Morphology of a digital narrative
Prototyping digital narratives using the theories of Vladimir Propp

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Abstract

This paper will detail the prototyping and subsequent production of an digital narrative experience utilizing the theories of Vladimir Propp. The prototype will examine the theories detailed in Propp's *Morphology of the Folktale*. It will implement Propp's narrative functions according to a general scheme, connected by connectives. The prototype will dynamically generate narratives according to this scheme. Finally, this paper will draw conclusions about the advantages of a Propp-based system of narrative generation and the narratives produced compared to other digital narratives, such as hypertext.

**Keywords:** narrative, game design, digital narrative, narrative generation, prototyping
# Table of Content

1 Introduction........................................................................................................................................1
   1.1 Background..................................................................................................................................1
   1.1.1 Narratology ..........................................................................................................................1
   1.1.2 Digital narratives .....................................................................................................................2
   1.2 Purpose .......................................................................................................................................2
   1.3 Definitions ..................................................................................................................................3
   1.4 Previous studies ............................................................................................................................3
2 Theory and method .............................................................................................................................4
   2.1 Morphology of the Folktale .........................................................................................................4
   2.2 Prototyping method .......................................................................................................................8
3 Result ...............................................................................................................................................8
   3.1 Brainstorming phase ...................................................................................................................9
   3.2 Physical prototype phase ............................................................................................................10
   3.3 Digital prototype phase .............................................................................................................16
4 Analysis .........................................................................................................................................19
5 Conclusion ....................................................................................................................................20
6 Discussion ......................................................................................................................................21

References.........................................................................................................................................22

Appendix A.......................................................................................................................................24

Appendix B.......................................................................................................................................32
1 Introduction

This paper will detail the prototyping of digital narratives with the help of Vladimir Propp's theories about narrative structure. While Propp's theories deal with analyzing narratives, this paper will examine a possible method for generating them.

1.1 Background

As hardware has become increasingly more powerful, some areas of game design have flourished. Advances in rendering and simulation of physics have all advanced the field and led to new possibilities. Procedural generation of content and game worlds has given us the possibility to design games that play differently each playthrough. Procedurally generated worlds, however, often lack a certain quality: a gripping narrative as dynamic as the rest of the game.

If game designers had tools that allowed them to generate compelling narratives in the same way that they today have specific engines for rendering, new fields of play could be opened. We could see sandbox-style games that not only created a big world, but could also fill that same world with meaningful narrative.

1.1.1 Narratology

The field of literature studies have put considerable effort into studying narratives and texts in a wide array of perspectives. One of these perspectives is narratology. Narratology focuses on narratives and their structures. Barthes claimed that the goal of the narratologist is examining “The system (la langue) from which the infinity of narrative messages (la parole) derives and on the basis of which they can be understood as stories in the first place” (Routledge Encyclopedia of Narrative Theory 2005:573). This approach is called structuralist narratology (Routledge Encyclopedia of Narrative Theory 2005:571-576).

The Russian formalist movement is considered by some to be one of the origin points of modern literature studies (Routledge Encyclopedia of Narrative Theory 2005:180) and structuralist narratology (Routledge Encyclopedia of Narrative Theory 2005:572). Formalists adhere to a few basic principles. They believe that the content of a narrative can be separated from the form of the work. Additionally, the form can and should be described systematically as a finite amount of elements (Routledge Encyclopedia of Narrative Theory 2005:180). For example, both “Bowser swoops away with the princess in his flying machine” and “the evil lion took the little lamb and ran away” could be separated into the narrative element “villain abducts character”. This can be done while still keeping an infinite variability in content (Routledge Encyclopedia of Narrative Theory 2005:180).

One of the foremost Russian formalists was Vladimir Propp. In his 1928 text *Morphology of the folk tale*, Propp studied a selection of hundreds Russian folk tales. He concluded that the form of these could be described as 31 narrative functions corresponding to the form described above (such as Villainy or *The hero struggles with the villain*), connected by connectives (for example, a villager telling a witch where the hero went so that a chase may ensue) (Propp 1968).
1.1.2 Digital narratives

A digital narrative is a narrative that is represented digitally. The definition might seem vague, but any attempt at narrowing it down must necessarily exclude narratives that should be included. Both text-based adventure games like Zork, graphical adventure games like The Last Express and hypertext narratives can be studied and thought of as digital narratives (Routledge Encyclopedia of Narrative Theory 2005:108).

To account for the increased interactive possibilities of digital narratives, the textual category of ergodic texts was conceived. Ergodic texts were first described by Espen J. Aarseth in his 1997 text Cybertext: Perspectives on Ergodic Literature. Routledge Encyclopedia of Narrative Theory define them as “literature that produces a semiotic sequence which may differ from reading to reading (Routledge Encyclopedia of Narrative Theory 2005:141).

Many digital narratives are constructed as multi-path narratives. Routledge Encyclopedia of Narrative Theory define multi-path narratives as a “work of fiction where the audience or reader at specific points has to choose between branching alternatives in the text” (Routledge Encyclopedia of Narrative Theory 2005:323). Examples of this type of narrative in digital form is the Gamebook Adventure (Tin Man Games 2010) series for mobile platforms, which intermingle game mechanics with multi-path narratives.

Other narratives have been constructed as hypertexts. A hypertext is a “collection of texts or text fragments interconnected by links that afford a choice of reading order” (Routledge Encyclopedia of Narrative Theory 2005:228). The premier example of this narrative type is Afternoon, a story (Routledge Encyclopedia of Narrative Theory 2005:323). Hypertext narratives can be distinguished from multi-path narratives by the fact that they do not necessarily form complete narratives. Afternoon, a story is constructed as a labyrinth, which means that the reader may get stuck in textual fragments that produce no meaningful narrative (Routledge Encyclopedia of Narrative Theory 2005:323).

Many have tried to generate digital narratives using algorithms and other means. One of the first of these attempts was Meehans Tale-Spin, which utilized AI agents who acted together according to rules to create a narrative. (Meehan 1977) Since then, other approaches have been taken (see point 1.4).

1.2 Purpose

Using Propps methods for formalising narratives, we can schematically deconstruct fairy tales. The aim of this paper is instead to examine how to schematically construct narratives. I aim to examine the utilization of Propps theories in Morphology of a Folktale in the generation of digital narratives. This will be done by creating a digital prototype utilizing the theories. I will examine the following questions:

- Can Propps theories in Morphology of a Folktale be applied to games?
- If so, can they be used to generate digital narratives?
- Can these narratives be interactive?
1.3 Definitions

To discuss the design of games, we must first define what a game is. The study of game design as an academic pursuit is a relatively new one. Therefore, a universally accepted definition of what a game is has not arisen. This paper will use the definition put forth by Ernest Adams in his book *Fundamentals of Game Design*:

*A game is a type of play activity, conducted in the context of a pretended reality, in which participants(s) try to achieve at least one arbitrary, nontrivial goal by acting in accordance with rules* (Adams 2009:3)

Game design is not limited to digital games, but may also apply to physical games like board games or card games. In Ernest Adams and Andrew Rollings on Game Design, the authors define game design in the following manner:

*Game design is the process of:*

- Imagining a game
- Defining the way it works
- Describing the elements that make up the game (conceptual, functional, artistic, and others)
- Transmitting that information to the team that will build the game.

(Adams & Rollings 2003:2)

In designing digital narratives, we must also know what a narrative is. In this paper, the definition from Oxford Dictionary will be used:

*a spoken or written account of connected events: a story* (Oxford Dictionaries 2013)

1.4 Previous studies

Several studies have used Propp to analyze digital narratives.

In the bachelor paper *En digital hjälte? En klassisk narratologisk analys av ett nytt medium – tv-spelet som medietext*, Daniel Sthål analyzes the video game *Shadow of the Colossus* with help from Propps narrative functions. He finds that several of the narrative functions are applicable to the narrative of this specific game. (Sthål 2007)

Many studies have been conducted in the field of generating narratives, with or without the use of Propps theories. What follows is a non-comprehensive look at some of these.
In the paper *Murder She Programmed: Dynamic Plot Generating Engine for Murder Mystery Based Games*, María Arinbjarnar describes the creation of a generator of digital mystery plots. Although she does not implement Proppian narrative functions, she describes the possibility to do so in the context of her prototype. Arinbjarnar’s prototype shows the possibilities to generate what Propp called *initial situation* dynamically and coherently (Arinbjarnar 2005).

Digital Storytelling With DINAH: Dynamic, Interactive, Narrative Authoring Heuristic by David Ventura and David Brogan presents a model for generating dynamic narratives using *story clips*. These story clips are narrative elements inspired by Propp’s narrative functions, and contain explicit pre- and post conditions. These conditions are then run via algorithms through a narrative engine, which decides how the narrative should proceed. However, DINAH does not keep to the defined narrative functions of Propp’s (Ventura & Brogan 2002).

Zach Tomaszewski and Kim Binsted, in their paper *The Limitations of a Propp-based Approach to Interactive Drama*, detail some limits inherent in approaches to digital narratives based on Propp’s work. The authors found that a narrative following Propp’s structure does not offer significant choice in what happens: for example, any interdiction set up against the hero must be violated. In the system developed as part of the paper, the authors instead gave freedom to the user in regards to how the narrative progressed. *The Limitations of a Propp-based Approach to Interactive Drama* makes the assumption that the narrative sequence must always be complete and that the player may therefore not fail. They choose not to implement their system (Tomaszewski & Binsted 2008).

## 2 Theory and method

### 2.1 Morphology of the Folktale

In *Morphology of the Folktale*, Vladimir Propp analyses a selection of 100 Russian fairy tales. From them, he draws the following conclusions:

‘1. Functions of character serve as stable, constant elements in a tale, independent of how and by whom they are fulfilled. They constitute the fundamental elements of a tale.

2. The number of functions to the fairy tale is limited.

3. The sequence of functions is always identical.

4. All fairy tales are of one type in their structure.’ (Propp 1968:21-23)

We shall now examine each of these conclusions.

In the first conclusion, Propp talks about *functions of characters*. They are defined as “*an act of character, defined from the point of view of its significance for the course of the action*” and referred to in his work as *narrative functions* (Propp 1968:21). For example, the act of the hero leaving home can be formalized into a narrative function which is defined as “departure” and receives the symbolic designation ↑. It does not matter what content this narrative function is filled with. The hero leaving by foot, by horse or by air plane can still be designated ↑. Leaving by foot then becomes a *subfunction* of ↑.
Most narrative functions have several subfunctions. For example, A has 19 subfunctions. These are designated $A^1$, $A^2$ and so on. $A^1$ is summarized as “The villain abducts a person”, while $A^2$ is “The villain seizes or takes away a magical agent”. As can be seen, they can easily be distilled to A (Villainy). For practical reasons, all subfunctions will not be listed here. For a list of all subfunctions, see (Propp 1968:25-65).

According to the author, there exist only a finite amount of narrative functions in the fairy tales analysed. This does not mean that these functions are the same for all narratives. The author finds, in his source material, 31 narrative functions. These are listed below:

Table 1. Propps narrative functions

<table>
<thead>
<tr>
<th>Number</th>
<th>Summary</th>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ONE OF THE MEMBERS OF THE FAMILY ABSENTS HIMSELF FROM HOME</td>
<td>Abstention</td>
<td>$\beta$</td>
</tr>
<tr>
<td>2</td>
<td>AN INTERDICTION IS ADRESSED TO THE HERO</td>
<td>Interdiction</td>
<td>$\gamma$</td>
</tr>
<tr>
<td>3</td>
<td>THE INTERDICTION IS VIOLATED</td>
<td>Violation</td>
<td>$\delta$</td>
</tr>
<tr>
<td>4</td>
<td>THE VILLIAN MAKES AN ATTEMPT AT RECONNAISSANCE</td>
<td>Reconnaissance</td>
<td>$e$</td>
</tr>
<tr>
<td>5</td>
<td>THE VILLIAN RECEIVES INFORMATION ABOUT HIS VICTIM</td>
<td>Delivery</td>
<td>$Z$</td>
</tr>
<tr>
<td>6</td>
<td>THE VILLIAN ATTEMPTS TO DECIEVE HIS VICTIM IN ORDER TO TAKE POSSESSION OF HIM OR HIS BELONGINGS</td>
<td>Trickery</td>
<td>$N$</td>
</tr>
<tr>
<td>7</td>
<td>THE VICTIM SUBMITS TO DECEPTION AND THEREFORE UNWITTINGLY HELPS HIS ENEMY</td>
<td>Complicity</td>
<td>$O$</td>
</tr>
<tr>
<td>8</td>
<td>THE VILLIAN CAUSES HARM OR INJURY TO A MEMBER OF A FAMILY</td>
<td>Villainy</td>
<td>$A$</td>
</tr>
<tr>
<td>8a</td>
<td>ONE MEMBER OF A FAMILY EITHER LACKS SOMETHING OR DESIRES TO HAVE SOMETHING</td>
<td>Lack</td>
<td>$a$</td>
</tr>
<tr>
<td>9</td>
<td>MISFORTUNE OR LACK IS MADE KNOWN: THE HERO IS APPROACHED WITH A REQUEST OR COMMAND: HE IS ALLOWED TO GO OR HE IS DISPATCHED</td>
<td>Mediation, the connective incident</td>
<td>$B$</td>
</tr>
<tr>
<td>10</td>
<td>THE SEEKER AGREES TO OR DECIDES UPON COUNTERACTION</td>
<td>Beginning counteraction</td>
<td>$C$</td>
</tr>
</tbody>
</table>
11 THE HERO LEAVES HOME

12 THE HERO IS TESTED, INTERROGATED, ATTACKED ETC., WHICH PREPARES THE WAY FOR HIS RECEIVING EITHER A MAGICAL AGENT OR HELPER

13 THE HERO REACTS TO THE ACTIONS OF THE FUTURE DONOR

14 THE HERO ACQUIRES THE USE OF A MAGICAL AGENT

15 THE HERO IS TRANSFERRED, DELIVERED OR LED TO THE WHEREABOUTS OF AN OBJECT OF SEARCH

16 THE HERO AND THE VILLAIN JOIN IN DIRECT COMBAT

17 THE HERO IS BRANDED

18 THE VILLAIN IS DEFEATED

19 THE INITIAL MISFORTUNE OR LACK IS LIQUIDATED

20 THE HERO RETURNS

21 THE HERO IS PURSUED

22 RESQUE OF THE HERO FROM PURSUIT

23 THE HERO, UNRECOGNIZED, ARRIVES HOME OR IN ANOTHER COUNTRY

24 A FALSE HERO PRESENTS UNFOUNDED CLAIMS

25 A DIFFICULT TASK IS PROPOSED TO THE HERO

26 THE TASK IS RESOLVED

27 THE HERO IS RECOGNIZED

28 THE FALSE HERO OR VILLAIN IS EXPOSED

29 THE HERO IS GIVEN A NEW APPEARANCE

30 THE VILLAIN IS PUNISHED

31 THE HERO IS MARRIED AND ASCENDS THE THRONE
Narrative functions always follow in the same sequence. That is to say, they cannot be mixed completely at random. A hero cannot return home before he has left. In the same manner, the villain is never defeated before he has committed his act of villainy.

All analysed fairy tales are subject to the same type of structure. This enables Propp to analyse fairy tales in the form of schemes. In fact, the author identifies two general schemes that all analysed fairy tales follow (Propp 1968:105). These are:

Tales which contain a struggle with a villain:

A B C ↑ D E F G H J I K ↓ Pr – Rs L Q Ex T U W *

Tales that do not contain a struggle with a villain, but are instead driven by lack:

A B C ↑ D E F G L M J N K ↓ Pr – Rs L Q Ex T U W *

As can be seen above, some functions are paired. For example, Pr (pursuit) is paired with Rs (rescue). The above schemes does not imply that every narrative must always contain all the functions. It simply implies that they must develop according to this general scheme.

Propp himself realized the possibilities to create new narratives with the help of his theories, and even gave a description of how:

It is possible to artificially create new plots of an unlimited number. All of these plots will reflect the basic scheme, while they themselves may not resemble one another. In order to create a tale artificially, one may take any A, then one of the possible B:s then a C↑, followed by absolutely any D, then an E, then any of the possible F:s, then any G, and so on. (Propp 1968:111)

In the creation of a narrative, Propp points out several freedoms that the creator may take when creating narratives. The creator may choose which functions to use and which he does not use (for example, if the creator does not want the story to end with W(wedding), he can omit it). He may also choose how a function is implemented (the wedding may be in a church or in a garden, and this does not affect the general structure). The structure of the narrative does not affect the personality of the characters involved in it: therefore, the author is free to create characters that have any properties. Finally, the author can choose the linguistic means in which the narrative is presented (Propp 1968:112-113).

Propp gives some additional help in categorizing the parts of the narrative that are not narrative functions. One important concept the author mentions is connectives. Connectives make up the connective tissue between narrative functions. Any element that connects narrative functions can be a connective. For example, the act of a character telling the villain that the hero has rescued the princess may be a connective between K and Pr (Propp 1968:71). Trebling is the way in which narrative functions are repeated. For example, a hero may be captured and his brothers sent out to rescue him, whereupon they must go through functions M-K (Propp 1968:75). Finally, motivations are defined as “both the reasons and the aims of personages that cause them to commit various acts”. If the hero is motivated to save the princess by greed or by pride, this does not change the overall structure of the narrative but yet affects the perception of it (Propp 1968: 75-78).
2.2 Prototyping method

To answer the questions described under segment 1.2, I will create a prototype of a digital narrative using Propp's theories. When creating prototypes, a certain methodology has to be followed. The one used in this paper is modelled on the one proposed in Fullerton's *Game Design Workshop: A Playcentric Approach to Creating Innovative Video Games*. (Fullerton 2008). The approach focuses on an iterative process where prototypes of game systems are created, tested and then iterated upon. The goal of the process is to test ideas in practice early, so that mistakes in the design can be corrected as early as possible (Fullerton 2008:11).

The first recommended stage of the playcentric prototype methodology is *brainstorming*. In this stage, one must set player experience goals that the prototyping will then revolve around. Player experience goals are defined as “goals that the game designer sets for the type of experience that players will have during play” (Fullerton 2008:11). These set the stage for the rest of the prototyping. Together with the overall design goal, these form an overarching set of goals to adhere to. The designer must then start to conceptualize ideas for game systems that will fulfil the defined goals.

The next stage is the *physical prototype*. A physical prototype is a playable version of the core game mechanics, utilizing physical components. These components may be cards, string, carton, or any other object that can symbolize game elements. This stage is very important in that it allows the designer to test the ideas before going into development of the digital product, where changes to the systems are harder to implement (Fullerton 2008:11-15).

With the physical prototype as a template, I will then create a digital prototype. At this stage, the basic systems should be outlined. The specific implementation platform, code language and other technical details should if possible be chosen to complement these systems, instead of being a prerequisite. For example, if the game systems would benefit from motion controls as they are used on the video game console Nintendo Wii, but a prerequisite exists for creating the game for the video game console Microsofts Xbox 360, then the game might not reach its full potential (Fullerton 2008:11-15).

Some goals of the prototype are predefined even before the brainstorming phase. These are goals that are inherent due to the nature of this paper. In section 1.2, I detail some questions that the prototype is supposed to explore. These serve as an initial focus in the brainstorming. From these questions, we can deduce an overarching goal: the prototype must feature narrative generated in whole or in part utilizing the theories of Propp.

In addition to goals inherent from the purpose of this paper, production variables set limits. The manpower and time frame involved ensures that the prototype will not reach the stage of full commercial product. They also ensure that the playtime of the prototype be kept low, as to focus on quality instead of quantity. No artists will be involved in the production of the prototype, which will limit the possibilities to purvey narrative information and gameplay graphically.

3 Result

In this segment, I will detail the creation of the prototype according to the utilized methodologies. I will also present the final prototype.
3.1 Brainstorming phase

In the brainstorming phase, ideas can run free. They must, however, do so according to some constraints. The constraints inherent in the prototype because of its part in this paper had already been set. What then remained was to set additional player experience goals. These goals proved hard to set, as the purpose of the prototype was not to entertain but to examine an academic question. Additionally, these goals would not be tested on a group of players, making the fulfillment of them uncertain.

In the end, I opted for a few player experience goals to help focus the prototyping, even though these would not be objectively tested for fulfilment in the final prototype. I knew that I wanted the player to feel like his choices had a meaningful impact on the narratives progress. In short, the narrative could not be purely generated by random factors, as that would exclude the player from the process. I also wanted to make the player feel like the narrative was dynamic. Every playthrough should be different, while still adhering to the same general structure.

After setting these goals, I commenced the brainstorming process. I soon realized that my first step should be in validating my theories. I had to know two things: if Propps theories were applicable to games, and if they could be used to generate narratives. This should disregard setting as a factor. In the collection of narrative functions found in *Morphology of a Folktale*, I identified some functions and subfunctions that were clearly not applicable to generic narrative generation that worked regardless of setting. Mostly these cases manifested themselves in subfunctions. Pr1 (He pursues the hero, rapidly transforming himself into various animals, etc.) is a good example of a subfunction that works in a fairy tale setting but not in a generic narrative (Propp 1968: 56). There were also several narrative functions that, while clearly possible to include, did not feel like a core part of the narrative generation. Examples of these are W (wedding) and L (unfounded claim). While they could theoretically be part of the narrative generation (especially if subfunction W0, signifying the receiving of a reward other than the princess or the kingdom, were to be included), they were not integral to proving the theories and were excluded in initial testing (Propp 1968: 64).

In *Morphology of the Folktale*, Propp states that it is possible to generate new narratives by taking first any of the subfunctions of A, then any of the B:s, and so on. I decided to test this with the lack-based generic scheme described in section 2.1 (Propp 1968:105). I decided to start in as simple a manner as possible, with functions A-D using the original subfunctions (Propp 1968:150-155). ↑ has no subfunctions and was therefore not randomized. For this initial tests, I used a tool developed by Dr Mads Hahr of Trinity College. This tool allows for randomization between customizable integer values. The randomization is based on atmospheric noise (Random.org 2013).

I thus generated the following two narratives:

**Test 1, variant 1:**

A5: lack of money or the means of existence.
B3: release; departure
C: Negative consent

↑: Departure, dispatch of the hero from home
D4: Entreaty of prisoner for freedom
Test 1, variant 2:
A2: Lack of helper or magical agent
B4: Announcement of misfortune in various forms
C: Positive consent
↑: Departure, dispatch of the hero from home
D4: Greeting, interrogation

As can be seen above, the simple randomization of the initial five functions create varied narratives that follow the same structure while still being different from each other. This was a successful result. At this stage, I felt confident enough in my idea to move on to the physical prototype phase.

3.2 Physical prototype phase

Having identified a system that successfully generated segments of narratives, the next step was to generate complete ones. To structure my tests, I divided up the lack-based narrative scheme (see segment 2.1) into a beginning, a middle and an end:

\[
\begin{array}{ccc}
\text{(Beginning)} & \text{(Middle)} & \text{(End)} \\
ABC & DEF & LMJNK \\
& & Pr-Rs \\
& & Q Ex T U W.
\end{array}
\]

I then set about to modify each part of the narrative to fit my goals, starting with the beginning. It does not matter what subfunctions are associated with each main functions, as long as they still can be distilled further to the main function. I could therefore adjust the subfunctions to better fit my purposes. I created the following subfunctions (below sorted by main function):

**a: Lack**

A1: Lack of food
A2: Lack of water
A3: Lack of heat
A4: Lack of workforce (slaves)
A5: Lack of specific person (mayors daughter)

**B: Connective instance**

B1: Call for help
B2: Dispatch
B3: Release (allowance)
B4: Kicked out, told to redeem self

C: Willingness
C1: Hero goes willingly
C2: Hero goes unwillingly

D: Hero meets companion, who acts in one of the following ways:
D1: Aggressively
D2: Jokingly
D3: Familiarly

E: Hero acts towards the companion
E1: Act friendly
E2: Act hostile

As for the middle section, I modified it by removing what I found to be non-essential parts. L (unfounded claims) and J (branding) were not essential to the narrative. The middle part now followed this scheme:

M N K ↓ Pr – Rs

I identified the following sub-functions:

M: Difficult task
M1: Ordeal by food and drink.
M2: Ordeal by fire
M3: Riddle guessing
M4: Ordeal of choice
M5: Hide and seek
M6: Test of strength
M7: Task of supply and manufacture

N: Completion of task
N1: The hero completes the task
N2: The hero does not complete the task

Pr:
Pr1: Pursued on foot
Pr2: Pursued in air
Pr3: Pursued in land vehicle
Rs:
Rs1: Escapes by throwing objects
Rs2: Escapes by shaking of pursuers
Rs3: Escapes by hiding from pursuers
Rs4: Escapes by being hidden by external character
Rs5: Gets captured

If Rs5:
Rs5a: Escapes
Rs5b: Does not escape

As can be seen above, the first conditional function manifested itself. If Rs5 is selected, the player is directed towards two alternatives: escape or do not escape from capture. If Rs5a is activated, a new Rs is randomized.

As for the end part, I found all of the functions nonessential at this stage. I realized the need to replace them with my own structure in the future, which would simply list a series of consequences of the players choices in the beginning and the middle parts. I therefore replaced the end with a single function, containing a single subfunction:

End:
End1: Returns home

Now having a complete structure to work with, I generated several narratives:

Test 2, variant 1:
A: Heat.
B: release (allowance)
C: Hero does not want to go.
D: Meets companion, who acts disdainful.
E: Hero acts friendly
F: Hero receives companions trust.
M: Ordeal of choice is presented to hero
N: Hero completes task.
Pr: Pursued on foot
Rs: Gets captured
Rs5a: Escapes
Rs: Escapes by being hidden by external character
End: Returns home
Test 2, variant 2:
A: Mayors daughter
B: Call for help
C: The hero is willing
D: Companion acts jokingly
E: Hero acts hostile.
F: Companions goes with anyway.
M: Ordeal of food and drink is presented.
N: Hero completes task
Pr: Hero is not pursued
End: Returns home

From these tests, I learned that my method worked for generating a complete narrative with a beginning, a middle and an end. I also realized that the best place to introduce new narrative functions was in the middle part of the scheme. In the conditional functions of Rs5a (Escapes) and Rs5b (Does not escape), I saw a way to introduce trebling. The player could try to escape several times, only succeeding in his third and final try.

At this point, the narrative was randomized in whole without the player having any ability to interact with it. To introduce interactivity, I examined Propps concept of connectives. These connect narrative functions with each other, and may consist of any element that leads from one function to another. I implemented them as simple choices in a few select locations in the narrative. I let the player make simple binary choices in functions C (go willingly or unwillingly) and E (act friendly or hostile against companion). Finding that this did not interfere with the larger structure of the narrative, I deemed connectives to be a sufficient way to interact with the narrative.

The function M (Difficult task) did not lend itself easily to connectives based on binary choices. The choice of completing or not completing a task is not a real choice if there is no risk involved. I therefore modified the M (difficult task) function to include several randomized factors. These where the following:

MA: Action
MA1: Get past
MA2: Defeat
MA3: Tame
MA4: Save
MB: Danger
MB1: Element of water
MB2: Element of earth
This system of generating M subfunctions led to some obvious oddities. How, for example, does one “tame” a child? These oddities were solvable. One can theoretically gain the trust of both a wild animal, a child and bandits by giving them a generic resource (food, money). The elements, however, where less suited for generic actions. I decided that the system in itself was solid, and that individual subfunctions would be pruned away or added at later prototyping stages.

Up until this point, my prototype had been built around a narrative structure without context. To prove the point of the narrative structure being applicable to many different contexts, I implemented a simple world randomization system based on theme and starting place:

**Context A:** Starting place

Context A1: Ship
These generated the following results:

**Test 4, variant 1:**
ContextA4: Outpost
ContextB5: Apocalypse

**Test 4, variant 2:**
ContextA1: Ship
ContextB2: Space

**Test 4, variant 3:**
ContextA3: Town
ContextB3: Fantasy

The context variables could theoretically unlock subfunctions specific to certain combinations. For example, in the generation of M (Difficult task) subfunctions, the new subfunction *MB8: Entity, aliens* could be unlocked on the condition that ContextB2 (Space) was generated. As of present, I chose not to implement this possibility, as it was not core to the narrative generation. To show how a complete generation of the narrative utilizing all current systems worked, I generated a new full narrative:

**Test 5, variant 1:**
ContextA1: Ship
ContextB5: Apocalypse
A5: Lack of workforce (slaves)
B2: Dispatch
C2: Assumed unwillingness from hero
D1: Companion acts aggressively  
E2: Assumed hostile act from player  
F2: Pair with E2. Companion goes with hero anyway.  
MA1, MB1: Get past element of water  
N1: Assumed completion of task  
Pr1: Pursued on foot  
Rs1: Escapes by throwing objects  
End1: Hero returns home

At this point, I had a fully realized narrative structure generation with implemented interactivity through connectives. The prototype only existed in the form of documents on my computer. This can still be said to be a “physical” prototype, as there is no functional difference between a paper and digital text document. In addition, instead of using online tools for randomization, I could simply have used dice (or manufactured cards that were drawn to select a random subfunction to a specific function). The end goal, however, was a digital prototype. I now had enough materials to move forward to the next phase.

### 3.3 Digital prototype phase

With the current physical prototype as a template, my goal was now to create a digital prototype. The first step was to choose platform. Looking at the prototype, one can see that the demands for graphical representation are low or non-existent. The system could easily be represented using only text and buttons. Processing power of the platform becomes a non-factor. Important factors are instead speed of implementation and easy GUI configuration. Obvious platforms where Windows-based PC:s (using either a combination of C# and XNA or HTML5) and iOS (programming in Objective-C using Xcode). I ultimately choose to develop the prototype for iOS because of several factors. Having some previous experience with the platform, I was confident that implementation speed would be sufficiently high. Programming in Xcode using Objective-C with Apple's own API:s allows for a low amount of time being spent on low-level programming tasks. GUI is handled with a combination of drag-and-drop interfaces and generation of GUI elements programmatically. To limit implementation time, I chose to focus on one device: the iPhone 4S, running iOS 6.1.3. Later versions of iPhone and other iOS devices have different screen sizes, creating difficulties in implementing GUI. Additionally, implementing for other versions of iOS would have required an unreasonable amount of implementation time, due to major differences in memory handling and API:s.
I decided to implement the GUI in the following way:

Figure 1: GUI implementation
Source: Johan Sjöström

Screenshots taken in iOS Simulator

The visual contents of a iPhone screen is stored in its current view. The top part of the view displays the current narrative function by its designation. The middle displays the current information specific to the narrative function. Finally, the buttons at the bottom represent the choices the player can make.

The prototype is built around a few simple data objects that could be implemented in many programming languages other than Objective-C. The main object is the NarrativeFunction. This object contains all relevant data for identifying, connecting and visualising a Proppian narrative function. All NarrativeFunctions are subfunctions in a function group, which is the main function they adhere to. For example, a NarrativeFunction with designation a1 belongs to the function group a. Other than identifying information, the NarrativeFunction contains pre- and postconditions. Preconditions state what NarrativeFunctions that has to be present in the previous narrative for the tested NarrativeFunction to be included. Postconditions state what function group or specific NarrativeFunction the buttons of the scene should point to.

Each NarrativeFunction contains a list of NarrativeInfo objects. These contain a textual representation (which goes into the middle text field, and produces what the player sees as the narrative) and a list of resulting Connective objects.
Buttons are generated from Connective objects. Connective objects simply contain a textual representation (the text that goes on the button) and the designation of the NarrativeFunction the button should point to. When a NarrativeFunction is loaded, a list of all Connectives is generated from the NarrativeFunctions postconditions and all active NarrativeInfo objects.

This is a simple structure that allows for a wide range of narrative possibilities. While the overall structure has not been changed from the physical prototype, some details are different. For example, I have returned to more traditional fixed M subfunctions. I instead solved the demands for interactivity with the help of function pairs. For example, the player may receive some rope from a tradesman (NarrativeFunction f3). Later the player may tie up some guards in a camp with this rope (NarrativeFunction MSub4).

Early versions of the digital prototype had only generic NarrativeInfo texts. This was later changed because of an important difference between physical and digital prototype: the setting generation is not present in the digital prototype. As it was not core to proving the usability of Propp’s theories and their applications both games and other digital narratives, I decided to focus instead on a constant theme.

![Image of the digital prototype with text](image)

**Figure 2**: Specific vs. generic narrative

*Source: Johan Sjöström*

*Left: Current NarrativeInfo. Right: Generic NarrativeInfo.*

Trebling is implemented in the digital prototype. There are several occurrences when the player fails in his task to liquidate the lack. This then results in the choosing of a new hero. The only thing remaining from the last narrative generated is the specific lack subfunction. New subfunctions for B, C, D and so forth are generated.
4 Analysis

The digital prototype uses Propp's narrative functions combined with connectives to generate diverse and dynamic narratives. The grouping of subfunctions into function groups that are structured in a fixed scheme ensure that narratives produced are coherent and produce complete narratives (as long as the subfunctions are correctly created and function pairs correctly implemented). There is no way for the player to make choices that produce incoherent or incomplete narrative schemes. This is a major advantage compared to hypertext narratives (which do not guarantee coherent and complete narratives) or simple branched narratives (which may lead to exponentially complex narratives with no guarantee for a complete narrative being produced). The digital prototype ensures that the player cannot make a mistake early on and therefore not encounter the donor, which would be possible in hypertext narratives (if, indeed, the hypertext narrative has a donor at all).

The results of generated narratives using the prototypes narrative subfunctions are limited by the number of functions in each function group. For example, function group B and D contains only two subfunctions each. Propp identified 7 subfunctions for B and 12 subfunctions for D (Propp 1968: 151). We see that the possibilities for variation inherent in Propp's theories are greater than what the prototype shows. As the prototype is only a basic application of Propp's theories, this does in no way invalidate the prototype nor the narratives it produces.

There are several things the prototype does not handle that may be conceived as weaknesses in the generation of narratives. These are mostly based upon the freedoms Propp pointed out for authors of narratives. Most importantly, no characters are generated. No AI systems are implemented for controlling the actions of characters. Actions of characters are instead implemented using the pre- and postconditions of narrative functions. Additionally, no system for generation of text is implemented. Therefore, character creation, characterization and linguistic representation of the narrative is up to the person creating the specific implementation. One may, however, conceive these not as weaknesses but as strengths. They provide freedom for the author to exert control over the narrative generation, which increases the number of possible applications Propp-based narrative generation can have on digital narratives. For example, in games where the world and characters are already defined, narrative generation may be used to create stories involving that world and those characters. Characters and worlds may also be generated using methods of the authors choosing not described in this paper.

Because of the lack of generated context in Propp-based systems, the quality of the narrative produced is largely in the hands of the narrative creator. I have made no inquiries in the quality of my specific narrative, nor was the goal of this paper to produce a specific high-quality narrative. However, the narratives produced follow the structure of the Russian fairy tale, a structure inherently dramatic and memorable enough to ensure the propagation of narratives through generations of people. This ensures a minimum level of quality.
Propp only analysed a selection of Russian folktales. One may argue that any narrative generated based on Propps functions will therefore share the structure of a folktale. This limits the kind of narrative that may be produced using schematics with Propps functions. In regarding this, we would be well served by re-examining what a narrative function is. Propp defines narrative functions as “an act of character, defined from the point of view of its significance for the course of the action” (Propp 1968: 21). Analysing other types of narratives than folktales may identify other narrative functions, organized in different schemes and producing different kinds of narratives. These analyses are not covered in this paper, but have been made by others. Such diverse genres as western films (Wright 1975) and James Bond novels (Eco 1984) have been analysed using modified versions of Propps theories.

The mutability and customizable of narrative functions also apply to connectives. In the digital prototype, connectives are implemented as buttons the player presses to make choices. A connective can, however, be any narrative element that connects two narrative functions. Consider the function Pr (pursuit, chase). In Grand Theft Auto 4 (Rockstar North 2008), the player has the ability to steal cars. The act of stealing a car sometimes triggers a pursuit by armed forces. It may also sometimes trigger a pursuit by the owner of the car. In both cases, the player is pursued by the guardian of the resource. The act of stealing the car is the connective that leads from the current narrative function to Pr (pursuit). However, any unlawful act (such as inflicting violence on characters and objects, robbing a store or entering a forbidden area) may act as the connective to Pr (pursuit). In Dragon Age: Origins (Bioware 2009), the act of entering into a conversation is a connective that may lead to a quest (missions handed out by characters in the game). This corresponds to D (donor) in Propps scheme. A connective may also be something that the player has no control over, such as day turning to night.

5 Conclusion

This paper set out to examine several questions regarding the theories put forth in Morphology of a Folktale. By creating a digital prototype game, it would examine if these theories were applicable to digital narratives. The prototype would also examine if digital narratives could be generated using Propps methods.

The digital prototype successfully generated narratives using Propps narrative functions with a modified set of subfunctions. These narratives where interactive through the use of connectives linking different narrative functions to each other. All narratives produced by the prototype follow the same general scheme of narrative functions, while still being different in which subfunctions are utilized. They are thus varied without being incoherent.

While adhering to Propps general scheme of lack regarding main functions, the prototype uses a modified set of narrative subfunctions. This shows that Propps list of subfunctions is not complete, and that subfunctions can be created and utilized in the narrative generation as long as they can be distilled into a main function.
There are limitations in using a purely Propp-based narrative generation. These limitations are inherent in Propp's theories, and are related to several freedoms that *Morphology of the Folktale* reserves to the author of narratives. One main limitation is the lack of character generation. Another is the burden of the author/game designer to create representations of the narrative function, be it through text, audio, computer graphics or a combination of different means. This produces no problems in a relatively small prototype, but may be a significant problem as the number of subfunctions and thus function pairs increase.

The utilization of Propp-based narrative generation has applications in many games, and could be used to create narrative cohesion in digital narratives. Proper utilization of narrative functions and connectives could theoretically lead to more dynamic narratives in sandbox-style games, roleplaying games and other genres of digital narratives.

6 Discussion

There are many possible applications of Propp-based narrative generation that is not within the scope of this paper. The conclusions drawn open a wide array of research areas.

The digital prototype created as part of this paper utilizes Propp's original general lack-based scheme of narrative functions. Further research could focus on applying a villainy-based scheme. Later writers have modified Propp's collection of narrative functions to analyse different narratives. These have yet to be utilized in narrative generation for digital narratives, and warrant examination.

The lack of characterization and character generation, combined with no inherent generation of context, are both weaknesses and strengths of Propp-based narrative generation. Further studies could combine methods of character and world generation with Propp-based narrative generation to create complete narrative experiences without the need of human authoring. *Morphology of the Folktale* contains some theories on character roles and motivations not utilized in this paper that may help in the development of these systems.
References:


Appendix A

The following is a complete list of all narrative functions contained in the digital prototype. The narrative functions are shown as screenshots taken from the iOS Simulator.
c1
The hero was willing to go. The villagers had to be saved.

Leave village

c2
The hero was unwilling to go. Better that the villagers die than me, the hero thought as he looked back at the village. But he could not go back now. With a sigh, he went on.

Leave village

Act kindly
Act angry

d1
The hero's companion appears. "Hurry up!" she says. "People's lives are dependent on us! How will the hero act towards the companion?"

Save tradesman
Don’t save tradesman

dp1
The hero left the village by foot.

Go on

dp2
The hero was given a horse by the villagers. He rode off into the wild in search of a solution.

Go on
e1
“You're absolutely right! We have to help those poor people, and I'm so very grateful for your help, you say to the companion.

Go on

e2
I never asked for your help', you say angrily.

Go on

e3
You help the tradesman, scaring the bandits of.

Go on

e4
You walk past the tradesman. You have more important things on your mind.

Go on

e5
You decide to help the companion, at the risk of your own life.

Help

e6
You decide to not help the companion.

Don't help
The companion smiles at you, signalling her trust. You have a feeling that the two of you will get along fine.

The companion does not trust you, but goes with you anyway. "I'll help save the village whether you like it or not," she says through her teeth as she walks some distance away.

The tradesman gives you some rope as a token of his gratitude.

The tradesman screams desperately as the bandits put their swords through his neck. The bandits seem too preoccupied to chase after you.

The companion lives.

The companion dies.
g1
The hero traveled onwards by foot.

Go on

k1
The hero finds a fertile area filled with fruits, cattle and riverbeds. He promptly marks the place on his map, packs some fruit and water into his backpack and starts the journey back to the village.

Go on

k2
The hero finds a fertile area filled with fruits, cattle and riverbeds. He promptly marks the place on his map, packs some fruit and water into his backpack and starts the journey back to the village.

Go on

k3
A great forest lays before the hero. He promptly marks the place on his map, gathers as much wood as he can carry and starts the journey back towards the village.

Go on

k4
The hero finds another village, hidden in a cloud of mist. He tells them of the plague that has befallen his home. The people of the village are horrified, and promise to help.

Go on
The hero encounters a mountain. At the top of the mountain, rumors say he will find the solution to the village's problems. How does the hero proceed?

Go on

The hero encounters a camp in the wilderness. In the camp, rumors say the solution to the village's problems can be found.

Go on

The companion screams in horror as she realizes she is in deadly danger. Will you help her?

Help companion

Don't help companion

You use the rope to climb the mountain.

Go on

The journey was uneventful.
**n1**
The hero has overcome many hardships, and is now at the place where the solution to the village's problems was rumored to be found.

**pr1**
The hero looks around and finds himself being chased by bandits. They want to steal that which can save his village!

**prSub1**
The hero rides away on his horse, leaving the angry bandits behind. Their shouts are drowned by the hero's laughter.

**prSub2**
"RUN!", the companion screams as she rushes headlong into the bandits. The hero hesitates, but realizes that he could never fight all of the bandits. The companion has given the hero time to escape, and not doing so would only doom both the hero and the village. This does not stop the hero from feeling tears in his eyes as he runs towards his home.

**prSub3**
The hero is caught by the bandits. Laughingly, the bandit leader commands you to hand over everything you have?
rs1
The hero escapes the bandits with his life.

Return home

rs2
Crying, the hero hands over his possessions to the bandits. "Don't ever say that I'm not a man of honor," he says as he lets you go. "I could just as easily have taken your life." The hero runs towards home.

Return home

rs3
The hero refuses to give his possessions to the bandits. "But yourself, scum," the bandit leader says as he pulls out his knife. The heroes last thoughts go to the villagers, and the suffering his failure will bring them.

New hero

rt1
The hero returns to the village. With him, he brought the solution to the villages problem. The villagers rejoice as their problems are solved. Now, their future looks a little less dark.

rt2
The hero returns to the village with his tail between his legs. He did not manage to solve the villages problem, and now, his people will suffer for it.

New hero

restart1
The lack still remained. A new hero had to be chosen.
Appendix B

This is an example of a generated narrative from the digital prototype. It consists of screenshots of each narrative function generated in this specific narrative. The screenshots were taken using iOS Simulator. The narrative progresses from top to bottom, left to right.
f2
The companion does not trust you, but goes with you anyway. "I'll help save the village whether you like it or not, she says tough her teeth as she walks some distance away.

Go on

m1
The hero encounters a mountain. At the top of the mountain, rumors say he will find the solution to the village's problems. How does the hero proceed?

Go on

n1
The hero has overcome many hardships, and is now at the place where the solution to the village's problems was rumored to be found.

Go on

k4
The hero finds another village, hidden in a cloud of mist. He tells them of the plague that has befallen his home. The people of the village are horrified, and promise to help.

Go on
pr1
The hero looks around and finds himself being chased by bandits. They want to steal that which can save his village!

Go home

prSub3
The hero is caught by the bandits. Laughingly, the bandit leader commands you to hand over everything you have?

Accept
Refuse

rs3
The hero refuses to give his possessions to the bandits. 'But yourself, scum', the bandit leader says as he pulls out his knife. The heroes last thoughts go to the villagers, and the suffering his failure will bring them.

New hero

restart1
The lock still remained. A new hero had to be chosen.

Choose hero

b1
The mayor of the village has no choice but to dispatch someone to find a solution. The hero was chosen. Did the hero go willingly or not?

Go willingly
Go unwillingly

c1
The hero was willing to go. The villagers had to be saved.

Leave village
dp2
The hero was given a horse by the villagers. He rode off into the wild in search of a solution.

Go on

Act kindly
Act angry

f1
The companion smiles at you, signifying her trust. You have a feeling that the two of you will get along fine.

Go on

g2
The hero traveled onwards on his horse.

Go on

m1
The hero encounters a mountain. At the top of the mountain, rumors say he will find the solution to the village's problems. How does the hero proceed?

Go on

e1
You’re absolutely right! We have to help those poor people, and I’m so very grateful for your help, you say to the companion.
mSub3
The journey was uneventful.

n1
The hero has overcome many hardships, and is now at the place where the solution to the village's problems was rumored to be found.

k4
The hero finds another village, hidden in a cloud of mist. He tells them of the plague that has befallen his home. The people of the village are horrified, and promise to help.

pr1
The hero looks around and finds himself being chased by bandits. They want to steal that which can save his village!

prSub3
The hero is caught by the bandits. Laughingly, the bandit leader commands you to hand over everything you have?

rs2
Crying, the hero hands over his possessions to the bandits. "Don’t ever say that I’m not a man of honor," he says as he let’s you go. "I could just as easily have taken your life". The hero runs towards home.
r2
The hero returns to the village with his tail between his legs. He did not manage to solve the village's problem, and now, his people will suffer for it.

Choose hero

restart1
The lack still remained. A new hero had to be chosen.

Go willingly
Go unwillingly

b1
The mayor of the village has no choice but to dispatch someone to find a solution. The hero was chosen. Did the hero go willingly or not?

c1
The hero was willing to go. The villagers had to be saved.

Leave village

dp2
The hero was given a horse by the villagers. He rode off into the wild in search of a solution.

Go on

Save tradesman
Don't save tradesman
c2
The hero encounters a tradesman. He is being attacked by bandits and in desperate need for help. Will you risk helping the tradesman?
c3
You help the tradesman, scaring the bandits of.

Go on

0
The tradesman gives you some rope as a token of his gratitude.

Go on

g2
The hero traveled onwards on his horse.

Go on

m1
The hero encounters a mountain. At the top of the mountain, rumors say he will find the solution to the village's problems. How does the hero proceed?

Go on

mSub3
The journey was uneventful.

Go on

n1
The hero has overcome many hardships, and is now at the place where the solution to the village's problems was rumored to be found.

Go on
k4
The hero finds another village, hidden in a cloud of mist. He tells them of the plague that has befallen his home. The people of the village are horrified, and promise to help.

Go on

pr1
The hero looks around and finds himself being chased by bandits. They want to steal that which can save his village.

Go home

prSub1
The hero rides away on his horse, leaving the angry bandits behind. Their shouts are drowned by the heroes laughter.

Try to escape

rs1
The hero escapes the bandits with his life.

Return home

rt1
The hero returns to the village. With him, he brought the solution to the villages problem. The villagers rejoice as their problems are solved. Now, their future looks a little less dark.