a system for how to use the mind that needs to be investigated further [...] We recommend that colleagues venturing into the facilities take the utmost caution. Depending on what you bring in and how you act PI can be either your personal purgatory or your personal paradise. We also recommend colleagues to be prepared to help each other — the expression ‘No man is an island’ has never been more true.

The board of the central committee encouraged the former Lead Investigator to draft a confidential policy document regarding the situation at PI. She wrote, late in the night:

It falls under both the jurisdiction and responsibility of the Central Committee (CC) to investigate the situation at the Pataphysic Institute (PI). Opportunities include investigating the ‘Mind System’ and gaining an understanding of a possible solution to the situation. It is advisable to use investigators of various backgrounds in order to gain a multitude of nuanced perspectives. The first objective of the investigation is to determine whether the ‘Outbreak’ is only dangerous. It cannot be ruled out that we could learn about potentially beneficial [...] 

Then she stopped writing, thinking: ‘I want to see those manifestations again’. She glanced at her archive, which contained the transcribed interviews of the staff of PI.
'And those people need help. But I can't do it alone.'

7.4.1 Introducing the Back-story to Players

Players are introduced to the back-story of PI at the log-in page of the game through excerpts of Katherine’s diary. Katherine recounts of her encounters with the staff at PI and speculates about the Outbreak. The story is presented to players in three parts so that players can choose to read only parts of it. Figure 7.10 shows the web page where players can log in to PI. The full text of the back-story is available in Appendix B.5.

![Figure 7.10: PI Login Page](image)

7.4.2 Non-Playable Characters

Two NPCs are present in the PI prototype, Karl Sundgren, the former head of human resources (HR) at PI, and Teresa, a former PhD student at the institute. Their roles
are partly functional; Karl provides information about Mind Magic Spells and Teresa about AAs.

**Karl Sundgren - the Gate Keeper**

Karl Sundgren saw the situation that preceded the Outbreak in his role as head of the HR Department. He was afraid to handle the situation, but only after the outbreak has he confessed this to himself. Karl had fled into the secure world of spreadsheets, filling his time by cataloguing. The main part of his communication with others had the purpose of gathering data for more spread-sheets and reminding others to provide more material.

Karl blames himself for not handling the situation that led to the Outbreak. He tells himself that as head of HR the group dynamics was his responsibility. Karl sees the Outbreak as *his* punishment. He believes that if he can have all manifestations eliminated, the membrane between the physical and mental worlds will close again and things will go back to normal.

Karl becomes the Gate Keeper. His aim is to educate everyone who can help so that they most efficiently can rid the PI of the manifestations, good ones as well as bad ones.

**Teresa**

Before the Outbreak Teresa was working on her thesis titled ‘The Pataphysic Frontier’. Teresa does not agree with the Gate Keeper’s belief that ‘all will be well’ once the manifestations are eliminated. She has not formulated any counter theory, but she has been studying how social acts seem to be organised into patterns. She is sketching
a tentative framework for the rules, based on experience, of what she calls affective actions. Teresa hopes that a systematic use of affective actions can be key to coping with the Outbreak.

**Teresa’s and Karl’s Mind Modules**

Teresa and Karl have a reciprocal relation of friendship which renders them a permanent sentiment of belonging toward each other. Teresa is likely to have many short-term sentiments toward PCs because she is introducing them to performing AAs, offering herself as a guinea pig. Teresa’s personality is quite neurotic and she is very open to experience. She is not very extrovert or agreeable. Karl on the other hand is very extrovert and quite conscientious, but not very open to experience. Just as Teresa, he is not very agreeable. Karl’s and Teresa’s personality trait node values can be found in Appendix B.3.

### 7.4.3 Dialogue

Much of the back story of PI and the characters of Karl and Teresa is revealed via dialogue. Dialogue is also the main tool used to present the players with the game mechanics. The dialogue system is described in Appendix B.8. In Appendix B.6 the dialogue for the PI prototype is available for reading. The codes for the dialogues below notifies by letter who utters the dialogue and the number in what order. The notifier GK 1-3 means that the dialogue line is given by the Gate Keeper (Karl) in the first conversation, and that it is the third line of dialogue of the conversation.

Figure 7.11 shows a screen from PI where the PC Emil engages in dialogue with Karl. In the left of the figure the latest dialogue line, GK 1-7 is displayed. The
preceding dialogue lines, GK 1-5 and GK 1-6 are displayed to the right in the screen.

![Screen of dialogue in PI when Karl tells the PC Emil that he can Dull Pain.]

Figure 7.11: Screen of dialogue in PI when Karl tells the PC Emil that he can Dull Pain.

### Notebooks

The information provided by Teresa and Karl, and more in-depth information about for example personality traits are provided to players through notebook objects adjacent to the NPCs in the geography. The purpose of these objects is to let the player browse information at any time. The text in Karl’s notebook is available in Appendix B.7.

### 7.5 Formalised Social Relationships

In PI formalised social relationships between PCs are formed in the following ways:

- as a result of interaction and a mutual definition of the relationship between two PCs;
• as side-effects when ‘related’ PCs form relationships (i.e. becoming part of the same Department);
• as a result of authoring in the world.

7.5.1 Friends

In PI friendships gives the characters the feeling of belonging, more energy, and increase their resistance to mental threats as well as their energy.

Maximum number of friends

The maximum amount of friends a character can have depend on her personality:
Maximum amount of friends = (friendliness/20) + (cheerfulness/20) + (cooperation/20) + (adventurousness/20) - (vulnerability/20).

Figure 7.12 shows two screens of friend lists in PI. The left the PC Emil’s friend list is displayed. His dominant personality facet is agreeableness, and he can have 8 friends at most. The friend list of the PC Neurotica is displayed to the right: her dominant facet is neuroticism, and she is not very extroverted, giving her the possibility of having 3 friends at the most.
Forming a Friendship

A friendship can be formed between two PCs if they have performed positive AAs on each other and if they have positive sentiments toward each other.

The prerequisites for forming a friendship are as follows:

- number of positive AAs targeting each other $=> 20$;
- number of positive sentiments toward each other $> 1$.

If these conditions are fulfilled, PCs may ask each other to be friends. Any party can end the friendship at any point.
Permanent Friendship Effect

In PI each friendship gives PCs a *permanent friendship effect*. Each friendship increases the maximum amount MR and ME as follows:

\[
\text{Permanent friendship effect} = \frac{10}{\text{maximum amount of friends}}.
\]

The highest total permanent friendship effect is 10 percent of the (un-friended) maximum MR and ME. The total permanent friendship effect amounts to the same amount for all characters irrespectively of how many friends they are allowed to have.

Proximity Friendship Effect

The *proximity friendship effect* is a sentiment which increase value of the emotion node Belonging. An increase of Belonging increase the values of the inner and outer mood nodes, and thus also increase the regeneration rate of MR and ME.

The proximity friendship effect scales by proximity — the nearer the object, the stronger the effect. The effect increases with 0.1 multiplied with the relative distance to the sentiment object per second.

Figure 7.13 shows the PC Emil’s Mind window when he is in proximity of his friend Neurotica. In the bottom of the mind window she is listed as a sentiment object of the emotion Belonging. In Emil’s emotion list Belonging has increased to 56 from 50 in her proximity.
Long Friendship Effect

The long friendship effect increase the proximity friendship effect. For each month the friendship bond is intact the proximity friendship effect increases with 0.5 percent to a total maximum amount of 20 percent.

The Special Friend

If a PC has five or more friends she can form a special-friend bond with one of them, given that the other also has five or more friends already. If the maximum amount of friends a PC can have is less than five, the maximum amount of friends is sufficient to form a special-friend bond.

The special friend effect increases the maximum MR and ME by 5 percent. In proximity of the special friend the special friend effect increase the current value of the emotion node Belonging of a PC with 20 percent of its maximum value. This
value increases with 0.5 percent per month to a total maximum amount of 30 percent.

### 7.5.2 Protectors, Protégés and Departments

**Protectors and Protégés**

The role of the Protector is to help the Protégé. As a reward the Protector receives a percentage of the experience points the protégé earns.

The gain of the protector-protégé relationship is that experienced players get an incitement to help new players to get started in the world.

This relationship opens up the activation of the emotion node Pride (of another’s achievement). No prerequisites are needed for forming the protector-protégé relationship. A character can have two protectors and two protégés.

**Protégé Effect**

The *protégé effect* gives the protector 10 percent of the Protégés XP and an increase of the value in the emotion node Pride. The protector receives the XP and the value of the pride node is set to its maximum amount when the Protégé gains a level. The XP is not taken from the protégé, the sum is calculated on the amount of XP the character has gained during the level. The emotion node Pride is have a positive weighting to both the inner and the outer mood nodes.

**Permanent groupings - Departments**

The networks of protectors and protégés are what constitute a permanent grouping or guild — in PI these are called Departments. Because characters can have two protectors they can belong to two departments.
If character A, who leads a department of seven characters, became the protector of B, who leads a department of nine characters, A would become the leader of a department of sixteen characters. This is illustrated in Figure 7.14 where the circles with letters in them represent PCs. The lines between the circles represent protector-protégé relationships, where the protectors are higher up in the figure than the protégés.

Figure 7.14: Protectors, Protégés and Departments.

**Department Proximity Effect**

If a PC who is member of a department is in proximity of another member of the same department she gains the *department proximity effect*. The value in the emotion node Belonging is increased with 1 percent of its maximum value. The effect applies to each department member in proximity, and would thus be strong at a big department meeting.
7.5.3 Acquaintances

Acquaintances are listed in a simple list where a player can add PCs and a short memory note. The acquaintance role has no bearing on the game mechanics — it is only intended as a practical feature for the player to list people she has met.

7.5.4 Authored relationships

Authored relationships are sets of sentiments set between PCs. Specific sets of sentiments can be defined, as well as possibilities of how and by whom they can be set. These relationships can be created by game masters by scripting in advance of, or during, guided play-test sessions.

7.5.5 Design Notes about Social Relationship Features

The system of protector and protégés (under other names) was successfully used in Asheron’s Call (Turbine Entertainment Software, 1999) and Asheron’s Call 2 (Turbine Entertainment Software & Microsoft Game Studios, 2002), though each character could only belong to one permanent grouping. A similar system was implemented in A Tale in the Desert (eGenesis, 2003).

The feature of the two possible departments a character can belong to is modelled after real-world circumstances where people can find themselves in loyalty conflicts between different groupings they may belong to. A possible similar situation in real life is that of conflicts between families where an individual belonging to two families (mother’s side and father’s side) needs to make a difficult choice.

The feature of the Special Friend is modelled after real life strong relationships such as partnerships. It is not uncommon in VGWs that strong relationships evolve
as part of characters' lives. This feature is an attempt to accommodate this into the
game mechanics. Formation, maintenance and ending of Special Friend relationships
can potentially be dramatic in the sense that actions affecting the relationship may
be sources of strong feelings for the player.

7.6 Mind Magic Spells

7.6.1 Spell Types

There are five main types of mind magic spells as listed below, differentiated by what
properties are affected in the target of the spell.

- *Emotion spells* diminish or increase the value of an emotion node of the target.
  Emotion spell cost ME to cast. These can be of the type *Area of Effect* (AOE),
  which means that they affect all entities in proximity of the caster. If an AOE
  is used it is not necessary to target another entity.

- *Mind Resistance and Mind Energy Spells* (MR-ME spells) causes a direct de-
  crease or increase of either ME or MR of the target. These can be of the type
  AOE.

- *Sentiment spells* instantiate a sentiment in the target.

- *Personality alteration spells* temporarily changes the value of a trait node of
  the target.

- *Sentiment set spells* instantiate several sentiments, a sentiment set, in the target.
Spells are learned successively during play. Emotion spells and MR-ME spells can be used by PCs, manifestations and NPCs, but using these PCs cannot cast destructive spells on other PCs. Sentiment set spells and personality alteration spells are not included as features in PI but can be used by game masters leading guided play tests by scripting in run time. Sentiment spells are further described in Section 7.9.4 since the spells ‘Sentiment Blessing’ and ‘Sentiment Curse’ are tied to the creation of compound manifestations.

7.6.2 Emotion Spells

Emotion spells increase or decrease the value of an emotion node of the targeted entity.

Table 7.15: Spells affecting the values of emotion nodes in targets.

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Spell increasing emotion</th>
<th>Spell decreasing Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amusement</td>
<td>Burst of Wittiness</td>
<td>Blotch of Boredom</td>
</tr>
<tr>
<td>Interest</td>
<td>Toss Secretive Glossy Parcels</td>
<td>Drabby Humdrum</td>
</tr>
<tr>
<td>Joy</td>
<td>Cheer Contagion</td>
<td>Woe</td>
</tr>
<tr>
<td>Relief</td>
<td>Threads of Salvation</td>
<td>Problematisation</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Cloud of Complacency</td>
<td>Greed Golps</td>
</tr>
<tr>
<td>Surprise</td>
<td>Sudden Blipp! Astonishers</td>
<td>Blotch of Same-Bores</td>
</tr>
<tr>
<td>Confusion</td>
<td>Trumpet Irrelevant Questions</td>
<td>Laser Pen of Clarity</td>
</tr>
<tr>
<td>Anguish</td>
<td>Song of Pain</td>
<td>Dull Pain</td>
</tr>
<tr>
<td>Fear</td>
<td>Cold Ripple of Fear</td>
<td>Hold Hand</td>
</tr>
<tr>
<td>Anger</td>
<td>Primal fury</td>
<td>Cooling Cloth</td>
</tr>
<tr>
<td>Shame</td>
<td>Veil of Humiliation</td>
<td>Spine of Confidence</td>
</tr>
<tr>
<td>Sadness</td>
<td>Wet net of Tears</td>
<td>Accommodate Sorrow</td>
</tr>
<tr>
<td>Guilt</td>
<td>True-sounding accusation</td>
<td>Forgive</td>
</tr>
</tbody>
</table>

The emotion spells available in PI are listed in Table 7.15 where the column to the
left specifies the emotion that the spells in the middle and right columns affect.

### 7.6.3 Mind Energy and Mind Resistance Spells

PCs can use MR-ME spells to give MR and ME to other entities, and reduce MR and ME of their opponents. What MR-ME spells they can use depend on their mood. These availability of these spells is granted to all characters when they start playing. The spells are listed in Table 7.16.

<table>
<thead>
<tr>
<th>Spell effect strength</th>
<th>Give MR to other</th>
<th>Reduce MR of other</th>
<th>Give ME to other</th>
<th>Drain MR from other*</th>
<th>Drain ME from other**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Minor unfocussed resistance aid</td>
<td>Minor unfocussed aggression</td>
<td>Minor unfocussed energy rush</td>
<td>Minor unfocussed resistance drain</td>
<td>Minor unfocussed energy drain</td>
</tr>
<tr>
<td>Medium</td>
<td>Unfocused resistance aid</td>
<td>Unfocused aggression</td>
<td>Unfocused energy rush</td>
<td>Unfocused resistance drain</td>
<td>Unfocused energy drain</td>
</tr>
<tr>
<td>High</td>
<td>Focused resistance aid</td>
<td>Focused aggression</td>
<td>Focused energy rush</td>
<td>Focused resistance drain</td>
<td>Focused energy drain</td>
</tr>
<tr>
<td>Very High</td>
<td>Grand focused resistance aid</td>
<td>Grand focused aggression</td>
<td>Grand focused energy rush</td>
<td>Grand focused resistance drain</td>
<td>Grand focused energy drain</td>
</tr>
</tbody>
</table>

* Fifty percent of the efficiency compared to the other spells in this category. MR is taken from target and given to self.  
** ME is taken from target and given to self.

### 7.6.4 Mood Requirement for Casting Spells

The MR-ME spells that a character varies with the mood of the caster. The aim with the design is to have the actions mirror the caster’s mood.
Figure 7.17: mood spaces in the mood co-ordinate system governing availability of MR-ME spells.

The mood co-ordinate system is divided into 13 spaces, as shown in Figure 7.17 where each mood space is associated to MR-ME spell(s). When characters are in neutral mood space they have access to all types of MR-ME spell, but only the weakest varieties. The more extreme the mood is, that is that either the inner or outer mood node dominates either towards a positive or a negative value, the more powerful MR-ME spells become available, but simultaneously the range of MR-ME spell types gets
more narrow. For example, a character in a furious mood can cast strong aggressive spells but no benevolent ones, while a character in a blissful mood can cast strong beneficial ones, but no harmful spells.

Figure 7.18 shows the MR-ME spells available when casters are in a neutral mood. In this mood the full functional range of both giving and taking MR and ME to and from others is available, but only in the weakest varieties of the spells.
Figure 7.19 shows the available spells in three moods. In the circle to the left the mood is glad. In this mood the caster can cast the full range of the weakest spells, and all spells of the second weakest type except Unfocused Aggression. The middle circle of Figure 7.19 shows a Cheerful mood, that is, a mood that has a higher value in the outer mood node than the previous mood mentioned. In this mood the caster can, besides the spells available in the cheerful mood, also cast Focused Resistance Aid. In the right circle of Figure 7.19 a Jubilant mood is shown. In this extreme mood the caster can only cast spells of the type that gives resistance to the targets of the spell, but has access to the most powerful of the type, Grand Focused Resistance Aid.

Figure 7.19: availability of MR-ME spells vary with mood. From the left: Glad mood, Cheerful mood and Jubilant mood. The text in mood-spaces is the same as in Figure 7.17.

The mood spaces along the lower part of the inner mood axis where a character is in a gloomy, sad or depressed mood are associated with two types of spell, Energy Drain and Resistance Drain while the other mood spaces only have one type of spell associated with them. The reason for this is that characters whose mood are the in gloomy, sad and depressed mood spaces regenerate MR and ME very slowly. The regeneration rates of MR and ME are, as illustrated in Figure 7.2 are tied to the values
of the mood nodes. Characters in Furious moods for example regenerate energy very quickly. Characters in a Depressed mood need to act as ‘energy vampires’, to use a popular expression, and can therefore be helpful in groups that set forth to vanquish powerful manifestations since they, though fragile, can harm both the foe’s pool of energy and resistance. Characters in a Harmonic mood regenerates mind resistance quickly, and can share this with their friends, while if they are in Jubilant mood and quickly regenerates energy, they can share this instead.

7.6.5 Personality-based Area of Effect Spells that Affect Mental Energy and Resistance

When PCs reach level eight they learn a special personality based MR-ME Spell with is of the type AOE. (This means that no targeting is necessary and that all entities in proximity are affected by the spell.) This spell can be used independent of mood.

<table>
<thead>
<tr>
<th>MR-MS Area of Effect Spell</th>
<th>Trait prerequisites based on values of the trait nodes activity and altruism</th>
<th>Effect on expressive agents in proximity and on self</th>
<th>Effect on Self</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alacrity Alarm</td>
<td>Lowest difference value is towards maximum activity level</td>
<td>Increase of ME</td>
<td>Small decrease of ME</td>
</tr>
<tr>
<td>Damp Dough of Catatonia</td>
<td>Lowest difference value is towards minimum activity level</td>
<td>Decrease of ME</td>
<td>Small decrease of ME</td>
</tr>
<tr>
<td>All Out Resistance</td>
<td>Lowest difference value is towards maximum altruism</td>
<td>Increase of MR</td>
<td>Small decrease of ME</td>
</tr>
<tr>
<td>All Out Aggression</td>
<td>Lowest difference value is towards minimum altruism</td>
<td>Decrease MR</td>
<td>Small decrease of ME</td>
</tr>
</tbody>
</table>

Table 7.20: MR-ME area of effect spells.
Which spell characters learn depend on their traits nodes Altruism and Activity Level. The number that defines what spell to get is calculated on which of the difference between the actual value of a trait and its difference to the traits maximum and minimum value. The lowest difference-value decides which spell is given. The number of possible spells is limited to four. These are listed in Table 7.20

7.7 Affective Actions

A player can perform an AA towards another character in order to change that character’s mental state in both positive and negative ways. Players can affect each other’s moods by using AAs, thus controlling the selection of spells available. AAs are actively chosen by the players, they are not effects of other social actions. If players target another avatar they can choose from a selection of AAs. For example, the AA Comfort can be used successfully on targets that have an active emotion node of Sadness, but only if the player’s own avatar is not in the area of Furious on the mood co-ordinate system. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character. An example of an AA is *Flaunt Big Secret* which increases the value of the Interest emotion node in the targeted entity (where the value depend on the personality traits of the target).

7.7.1 Prerequisites and Success Criteria

Some affective actions can be performed at any time and at any target. Others can only be performed as response to other AAs, such as *Laugh at Joke*. However, there
may be prerequisites whether the action has an effect, depending on the mood of
the target. These can also be called the success criteria for the AAs. For example,
a character in a depressed mood cannot respond with the AA Laugh at Joke. The
success criteria can also depend on the relationship. *Praise* for example will give an
increase the emotion Pride to a target that is a protégé, but not affect others. Figure
7.21 shows the interface in PI for using AAs. The screen capture shows the PC Emil
who has targeted the PC Neurotica and performed the AA Calm Down. The system
says (in the bottom left of the picture) that this is unsuccessful, since Neurotica’s
Outer Mood is higher than -5, something which the colour of her aura signals.

Figure 7.21: The PC Emil unsuccessfully performs the AA Calm Down on the PC
Neurotica.

Figure 7.8 in Section 7.3.10 shows a screen from PI with the PC Emil’s mind window
is displayed. The text in the lower right part of the window reports that Emil success-
fully has performed the AA Squeeze Hand on his friend Neurotica, who has performed
the same AA on him. This has increased the value of the emotion Belonging, visible
in the list in the middle of the mind window.

Possible prerequisites and success criteria for AAs are the following:

- mood and emotions of target (success criteria);
- mood and emotions of performer (prerequisite for performance);
- relationship to target (success criterion);
- other AA (other action as prerequisite).

When a PCs mood is either the prerequisite for performance or the targets mood is
the success criteria for the performed action, a selection of nine spaces in the mood
co-ordinate system is used as illustrated in Figure 7.22.

Figure 7.22: Spaces in the mood co-ordinate system used by the AA system.
7.7.2 Design and Test Process of the Affective Actions Feature

The AA feature is the feature that has undergone the largest numbers of iterations. The feature was worked out on a conceptual level in 2005 as part of the GED prototype described in Section 6.2. A small paper prototype play-test, described in Section 6.2.3, with participants of different backgrounds in terms role-playing game-playing experience was performed the same year. This test confirmed that the AA feature was worthwhile developing further. A second iteration of the design was pondered upon in relation to a potential project involving natural language processing, described in Brusk and Eladhari (2006). A second paper prototype play-test of the AA feature was conducted in 2008 for the WoM prototype which is further described in Chapter 8. In this second test the participants used AAs in combination with Mind Magic Spells, and were presented to sets of AAs in steps in order to make the feature more accessible and not overwhelm the participants with too many AAs. At each step the participants were asked whether they missed any AAs. The results of this test was the basis for the next iteration of the AA feature. A small functional test was conducted by three persons working with the development of the digital PI prototype. This functional test was partly done in order to find which AAs had effects that duplicated each other so that they could be considered for removal from the system. Another aim with the test was to refine the order in which players learn AAs and to make sure that at each step contained AAs affecting the mood co-ordinate system in all four directions of the mood node axes.
### 7.7.3 Specific Affective Actions

<table>
<thead>
<tr>
<th>Affective Action</th>
<th>Effect on target</th>
<th>Effect on self</th>
<th>Success criteria</th>
<th>Prerequisite for performance</th>
<th>Decay rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree enthusiastically</td>
<td>Joy 0.6</td>
<td>Interest 0.2</td>
<td>Self not in furious or depressed mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Misunderstand purpose</td>
<td>Distress 0.2</td>
<td>Confusion 0.1</td>
<td>Self not in blissful or jubilant mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Joke with someone</td>
<td>Effect depends on response</td>
<td>Target not in furious or depressed mood</td>
<td>Self not in furious or depressed mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Refuse to laugh at joke</td>
<td>Distress 0.4</td>
<td>Sadness 0.2</td>
<td>Joke with someone cast on self.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Laugh at joke</td>
<td>Joy 0.4</td>
<td>Satisfaction 0.2</td>
<td>AA: Joke with someone, Self not in furious or depressed mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Comfort</td>
<td>Sadness -0.5</td>
<td>PreValT = -40 Self not in furious mood</td>
<td>PreValT = -10 Self not in furious mood</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Cheer up</td>
<td>Amusement 0.5</td>
<td>Target not in gloomy or depressed mood</td>
<td>PreValT = -10 Self not in furious mood</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Affirm</td>
<td>Joy 0.2</td>
<td>Belonging 0.05</td>
<td>Self not in furious mood</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Threaten</td>
<td>Fear 0.2</td>
<td>Self not in blissful or jubilant mood</td>
<td>Norm value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blame</td>
<td>Shame 0.3</td>
<td>Self not in blissful or jubilant mood</td>
<td>Norm value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insult</td>
<td>Anger 0.3</td>
<td>Distress 0.2</td>
<td>Self not in blissful or jubilant mood</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Compliment</td>
<td>Joy 0.3</td>
<td>Pride 0.1</td>
<td>Target not depressed or furious</td>
<td>Self not in furious mood</td>
<td>Norm value</td>
</tr>
<tr>
<td>Interrupt</td>
<td>Anger 0.3</td>
<td>Distress 0.2</td>
<td>Self not in blissful or jubilant mood</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Ignore</td>
<td>Anger 0.3</td>
<td>Distress 0.2</td>
<td>Self not in blissful or jubilant mood</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Be attentive</td>
<td>Satisfaction 0.4</td>
<td>Self not in furious mood</td>
<td>Norm value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make feel guilty</td>
<td>Guilt 0.3</td>
<td>Satisfaction 0.6</td>
<td>Self not in blissful or jubilant mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Boast</td>
<td>Guilt 0.1</td>
<td>Satisfaction 0.2</td>
<td>Self not in blissful or jubilant mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Forgive</td>
<td>Guilt -0.4</td>
<td>Shift to satisfaction 0.2</td>
<td>Self not in furious mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Show affection</td>
<td>Distress 0.2</td>
<td>Shame 0.2</td>
<td>Self not in blissful or jubilant mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Show affection</td>
<td>Joy 0.2</td>
<td>Satisfaction 0.2</td>
<td>Self not in furious mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Flirt Big Secret</td>
<td>Interest/excitement 0.3</td>
<td>Amusement 0.2</td>
<td>Self not in blissful or jubilant mood.</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Reveal Big Secret</td>
<td>Satisfaction 0.3</td>
<td>Belonging 0.2</td>
<td>Flirt Big Secret (20)</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Stunned Silence</td>
<td>Satisfaction 0.3</td>
<td>Confusion 0.1</td>
<td>Any positive AA</td>
<td>Norm value</td>
<td></td>
</tr>
<tr>
<td>Small Talk</td>
<td>0.05 Interest</td>
<td>Self not in angry or furious mood</td>
<td>Norm value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thank</td>
<td>0.2 Satisfaction</td>
<td>Self not in angry or furious mood</td>
<td>Norm value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hug</td>
<td>Depends on reaction</td>
<td>Target not in angry or furious mood</td>
<td>Norm value</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 7.24: Affective Actions continued

<table>
<thead>
<tr>
<th>Affective Action</th>
<th>Effect on target</th>
<th>Effect on self</th>
<th>Success criterion</th>
<th>Prerequisite for performance</th>
<th>Decay rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Be hugged</strong></td>
<td>0.2 satisfaction</td>
<td>0.2 joy</td>
<td>Target not in angry or furious mood</td>
<td>AA: Hug Self not in angry or furious mood</td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.2 sadness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.2 sadness (if sadness &gt; 0)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shrink away</strong></td>
<td>0.3 shame</td>
<td>0.3 sadness</td>
<td>0.1 guilt</td>
<td>AA: Hug Self not in jubilant or blissful mood</td>
<td>Norm value</td>
</tr>
<tr>
<td><strong>Look at target</strong></td>
<td>0.1 sadness</td>
<td>0.1 shame</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td>with dismay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sigh</strong></td>
<td>0.2 interest</td>
<td>0.2 joy</td>
<td></td>
<td>Self not in furious mood</td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.1 interest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tell a small secret</strong></td>
<td>0.2 interest</td>
<td>0.1 belonging</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.1 surprise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Share a memory</strong></td>
<td>0.3 interest</td>
<td>0.2 belonging</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.1 belonging</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mumble unintelligibly in sulky tone</strong></td>
<td>0.3 confusion</td>
<td>0.3 confusion</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.2 confusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Calm down</strong></td>
<td>-0.5 anger</td>
<td>-0.1 all negative emotions</td>
<td>Target not in angry or furious mood</td>
<td>Self not in furious mood</td>
<td>Norm value</td>
</tr>
<tr>
<td><strong>Let off steam</strong></td>
<td>0.3 confusion</td>
<td>-0.3 tension</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.1 all negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disagree</strong></td>
<td>0.2 anger</td>
<td>0.2 anger</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td><strong>Angry discussion about mutual</strong></td>
<td>-0.2 anger</td>
<td>-0.2 anger</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td><strong>Unhappy</strong></td>
<td>0.3 distress</td>
<td>0.3 relief</td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>1.0 confusion (on entities in proximity)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Radiate Bliss</strong></td>
<td>0.4 satisfaction</td>
<td>0.4 satisfaction on entities in proximity</td>
<td>Must be in bliss</td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.3 joy on entities in proximity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exaltant</strong></td>
<td>0.3 joy on entities in proximity</td>
<td></td>
<td></td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.3 joy in proximity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uncontrolled Wrath</strong></td>
<td>0.1 confusion</td>
<td>0.2 anger</td>
<td>Must be in fury</td>
<td></td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td>0.2 anger</td>
<td>0.2 fearful</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2 fear</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2 fear in proximity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Respect</strong></td>
<td>0.5 pride</td>
<td></td>
<td></td>
<td>Target must be protector of self</td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 amenity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Praise</strong></td>
<td>0.5 pride</td>
<td></td>
<td></td>
<td>Target must be protector of self</td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 amenity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reproach</strong></td>
<td>0.5 shame</td>
<td></td>
<td></td>
<td>Target must be protector of self</td>
<td>Norm value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 resentment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Spare my hand</strong></td>
<td>0.3 belonging</td>
<td></td>
<td></td>
<td>Target must be a friend</td>
<td>Norm value</td>
</tr>
<tr>
<td><strong>Group Hug</strong></td>
<td>0.8 belonging</td>
<td></td>
<td></td>
<td>3 participants who are friends</td>
<td>Norm value</td>
</tr>
<tr>
<td><strong>Funny Walk</strong></td>
<td>0.4 amusement</td>
<td></td>
<td></td>
<td>Target may not be in gloomy, annoyed, depressed or furious mood</td>
<td>Norm value</td>
</tr>
</tbody>
</table>
The design and test process summarised in the previous section resulted in 48 AAs which are learned by players in six steps. In Table 7.23 and 7.24 these AAs are listed along with information about the effect of the AAs on the performer and target as well as success criteria and prerequisites for the performance of the AAs. The colours of the cells in the tables signifies what kind of effect in terms of mood the AA has. Yellow signifies an increase on outer mood, and red a decrease of the same mood node. Light blue signifies that the AA has an effect that increase the value of the inner mood, and darker blue that the value is decreased. Salmon coloured cells signifies that the effect of an AA increases both the values of the inner and the outer mood node, while the colour bordeaux signifies that the values decrease. The categories signified by colour are based on how the emotion nodes affected by the AAs are weighted toward the mood nodes, as illustrated in Figure 5.8.

7.7.4 Design Consideration of Affective Actions Economy

In the WoM play-test (described in Chapter 8) players could use an unlimited amount of AAs. The reason for this was to observe potential patterns for the use of AAs. Many ways of restricting the use of AAs are possible to use, among them the following were considered:

- restrictions based on cost of mental energy;
- limiting the total number of AAs that can be cast by a performer on any target;
- limiting the number of AAs that can be cast on a single target, by a single performer, or by all potential performers;
- limiting the number of each type of AA that can be cast between performers and targets.
The play-test indicated that, in terms of game mechanics, it can be good to be able to use AAs even if the pool of ME is running out. In terms of believability, it might be good to restrict the number of identical AAs possible to use in sequence so that characters are restrained from using AAs of similar types too many times. These consideration resulted in the following restrictions, suggested by Christoph Pech, developer at Pixeltamer:

- each AA is active for a limited amount of time, depending on its specified decay rate;
- characters can receive a maximum amount of eight AAs that are active at the same time;
- characters can only have one of the same type of received AA active at the same time;
- characters can perform a maximum amount of four AAs that are active at the same in a single target.

### 7.7.5 Learning Affective Actions and Spells

The list below summarises the steps for PCs of learning new abilities as they gain levels. Specific AAs and spells referred to in the list are specified in Appendix B.1.

- Level 0 - The full range of mood based MR-ME Spells, 1 personality based emotion spell and 8 AAs.
- Level 3 - 8 new AAs.
- Level 5 - 1 personality based emotion spell.
- Level 7 - 4 new AAs.
- Level 8 - 2 new personality based emotion spells.
- Level 10 - 2 new personality based emotion spells.
- Level 12 - 6 new AAs
• Level 15 - 2 new emotion spells
• Level 17 - 8 new AAs
• Level 22 - 8 new AAs
• Level 30 - 2 sentiment spells

The PC’s learning of new abilities is in two cases triggered by events instead of by gaining a certain level. When a PC for the first time either becomes the protector or the protégé of another PC three new AAs are introduced: Respect, Reproach and Praise. When a PC for the first time forms a reciprocal friendship the AAs Squeeze hand and Group hug become available for use.

7.8 Single-Sentiment Manifestations

Single Sentiment Manifestations (SSMs), are types of manifestation that have their origin in a single emotion. They have a limited amount of mental resistance and energy. If the value of the emotion they represent equals zero they dissolve. The spells an SSM can cast increase the value of ‘their’ emotion in targeted entity. SSMs are mainly instantiated by scripting at designated points in the geography of the game world (spawn points) or due to emotional threshold values reached in PCs’ states of mind. In PI all emotions of the Mind Module except pride, belonging and desire have representations in the form of SSMs.

7.8.1 SSM Properties

SSMs have full mind modules. An SSM is instantiated with its emotion at 99 percent of maximum, and with full MR and ME. Maximum MR and ME are modified for
CHAPTER 7. GAME DESIGN

The norm value for the emotion is set to 90 percent of its maximum value. This means that a manifestation that is wounded in its emotion will recuperate over time in this respect.

In PI SSMs have their personality trait values set at mid-values. It is possible instead to use customised personality templates. These would need to be set so that manifestations can cast their emotion spell according to the same principle as PCs are assigned spells. It is also possible to assign sentiments to a manifestation that upholds an extreme emotional value instead of setting a norm value of 90 percent of maximum. This is done in the authored CMs, as described in Section 7.9. For example, the SSMs of the type Sail of Sorrow are instantiated with Sadness at 99 percent of maximum, and with full MR and ME. Maximum MR and ME are modified to their level.

SSMs can be instantiated in three ways:

- by scripting of the game world;
- instantiated if a maximum-level of the emotion it represents is reached in a PC, NPC or CM (Its level becomes half of the entity’s level who is cause of the instantiation.);
- by a game master using the administration interface of PI in run-time.

SSMs target PCs if they are in proximity. Spells are cast on the targets. Spell to cast are chosen randomly from its limited set of known spells. A Sail of Sorrow for example alters between casting Drain Energy, Aggression and its ‘own’ emotion spell, Wet Net of Tears, which increase the value of the emotion node sadness in the target.
An SSM dissolves if the emotion it represents or if the MR reaches the value zero. A Sail of Sorrow dissolves if the value of its emotion node sadness is zero, or if the MR is zero. Thus SSMs are especially vulnerable to spells that decreases the value of the emotions they represents. Sails of Sorrows are especially vulnerable to the spell Accommodate Sorrow.

7.8.2 Exclamations

The SSMs of PI exclaim lines of dialogue when their MR, ME and the emotion they represent reach threshold values. The text is shown in the client as speech bubbles. Table 7.25 shows the threshold values of SSMs’ emotion nodes that are used for triggering exclamations. The exclamations are specific for each emotion.

Table 7.25: threshold values in SSM emotion nodes that trigger exclamations.

<table>
<thead>
<tr>
<th>Mental Resistance</th>
<th>Mental Energy</th>
<th>Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0% of maximum</td>
<td>0.0% of maximum</td>
<td>0.0% of maximum</td>
</tr>
<tr>
<td>(when they dissolve)</td>
<td>(when they can not cast any spells)</td>
<td>(when they dissolve)</td>
</tr>
<tr>
<td>10% of maximum</td>
<td>10% of maximum</td>
<td>10% of maximum</td>
</tr>
<tr>
<td>30% of maximum</td>
<td>30% of maximum</td>
<td>30% of maximum</td>
</tr>
<tr>
<td>60% of maximum</td>
<td>60% of maximum</td>
<td>60% of maximum</td>
</tr>
</tbody>
</table>

All SSMs make the same exclamations when their MR and ME decrease. The threshold values for these exclamations and the dialogue lines displayed in the PI client are specified in Table 7.26.
Table 7.26: threshold values of MR and ME of SSMs and the exclamations triggered.

<table>
<thead>
<tr>
<th>MR</th>
<th>Dialogue Line</th>
<th>ME</th>
<th>Dialogue Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0% of</td>
<td>I can’t resist anymore.</td>
<td>0.0% of</td>
<td>I’m exhausted. I’ll just sit here.</td>
</tr>
<tr>
<td>maximum</td>
<td></td>
<td>maximum</td>
<td></td>
</tr>
<tr>
<td>10% of</td>
<td>Please! You hurt me!</td>
<td>10% of</td>
<td>I’m so tired! Why are you doing this</td>
</tr>
<tr>
<td>maximum</td>
<td></td>
<td>maximum</td>
<td>to me?</td>
</tr>
<tr>
<td>30% of</td>
<td>I feel so vulnerable.</td>
<td>30% of</td>
<td>Oh no, you must be one of those</td>
</tr>
<tr>
<td>maximum</td>
<td></td>
<td>maximum</td>
<td>energy vampires!</td>
</tr>
<tr>
<td>60% of</td>
<td>Think you can wear me down?</td>
<td>60% of</td>
<td>You may be an energy eater, but</td>
</tr>
<tr>
<td>maximum</td>
<td></td>
<td>maximum</td>
<td>I can still do things!</td>
</tr>
</tbody>
</table>

### 7.8.3 Specific SSMs

Thirteen SSMs appear in the PI game world: Amusement Articles, Interest Integrals, Joy Jumbos, Relief Raptors, Satisfaction Shells, Surprise Singletons, Colossuses of Confusion, Anguish Abominations, Terror Trolls, Rage Roughnecks, Shame Shells, Sails of Sorrow and Guilt Ghosts. All these are described in Appendix B.4, but the Sail of Sorrow is described below as an example.

**Example: Sail of Sorrow**

Figure 7.27: Concept art for the SSM Sail of Sorrow.

Figure 7.28: The SSM Sail of Sorrow in the PI client.
Table 7.29: Spells that the SSM Sail of Sorrow casts, and a spell it is vulnerable to.

<table>
<thead>
<tr>
<th>Casts Spell</th>
<th>Effect on target</th>
<th>Effect on self</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Net of Tears</td>
<td>Increase of Sadness</td>
<td>Decrease of ME</td>
</tr>
<tr>
<td>Aggression</td>
<td>Decrease of MR</td>
<td>Decrease of ME</td>
</tr>
<tr>
<td>Drain</td>
<td>Decrease of ME</td>
<td>Decrease of ME</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vulnerable to Spell</th>
<th>Effect on target (i.e., self)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodate Sorrow</td>
<td>Decrease of Sadness</td>
</tr>
</tbody>
</table>

Table 7.30: Exclamations that the SSM Sail of Sorrow makes at certain threshold values of its emotion node Sorrow.

<table>
<thead>
<tr>
<th>Emotion: Sadness</th>
<th>Exclamation (dialogue line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0% of maximum</td>
<td>Goodbye friend. You taught me to use my sails.</td>
</tr>
<tr>
<td>10% of maximum</td>
<td>I can see the color of the world now. The lump in my throat is melting.</td>
</tr>
<tr>
<td>30% of maximum</td>
<td>I don’t know who I am when the sorrow diminishes. I have been crying for so long.</td>
</tr>
<tr>
<td>60% of maximum</td>
<td>You may try, but my sorrow goes too deep. It is impossible to accommodate a world devoid of color.</td>
</tr>
</tbody>
</table>

### 7.9 Compound Manifestations

Compound Manifestations (CMs) are unique, that is, there is only one of each. CMs are stronger than SSMs in terms of larger maximum amounts of MR and ME and are more versatile in their behaviour, they can cast both spells and AAs. In order to vanquish a CM generally several players need to co-operate. CMs do not engage in dialogue, as NPCs, but they can have custom-written exclamations that are triggered under specified conditions. For example, exclamation-triggering conditions can be threshold values of the MM or PCs entering the perception range of a CM.
7.9.1 Properties

CMs have full mind modules. They generally have strong permanent non-decreasing sentiments. CMs target PCs, SSMs and other CMs if they are in proximity. Spells to cast and AAs to perform are chosen randomly from their known spells. If several targets are in proximity the CM chooses the one that has cast a spell on it. If no one has cast anything targeting the CM, it cycles between the targets, choosing randomly for each spell which target to cast it on. CMs can move over a fairly large area, large in comparison to the movement of the SSMs. CMs spawn SSMs in the same way as NPCs and PCs do (as described in Section 7.3.11). Because of this CMs might end up killing or boosting their own spawns.

CMs are instantiated in ways which differ depending on the role of the person creating them. Firstly, CMs can be created for instantiation by developers who script them as part of the game world. In the scripting the location of the CM is defined, as well as several other properties. Section 7.9.2 provides an example of a scripted, that is, a pre-authored, CM where these properties are described by example.

Secondly, CMs can be instantiated by a game master using the administration interface of the PI client, which include real time world editing tools. This is useful in guided play tests.

Thirdly, CMs can be instantiated by players through an in-game interface. These CMs can be of different types; Manifestation of Curse, Manifestation of Blessing and Free Form Manifestation, which are described in Section 7.9.3 and 7.9.4.

Each CM has a unique name and description, written by the creator of the CM.
Spells that CMs cast can be given unique names, though picked from the standard set of spells when a CM is created. The creators of the CMs can custom-write the exclamations of the CMs.

Player-created CMs and CMs created by game masters dissolve if their MR reaches 0. Scripted, or authored, CMs (such as the Confused Guest Lecturer, described below in Section 7.9.2) do not dissolve, but recuperate.

### 7.9.2 Example of an Authored Compound Manifestation

An example of an authored CM is The Confused Guest Lecturer (TCGL). TCGL was trapped in a lecture hall at the Outbreak, and being slightly traumatised already he cannot get out. He is in a constant state of confusion, fuelling this feeling by repeating the reasons for his confusion over and over again. His confusion node goes out of bound repeatedly, spawning SSMs of the type Colossus of Confusion.

The strongest personality facet of TCGL is neuroticism, and his second strongest is conscientiousness. His least pronounced facet is openness. He rigidly stays in his confused state, refusing to let go. Even immobilised he keeps mumbling.

When TCGL is approached by PCs it gets even worse, since he feels an obligation to lecture them. Doing this he cannot refrain from blaming them, though he knows this is irrational. He also tries to get them to understand his situation by ‘sharing’ his confusion.

Toward PCs TCGL has sentiments of confusion and shame. These are triggered as the PCs approach, that is, enters TCGLs range of perception. The number of players in proximity multiplies the number of active sentiments. This has the effect that level of difficulty for calming TCGL is adjusted to the number of PCs co-operating.
TCGL is confused because he is not sure whether they are students or not, and ashamed because he knows his lecture probably not is what is expected of him. He falsely claimed to be versed in pataphysics in order to get the lecturing assignment.

If a PC targets the TCGL the following description is shown: ‘This confused guest lecturer is trapped in a jungle of slippery theory.’ TCGL casts spells on PCs in proximity as listed below. The effects on the targets of the spells are noted in parenthesis.

- Problematisation (- relief)
- Drabby Humdrum (- interest)
- Trumpet Irrelevant Question (+ confusion)
- True-sounding accusation (+ guilt)
- Energy Drain, if his mood permits it (- ME)
- Resistance Drain, if his mood permits it (- MR)
- Aggression, if his mood permits it (- MR)

After two spells, TCGL performs an AA. These are listed below. In parenthesis the emotion affected in the target of the AA is specified.

- Misunderstand on purpose (+ distress, + confusion)
- Blame (+ shame)
- Be martyr (+ guilt)
- Look at target with dismay (+ sadness, + humiliation)
- Mumble unintelligibly in sulky way (+ confusion)

When TCGL is in full force, that is when his values of MR, ME and Confusion are greater than 80 percent of maximum, he may utter any of the following exclamations:
‘Yes! I DO propose pataphysical counterpoint to the rational axiology of mathematics!’

‘You there! Elaborate on the mathematics of the Umbrella! Arnaud explained it already in 1955! That was mandatory reading!’

‘You asked me... oh yes. We can indeed use the Pataphysics of Sophrotatos in order to calculate that God is equal to the tangent between nihilility and infinity.’

If TCGL is somewhat weakened in his confusion, that is, if the value of his emotion node confusion is lesser than 60 percent and greater than 30 percent of its maximum value, he may exclaim:

‘I must confess! I’m a mathematician! But I DON’T understand the aerodynamics of equations!’

‘Listen closely. You need to trace the spirals of your own cognitive gidouille deriving the reductio ad absurdum of an impossible hypothesis!’

If the MR of TCGL reaches zero he exclaims:

‘I do not want to interact. I must understand the ‘Pataphysic Frontier’.’

If the MR of TCGL reaches zero he does not dissolve. Instead he recuperates. On PCs in his proximity he performs the AA Mumble unintelligibly in sulky way.

7.9.3 Free Form Manifestation of CM

Game masters and players with high-level PCs can instantiate free form CMs using an in-game interface. First, they need to name the CM and give it a short description.
Second, they are presented with a drop-down list of spells. These are the existing MR-ME spells and the emotion spells. When the creator has picked a spell they can give it a custom name, though the effect is that of the chosen spell. Next, the creator is presented with a drop-down list of AAs. Also these can be renamed by the creator. After this the creator can choose between three graphical representations for the CM. Finally the creator may write exclamations for the CM and define under what conditions these are uttered. This last step requires knowledge of the scripting syntax used in PI.

Suppose that a player with a PC named Adam create a free form CM in the location Entrance. The player names the CM as ‘The bus driver’ and describe it as ‘The evil bus driver hates all passengers. When they are in his bus they talk, and he can’t hear his music.’ The player chooses the emotion spell Wet net of tears and names it ‘Drives by’. Among AAs the player chooses Ignore, but keeps the name Ignore for the AA. Finally, the player chooses to not write any exclamations.

When the player has confirmed all choices the free form CM is instantiated. The bus driver emerges at a point close to the PC Adam, but far away enough for Adam to not be within perception range of the CM. A system message is sent to all players online: ‘The bus driver is in the Entrance, casting Drive by and Ignore!’

7.9.4 Manifestations of Curses and Blessings

PCs can be affected by the spells Sentiment Curse and Sentiment Blessing. The spell Sentiment Curse gives a player a strong negative sentiment that has a zero decay rate. For example, it can be a curse of Guilt. The way to get rid of this sentiment is to create a manifestation of the sentiment, a CM. If the CM is vanquished, the
sentiment disappears.

Sentiment Blessings are different from curses in the way that the emotion attached to the sentiment is positive, it could for example be Joy. The player might want to keep the blessing or curse instead of ‘externalising’ it as a CM if it affects the mood of the PC in a way that the player finds desirable. However, if a CM is instantiated it can cast beneficial spells on other players, or can help vanquish other CMs.

Which spells CMs of the curse/blessing type cast on entities in proximity depends on which emotion they represent. CMs cast the emotion spell that increase the emotion they represent, as listed in Table 7.15. The MR-ME spells they cast depend on how the emotion they represent is weighted to the mood nodes. Blessing CMs of Amusement and Interest cast Energy Rush, and those representing Satisfaction or Surprise cast Resistance Aid. Blessing CMs representing Joy or Relief cast both Energy Rush and Resistance Aid. Curse CMs representing Anger, Fear or Shame cast Aggression while those representing Confusion, Guilt or Sadness cast Energy Drain and Resistance Drain. Curse CMs representing Distress/Anguish cast both Aggression, Resistance Drain and Energy Drain.

The interface for creating Curse- and Blessing-CMs is similar to the one for creating Free Form CMs, but is simpler since all choices are limited by spells and AAs affecting the emotion that the CM represents. Players can name and describe the CM, and are then presented with the emotion spell which increases the emotion the CM is to represent. Players can rename this spell. Then a drop down list of AAs increasing the emotion is presented from which the player can choose one and rename it. Finally the player can choose to write three or less short texts that the CM can exclaim.
CHAPTER 7. GAME DESIGN

In the PI client the graphic representations for CMs are the same as for SS manifestations but three times larger. Names of the CMs are visible, while their descriptions are displayed if a CM is targeted by a PC. The place in the world where the CM emerges, called the spawn point, is close to the player who created the CM, but not within the perception range of the CM where it targets players and start casting spells. The reason is that the player might need to retreat, perhaps for fetching friends for reinforcement if the CM is a hostile one. Exclamations of Curse- and Blessing-CMs are exclaimed issued per minute, and the dialogue line is randomly picked.

The personality trait values of these CMs are mid-level, that is, the values in the trait nodes are in the middle between their possible minimal and maximal values. Each CM of curse/blessing type has a strong sentiment object of the emotion it is to represent. The sentiment is directed toward objects of type the PC. This means that a CM associated to the emotion Joy ‘feels’ strong joy if a PC approaches. A CM associated to Guilt would ‘feel’ guilt under the same circumstances. The effect multiplies if several PCs approach.

Suppose that a PC named Adam is afflicted by a sentiment curse of guilt. The player does not find the state of mind this results in desirable for Adam and decides to instantiate a Curse CM. While being in the location Entrance he names it ‘Grandmother’ and describes it as ‘Forgives you when you don’t deserve it’. The spell ‘True Sounding Accusation’ is renamed to ‘being so unselfish that you can never repay it’. He picks the AA ‘Be martyr’ and lets it keep the original name. He writes three custom exclamations: ‘And I, who loved you so much’, ‘I never expected anyone to
thank me’ and ‘I don’t want to be a burden’.

When Grandmother is instantiated the following message is sent to all players online: ‘Grandmother roams in the Entrance, being so unselfish that you can never repay it and being a martyr! Adam needs help to get rid of the trauma!’

If the CM instantiated would have been a Blessing CM the wording of the system message instead would have been: ‘[Name of PC who made it] has blessed us! [CM Name] casts [custom spell name] and [affective action] in [Location]!’

In order to vanquish Grandmother PCs would either need to get her MR or the value of her emotion node guilt to zero. If Adam chose the strategy to reduce Grandmothers guilt value he would need to cast the emotion spell ‘Forgive’ on her, which reduces guilt. If he is unable to cast Forgive he would need to find a PC who can. Suppose that the PC Christine has a personality allowing her to cast Forgive, and that she comes to help. Christine, being the caster, would be targeted by Grandmother. Grandmother would cast the spells and AAs specified by Adam on Christine, as well as energy drain and resistance drain spells. Adam and other PCs coming to assist would want to make sure to give Christine both MR an ME to ensure her ability to cast and for her to not suffer a mental break-down. In order to give Christine ME and ME the other PCs would need to be in positive mood spaces on the mood co-ordinate system allowing them to cast spells of energy rush and resistance aid. In order to balance their minds to be in the positive mood spaces allowing them to do this they could perform positive AAs toward each other. If PCs helping out have relations of friendship among them this would increase their mood through an increase of Belonging in each others’ proximity, and would be able to use the especially effective
If Adam instead chose to vanquish Grandmother by reducing her MR to zero he would need to make sure to either himself be or, have a group of assisting PCs who could be, in a depressed or furious space of the mood co-ordinate system. A PC in a furious state can cast Grand Focussed Aggression while regenerating ME quickly. A PC in the furious mood space might need assistance from entities that can aid in giving MR in the case the conflict takes long time. A PC in the depressed mood space can cast Grand Focussed Resistance Drain as well as Grand Focussed Energy Drain. Since a PC in the depressed mood state do not generate MR and ME over time the PC would need to steal the MR and ME from the opponent. In assembling a group of PCs for reducing Grandmother’s MR Adam might want to make sure to include members who because of their personalities deviate toward depressed states of mind, that is, PCs who have dominant neurotic facets.

7.10 Characterising Action Potential

In PI the mood and the personality are the guiding principles which define the characterising action potential (CAP) as described in Chapter 3. The personality which in turn governs the trend of mood change and direction of the mood co-ordinate system is authored and thus controlled by the player who in the beginning of the game define the traits by taking the IPIP NEO test. The mood is controlled by the player through actions performed in the VGW. However, players do not act in isolation. The relation to others, and how others relate to a PC through actions define the mood of a PC. Indirectly in PI, PCs become partly defined in their CAP by those PCs close to them.
7.10.1 Summary of Interrelated Elements Governing the Characterising Action Potential

The list below summarises the CAP given to PCs in PI by the Mind Module and elements in the design affecting it:

1. Personality trait nodes define:
   
   (a) trends in mood fluctuations;
   
   (b) specific mind magic spells available;
   
   (c) the number of possible friends.

2. The current position in the mood co-ordinate system depends on:
   
   (a) trends in mood fluctuations given by personality traits;
   
   (b) affective actions performed;
   
   (c) affective actions received;
   
   (d) spells cast on self;
   
   (e) if a protégé gains a level (increase of Pride);
   
   (f) proximity to other entities which the own PC have a sentiment toward:
      
      i. friends and special friend (where the amount of Belonging increase the longer a friendship lasts);
      
      ii. protectors, protégés and members of the same department (increase of Belonging);
      
      iii. an entity which the PC has a sentiment toward which is an effect of previous interactions (PCs and NPCs);
(g) whether the PC in the process of dealing with a sentiment blessing or a sentiment curse, either by ‘keeping’ the sentiment or by externalising it by authoring a CM;

(h) whether the player has had an emotion go out of bounds and the emotion reset is to its norm value by the event of spawning of a manifestation of the emotion.

3. The position in mood co-ordinate system define in a given moment:

(a) possible AAs to perform;

(b) possible AAs receive from others;

(c) possible MR-ME spells to cast, whether the player may cast restorative or harmful spells, and whether those affect the MR or ME of the player, and what kind of space the cast spells affect in the mood co-ordinate system of the receiver;

(d) regeneration rate of MR and ME.

4. The overall action potential depend on:

(a) current position in the mood co-ordinate system;

(b) amount of AAs performed already on a targeted entity;

(c) progression, that is, level define how many AAs and spells a character has learned;

(d) amount of available MR and ME, where the maximum values depend on:
   i. level (a PC with protégés who play actively will reach high levels faster because they receive a percentage of their protégés' XP);
ii. number of friends and whether there is a Special Friend.

7.11 Summary

In this chapter the game design of PI and WoM has been described. A background to the practical work of developing the prototype and an overview of the game design was given. Next, the core game mechanics were described briefly. Then the main features of the design was described in detail. What PCs can do in a given moment is largely governed by their mood. Depending on which mood space PCs are in they can cast different spells, which affect values of mental energy, resistance and emotion in their targets. The position in the mood co-ordinate system also governs which affective actions they can perform toward other PCs and what affective actions they are receptive to. By performing affective actions on each other PCs can affect each others emotions, which, if they are strong, may result in sentiments toward each other. PCs’ personalities governs the trend in the individual fluctuations of mood and emotions, and define which types of spells PCs can cast. Formalised social relationships such as friendships and protector-protégé-relationships also affect the CAP, giving players more energy and resistance, as well as by activating the emotion nodes Belonging and Pride. PCs states of mind are reflected in the world in the form of physical manifestations that emerge if an emotion ‘goes out of bound’. These manifestations are entities which cast different spells on approaching PCs depending on what emotion the manifestations represent. PCs can also partake in authoring manifestations which become part of the world and the game-play in it.

The Ouroboros prototype (Section 6.1 in Chapter 6) focussed on expression of
character performed to other players through gestures, while the Mind Music prototype (Section 6.3 in Chapter 6) explored expression of the own PC to the player herself. The focus of PI is on expression of character — to both self and others — through fluctuations of CAP and of manifestations of the PC’s mental state that become part of the game world.
Chapter 8

Play-Test of World of Minds

Contents

8.1 Rationale .............................................. 218
8.2 Research Questions and Aims ...................... 219
8.3 Method ................................................ 221
  8.3.1 Research Ethics ................................ 222
  8.3.2 Play-Test and Survey Design ................ 223
  8.3.3 Participants ...................................... 226
  8.3.4 Materials ......................................... 227
  8.3.5 Procedure ....................................... 233
  8.3.6 Data Analysis .................................. 234
8.4 Discussion: Player’s mental models of the system .... 236
  8.4.1 Effects of Personality Factors ................ 238
  8.4.2 Extraversion and the design risks of Five Factor Model . 240
  8.4.3 Emergent Game-Play .......................... 241
8.5 Discussion: Individual Differences ................. 243
8.6 Discussion: Implementation Focused Design Evaluation 244
  8.6.1 Sentiments in the Play-Test Scenarios ........ 244
  8.6.2 Survey and Interview Results Regarding the Sentiments . 247
  8.6.3 Deep Structure and Sentiments ............... 250
This chapter presents a case-study of AI-based game design, where the design is based on the Mind Module (MM), and lessons learned for both the MM and the game design from a play-test of a paper prototype of World of Minds (WoM).\textsuperscript{1} WoM was the virtual game world (VGW) prototype preceding the Pataphysic Institute (PI) prototype.

\section{Rationale}

Experimental research and evaluations of rules and game mechanics in VGWs are rare in the academic sphere due to the enormous work effort required for the development of VGWs. Researchers are generally constrained to studying existing VGWs or using (e.g., Castranova (2008), Tychsen (2007)) existing systems, such as the Aurora scripting system of Neverwinter Nights (Bioware, 2002), that through their architecture enforces very traditional computer role playing game mechanics. When building new game mechanics from scratch where the system need to support a large number of simultaneous players it is necessary, unless the research funds are unlimited, to

\footnote{\textsuperscript{1}Some of the findings described in this chapter have been presented in (Eladhari, 2009; Eladhari & Sellers, 2008; Eladhari & Mateas, 2008).}
find alternative evaluation methods, such as paper prototyping. The guided paper prototype play-test described in this section was conducted in order to get feedback early in the development process with the aim to render results that could guide the development of the digital prototype towards game-play elements most useful for the design of characterising action potential (CAP).

8.2 Research Questions and Aims

The purpose of the play testing was to acquire information that could help address questions in three main areas: players’ mental models of the game-play in the WoM prototype, how and if individual differences of participants affected they way they related to the presented game-play, and how the game-play of WoM could be improved.

The following list, divided in the three categories mentioned above, present the research questions that the play-test was designed to elicit feedback on.

1. Can participants build mental models of the MM in order to use it for game-play in the WoM prototype? Mental models are here understood as the result of the construction of meshed sets of patterns of actions as described by (Schubert et al., 2001), expanded upon in Section 3.6.

   (a) During game-play, are players able to ‘reverse engineer’ the MM to build a mental model of how to manipulate emotional state to achieve game-play goals? For any successful game design, players must be able to build a model of the mechanics that allow them to successfully interact with the game.
(b) How can players’ hypotheses of how traits relate to MM state and gameplay be used in order to gather new design ideas for how traits might influence emotional state and gameplay?

(c) How do players perceive the relationship between the emotional state maintained by the MM and the game mechanics and interaction options that depend on that state?

2. What impact does individual differences of participants have on the way they relate to the play-test?

(a) What differences are displayed depending on whether participants role-play, self-play or use a mixed approach?

(b) Does participants’ general attitude towards personality tests affect their attitude to the personality trait based gameplay?

(c) What are participants attitudes to how sensitive personality trait data are in a VGW gameplay situation?

(d) Does previous experience of game-playing and preferences regarding game genres matter for players’ understanding of the gameplay in the prototype?

3. In what ways can the game design be improved?

(a) In what ways can sentiment objects be created and used in a game to be meaningful for the play experience in a VGW? Three different ways of instantiating sentiment objects were evaluated using the paper prototype in order to see which ways would relevant to implement for further testing
in the digital prototype. Issues of agency and player’s attached meanings to sentiment objects were explored. Also different ways of interacting with the sentiment objects were studied.

(b) How can the feature of affective actions (AA’s) be improved? How do players use AAs combined with the other features of the prototype? In what pace can players be introduced to new AAs? Are participants missing any possible AAs in the limited scenarios given, and if so, which ones?

(c) How can new spell abilities be introduced to players? Two ways of introducing players to new spells were tested and evaluated. Focus was put on getting feedback regarding abilities that would characterise PCs according to their personalities.

(d) Do players understand the core mechanics? Do players understand the concepts of mental energy and mental resistance and how the regeneration rates of these are related to the mood of their PC? Do participants understand how to vanquish hostile single-sentiment manifestations using these concepts?

8.3 Method

A paper prototype of WoM was constructed, in which players were guided through five scenarios that presented the main categories of action in WoM. Players were asked to think aloud while playing the game; additionally, the test leader stopped the game at two points and conducted interviews. Additionally, data were collected through web-based surveys.
During the five scenarios, each player was guided while using the main categories of actions in the game, including affective actions, navigation in a landscape of sentiment, and mind magic spells. Using the game interface presented in Figure 8.1, the test leader updated the state of mind of the PC and NPCs, showing the player the effect of her actions in the game in terms of fluctuations in emotions, mood, mind energy and mind resistance.

![Mind Sheet](image)

**Figure 8.1: Mind Sheet used in play-test of WoM.**

### 8.3.1 Research Ethics

The play-test was conducted in May 2009 in Expressive Intelligence Studio (EIS) at University of California Santa Cruz (UCSC) where I was a visiting scholar at the time. In order to conduct tests with human participants it is necessary to request
and be granted an exemption from Institutional Review Board (IRB) Review. This is equivalent of ethics approval. The request for an exemption from IRB review for the WoM play-test can be found in Appendix C.3 and the approval of it can be found in Appendix C.4.

8.3.2 Play-Test and Survey Design

My approach for evaluating the game design via a paper prototype combines features from several approaches of User-Centred Design where users’ experience is the main driver for the design, as well as from rapid prototyping and play testing approaches that are becoming more common in game design (Fullerton et al., 2004; Salen & Zimmerman, 2001). In the test of the WoM prototype I used scenarios, using the Wizard of Oz method to simulate user-interaction. When conducting my tests I had real players playing the game individually. Just as in the play-test of GED, described in Chapter 6, I used scenarios and a game master/test leader, who simulated the game events. Players were asked to think aloud while playing the game; additionally, the test leader (me) stopped the game at several points and conducted interviews. The approach that was taken is described in detail in Koivisto and Eladhari (2006b).

During the scenarios, the players were presented with the interaction objects and given minimal explanations about how and what to do, in order to capture confusions and, even more important, implicit assumptions about the game-play. At any point the users could tap the ‘manual’ button and ask any question, whereupon the dialogue with the test leader temporarily left the think aloud protocol. Figure 8.2 shows the state of mind of a PC in the paper prototype in the end of a session.
In order to capture answers to the questions described in Section 8.2 several ways of asking them were considered necessary. For questions in category one and three I believed it could be useful to observe the players as they were interacting with the prototype as well as listen to them using the think aloud protocol in order to understand the way they reasoned about their own actions and how they understood the system. I also believed it could be useful to interview participants in depth with open ended questions which potentially could capture issues that were not foreseen when designing the test scenarios. The survey questions sometimes duplicated the interview questions. One purpose of this was to capture potential negative feedback that the player might not be comfortable voicing in the interview situation. Another purpose was to capture further thoughts about the same subjects that may have evolved during and after the conversation in the interviews. To gather data concerning the second category of questions described in Section 8.2, relevant characteristics of
the participants, two online-surveys were conducted before the play-test sessions.

In both surveys conducted before the test the participants were exposed to the question whether they would prefer to role play a character or play as ‘themselves’ in order to play down the potential feeling of vulnerability if they had answered the personality test as ‘themselves’, and also to prepare for the test by bringing the issue of role-playing to consciousness. Since it is not always possible to know before a test is conducted exactly which questions or scenarios will yield relevant data a multitude of questions were asked, but in order to not make it too strenuous for the participants they were asked in steps.

In association to the play-test, each participant answered survey and interview questions in six steps. For the surveys, the online survey tool SurveyMonkey was used (SurveyMonkey Corporation, 1999-2009). On each page of the surveys, three questions were asked. Each survey was limited to nine questions.

The first survey was concerned with demographics and players’ previous experience of role-playing games. When the participants had completed the first survey they were asked to fill in the online IPIP NEO personality trait test, save the results and send them by email to the test leader. After this they were instructed to fill in the second survey. The reason for ordering the questions in this sequence was to capture the participants’ attitude to the use of a detailed personality test before the play-test, when the experience was still fresh in the memory and not blended with the experience of the play-test. The second survey asked about participants’ intended play-style, whether they planned to self-play, role play or use a mixed approach, as

\footnote{Using SurveyMonkey for IPIP-NEO was not considered since the program code underlying the scoring routines and the narrative report was not feasible to duplicate using SurveyMonkey.}
well as several questions about attitudes towards personality related issues in potential game-play situations. The participants were also asked about their attitude towards personality tests in general.

The first interview with the participants was conducted after the first two scenarios in the play-test. The interview-questions were concerned with the participants’ impressions of what was presented to them in the scenarios; sentiments, mood and affective actions. The second interview was conducted at the end of the play-test. The questions were concerned with personality related game-play issues, spells, mood and participants’ general impressions.

Immediately after the play-test the participants were instructed to fill in two short surveys. The majority of the participants filled them in within three hours after participating in the test. The questions in the last surveys duplicated many of the interview questions and asked participants about what sentiment objects they remembered. One question also asked the players to describe in their own words what ‘mood’ in WoM is. The questions asked in the interviews and in the surveys are presented in Appendix C.8.

8.3.3 Participants

The ten participants of the play-test were graduate students and staff at UCSC and their spouses.\(^3\) Participants had a mean age of 28 with a standard deviation of 5.6. Of the ten participants four were female and six male. Seven participants were graduate students in computing science, two were spouses of graduate students and

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\(^3\)An eleventh test with a female participant was conducted, but due to a prior engagement of the participant the test was ended after two scenarios and one interview. Therefore the data from the eleventh play-test are not included in the data analysis, nor in the discussion.
one participant was a member of staff. All participants were residents in California, USA.

8.3.4 Materials

For character creation the WoM paper prototype used a short version the International Personality Item Pool Representation of the NEO PI-R (IPIP-NEO) as constructed by Johnson, a method for evaluating personality traits using a survey with 120 items the user rates on binary scale (Johnson, 2001). The full IPIP contains 1,699 items assembled by Dr. Lewis R. Goldberg. For the purposes of the prototype the short version was considered sufficient.

As mentioned, before filling in the IPIP-NEO test players were advised to decide whether they wanted to play as being themselves or if they wanted to role play a character of their own design. If they chose to role-play a fictive character they were advised to fill in the IPIP-NEO rating the items as if they were rating the attitudes of their fictional character.

The IPIP-NEO was implemented in the digital PI prototype, but did not yet exist when this test was conducted. Participants were instead directed to a web-page where the IPIP-NEO is available, and were instructed to save their results which they could attach to an email and send to the test leader.\footnote{The IPIP-NEO Short Form is available at the following URL (verified 2009-09-10): http://www.personal.psu.edu/j5j/IPIP/ipipneo120.htm.} The ‘system’ could then create a PC for the test session.

The remainder of this section describes the scenarios in the guided play-test. The PC Mastaya’s traversal through the scenarios is used for illustration. The script for the
Scenario 1 - Sentiments

The PC meets the character ‘the gate keeper’ (Karl Sundgren). Via prewritten dialogue script the gate keeper gives information about the game world. The gate keeper has a bucket which he searches in order to give the player two random sentiment objects. In the scenario the test leader has the role of the gatekeeper, and takes two paper tokens representing the objects at random from a plastic container, as well as tokens representing different emotions. The player represented by the PC Mastaya was given a sentiment of Anger towards mittens and Amusement towards socks. The gate keeper also asks the player to picture an unnerving scenario where she can choose which of three different objects would be most scary. Mastaya picked garden gnomes and was given a Fear sentiment towards objects of the type garden gnome. Finally, the gate keeper asks Mastaya to fetch him a glass of water from the water cooler down the corridor.

Scenario 2 - Affective Actions

The PC meets the character Teresa who says she is too sad for explaining what affective actions (AAs) are, and asks the PC for a hug. A selection of AAs is presented to the player. Teresa and the PC exchange AAs until threshold values for emotions result in the generation of sentiment objects between the characters. Mastaya chose to comfort Teresa instead of hugging her. Teresa’s Distress and Sadness decreased, and her mood improved. After a few exchanges of AAs a threshold value for Mataya’s emotion Interest/Excitement was reached and the system generated a sentiment for
Mastaya of this emotion towards Teresa.

**Scenario 3 - Facing the Sentiments**

The player needs to guide the PC through an environment with sentiment objects in order to reach the water cooler. The state of mind of the PC changes according to which sentiments are encountered. Mastaya avoided her Fears (garden gnomes) on her way to the water cooler, and then moved close to the sock in order to gain Amusement before moving on.

**Scenario 4 - Using Spells and Affective Actions**

The player finds Teresa in a state of distress as she is attacked by a manifestation of Confusion. The player finds a spell, Laser Pen of Clarity, which reduces Confusion and mental resistance in the target. The player is introduced to the concepts of mental energy and resistance through seeing the mind values on Teresa, the Colossus of Confusion and her own PC. When the Colossus of Confusion is defeated a new foe enters the scene, the Sail of Sorrow. When this is defeated Teresa explains that when an emotion goes out of bounds a manifestation of that emotion is created.

**Scenario 5 - Trait based spells**

The gate keeper accepts the glass of water and gives the PC two spells that he claims are based on the personality of the PC. Mastaya learns an ‘Interest/Excitement Shower’, based on that her highest factor except Neuroticism is Openness. She also learns the ‘Soothing Hand’, which lowers Fear in the target, based on that the highest value of her traits in the Neuroticism factor is Anxiety. The gate keeper tells her that
she will be particularly good at defeating manifestations of Fear, the Terror Trolls.

Figure 8.3 shows the table in the end of the five sessions on which the tests were conducted, when all game elements have been presented to a player. The figure is annotated with numbers. In the list below the numbered items describe elements in the figure at positions with corresponding numbers.

Figure 8.3: When all five scenarios were traversed most game-play elements were visible on the table.

1. The blue horizontal lines are the meters of values of the five personality factors of the PC. The values of the thirty traits were available on lists for each PC. These lists are not visible in the figure.

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5In the prototype meters were used to represent values of parameters relevant to the game-play mechanics. The spaces to the left in the meters represented low values and the spaces to the right represented high values. Markers were placed on the spaces of the meters that represented the current values of the corresponding properties.
2. The horizontal lines are the meters of values of PCs’ emotions. Markers were placed on the meters at positions corresponding to current values.

3. The rectangle of coloured dots represents the mood co-ordinate system of the participants PC. The marker is placed on the position of the current mood.

4. Above number 4 is the space where representations of the PCs sentiment objects were placed. To the right of number 4 are the meters for values of mind energy and mind resistance where markers were placed on spaces representing current values.

5. The horizontal lines are the meters of the NPC Teresa’s emotions. These were not visible to the player during the scenarios. The values were used by the test leader to calculate the current mood of Teresa. Above the sheet with Teresa’s emotion values a pile of paper notes representing items. When the gate keeper ‘searched his bucket’ in order to create sentiment objects the test leader picked two items from the pile at random. One of the items was associated to anger, the other to amusement.

6. The rectangle of coloured dots represents the mood co-ordinate system of the NPC Teresa. The marker shows in which mood space Teresa is in at a given moment. This was visible to players during the scenarios.

7. The white rectangle represents the location of the gate keeper’s office. This was the location for Scenario 1 and 5. The green marker right of the number 7 represents the current position of the PC in the geography of WoM. The paper figure above the number 7 represent the gate keeper. Below the white rectangle are six pieces of carton. These represented ‘buttons’ in a supposed digital
interface. The yellow ones are turned up, signalling that they are ‘clickable’. The brown ones are turned down, signalling that they are ‘greyed out’ and not ‘clickable’. From left the buttons are as follows: ‘mind’, ‘manual’, ‘dedications’, ‘spells’, ‘affective actions’ and ‘social contracts’. In the scenarios, the buttons were ‘turned up’ on their yellow ‘clickable’ side as the abilities became available. All buttons except ‘dedications’ and ‘social contracts’ were used by the participants during the scenarios.

8. The white rectangle represents the part of the corridor where Teresa is located. This was the location for Scenario 2 and 4. The paper figure to the top left of the number 8 represents the single sentiment manifestation Sail of Sorrow. The table representing the Sail of Sorrow’s mental energy, mental resistance and current value of the emotion sadness is not visible in the figure. The paper figure above and to the right of the number 8 represents the NPC Teresa.

9. The white rectangle represents the location of the corridor where the water cooler is located. This was the location for Scenario 3. In the figure, the items of this scenario (different for each PC) are not visible.

10. The notes represent affective actions. Participants could pick them up and point them towards an entity, an action symbolising the performance of the affective action named on the note towards the entity it was pointed at.

11. The notes contain lines of dialogue. When the NPCs Teresa and the gatekeeper said something the test leader gave a note with dialogue written on it to a participant.
12. The notes represent spells. In order to use a particular spell, participants picked up the corresponding note.

### 8.3.5 Procedure

Before the play-tests the majority of participants were briefed at a meeting about the procedure and the privacy of the data they would provide during the test, as well as how the video material would be used (C.2). Before the test sessions the participants signed two forms, one about volunteering as test subjects (Appendix C.5) and another about granting, or not granting, use of the video material in publications (Appendix C.6). Ten guided paper prototype play tests were conducted. In the procedure a participant completed the following steps in order.

1. Filled in a short (fewer than ten questions) survey about demographics and previous play experience.

2. Took the IPIP NEO Personality test and emailed the results to the test leader.

3. Filled in a short survey about their opinions about using personality traits for PC creation.

4. Went through the guided play-test. Each test was videotaped and took between one and one and half hours. The player was guided through three scenarios. After that the participant was interviewed, 14 questions were asked. Then the player was guided through the remaining two scenarios. The test was concluded with an interview with nine questions.

5. Filled in two more short surveys, one on the subjects of sentiment objects, the other about general impressions of the experience.
8.3.6 Data Analysis

Ten participants can be considered a small number. However, Ollila (formerly Koivisto) has shown (2009, p. 64) that often already six players are enough in laboratory testing to provide good understanding of a player experience of a game, given that the results are interpreted carefully.

The video analysis tool Transana (Woods & Fassnacht, 2007) was used to transcribe and analyse the 15 hours of videorecordings of interviews and play sessions. Transana is an open-source transcription and annotation tool developed by University of Wisconsin that allows researchers to transcribe and analyse collections of video and audio data. With Transana, I viewed the video clip first. I then identified and organised analytically interesting portions of video, and attached keywords to those video clips. The tool embedded automatic time codes during the transcription process. A coding scheme for potentially relevant phenomena was developed guided by the research questions presented in Section 8.2. This provided the initial framework for searching for patterns and regularities, as advocated by (Miles & Huberman, 1994). An overview of the analysis process recommended by Miles and Huberman is presented in Appendix C.1. The interesting portions of the video-recordings were transcribed verbatim. Qualitative analysis in the form of thematic coding was carried out on the portions transcribed verbatim.

Figure 8.4 shows different windows in the transcription tool. The window in the top left shows a visualisation of the audio file (sound-wave form) of a video clip while the window to the top plays the video image. The window in the left bottom shows a verbatim transcript of a portion of a video recording. The window to the lower right shows which keywords have been assigned to the particular clip. In this case the video
clip is of a participant answering Question 2 in Interview 2, where she was asked how she thought the personality of her PC affected other elements of the mind of the PC. The keywords assigned to the clip visible in the figure annotates that this particular participant reasons about the personality’s potential effects on the emotions Interest and Distress. The collection report of the second question in the second interview generated by the tool Transana containing the keywords used and their frequency is presented in Appendix C.9 as an example. Verbatim transcripts are available in rtf-format on a CD which is provided with this thesis.

The results of the surveys were compared to the results of the interviews in order to verify the statements by participants in the interviews. Five-level Likert items were
used to acquire participants attitudes in terms of preference to certain game elements. Summaries of all responses gathered in the surveys are presented in Appendix C.10

Also, in one case, participants were given the teach-back task to describe what mood is in WoM to someone else. Teach-back tasks are often used in user-centred design in order to assess users’ mental models of systems (Van der Veer et al., 1990; Puerta-Melguizo et al., 2002). The texts that participants produced describing mood were compared with their behaviour and statements in the videotaped materials. The survey results served as possible validations (or refutations) of the conclusions drawn from the analysis of the videotaped material that was conducted using the coding scheme. The coding scheme was developed in order to address the research questions.

8.4 Discussion: Player’s mental models of the system

All players built mental models of at least one of the effects of personality on the MM and the game mechanics that were ‘correct’ in the sense that players understood existing relations between personality traits and other elements in WoM.\(^6\) That is, players were able to construct meshed sets of patterns of actions (as described by Schubert et al. (2001)) constituting a mental model of what action potential players had in the WoM paper prototype. Three of the players built correct models of multiple effects of personality. As summarised in Table 8.5 five of the ten players thought that personality affected the strength and/or the nature of emotional responses. Two players thought that personality affected the amount of mind energy

\(^6\)This was observed in conversations following the second question in the second interview: ‘How do you think the personality of your PC affects the other values in the mind?’
and mind resistance. Three players thought that the effect of AAs on themselves and others depended on personality. One player thought there were personality-specific effects on mood values, hypothesising a mapping between traits, emotions and mood. All of these effects are indeed part of the mechanics.  

Table 8.5: Participants assumptions about effects of personality on other elements.

<table>
<thead>
<tr>
<th>Participant supposes personality affects</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>the strength and nature of emotional responses of the own PC</td>
<td>5</td>
</tr>
<tr>
<td>the amount of mind energy and mind resistance of the own PC</td>
<td>2</td>
</tr>
<tr>
<td>the effect affective actions have on their own PC and other players’ PCs</td>
<td>3</td>
</tr>
<tr>
<td>mood values of the own PC</td>
<td>1</td>
</tr>
</tbody>
</table>

All players demonstrated enough understanding of the system to be able to act in the world in such a way as to reach an emotional state they found desirable. At the end of the test, the mood of all ten PCs was in the range between jubilant/exultant and bliss. There was one exception to the general pattern of striving towards positive mood spaces in that one player in his interaction with Teresa in the second scenario used AAs in order to let his PC enter an angry mood, but once he had tried that he made sure to, during the rest of the scenarios, choose actions which left his PC in the mood space of bliss when the play-test came to its end.

These end-states indicate that players’ preconceptions regarding mood states in their ordinary lives, where being in happy or harmonic moods are generally more desirable than in being furious or depressed moods, transferred to their choice of

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7The collection report of the second question in the second interview generated by the tool Transana containing the keywords used and their frequency is presented in Appendix C.9.
actions in the play-test. Being in a blissful or happy mood was by players perceived as a success criteria for their play. In the tightly scripted scenarios there was no indication given to players that this was not a desired state. However, in WoM and PI negative states of mind can be desirable in certain context, even though this aspect of the game design was not tested in the paper prototype play-test. The behaviour of the participants in the test indicates that if a game design is used where the game-play mechanics is at odds with the preconceptions players have regarding mood states in the ordinary life this needs to be communicated to players in a clear way.

8.4.1 Effects of Personality Factors

Regarding the detailed mapping between factors and their effects, players had an inclination towards building models about extraversion. Eight of the ten players hypothesised about the Extraversion factor, though they had different hypotheses of exactly how the level of Extraversion would affect their PC. Table 8.6 summarises which personality factors participants discussed in the second question of the second interview. In the table, ‘Relating’ signifies that the participant had a hypothesis about the effects of a particular factor. ‘Mentioning’ means that the participant mentioned a personality factor, but that the participant did not expand the discussion about a factor’s potential effects. ‘Unsure’ means that a participant attempted to build a hypothesis of how a personality factor might affect other elements of the MM, but that the participant did not come to a conclusion.
Eric the Red’s player hypothesised that ‘Depending on how extroverted you are, sadness and guilt would probably move more or less as you are affected by them.’ Kita’s player said ‘So, like, if you are an extrovert you might get interested and excited more easily, but you also might get distressed or anguished more easily, so each one kind of ... you know ... had an effect on your emotions.’ Players chose to discuss certain emotions more than others in relation to extraversion: amusement, anger, excitement and sadness were discussed by three players each, while the other eight emotions were only discussed by two players or fewer. Perhaps players found the emotions they discussed to be particularly relevant to extroversion.

The factor Agreeableness was accessible or interesting enough for six of the players to mention it and for three players to discuss it in more depth. The factor Conscientiousness was the most difficult for players to relate to. The following statement about it comes from Dante’s player: ‘If you are not conscientious at all [...], other people pick up on that, how [...] are they going to ask you to do anything for them?’ These results indicate that players are able to successfully use their everyday theories of mind and personality to apply them to the personality-based game mechanics in WoM. However, future design work may be needed to make some of the factors, such as...
CHAPTER 8. PLAY-TEST OF WORLD OF MINDS

as conscientiousness, more understandable to players.

8.4.2 Extraversion and the design risks of Five Factor Model

It is no surprise that the factor of extraversion was perceived as the most accessible. Even in ancient Greek philosophy, extraversion is included as a central dimension of human personality. Recent research where the FFM is used in the context of synthetic humans and conversational agents also favours extraversion before the other factors (Mairesse & Walker, 2007; Isbister & Nass, 2000). From a design perspective, the results of the play-test indicate that it would be beneficial to introduce players to the mechanics of WoM or PI by focusing on the factor of extraversion in the early stage of the game.

However, as a character trait in an RPG, the dominance of extraversion carries a design risk. The participants expressed worries about how their PCs would perform in social situations if their level of extraversion is low, relating to real world social situations where introverted persons have difficulties. If a game world heavily relies on game mechanics derived from metaphors of social interactions, such as AAs, it would be easy to perceive an introverted PC as ‘gimped’, that is, the PC has properties that make it difficult or impossible for its player to progress in the game.

The design goal of WoM was for personality traits to be non-normative: a game design in which each possible combination of personality traits allows a player to successfully progress in the game. The design of the Mind Module does weight connections between trait and emotion nodes such that it may be more difficult for an introverted PC to perform certain social actions. In the play-test of WoM the use of spells was very limited and only constrained by the amount available mind energy.
The feedback from the participants, along with the non-normative design goal was used when refining the mind magic spell system as described in Section 7.6.4. The intention of the system design is manifold: on the one hand to by action potential reflect both the personality and the mood of the PCs, and on other hand make sure that PCs who tend to (as a result of perhaps high values in the trait nodes of the neuroticism factor) deviate towards the Depressed areas in the mood co-ordinate system (where MR and ME regenerate slowly) have spells powerful enough to make the game playable and enjoyable. Focus was also put on creating a system where different strategies regarding where to be in the mood co-ordinate system would be beneficial to use for players co-operating taking on different functional roles, while not restraining players to need to use the same strategy all the time.

8.4.3 Emergent Game-Play

The scenarios in the prototype were purposefully tightly scripted, since a primary purpose of the prototype was to explore players’ understanding of the MM in the context of WoM. Nevertheless, players used the MM-based game mechanics to discover alternative strategies for completing the scenarios that had not been foreseen in the design.

A clear example of this appears in the fourth scenario, when the player helps Teresa battle the Colossus of Confusion. The only other object in the environment was the Laser Pen of Clarity, which the player can pick up to learn the spell of the same name. This spell reduces confusion and mental resistance; in the design it was assumed that players would use only this spell to help Teresa by casting the Laser Pen of Clarity on the Colossus of Confusion. However, 70 percent of the players
combined the use of AAs on Teresa with the use of their (only) spell on the Colossus of Confusion. Players hoped to improve Teresa's emotional state through the AAs, and thus increase her effectiveness at battling the Colossus of Confusion. Thirty percent of the players used their Laser Pen of Clarity on Teresa, which decreased her confusion and again made her more efficient against the Colossus of Confusion. Thirty percent of the players used AAs instead of the Laser Pen of Clarity on the Colossus of Confusion, damaging the Colossus of Confusion with a lesser decrease in their mind energy than using the Laser Pen of Clarity. Figure 8.7 illustrate the fourth scenario of the paper prototype.

Figure 8.7: In the fourth scenario players pick up the spell Laser Pen of Clarity to help Teresa overcome the Colossus of Confusion.

The fact that players discovered interesting, alternative strategies even in very constrained and simple scenarios validates the potential for rich and emergent game-play in MM-based game mechanics. In the same way that physics systems have created opportunities for emergent game-play in games such as Deus Ex (Ion Storm Inc.,
2000), the ‘mental physics’ of the MM creates emergent game-play opportunities for VGWs.

8.5 Discussion: Individual Differences

All ten participants in the play-test chose to either self-play or use a mixed approach, that is, no participants chose to create a fictional character to role-play. Thus, the potential role-playing aspects were not explored in the test which instead could become focused on the mental model players created of the system while they related the personality trait properties to themselves. The majority of the participants were of the opinion that the IPIP NEO had reflected their personalities in a way that reflected them in a ‘accurate’ way as self-playing PCs (Survey 2, Question 7). Their attitudes towards personality tests in general were mixed (Survey 2, Question 9), but these attitudes did not moderate any of the effects of other individual differences studied, nor was any differences in approach to the WoM prototype noticeable that could be connected to these attitudes.

Several questions in the second survey explored players’ attitudes towards the privacy of the information of personality trait values. Given the situation presented, in which other players in the VGW would not be provided information about whether another PC was self-playing, and thus using their ‘own’ trait data, or role-playing using fictional authored trait values, the issue of privacy was not considered a problem by any of the participants. The design of PI does not allow PCs to see any properties of other PCs except the current mood which is signalled by the colour of the ‘aura’ (see Section 7.3.5). However, the attitude of the participants indicate that features regarding display of information on personality traits that may cater for strategic
game-play could be positively received. (The response text given by participants answering Question 6 in Survey 2 is presented in Appendix C.11.)

The previous play experience and preferred game genres seemed to correspond with attitudes towards the trait-based system of defining sets of abilities where the avid role-playing- and strategy game players were less positive than the others, as elaborated on in Section 8.6.5. Only one of the players had no RPG playing experience of any genre asked about in Survey 1. Perhaps surprisingly, she was the player who showed the most rapid understanding of the game mechanics which were directly derived from the MM. Given the small sample of players no definite conclusion can be drawn from this, but it indicates that the mental model of the typical RPG class-based system may conflict with the mental model of the MM, which is derived from psychological models of personality and emotion.

8.6 Discussion: Implementation Focused Design Evaluation

8.6.1 Sentiments in the Play-Test Scenarios

As described in Section 8.3.4, where the PC Mastaya’s traversal of the scenarios in the play-test was used as an example, sentiments came into play in the following situations.

In the first scenario, the gate keeper gave Mastaya two random sentiments by

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8In this case there was a discrepancy between the results from the surveys and from the interviews and think-aloud sessions. In the survey results the participants reasoning about the trait-system was more positive and less elaborated ('It is great!') than in the interviews. Therefore the conclusions guiding the further development of the prototypes in this respect rely more on the materials from the think-aloud sessions than from the survey results.
pulling out objects from his bucket. The natures of the objects are deliberately chosen to have little emotional charge. Pulling out a spider from the bucket would for example have the given preconception of fear towards it. The objects that are in the gate keeper’s bucket are as follows: a ping pong ball, a hat, an eraser, a sock, a mitten, a pencil, a pair of scissors and a shoe. One of the items were associated to Anger, the other to Amusement. These combinations constitute sentiments, i.e., for Mastaya a sock is tied to Amusement.

After this the gate keeper tells Mastaya the following: ‘At night you wake up by an unfamiliar touch. There is a damp smell.’ Mastaya is then asked which of three objects would be most disturbing to find in the bed: a garden gnome, an empty noodle container or a small chair. Mastaya chose the garden gnome, and received a sentiment of Fear towards garden gnomes. In the second scenario Mastaya interacted with the NPC Teresa who was puppeteered by the test leader. Mastaya chose AAs such as ‘gossip’, ‘tell small secret’ and ‘flaunt big secret’, and the test leader chose reciprocal AAs that resulted, for Mastaya’s part, in a sentiment of Interest towards Teresa. Teresa gained a sentiment of Interest towards Mastaya.

In the second scenario, players displayed a higher variety of differentiation in their choice of action than anticipated by the test leader. Teresa’s emotional memory after the ten sessions in terms of sentiments may give a pointer; she has a sentiment of Amusement towards one character, Interest towards three, Joy towards three, and Satisfaction towards three characters. In the limited set of AAs available to the players it is possible to see which main types of AAs were chosen in the interactions. For instance, the three characters receiving a sentiment of Satisfaction chose to ‘hug’ Teresa several times.
In these two scenarios, sentiments, or emotional attachments, were instantiated in three different ways. From the gate keeper’s bucket a *random sentiment* was instantiated (the Amusing sock), through a question a *sentiment of limited choice* was created (the Fearsome garden gnome), and finally sentiments were born as *results of interactions* (the Interesting character Teresa).

In the third scenario the player is navigating her PC on a board as shown in Figure 8.8. Present on the board is the goal, in form of a water cooler, and a number of objects. For each player three items were placed on the board, one that had a sentiment of Fear attached to it, one item that had a positive feeling attached to it, and one object that the PC did not have any sentiments attached to. The player started to navigate from the top left corner on the board as shown as a picture using a marker to signify the position of the PC on the grid.

![Figure 8.8: The board with a goal and sentiment objects that players navigated in the third scenario of the play-test.](image)

This scenario mainly functioned to confirm that the concept of emotional attachments and their effect in a spatial environment was understandable to the participants in the play-test. All players successfully navigated the board towards the goal. An example
transcription of one of the players reads as follows:

‘I was like whatever there is a gnome and then when I got close to it, I was like, well not that close. But then you said I was close and you started moving my things [note: the fear meter] and I was, oh my gosh, something is happening. Then I was like, oh whatever. What can a gnome do to me? So I tried to go right to it, then you like moved it up a lot and I was like, oh crap. So then I just tried to move away from it, and now I’m trying to walk around it cause I don’t want to leave any spawns around that are bad [note: an emotion out of bounds spawns manifestations that stay in the environment, in this case Terror Trolls].

The majority explored what effect all the different objects would have on their PC’s states of mind, and a few committed to reach certain moods in order to experiment on what effect that would have in the coming scenario.

In the fourth scenario Teresa asked for help in defending herself against the manifestations of Confusion. The PCs had reciprocal positive sentiments towards Teresa, resulting in giving both the PCs and Teresa a ‘boost’ in their state of mind, different according to the individual sentiments. This boost was helpful when they together defeated the Colossus of Confusion and the Sails of Sorrows and illustrated what effect a sentiment could have on the game mechanics.

8.6.2 Survey and Interview Results Regarding the Sentiments

As mentioned, a survey was conducted immediately after the play-test. One of questions was whether the participants remembered the sentiment objects, and if so which ones? One hundred percent of the participants remember the sentiment of fear they
got by limited choice (garden gnome, small chair or noodle container). For the random sentiments the memory of the group was less accurate, of the total 20 random sentiment objects (2 for each participant) 15 were accurately remembered, or 75 percent. The response text from the survey regarding remembered sentiments is presented in Appendix C.12

The players were asked to rate the three different types of sentiment objects according to their preference on a scale from Bad(1), Not so good (2), It was ok (3), Good (4), to Very good (5). There was a strong trend of preferring the instantiation of sentiment objects that resulted from interactions with Teresa, which received the overall score of 4.58, while the sentiments given by limited choice were rated to 4.0 and the random sentiment only 3.33. A representative comment by a player asked the survey question ‘What did you think about getting a sentiment towards the NPC Teresa when you interacted with her through using affective actions via your PC?’ was:

*It was built through my actions and therefore made sense. I also felt a real emotional attachment to Teresa, whereas I could not care less about pencils or garden gnomes.*

To the question of what sentiment object that had made most sense to the players and why, there was a strong trend to mentioning Teresa (70 percent), motivating it with that there was an effect of their actions that ‘made sense’. Three of the players instead mentioned the chosen sentiments: ‘because I picked it’. When asked which sentiment object that had made least sense to them the majority of the players mentioned one of the randomly assigned sentiments: ‘Anger towards mittens. What did they ever do to me?’
CHAPTER 8. PLAY-TEST OF WORLD OF MINDS

The interviews conducted in the play-test gave almost the same result as the surveys. Eighty percent of the players strongly expressed their approval of receive a sentiment towards Teresa through interaction. One player said:


[…]even though it is a made up NPC, it is like just the way you are interacting, the way you are affecting her mood, it makes sense to have a lasting effect. Like I’m going to remember Teresa. […] in this sense it was like I was on par with her so it was cool that it had a lasting effect on both of us. And it makes it feel more real because they remember me too…so I like that part a lot.

In the interviews, 50 percent explicitly expressed approval of the chosen sentiments, and 30 percent of the random sentiments, a similar result as in the survey, though in some cases some silent on a certain subject in the interview instead expressed themselves in the survey, and the other way around. ⁹

In both interviews and surveys, players expressed that the more agency they felt in relation to the creation of sentiments, the more they preferred it. One player said:

‘This one made the most sense [pointing at the sentiment towards Teresa], the satisfaction. Because with Teresa I had a history with her, whereas I did not have much of a history with these other things. I have a history with the garden gnome, but it seems just as likely it could have been any of these other objects.

In the think-aloud parts of the tests, most of the players were reasoning about each

⁹As mentioned, the survey was conducted as a way to make sure that the results would not be skewed by the finding that participants in face to face situations in tests often tend to want to please the test leader and thus did not express views that may not be ‘pleasant’ but relevant to the outcome of test.
object’s relevance to the rest of the context. The more impact they had had on the
creation of the sentiment, the more meaning they could read into it. In the case of
the sentiments towards Teresa they did not reason at all when they were ‘thinking
aloud’. Teresa and the sentiment towards her was not problematised or discussed, but
accepted at face value. She was explored rather than questioned. The chosen and the
randomly assigned sentiments were on the other hand discussed and interpreted. The
players attempted to come up with explanations for the random emotions towards
the objects. For example one player said ‘I’m angry at socks, because you always
lose that one in the dryer, then you end up with mismatched socks.’ Regarding the
chosen sentiments half of the players tried to come up with an own back-story of why
the particular object would hold a certain emotion for them, and 40 percent of the
players came up with ad hoc explanations for the randomly assigned sentiments.

8.6.3 Deep Structure and Sentiments

The interview and survey results showed that sentiments instantiated as a result
of interactions were what made most sense to the players. However, the notion of
the sentiments given by choice seems promising. In my interpretation of the data,
the players’ main dismay came from the reasonable standpoint that the objects did
not make sense in the environment. The fact that many of them created their own
meaning, and seemingly enjoyed doing so, and that the actual choice gave them a
limited feeling of agency is still unsatisfactory. Perhaps any such object needs to be
rooted in deep structure of a story driven game world. In the case of persistent VGWs
the drivers need to be the players if the chosen objects are to carry meaning. Possibly
the notion of life-path systems, a feature used in some table top role playing games,
could be experimented with as a formalised way of creating individual backstories for the PCs, where the entities tied into the back-story have functional representations in the virtual world. A sentiment or a set of sentiments towards such an object would function as a memory as well as have an effect on a PC’s state of mind and thus give a player material that a planned course of action can be based upon.

The interactions between Teresa and the PCs in the play-test were carried out in a context where several components were governing for the initial deep structure (discussed in Chapter 3). The script of the play-test gave the gate keeper, in Greimasian terms, the role as sender when he asked for a glass of water in the first scenario. Teresa received a role where she in the first meeting functioned as a giver of information, and in the second meeting had a role of someone seeking help. The PC had, in being the subject, in the first scenario a need for information, given that she was new in the environment, and in the second one she got the role of helper to Teresa. In the third scenario the sentiment objects with negative emotions tied to them would be the opponents and the ones with positive emotions would be the helpers in the PC’s navigation towards the water cooler. In the fourth scenario the opponents would be the Colossus of Confusion and the Sail of Sorrow, while the PC temporarily stays acting as Teresa’s helper on her way to the Gate Keeper (Karl). As a subject the PC could, in the last scenario, deliver the object (glass of water) to the sender (Gate Keeper). The constitution and rules of the game world governed the action potential of both characters, which was a limited dialogue, a set of AAs and a small sets of spells performing ‘mind magic’. The exact actions of all the PCs varied, and took

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10 A life-path system is a formalised way to provide a character with a back-story at the character creation stage. In the table top RPG MechWarrior 3 the following information is asked for: ‘early childhood, age 10’, ‘Late Childhood, age 16’, and 6 additional paths (Path 3 to 8) concerning ‘higher education and real life’. Another table top RPG using a life-path system is BattleTech Solaris.
place in the surface structure, but the result was that new components were added to the deep structure: the sentiments, different in nature to each PC, depending on the choices of the player.

### 8.6.4 Affective Actions

Players were introduced to Affective Actions (AAs) in the second scenario of the play-test where they met the NPC Teresa who was played by the test leader. Teresa had an identical character sheet as the player but with values showing that she was depressed. The players were able to see where Teresa’s marker was on her mood co-ordinate system. Teresa introduced the player to the use of Affective Actions (AAs) by saying that she was very sad, and asking for a ‘hug’.

Seven of the players chose to ‘hug’ Teresa, while three of them started the sequence of performing AAs in the scenario with using ‘comfort’. The AA ‘comfort’ would diminish the emotions of sadness and anguish in the targeted character. No one chose the AA ‘Look at target with dismay’ which would have created an increase in the nodes confusion and sadness. Some AA’s were to be used in a reciprocal fashion, such as ‘joke’ where the target could respond by either ‘Laugh at joke’, or ‘Refuse to laugh at Joke’. Using such an AA included a risk, since if the target chose to, or had to refuse due to the mood, the effect on the joker would be an increase in distress and sadness. Laughing on the other hand would give both the joker and the target in increase of amusement, plus an increase in the satisfaction node of the successful joker. However, if the target of the AA ‘Joke’ had her mood marker in the leftmost row in the mood co-ordinate system in the character sheet used in the play-test (see
CHAPTER 8. PLAY-TEST OF WORLD OF MINDS

Figure 8.1) it was not possible to use the ‘Laugh at Joke’ reciprocal AA. Figure 8.9 shows a participant using an AA in the play-test.

Figure 8.9: Guided paper prototype play-test. A player is using an AA by pointing the note representing the AA at the paper figure representing Teresa.

The play-test situation in the second scenario changed in the majority of the ten tests from the think-aloud protocol to more resemble a situation of participatory design. Players suggested other types of AA that they would like to use instead of the ones provided. These suggestions were immediately added to the prototype and the participant could try them on Teresa. Figure 8.10 shows the second scenario where Teresa asks for a hug. The marker on Teresa’s mood co-ordinate system in the top left of the picture shows that she is in a depressed mood. The markers symbolising the affective actions are placed in the lower part of the picture. The pink and the lilac AA markers were the ones provided in the start of the scenario; Comfort, Look at Target with Dismay, Hug, and two AAs reciprocal to Hug; Be Hugged and Shrink Away. Some of the players thought these actions too extreme given that this was
the first time they met Teresa; for example, one of them requested to respond with Stunned Silence (see hand-written note in Figure 8.10), another to be able to Small Talk.

![Image](image.png)

Figure 8.10: The first set of AAs introduced to participants of the WoM play-test.

In the second step of introducing AAs the following AAs were added: Cheer Up, Joke and the reciprocal Laugh at Joke and Refuse to Laugh at Joke. The conversational AAs Gossip, Tell a Small Secret and Share a Memory were added along with the reciprocal Agree, Be Very Attentive and Misunderstand on Purpose. Two more steps of introducing AAs were added in some sessions if the time limit allowed and the participant requested it.

The feedback from the participants was used when the AA feature was reiterated
for the digital PI prototype. In PI the initial meeting of the NPC Teresa was also different (see her dialogue in PI in Appendix B.6), she did not ask to get hugged. In PI the first set of AAs the player can learn is Small Talk, Calm Down, Look at Target with Dismay, Ignore, Joke, and the reciprocal Laugh at Joke and Refuse to Laugh at Joke. This set of initial AAs in PI affects the mood of the target in all four directions of the mood co-ordinate system, allowing players to try out the feature on each other’s PCs. Specifications of which AAs a player has access to in the five subsequent steps of learning AAs in PI are presented in Appendix B.1. Based on the pace indicated as comfortable in the play-test for introduction of new AAs, sets of eight AAs are introduced at each step in PI except for one of the steps where only four are introduced. In this step players are introduced to AAs with more properties than the others; they affect all entities close to a PC and are only available if a PC is in an extreme mood.

The fourth scenario of the play-test was designed to focus on the introduction of mind energy and mind resistance and on using spells on single sentiment mobs, as well as on evaluating how the participants would take to the ‘spawning’ of new single-sentiment manifestations. While designing the scenario I was concerned about adding too much complexity due to a multitude of features and concepts in a single scenario. However, in the test situation all players used the game system to its fullest, even using AAs in combination with the spells. The behaviour of and the comments from the participants gave useful feedback about how to limit the use of AAs in the PI prototype as described in Chapter 7, Section 7. Several players noted that players might ‘misuse’ the system by repeatedly hugging each other, something that hardly
would be a believable behaviour.

Summarising, the players enjoyed monitoring the fluctuations of the mood in their own PCs and Teresa and experimenting with different AAs. The second scenario was popular among the participants. In the survey, which did not include any questions about the AAs, the majority of the players pointed it out as their favourite part of playing the prototype as a response to the question in the last survey about what they particularly enjoyed in the play-test. Several of the participants used the expression ‘make sense’ when discussing the mood feature in relation to the affective actions in the interviews conducted in relation to the tests.

8.6.5 Spell Abilities

During the play-test sessions players received spell-casting abilities at two occasions. The fourth scenario started with Teresa exclaiming via pre-written dialogue that she is attacked by a single-sentiment manifestation, a Colossus of Confusion. She calls for help and asks the player to ‘pick up the pen’. When players placed the marker for their PCs by the ‘pen’, as shown in Figure 8.7, the test leader gave them the spell Laser Pen of Clarity, represented by a white note in the lower part of the figure.

In the PI prototype the mechanics of ‘finding’ a spell as an item in the environment was discarded. The reason for this was not that the approach was dysfunctional. On the contrary, players found it comprehensible, and it is a common way in RPGs to give players access to spells (often contained in items called ‘scrolls’) where randomness create varieties in different PCs’ sets of abilities. The reason for discarding this way of giving abilities to PCs was a guiding design principle in PI not to use items
In the final scenario, each player was given two spells by the gate keeper, based on their personality traits. One spell was based on the highest trait value in the factor Neuroticism, while the other was based on the highest factor value (except if that factor was neuroticism, in which case it was ignored and the factor with the second-highest value was chosen).

Seven of the ten players had positive comments about receiving PC-capabilities based on traits. The other three raised the issue that the spells were not of their own choice. The three players who had reservations are avid players of single-player RPGs, and thus have deep knowledge of many varieties of character class systems. As Solemni’s player put it the fourth survey:

*Getting spells from personality is a different method of choosing how your PC interacts with the world — like a class. Not having direct control over your class may be a difficult pill to swallow.*

This highlights an important difference between a trait-based and class-based character systems. In traditional RPGs, the character class defines which abilities become available to the player during the progression of their PC in the game world. In contrast, instead of ‘rolling’ a new character as in a traditional RPG or MMORPG, the...
WoM player who would like to try another play style will instead create a character with a different personality. Since personality-based capabilities (such as mind magic spells) are not organised under classes, but instead rely on relationships between the different traits, the combination space of the possible actions for an individual PC is larger than in a traditional class-based RPG. A player will actively have to experiment with multiple characters to begin to gain a sense of the strengths and weaknesses of different trait combinations.

However, given that players in PI and WoM create their personalities in the beginning of the game they cannot, given the current implementation, affect the traits of their personality in order to modify their abilities. Instead they can learn during the progress of the character development about what this specific VGW gives them in terms of potential behaviour given the specified personality.

An alternative design which had to be discarded due to the large implementation effort required to realise it was to let players make a self-assessment of the five personality factors in the beginning of the game. During game-play different actions and challenges would be designed with inspiration from the Five Factor Model in order define the value of each trait as results of players’ actions. Each time a trait node received a value as a result of players’ actions the personality would become more refined, and the action potential of the PC would be modified. This approach might provide a more challenging an interesting way of, ‘becoming oneself’ during game-play as one would ‘be’ in the given environment. In this way the progression of a character in terms of levels and abilities might be closer to ‘the journey as a route to self-knowledge’ as discussed in Section 3.9.2.
8.7 Conclusions: Design Implications Relevant to the Pataphysic Institute

The relevance of results from a test of a paper prototype to a computational system cannot be taken for granted. For instance, in the WoM play-test the graphical representation of a PCs mood was represented in a way that differed a lot from the designed graphical representation of the mood in the digital PI prototype.

In the test, players were asked about their opinion of the colours representing moods in the mood co-ordinate system. In the WoM play-test, the mood was represented by hues and shades of red and blue. The position in the mood co-ordinate system was marked by a relatively large marker. Six of the participants were happy with it as it was, while five suggested using other, or several, colours (see Appendix C.13). In the implementation of PI a colour wheel is used, with the full spectrum of colours. Since the mood of other characters are signalled by an aura which is not that large, and transparent around the head of characters, I believe that the mood nuances would be easier to distinguish if more colours are used.

Another example where results from the paper prototype play-test did not yield useful advice for the design of the digital prototype were the two open-ended questions that started both interviews which were part of the play-test; ‘What do you think will happen next?’ The tightly scripted scenarios in the paper prototype were in most cases not representative enough for an open-ended VGW environment. Many answers were concerned with the interface; in the paper prototype pieces of yellow carton were used as symbols for buttons that the players could ‘click’ (by pointing at them). When they had their brown carton side up they signified that they were ‘greyed out’ and
not usable. As the test progressed more ‘buttons’ were turned up on their yellow side and became accessible to players. At the end of the last scenario there were still unused buttons left, among them ‘social contracts’, a feature which was discarded for the current PI design. The majority of the players correctly assumed that the next portion of the game would follow the same principle, and that they would get introduced to the mechanics underlying the greyed out buttons.

Norman (2005) noted a potential pitfall of user-centred design in that sometimes listening too closely to users may lead to overly complex solutions and lack of cohesion in a design. Norman argued for an approach that focussed on activities as compromised by tasks, which themselves are comprised of actions. The following sections summarise results from the test which have given pointers that were helpful for the design of the digital prototype. These results are guided by the feedback and the critique given by the participants, but also by observations of what types of activities the users accepted at face value and how they carried out these activities.

8.7.1 Sentiments and Attributing Meaning to them

In the discussion in Section 8.6.3 I concluded that if sentiments are to be used in meaningful way they need to be rooted in the deep structure of the world which is the base for story construction. The way the sentiment objects that were given to the participants as random choice and as result of interviews did not make sense to the players, who actively used their imagination in order to tie them into the world by giving them meaning. This was a hard task given the arbitrary nature of the objects. In the WoM prototype the sentiment that did make sense to the players were the one towards Teresa, which was a result of their interactions with
her. In PI, mechanics for the creation of sentiments as results of interactions were implemented, as well as the mind magic spell Sentiment Curse/Blessing, which is still in an experimental phase. The use of sentiment objects which are inanimate (that is, ‘things’ rather than expressive agents) holds a lot of potential however, given that the VGW they are to exist in caters for the functionality and that the crafting of the world incorporates the objects in ways that can be perceived as meaningful by the players. The sentiment nodes, or emotional attachments, can in WoM and PI emerge and decay as a world is inhabited, and would in the ideal case have meanings for those performing, playing and inhabiting the virtual world because they would be directly based on the interactions between them.

At the time of the play-test conducted with WoM the back-story was not worked out in detail. Several players requested more information of the back-story during the play-test. In those cases the test leader could explain events in the test relying on the back story. This gave the players better understanding of the systemic mechanics. The players’ understanding of the mechanics seemed to be intertwined with the meaning they could attribute to the events in terms of the back story of the world. The unconscious assumption that I had made while designing the play-test, that it would be enough to only provide the ‘skeleton’ (the system) for the understanding of the system, without giving the ‘meat’ (the back-story), proved to be false. It seems to be essential that any sentiment objects used — even for a testing situation — is anchored in the deep structure of the game world, even if it is a small one, in order to receive representative results regarding the systemic aspects of the design. For the PI prototype a more detailed back story was written as presented in Section 7.4.
8.7.2 Agency and Co-creation

During the tests, the interviews and the surveys there was an inclination among the participants to, when given alternatives related to issues of agency, prefer the alternatives with the highest possible agency. In this context the term agency conforms to Murray’s definition (1997, p. 126): ‘Agency is the satisfying power to take meaningful action and see the results of our decisions and choices’.

In the second survey, conducted after the IPIP-NEO test and before the play-test the participants were asked hypothetical question of how they would prefer their PC’s personality to be created. They were asked to rate three alternatives; a personality test in the beginning of the game, a series of interviews done by short dialogues with NPCs spread out during the game, and a series of game activities where their actions define the personality traits of their PCs. The participants rated the third choice highest and the first choice lowest on a scale of preference.

Section 8.6.2 discussed survey and interview results regarding sentiments that players preferred. Participants had a particularly positive attitude towards sentiments that had been created as results of players’ actions. The more impact they had had on the creation of a sentiment, the more meaning they could read into it, and the more ‘sense’ did it make.

The high perceived agency in the second scenario (where players interact with Teresa using AAs and sentiments are instantiated) might be an explanation for its popularity among the participants. However, an alternative interpretation could be that it was popular because the players in this scenario were welcomed to participate in the design process by suggesting new AAs. The satisfaction of co-creation can in PI potentially be experienced in the creation of compound manifestations, but perhaps
a possible future feature for implementation and testing would be the authoring AAs that could be either individual, as means of self-characterisation, or for departments, where specific AAs could be part of characterising the behaviour of a group.

8.7.3 Core Game Mechanics

The third scenario where the players navigated sentiment objects on a board had the main purpose of testing whether it would be feasible to use game mechanics where character’s emotions are affected by the mere proximity of an entity that the PC has a sentiment towards. Also, when players met Teresa for the second time their PCs’ emotions were affected by the sentiment created at their first meeting. The effect of the mechanics of sentiment by geographical proximity was accepted at face value — players seemed to view it as ‘natural’ that it would be so. This promising feature has therefore been used more in the PI design where PCs are not only affected by sentiments in proximity which are results of interaction or authoring, but also by formalised social relationships. PCs in PI ‘feel’ Belonging in proximity to friends and members of the same department.

Another feature which was accepted at face value by the participants was the ‘spawning’ of single-sentiment manifestation as results of emotions going ‘out of bounds’. One player was careful to not become so ‘scared’ while navigating the board of sentiments in the third scenario. She did not want to leave Terror Trolls behind on the board for the next participant in the play-test to deal with. Based on the direct acceptance of the mechanics of the birth of single sentiment manifestations showed by the participants the design was implemented as planned in PI.

The play-test gave important pointers to introducing AAs to players. As described
in Section 8.6.4, the results from the play-test affected which AAs became part of the current set and in what pace they are introduced to players in PI. When players interacted using AAs the constraints of which AAs they could use (depending on their own) mood, and which ones they could use on Teresa (depending on her mood) was understood instantly. In the test, no mood constraints were applied for the use of spells except for the available amount of mental energy. The direct understanding of mood constraints for AAs displayed by the participants in the test confirmed that this type of mechanics would be feasible to use. It was therefore used in the reiteration of the mind-magic spell system whose constraints builds upon 13 different spaces in the mood co-ordinate system as described in Section 7.6.4. As mentioned in Section 8.4.2, the spell system for PI was modified such that the action potential would characterise the current mood of the character as well as its personality. Furthermore, the system was balanced in a way that aims to make sure that introvert and neurotic characters not would be ‘gimped’ given the social character of many features in the game by giving them powerful spell options only usable in depressed states of mind. This design decision was directly based on the worries expressed by players regarding personality types, that in fact had a bearing on the game mechanics. Furthermore, as discussed in Section 8.6.5, the test results indicated that players found it ‘natural’ to receive spell-abilities that were characterising for the PC, a feature which was further developed in PI (as described in Section 7.6.5).

8.8 General Conclusions

The approach for play-testing WoM was inspired by methods from user-centred design as well as from iterative game design. Play-test sessions and interviews were
videotaped. Additional data were collected using web surveys. Data from the video-recorded material was gathered using the transcription and analysis tool Transana. The data was analysed using the model advocated by Miles and Huberman (1994). In addition, results from web surveys were used for potential refutations of the findings. Also, the activity-centred approach presented by Norman (2005) was taken into account when design implications of the findings were considered.

Generally, the findings indicated that participants were able to formulate ‘correct’ mental models of the MM-derived game-play mechanics in that they constructed meshed sets of patterns of action potential that allowed them to act in a way that had the effects on their PCs that they desired. Participants used the ‘mental physics’ of the MM to discover alternative strategies for completing scenarios that had not been foreseen by the test leader. Players used mental models of mood and personality from their ordinary lives to understand the MM-derived mechanics when information given in the play-test did not contradict these models. These results indicate that if the game-play mechanics differ from the mental models that players apply to a VGW using the MM, game-mechanics at odds with the players’ preconceptions need to be communicated clearly. Participants had the inclination to reason more about the personality factor extraversion than other factors. Therefore it appears that the mechanics of this factor would be particularly easy to communicate if its use resembles players’ preconceptions of it, but if it is used at odds with players’ preconceptions its mechanics need to be carefully designed and communicated.

Participants were generally of the opinion that the personalities of their PCs had been reflected in a ‘true’ way by the results of the IPIP-NEO. This indicates that this method of character creation can yield personalities for PCs that correlate with the
nature players intend for their PCs to have. The issue of privacy of the personality trait values were by players not considered to be more important than the potentially interesting strategic elements that revelation of these values might result in. That is, if personality trait values of a PC are visible to other players in certain contexts, and this adds to the game-play experience, this is more important than the lack of privacy because the PC’s personality traits are revealed.

Players with extensive knowledge of role-playing computer games expressed reservations regarding the trait-based character system. This indicates that a trait-based system for characters can initially be difficult to understand for players who use mental models of traditional class-based character system of role-playing computer games in a context where a trait-based system is used. If the intended target group of a VGW using the MM include avid computer role-playing game players this needs to be taken into account, and the game-mechanics at odds with their preconceptions need to be communicated clearly.

When participants were asked about their preferences regarding different game-play elements they responded that they generally preferred those options that gave them the highest possible agency. This reinforces the well-known design approach where a high sense of agency is a desirable goal for a design, assuming that it makes game-play experiences more enjoyable for players.\(^\text{13}\)

In the play-test participants accepted several game-play mechanics at face value. That geographical proximity of their PC to a sentiment object would affect their PC’s state of mind was one such mechanic. Another was that the ‘spawning’ of a single sentiment as an externalisation of a strong emotion was perceived as ‘natural’. A third

\(^{13}\)For extended discussions concerning the concept of agency in games with narrative elements, please see (Wardrip-Fruin et al., 2009; Mallon, 2007).
mechanic that was accepted at face value was that the mood a PC could restrain what types of action were possible to perform at a given moment. Fourth, it was perceived as natural by the participants that the availability of certain abilities could depend on the personality of their PC. These results indicate that these mechanics are feasible to use in the design of a VGW using ‘mental physics’ of the MM.

8.9 Summary

This chapter has described the guided paper-prototype play-test of World of Minds, in which the game mechanics build upon the MM’s model of personality and emotion. In a case study of AI-based game design, lessons learned from the test have been presented. The players were able to form and communicate mental models of the mind module and game mechanics, giving valuable feedback for the digital prototype PI. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that the ‘mental physics’ of the Mind Module may open up new possibilities for game design.
Chapter 9

Conclusions

Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>Summary</td>
<td>268</td>
</tr>
<tr>
<td>9.2</td>
<td>Challenges in the Design of Virtual Game Worlds</td>
<td>274</td>
</tr>
<tr>
<td>9.3</td>
<td>Concluding Discussion</td>
<td>275</td>
</tr>
<tr>
<td>9.4</td>
<td>Limitations</td>
<td>285</td>
</tr>
<tr>
<td>9.5</td>
<td>Conclusion</td>
<td>289</td>
</tr>
</tbody>
</table>

9.1 Summary

In Chapter 1 a number of qualities of virtual game worlds (VGWs) were identified as particularly interesting. Firstly, VGWs are places where players interact with and create elements carrying narrative potential. Secondly, players add goals, motives and driving forces to the narrative potential of the VGW which sometimes originates from the ordinary world. Thirdly, the protagonists of the world are players, and when acting in the world their characterisation is not carried out by an author, but expressed by players characterising their PCs. How players can express their PCs in
way that characterise them depends on what they can do, and how they can do it, which depends on the design of a particular VGW. This is the characterising action potential (CAP) of a VGW. Fourth, in VGWs Caillois’ notions of modes of play paida and ludus exist in combination and side by side, something Caillois did not think possible.

In Chapter 1, I also suggested that the often discussed lack of narrative and lack of role-playing elements in VGWs are perceived problems rather than real ones, originating from notions of what VGWs ‘should’ be rather than from what they are. I approach these questions, among others, from the perspective of what VGWs ‘could’ be. Relying on the thoughts of Mateas and Stern (2005), the design space of VGWs was identified as a wicked problem space. Exploring game design consists of ‘navigating complex relationships and constraints among individual design features, while at the same time discovering or inventing new features that expand the design space’ (p.8). In order to explore these design spaces it is necessary to not only study existing games but to build games. In other words, as put by Mateas and Stern (p. 2): ‘Models about the nature of games and their features run the risk of being incomplete or wrong, simply because certain design spaces has not yet been explored.’

Two main questions are explored in this thesis. Firstly, how can CAP can be designed to support players in expressing consistent characters in VGWs? Secondly, how can VGWs better support role-play in their rule-systems? By using iterative design, I have explored the wicked design space of CAP by building a semiautonomous agent structure, the Mind Module (MM) and applied it in VGW prototypes where the design of the CAP and other game features is derived from the MM.
In Chapter 2, VGWs were discussed as spaces for construction of narrative potential. Terms used in this thesis were introduced: story, narrative, discourse, narrative potential, agency and story construction. Expressive agents and semiautonomous agents, created and controlled by developers, in-game creators and players, were introduced as constructors and realisers of narrative potential. A four-layered model of text levels in VGWs was described, where the Code Level and the Story Level were recognised as the levels where the designed, or authored, narrative potential is created. The played narrative potential is created at the Discourse Level and the Narrative Level. The story construction is performed at the Story Level and the Discourse Level through persons using expressive agents for signification. Finally, the open story structure of VGWs was discussed by providing examples showing that the narrative potential is affected by a multitude of goals of which many are derived from motivations outside the narrative potential authored by the world creators.

In Chapter 3 the importance of the playable character (PC) was stressed. The concept of characterising action potential (CAP) was described as encompassing both characterisation and true character, as defined by McKee, designating what a player can do at a given moment in a VGW that characterises their PC. Role-playing, self-playing and identity construction in VGWs was discussed as well as immersion, presence and Bartle’s concept of persona. It was stated that current VGWs have elaborate tools for characterisation of PCs, but less for bringing out their true character. The expression of true character in game worlds could lead to deeper and more meaningful dramatic experiences as well as supporting a higher degree of immersion into a game world via
closer identification with a particular PC which, in turn, could support the development of a persona. It was suggested that expression of true character in VGWs may be achieved partly by game mastering and partly by developing more sophisticated architectures for CAP.

Chapter 4 introduced the concept of the bleeding circle as the situation where strong interpersonal relationships seep between VGWs and the ordinary world. A number of design questions which I find important for the evolution of VGWs were introduced, with the reservation that some of them may be ‘holy-grail questions’, that is, questions to which there may be no answer, but that are important because they provide the driving force to navigate wicked problem spaces. The questions are presented in their full length in Section 9.2 and discussed in Section 9.3.

Chapter 5 described the Mind Module (MM), a semiautonomous agent architecture built to be used in a VGW as a part of PCs. The MM gives PCs personalities based on the Five Factor Model, and a set of emotions that are tied to objects in the environment by attaching emotional values to these objects, called sentiments. The strength and nature of a PC’s current emotion(s) depends on the personality of the PC and is summarised by a mood. The MM consists of a spreading activation network of affect nodes that are interconnected by weighted relationships. The values of the nodes defining the personality traits of characters governs an individual PC’s state of mind through these weighted relationships, ideally resulting in values characterising a PC’s personality.

While describing the MM, an account was given for which sources of inspiration have been used in the construction: spreading activation theory, trait theory, affect
theory and Moffat’s model of how emotion can relate to personality. The approach used in the design of the MM was compared to the approach of Dynemotion People Engine and to that of the OCC model.

Chapter 5 also provided a brief history of the development of the MM as well as an overview of related work in the areas of believable agents and expressive AI, emotion modelling, applications for story construction and related work which use trait theory when constructing autonomous agents.

Chapter 6 described the early prototypes where the MM was used as part of the implementations. In Ouroboros an important focus was to explore the use of expressive gestures of 3-D characters. Different gestures were available for use depending on the state of mind of the PCs and were consistent with their personalities. In relation to this, early sources of inspiration for the implementation of the MM were described. Ouroboros was developed at the Zero Game Studio, part of the Interactive Institute in Sweden.

Garden of Earthly Delights (GED) was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO) of the Integrated Project for Pervasive Gaming (IPeRG). The focus of MMRO was to explore ways to integrate massively multiplayer gaming with the play via cell phones with geographical location data. A guided paper prototype play-test was conducted where issues of player-control of a semiautonomous PC was discussed. Test results showed that players with live-action role-playing experience were particularly positive towards the MM-derived game-play in the test. The Mind Music application, also a part of MMRO, focussed on how music can be used to express complex states of mind to players, communicating mood
and emotions of their own PC via leitmotifs and groove.

In Chapter 7 the game design of the prototypes the Pataphysic Institute (PI) and World of Minds (WoM) was described. A background to the practical work of developing the prototype and an overview of the game design was given. Next, the core game mechanics were described briefly: then the main features of the design were described in detail. What PCs can do in a given moment is largely governed by their mood. Depending on PCs’ mood space they can cast different spells, which affect values of mental energy, resistance and emotion in their targets. The position in the mood co-ordinate system also governs which affective actions they can perform towards other PCs and what affective actions they are receptive to. By performing affective actions on each other, PCs can affect each others’ emotions, which if they are strong, may result in sentiments towards each other. PCs’ personalities govern the trend in the individual fluctuations of mood and emotions, and define which types of spell PCs can cast. Formalised social relationships such as friendships and protector-protégé relationships also affect the CAP, giving players more energy and resistance, as well as activating the emotion nodes Belonging and Pride. PCs’ states of mind are reflected in the world in the form of physical manifestations that emerge if an emotion ‘goes out of bound’. These manifestations are entities which cast different spells on approaching PCs, depending on the emotion that the manifestations represent. PCs can also partake in authoring manifestations which become part of the world and the game-play in it. There was a strong focus of the design of the CAP in PI on expression of character — to both self and others — through fluctuations of CAP and of manifestations of the own mental state that become part of the game
world. The expression of true character may be facilitated by the designed CAP, but is ultimately dependent how players use the CAP while constructing and realising narrative potential.

Chapter 8 described a guided paper prototype play-test of World of Minds, in which the game mechanics build upon the MM’s model of personality and emotion. In a case study of AI-based game design, lessons learned from the test were presented. The participants in the test were able to form and communicate mental models of the mind module and game mechanics, giving valuable feedback for the digital prototype PI. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that the ‘mental physics’ of the MM may open up new game design possibilities. However, it must be noted that the test, while it was fruitful for the future work in PI, does not prove the MM’s general applicability to game worlds.

9.2 Challenges in the Design of Virtual Game Worlds

Six design questions which I find important for the evolution of VGWs were introduced in Chapter 4. The questions are presented here in their full length because they will be further expanded upon in the next section, referred to by number. The questions, whose relevance is based on assumptions presented in Chapters 2, 3 and 4, are as follows:
1. In what ways can VGWs be designed to facilitate situations that involve challenges, conflicts and choices that would express the true character — the very essence of a person’s nature — of a player — or a playable character (PC)?

2. In what ways can VGWs by their system design and game-play rules further support players’ development of personas to — as Bartle described it — reach the ‘final level of immersion’?

3. In what ways can means be provided for all players to be heroes, protagonists, in their own drama, that is, integrated in the very story construction and deep structure of VGWs?

4. The role-playing in current VGWs relies on meta-game rules since role-play is poorly supported by rule-sets and game mechanics. In what ways can VGWs support role-play in their rule systems?

5. How can characterising action potential (CAP) be designed to support players in expressing consistent and interesting characters in VGWs?

6. Players in VGWs often develop strong interpersonal relationships. Identity construction is affected by individuals’ relationships to and mirroring of each other. How can the power of these relationships be harnessed by design of the CAP to make the game mechanics more interesting?

**9.3 Concluding Discussion**

Characterising Action Potential (CAP) was described as what a PC can do in a VGW at a given moment that has characterising effects. CAP encompasses both
characterisation the way McKee describes it, as what is merely observable about a
character, as well as what McKee calls true character — a character’s essential nature,
expressed by choices of the PC. CAP is the means that players have for expressing
the character of their PCs to other players, but it is also via CAP the players gets to
know and develop their own PCs - a process which is an interplay between a particular
player and the game system.

The nature of CAP defines what role and what impact a PC can have in the
creation and realisation of the narrative potential in a VGW. It is also defining for
the progress of the PC in terms of achievement and role-differentiation in a VGW,
and for how this process is interpreted by the player while potentially constructing
the identity of the PC, the player’s second self. How the PC and its CAP is integrated
in the underlying story construction system of a VGW is defining for to what extent
PCs can make truly dramatic choices as part of the deep story structure of the VGW.
If they can, the PCs are protagonists in the world.

CAP is essential to addressing the question of how PCs in VGWs can be supported
in expressing consistent and interesting characters (Question 5 in the list of design
challenges in Section 9.2). This is also crucial for addressing how role-play can be
supported by the rule-systems of VGWs (Question 4).

While the Ouroboros prototype focussed on expression of character performed to
other players through gestures and the Mind Music prototype explored expression of
players’ own PCs to the players themselves, the focus of PI was on expression of char-
acter — to both self and others — through fluctuations of CAP and of manifestations
of the PC’s mental state that become part of the game world.

In Section 2.2.3, PCs were described as semiautonomous expressive agents, partly
controlled by their players, and partly controlled by context-sensitive action potential and possibilities of expression as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW they inhabit. A well known rule-of-thumb in game design is to make sure that the players feel in control (Höyniemi et al., 2004). Autonomous behaviour in PCs is rare in VGWs while the restraining of action potential of PCs is inherent in all designs.

The degree of player-control which would result in enjoyable game-play for players, the sweet spot of semiautonomy, could vary with the specific design of a VGW on a sliding scale of control as illustrated in Figure 9.1. It is also important to take preferences of player target groups into account. For instance, the play-test of GED (see section 6.2.2) indicated that VGW players with live-action role-playing (LARP) experience were more positive to a higher degree of autonomy of PCs than VGW players who did not have LARP experience. The players with LARP experience were particularly positive to those autonomous aspects that would support role-playing potentially interesting characters. For the design of CAP using semiautonomous agents it is important, in the design, to clearly distinguish between properties and features that characterise the PC to the PC’s player and which parts that are tools for the player to characterise the PC to other players. In the first case the CAP is an interplay between a system and a player, in the latter a player uses the CAP of a system to perform the role of a PC in relation other players and their PCs.

The behaviour of a PC equipped with a MM is two-layered: one layer is provided by the MM, which through integration with the architecture of a VGW provides the action potential. The other layer is the actions performed by the player controlling the PC, actions performed within the provided action potential. Ideally the bottom layer
of the semiautonomous agent structure of the MM would facilitate players’ expression of personality, in Moffat’s (1997) words ‘the name we give to those reaction tendencies that are consistent over situations and time’ (p. 133).

The restrictions of the action potential depend on both the context and the values of the personality trait nodes of an agent. Whether the values of the personality trait nodes are chosen by the player or authored by a world creator or game master is a design choice. Also, the level of player-control is a design choice which needs to be made according to specific designs of VGWs.

The social multiplayer aspect of the prototype worlds in which the MM is used makes it possible to use game-play mechanics that emphasise social aspects. Through game mechanics such as ‘affective actions’, and ‘mind magic spells’ described in Chapter 7 emotions are affected by the full range of traits of the Five Factor Model. In the PI prototype, players can themselves set their PCs’ node values of personality traits by completing the IPIP-NEO test consisting of 120 rating scale items in order to create a personality for their PCs, or they can choose a ready-made personality template. In the Ouroboros prototype the PCs were instead authored, designed to tie
into an authored plot that players could develop during play, possessing for instance the character Greyhowl (see Section 6.1.2).

The use of the MM in PI for PCs operates by design on the right-hand side of the scale of semiautonomy (Figure 9.1), that is, the autonomy is used in a fairly low degree, limited to constrictrions of action potential guided by personality and current mood. If the degree of autonomy for PCs was to be increased in PI, autonomous reactions of PCs could be triggered at threshold values of various MM properties. For instance, a PC could laugh (or rather an animation of the PC laughing could be triggered) if the emotion node Amusement reached a certain value. Another example could be that if the emotion node Fear reaches a certain value a PC could be caused to either flee or attack, where the involuntary reaction would depend on a particular PC’s personality. In relation to the degree of autonomy used for PCs, it has to be noted that autonomous reactions performed by players’ representations may be potential barriers to players’ experience of immersion, especially if the reactions of the PCs are at odds with players’ own emotional states.

While the architecture of the MM to a large extent relies on theoretical work from the field of psychology it has been an important design goal to make the MM into more than an experiment of different theories of psychology applied to agent structures, that is, to integrate the MM to VGW prototypes, with emphasis on the gaming aspect. Another important aspect of the design has been, to use Bates’ expression, the ‘believability’ of the semiautonomous PCs to their players.

CAP ties into Glenberg and Schubert et al.’s work about presence in virtual environments, where they propose that representation of users is understood by what
actions are possible to perform in the environment. The users construct, by assessing their action potential, meshed sets of patterns of action. This is comparable to strategies of action in VGWs which rely on the nature of the CAP of PCs. The meshed sets of patterns of actions are constructed by the users, constituting the mind models the users have of their action potential. The mental construction of CAP in VGWs is crucial since this governs how players use it. This is one of the reasons that the play-test of WoM had a strong focus of evaluating whether players could construct mental models, or ‘reverse-engineer’, the game mechanics derived from the MM. The test players’ understanding of the impact of personality trait nodes on their CAP in WoM was very important for the design of the digital PI prototype.

Interestingly, for some players the constructed meshed patterns of actions in the play-test of WoM was dependent on information about PI’s back-story. If they could relate game mechanics to the back-story, and also construct a mental image of the deep structure of the story it was easier for them construct the meshed patterns of action. In other cases the construction of meshed patterns of actions was hindered by the players’ preconception of role playing games, especially regarding the fact that the CAP was not dependent on character classes but rather on a combination space of personality trait nodes.

The CAP and the mental model of it are highly individualised in VGWs since it is normally possible to play in very different ways, depending on the chosen and developed action potential of PCs. The combination space of action potential results in highly differentiated patterns of behaviour. These patterns of actions characterise particular PCs to other players, but also to the players themselves. As mentioned, personality is in this context, in Moffat’s words, ‘the name we give to those reaction
tendencies that are consistent over situations and time. In VGWs, these reaction tendencies are the results of players’ strategies and habits they develop by inhabiting VGWs, but they are ultimately constrained by the action potential that a particular player has chosen in the character creation stage, and how the player has refined the action potential during the development of differentiated skills of his or her PC, and by what types of action potentials are provided by a specific VGW. In PI, the action potential of players is provided by the design of the prototype VGW, but the individual CAP is governed by the combination space of the trait nodes in combination with the types of activity that are available in PI, mainly affective actions and spells. That is, the reaction tendencies are developed by players, but the range of action is restrained by the characters’ combinations of personality-trait-node values. The values of the trait nodes are used to decide what type of emotion spells PCs can cast. The trait nodes are also the elements governing the tendencies of the mood fluctuations of the character. The CAP also depends on the position in the mood co-ordinate system towards which a PC’s mood has the tendency to fluctuate. This position governs the types of spells that they can perform that can affect mental energy and resistance in their targets. The CAP can guide players’ choice of role for their PC in situations where players co-operate. A player might find that his or her PC’s personality is specially useful in certain situations, while co-operating with players that have either compatible strategies or personalities which complement each other in certain situations. The reaction tendencies in PI are partly given by the personality, but players have the ultimate control of how they act in order to influence the mood of their PCs and that of other PCs.

Summarising, the nodes defining the personality traits of characters governs an
individual PC’s state of mind through individually weighted relationships to the other affect nodes, including the sentiments which are results of interactions with and relationships to other PCs, resulting in values characterising the PC’s personality. The participants of the WoM play-test, who all played as themselves rather than role-played, expressed that the results of their IPIP-NEO personality trait evaluation were close to their own self-images of their personalities. Perhaps, if players in a system can develop patterns of action while being provided CAP profoundly tying into a game world and its deep structure, it can facilitate players’ development of persona in Bartle’s sense. This was the concern of Question 2 in Section 9.2. Another potential method for facilitating players development of persona is the use of personalised sound tracks of mood-inducing music as described in Section 6.3. As mentioned, Pignatiello’s (1986) studies supports that music can induce different moods in listeners. If the mood induced by a PCs personal soundtrack matches the way a player interprets musical expression of emotion this perhaps can facilitate a closer identification with the PC for the player. Ideally ‘musical personalities’ of players would render mood-inducing music facilitating emotions in players which are connected to the emotions of their PCs.

In the play-test of WoM, participants expressed the worry that, in using the personality trait nodes of the MM as a base for action potential, introvert and neurotic characters may be disadvantaged given the social nature of many game-play features. The action potential for spell-use for different personality types was a special concern when designing the spell system for PI. The mood of PCs who have dominant facets of introversion or neuroticism fluctuate towards depression more easily than for other
types of personalities. The spells available to players in the depressed mood-state are both powerful and versatile enough that a depressed PC who regenerates energy slowly is still of good use, even essential, to a group of players facing a challenge. Care was also taken to make sure that the actions possible to take in different mood spaces could be characteristic actions for PCs in these moods.

The well-known notions of role taking from VGWs where PCs normally have functions such as ‘tank’, ‘healer’ or ‘damage dealer’ are comparable to possible PC-roles in PI. However, where in VGWs the role normally is given by character class, it is in PI given by a PC’s personality. That is, a neurotic introvert PC would be an eminent damage dealer since the PC’s current mood would easily move towards the depressed mood spaces which are required in order to casts spell decreasing the mind energy of opponents. Another type of effective damage dealer would be a PC with a neurotic extravert personality, who could quickly generate both energy and resistance if in a mood of fury while damaging the pool of resistance of the opponent. A PC prone to extraversion in general might function especially well as a healer if in a jubilant mood, being able to give mind energy to group members. PCs who naturally gravitate towards inner harmony might be able to function especially well as tanks given that they would regenerate mental resistance quicker than others.

Potentially, the elements of CAP outlined in the discussion above could support

\[1\] The role of tank in a group of PCs engaging in combat in VGW means that the PC tanking takes the damage dealt by opponents. The tank protects the other members of the group by making sure that the opponent’s aggression is directed to them. The damage dealer normally lacks health and resistance to be able to be in direct contact with the opponent, but may be located a bit further away from the tank and the opponent while using powerful ranged attacks. The role of the healer is to heal the tank and, if needed, also the damage dealer or themselves. For an extensive explanation of the game-play strategies involved in these roles, please refer to Musse Dolk’s MMORPG Gamer’s handbook (2008).
CHAPTER 9. CONCLUSIONS

players in expressing consistent characters, their second selves, and perhaps help
them to stay in character while acting in the VGW. However, in role-playing the
characterising of the PC is not the only concern, building story lines that a group
of role players can enact as well as establishing dramatic plots involving the PCs is
equally important. Potential answers to Question 4 concerning the support of role-
playing activity are thus tied into issues of story construction and plot-modelling in
VGWs.

In the work presented in this thesis, Fencott’s notion of narrative potential as the
integration of agency and narrative has been useful. In PI and WoM, the deep struc-
ture of potential story structures is governed by the relations the sentiment nodes
constitute between entities (as expanded upon in Sections 2.3.2 and 8.6.3). In the
play-test of WoM, sentiments were instantiated in three ways: randomly, by choice of
a particular player and as results of interactions between a PC and an NPC. The sen-
timents instantiated as results of interactions gave players the highest sense of agency
and were those that the players found to make most ‘sense’. In PI, all interactions
between PCs and between PCs and NPCs potentially result in sentiment nodes where
the emotional quality of the sentiment is dependent on the nature of the interaction,
that is, the emotions that interactions have evoked. In PI, characters automatically
add elements of narrative potential, reflecting their emotional state to the VGW by
the instantiation of single-sentiment manifestations. For example, if a PC’s emotion
node confusion reaches its maximum value, a Colossus of Confusion is instantiated
close to the PC. In PI, PCs can take part in the story construction of the world by
creating compound manifestations. A fictive example of this was described in Section
7.9.4, where the PC Adam created Grandmother, a manifestation spreading guilt to
other entities in proximity by custom-written actions authored by Adam’s player. The instances of manifestations are part of the CAP in PI because the single-sentiment manifestations reflect the emotional states of PCs. The characterisation expressed by the creation of compound manifestations is potentially even more characterising for the PC, but depends on players’ authoring style.

Relying on the discussion in Chapter 3, which took a stance in Bartle’s extensive work on VGWs (2003), it can be argued that players who develop second selves or personas are heroes and main protagonists in current VGWs given that they go through the ‘player’s journey’, where the development of persona is the very pinnacle of the climb through identity space. Likewise, it can be argued that the player’s journey in a current VGW can encompass challenges and choices that express the true character of a player’s second self, her PC or persona.

However, the Questions 1 and 3 in the list of design questions, concerning true character and heroship have for me the nature of holy-grail questions and are as such worthy of further systemic exploration. These, and other areas of interest are expanded upon in the next section.

9.4 Limitations

A document called the Morgue holds discarded design features of WoM and PI. Many of these features concerns Question 1 and 3 (see Section 9.2). Question 1 concerns the creation of an architecture which can cater for situations where players need to make truly dramatic choices — choices that can express the true character of their PCs. I believe that if these dramatic choices are tied into the deep structure of
stories underlying and evolving in a VGW, a sense of heroship might emerge, the subject addressed in Question 3. In this context I mean heroship as it is regarded in a structuralist perspective as discussed Section 2.3.2, but for each PC, as discussed in Section 3.9.1.

The dramatic choices I have attempted to model have mostly been concerned with conflicts of loyalty. I have modelled systems of social contracts (contracts made between PCs), contracts of dedication (contracts towards certain activities or achievements related to the back-story and deep structure of the world) and contracts of group loyalty (contracts towards factions or guilds). If a contract was signed by a PC it would render benefits in terms of game-play but it would also entail formalised responsibilities. The varieties of design have resulted in potential conflicts, but they have not necessarily catered for dramatic conflicts and choices, but in conflicts of resource- and time management for the intended players. In my functional testing of these, I have found situations where the game-play is not enjoyable or dramatic for players, but instead frustrating. To me, this area constitutes a space for further inquiry.

A promising approach to addressing Questions 1 and 3 might be further use of sets of sentiments, which is catered for in the MM and the PI prototype. By enabling sets of sentiments among PCs game masters can create plots which are defined by the emotional values of the sentiment sets, such as ‘infatuation’ or ‘jealousy’. As described in Section 5.3.4, the MM also caters for ‘objects of desire’, that is, sentiments of the emotional quality Desire can be directed among characters and objects. This is useful for investigating how plots involving several characters with conflicting emotions among each other may strive in questing towards acquiring objects of desire.
The objects of desire do not need to be physical objects, they could be symbolised abstract principles or certain states expressed by relationships between entities: eliminating, modifying or creating sets of sentiments between entities in the world. (such as, ‘help A and B to reconcile their romantic relationship after A has broken the social contract of loyalty to B by a liaison to C, but make sure that C is not miserable and lonely’.) PI caters functionality for the conduction of guided prototype play testing where potentially useful approaches, including those described above, can be identified for further implementation.

Another promising approach is that of Question 6, which is how interpersonal relationships can be used in the design of VGWs. The MM provides short-term sentiments of different emotional qualities between characters as results of interactions, but in PI there are also sentiments tied to formalised relationships. In PI, the permanent grouping system derived from the protector-protégé relationship allows for membership in two Departments, a system inspired by the structure of parental relationships and that of work environments. In PI, there are no formalised duties attached to these relationships, but, if used, they are of benefit to PCs in terms of additional mental energy and resistance as well as the activation of the emotion nodes Belonging and Pride (in another’s achievement). Another feature related to Question 6 is that of friendships. The maximum number of formalised friendships a PC can have (typically between 3 and 10) is tied to the CAP, given by the values of the personality trait nodes. The relationship-type ‘special friend’ is singular, that is, each PC can only have one relationship of this type, reciprocal with another PC. Again, this
relationship does not come with duties, but opens up for a strong reciprocal sentiment of Belonging, an emotion desirable for being in mood spaces where mental resistance and energy is regenerated quickly. Potentially, the choice of friends and the singular choice of a special friend, as well as the potential double membership in Departments can render interesting situations, potentially tying in interpersonal relationships spanning over the borders of VGWs and the ordinary world while they are part of the VGWs’ deep structure via the sentiments.

An additional area of further investigation could be to utilise the autonomous layer of the MM in order to further aid role-players by adding automated expressions of emotions in PI. This means not only using the MM for the modification of action potential, which for role-players can have an advisory function, but for autonomous action. Yet another possible area to investigate could be using the MM for autonomous emotional expressions of NPCs. In the current implementation of PI, all NPCs are equipped with MMs, having their action potential modified by their personalities, but given the focus on the CAP of PCs in the work presented in this thesis, the implementation efforts in the prototype construction was not directed towards the NPCs.

Summarising the concluding discussion by approaching the six design questions presented in Section 9.2, I consider Questions 5 (support of players’ expression of consistent characters) and 4 (support of role-play by the rule system of a VGW) to be addressed to some extent by the work presented in this thesis. These questions were discussed in section 9.3 in relation to the concepts of semiautonomous agents, CAP and players’ mental models of CAP. The other four questions were also discussed but
any conclusions regarding them remain to be confirmed by evidence from empirical studies of actual game-play. In Section 9.4 potentially useful approaches for further exploration of these and other potentially relevant questions were identified.

9.5 Conclusion

In the work presented in this thesis the concept of characterising action potential (CAP) has been explored by iterative design of a semiautonomous-agent architecture called the Mind Module (MM) in order to address how role-play and the expression of consistent interesting playable characters (PCs) can be supported in virtual game worlds (VGWs.) The MM has been part of several experimental game prototypes of which five are reported in this thesis. Play-testing has indicated that players with previous live-action role-playing experience are particularly positive to CAP that may help them to express consistent characters when role-playing. A number of experimental features have been implemented. Music has been used as a means to convey an accessible representation of a complex emotional state of a PC to its player. Availability of expression of emotion through body language has been adapted by design to particular characters’ personality and current mood as a mean to support players expressing the character of their PCs to others in a VGW.

The CAP of PCs has been constrained to actions that characterise PCs in terms of personality and current mood. These actions have been implemented in the VGW prototype Pataphysic Institute (PI) where the nature of the actions is profoundly interconnected with the game mechanics, facilitating players’ choice of characterising functional roles in co-operation with other players.

PCs’ relationships and emotionally loaded memories of entities in PI are results
of PCs' experiences in the VGW. These relationships and emotional attachments are called sentiments, and constitute the semantic syntax of the dynamic deep story-structure in PI.

In PI, relationships among PCs have systemic effects, modifying the CAP of PCs — in this way the identity of a particular PC can be developed in relation to social groups and to other PCs. Players may cross the borders of the bleeding circles of VGWs by integrating real-life relationships to the game-play and deep story structure of the world.

PI is structurally open to elements of narrative potential originating from the ordinary world. By authoring compound manifestations players can add elements of narrative potential, symbolising significant elements of their ordinary lives which become part of the game-play in PI. PCs also leave their mark in the world automatically if they experience strong emotions — manifestations of corresponding emotions are in those cases instantiated and become part of the game-play. Through these mechanics the world of PI is characterised by its inhabitants. In play-tests, the ‘mental physics’ of the MM allowed players, in constrained scenarios, to create mental models of the CAP provided by the MM to discover interesting alternative strategies not foreseen in the design, as such indicating the emergent properties of the MM.
Glossary

**Agency** is generally considered as a philosophical concept where an agent has the capacity to act in a world. The agency belongs to the agent. In contexts of interactive narrative and story-driven games, agency is usually referred to as a capacity of a player who, through a representation in a game, can experience as Murray described it: ‘the satisfying power to take meaningful action and see the results of our decisions and choices.’ (Murray, 1997, p. 126)

**Bleeding Circle**: in situations where interpersonal relationships move between the real world and virtual worlds, they cross the borders of the ‘magic circles’ of VGWs. Through bleeding circles relationships seep between ordinary and virtual worlds. I use the word bleeding because it is the very heart blood that is flowing over the borders. The dramatic associations to the expression are appropriate for the type of processes involved in the situations.

The **characterising action potential (CAP)** defines what characters can do at a given moment that characterise them, both in terms of observable behaviour and in expression of true character — a character’s essential nature, expressed by the choices a character makes. The observable characteristics include visual appearance,
what body language characters use, what sounds they make, what they say, and most important, what they do and how they behave.

**Game Master (GM):** a player who in a VGW acts as officiant and organiser in situations where rules apply. The game master is often part of the Live Team. In role-playing games (RPGs) in general, the GM’s role is to help with rules, to moderate, and to act as story-teller. Some RPG types require the GM to create environments where players can interact, as well as weave together the other participants' character-back-stories.

**Gimped characters:** playable characters with combinations of properties that are to their disadvantage in terms of success in achieving game-play related goals.

**Guild:** a permanent grouping of playable characters in a VGW.

**Guild Leader:** a player who (acting through his or her playable character) is the leader of a permanent group of players in a VGW.

**Holy-grail questions** are philosophical questions in which one, to use a game analogy, goes on a quest for the holy grail. One does not know whether it really exists, or if it is one’s strong wish that it should exist. Since it is so difficult to find, one does not get proof that it does not exist and thus the search can continue in new directions. Holy-grail questions fuel the navigation of wicked problem spaces.
A life-path system is a formalised way to provide a character with a back-story at the character creation stage. In the table top RPG MechWarrior 3 the following information is asked for: ‘early childhood, age 10’, ‘Late Childhood, age 16’, and 6 additional paths (Path 3 to 8) concerning ‘higher education and real life’. Another table top RPG using a life-path system is BattleTech Solaris.

Live Team: the people who maintain a VGW. Tasks include resolving any still existing errors in the game world, managing the community of the player population, and handling conflicts between players according to the rules of the specific game world.

Magic circle: in the context of games the magic circle is most often taken to constitute the border between the ordinary life and the playing of a game, where the playing activity is performed within the circle. The expression was coined by Huizinga (1938, 2006, p. 113): ‘We found that one of the most important characteristics of play was its spacial separation from ordinary life. A closed space is marked out for it, either materially or ideally, hedged off from the everyday surroundings. Inside this space the play proceeds, inside it the rules obtain.’

Narrative potential: Laurel (1994) used the expression narrative potential to describe ‘environments imbued with narrative potential’ as places that can be experienced and marked through narrative activity. Fencott (2003) describes narrative potential as the ‘accumulation of meaningful experience as a result of agency — allows participants to construct their own appropriate narratives. Narrative potential thus arises from agency but is not determined by it.’
Pervasive game: a game that has one or more features which expand the magic circle of play. Location-based games are often labelled as pervasive games, where the real-life geographical position of a player, often traced through a player’s cell-phone, is used in the game mechanics.

The **playable character (PC)**, also called player character or avatar, is a player’s representation in a VGW. All interaction with the world and with other players is done through the PC.

In **role-playing** persons change their behaviour to assume a role. In role-playing games (RPGs) players act according to adopted fictional roles. Participants in a RPG determine their actions in a game based on the characteristics of the adopted role. The actions’ success depend on formal systems of rules specific to a particular game. In table-top RPGs a game master can create settings for participants, and can also interpret the rules of specific games in ways that are fitting for the setting. In live-action role-playing (LARP) players perform their characters’ physical actions, and the playable character (PC) is the player, enacting a character in ways similar to improvisational theatre. In single-player role-playing computer games the rule-systems are provided by computational operations rather than game masters. Role-playing in single player games has a different meaning, since there are no other players to perform with. The concentration on the role-aspect is that of a playable characters’ advancement within a game world, where choices made by players affect the properties and action potential of the PC. In multi-player and massively
multi-player role-playing computer games (virtual game worlds) the game rules are computed, but sometimes scenarios and settings can be designed by game masters for groups of players.

**Semiautonomous agents** are partly controlled by their players, and partly controlled by context-sensitive action potential and expression possibilities, as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW the agents inhabits.

**Story construction:** a game system that allows for story construction provides players with building blocks and functionalities that form the narrative potential in the world, and can be used by players for creating experiences and traversals of events that are individually potentially meaningful and dramatic.

**Virtual Game Worlds (VGWs)** are realised by networked computers that simulate environments. In these worlds players have graphical representations, playable characters (PCs), that represent them in the world. All interaction with the world and with other players is done through the PC. The interaction in the world is in real time and the world is persistent, that is, the world is still there even though a particular PC is not active in the world. VGWs are often called Massively Multiplayer Online (MMO) games or Massively Multiplayer Role Playing Games (MMORPGs), but in this thesis the expression VGW is used. The term VGW is considered more representative because not all VGWs feature role-playing elements, nor always cater for several thousands of players, which is what is meant by ‘massive’.
Wicked problems are problems where every attempt at producing a solution changes the understanding of the problem.

Wizard of Oz is a method used in user-studies in the field of human-computer interaction. A person simulates computational operations that participants in studies interact with.
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297


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