The process to create a realistic looking fantasy creature for a modern Triple-A game title

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Department of game design

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Abstract

In this project paper I have described my process to make a pipeline for production of an anatomically believable character that would fit into a pre-existing game title.

To find out if the character model worked in chosen game world I did do an online Survey.

For this project I did chose BioWares title Dragon Age Origins and the model I chose to produce was a dragon.

The aim was to make the dragon character fit into the world of Dragon Age

This project is limited to the first two phases of the pipeline: Pre-production and base model production phase. This project paper does not examine the texture, rigging and animation phases of the pipeline.

Keywords: 3D game engine, 3D mesh, PC, NPC, 3D creation package, LOD, player avatar, triangles, quads
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<td>Alpha mask</td>
<td>Monochrome images with transparency</td>
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<td>PC</td>
<td>Player character</td>
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<td>NPC</td>
<td>None player character, a character that is controlled by the computer</td>
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<td>LOD</td>
<td>Level of detail. Load and unload models of different detail depending on distance to the player camera.</td>
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<td>3D Mesh</td>
<td>Term for an object created in a 3D package</td>
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<td>3D package</td>
<td>a software suite for 3D mesh creation</td>
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<tr>
<td>3D model</td>
<td>consists of one or more 3D meshes</td>
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<tr>
<td>3D modelling</td>
<td>the process of creating a 3D mesh</td>
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<tr>
<td>N-gon</td>
<td>A geometric figure with N number of sides where N is an integer variable.</td>
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<tr>
<td>Polygon</td>
<td>A geometric figure</td>
</tr>
<tr>
<td>Triangle</td>
<td>Consists of three sides and three angles.</td>
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<tr>
<td>Quad</td>
<td>A square shaped polygon</td>
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<tr>
<td>Vertex</td>
<td>A vector point</td>
</tr>
<tr>
<td>Edge</td>
<td>The line between two vertices and the outer bounds of a polygon</td>
</tr>
<tr>
<td>3D primitives</td>
<td>Basic geometric forms that can be created in a 3D package</td>
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<tr>
<td>Render farm</td>
<td>a network of powerful computers specialized on rendering still images of 3D content.</td>
</tr>
<tr>
<td>Real time 3D game engine</td>
<td>a code framework to render 3D content in real time.</td>
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1 Introduction

The world of computer and video games has gone from a couple of monochrome dots on a screen to photo realistic 3D graphics in less than 40 years. The medium has gone from simple puzzle games like Tetris to interactive storytelling games like Beyond Two Souls that combines computer graphics with motion capture data from actors to their 3D modelled self. Challenge the bounds of reality in terms of graphic fidelity.

As computers and video game systems rapidly has become more powerful and the capabilities for making more realistically looking games, the demand for better in game characters looks has increased. Players demands more stunning graphics.

Computer graphics is a combination of technology and traditional art. For an artist to be successful in the field he or she has to master traditional painting and sculpting techniques as well as the digital side.

1.1 Dragons in games

Dragons are a common theme for fantasy games and fantasy stories. A creature known in many of the world mythologies is portrayed differently in different parts of the world. In Europe dragons are most often evil characters as in contrast to Asian dragons that often are good and symbolize good fortune.

These powerful creatures often serve as the role of the main antagonist in fantasy narrative kind of games, for example in the board game Drakborgen published by Alga in 1985. A Swedish board game adaptation of the roleplaying game Dungeons & Dragons published by Wizards of the coast. When they are not the main enemy of the game they are often grumpy inhabitants of some remote mountain areas (like in Dragon Age Origins), characters with its own agenda, often simply an enemy you have to sneak by or fight. Games with dragons as protagonists are not that common. Spyro the Dragon, developed by Insomniac games and published by Activision Blizzard on the Sony Playstation, is one of the few video game series where a dragon is the hero and the main player avatar.

Dragon Age is a story driven fantasy roleplaying video game developed by BioWare and published by Electronic Arts. The first instalment in the franchise was Dragon Age Origins followed by Dragon Age 2. The games in some regards builds upon the Baldur’s Gate games with was also developed by BioWare and published by Black Isle Studios. Baldur’s Gate utilized a party system with gave the player control of all of the party members.

This is also true for Dragon Age Origins, the player starts out alone, and depending on what character race the player has selected he or she starts at different locations and in different scenarios, but will meet up with Duncan who is the senior Grey Warden and the real adventure begins. The player controls four party members in total including herself. This direct control is somewhat different from for example the Diablo series (developed and published by Blizzard Entertainment) where the player also is joined by other party members. In Diablo 3 the player can control them indirectly as he can chose their specialization. In Diablo if the player character dies the game has to be restarted from the last save point. Dragon Age is different in that matter to Diablo. The main character can die during battle but if that happens the player takes control over another member in the party. If all the enemies
are defeated and one of the party members are still alive the player character along with the rest of the party are resurrected and can continue on from there.

In the first instalment of the franchise Dragon Age Orgins, the player takes on the role of a Grey Warden in the land of Ferelden. The Grey Wardens is a peace keeping organisation, kind of a fantasy United Nations without the democracy. The player has to gather the support of lords and kings to finally face the Arch Daemon and his armies of dark spawn.

Ferelden and Orlais are old enemy countries and the grey wardens are faced with the fact that the ruler of Ferelden is a power hungry general who both betrayed his king as well as the people and the grey wardens. The player has to deal with the politics of Ferelden and expose the traitor and gather the needed support to defeat the large dragon who is the Arch Daemon and stop the invasion of the dark spawn.

The aesthetics of Dragon Age are dark and gritty and mature. The world is a classic medieval fantasy world populated with humans, elves, dwarfs and dragons. The antagonists are dark spawn, demons and trolls. On the other hand the world in Dragon Age are more fleshed out and it is not only about good versus evil. The player faces many moral and ethical dilemmas as well as political issues.

Dragon Age features some different dragons. There are the high dragon with is the classical western large flying, fire breathing dragon. There are smaller ones of the same variety as well as small none flying dragon type creature. The main antagonist of Dragon Age Orgins are the Arch Demon a slightly larger than the high dragon and a more sinister appearance.

1.2 3D modelling for real time 3D game engines

Creating 3D models for 3D games have different requirements than creating 3D models for cinema. 3D models for cinema can have very high number of polygons as the model renders to still images one frame at a time on render farms. In cinema you do not need to consider any target hardware in the same way as you have to do for games. That said, the core principles of 3D modelling is the same in both branches. If the model is bad in design has N-gons and many odd triangles instead of even quads this will show up in a still render as bad as in a real time application. The modeller has too analyse concept art and has to find the parts that may be difficult to model and also consider how it will work in animation. Considering the areas of the model that will deform and ad adequate geometry for those parts.

In a real time 3D game engine the model has to be efficient in the design. There are limitations in triangle count as any asset that is produced and will be present in a game have a triangle budget. The process of creating a 3D model that is going to be used in a game have to consider the limitations of the target platform and the number of polygons that is possible to have.

A real time 3D game engine runs upon the target hardware for example a video game console such as Microsoft Xbox One or Sony Playstation 4. There are a limited amount of processing power and memory and that sets the upper limit to how much content you can have in a game.

Will the model be used many times as instances in the game or will it be the player avatar in the game. This all affects the maximal number of triangles. A quad is made up of two
triangles, the geometry has to be efficient and still look good. The level of detail (LOD) is another factor. Level of detail referees to how far away a model is from the player camera. Depending on the distance lower or higher detailed models loads and unloads.

There are different approaches in the way 3D models are designed and created depending on the target platform. A program like Zbrush can create models with millions of polygon surfaces to make high and complex details like wrinkles in an old face for example. A model with millions of polygons is not especially useful to work with in a real time 3D game engine; for a game on a portable device for example you have a limited amount of processing power and memory with means the content has to be efficient in design to have as much content as possible if that is desirable.

A modern 3D game engine can handle a large number of instances of different models running in a scene at the same time.

1.3 Questions

How does the process look like to create a creature that do not exist in the real world but look like it does? My aim is to find out how to create a dragon that fits the intellectual property of Dragon Age and to make it anatomically believable. In order to do so I will research and analyze the intellectual property, as well as researching animals that share characteristics found from the intellectual property. As dragons are popular as subjects for artists and illustrators I will also study the work process of these persons to find out how they tackle these issues.

1.4 Purpose

The purpose of this degree project is to develop a methodology and a pipeline to make more realistic looking fantasy creatures, in this case dragons, but the conclusions of this work will be adaptable to any kind of imaginary characters.

2 Method

The methods I will be using consist of doing background research including anatomical studies of animals that have similarities with dragons and also study the work of other artists. I will apply what I have learned by creating a 3D model of a dragon and document the process. To verify that the model works in the intellectual property I will evaluate the results via a survey.

Programs I will use:

Autodesk 3Ds Max (2012).
Pixologic Zbrush 4 (revision 6).
Adobe Photoshop CS5.
Hardware:

Wacom Intuos 4 digital drawing tablet.

3DS Max is a 3D modeling, animation, and rendering software. It provides comprehensive modeling, animation, texturing, simulation and rendering solutions for games, film and motion graphics artists.

Zbrush 4 is a digital sculpting tool that is used to make 3D models. It has the capability to make high resolution models (up to ten million polygons), and lets the user create models in a way that more closely resembles traditional sculpting than most other 3D programs.

Photoshop CS5 is a raster graphics editing program that is used for photo manipulation and to create digital paintings. It also has some capacity to process text, vector graphics and animations.

Wacom Intuos 4 is a pen tablet input device. It enables the user to draw digital pictures utilizing appropriate software like Adobe Photoshop and it emulates the fashion of using normal pencils and papers to draw.

The pipeline goes like follows, concept in Photoshop and Zbrush, sculpting in Zbrush, cleaning up and posing in 3Ds Max.

2.1 Limitations

I will concentrate on the modeling and sculpting process and will not rig the dragon for animation nor UVW map the dragon. The reason for not mapping the model is that I will concentrate on the anatomical parts of the modeling process and to have a clean model to present. The reason for not rig the model for animation is time constraints. Making a functional animation rig is as time consuming as the modeling part. The downside to not have a rig is that it is not possible to analyze the proper muscle deformation and movement.

3 Description of the production process

I started the process by first look at concept art of the dragons in Dragon Age Orgins (see fig. 1), then I started to research real world animals such as birds and reptiles (see fig. 2). In this case it was some points of interests as claws, wings (see fig. 3), beaks and skin. The dragons of Dragon Age have a reptilian appearance of European mythology aesthetics, so I concentrated on reptilian features. A note here is that as dragons are fantasy creatures were are no real right or wrong way in designing and developing dragons, but the design highly depends on what kind of aesthetics you aim for as well as the physics of the world it will populate. A fantasy world has to be consistent in the way law of physics work to not break the magic circle. (Ludic space Lindley, Craig 2004)
3.1 The reference pictures

I collected reference pictures of real animals that had the anatomical characteristics of the dragon I spired to produce. As the dragon I decided to produce was a quadruped with wings I started to study and collect reference images of quadrupeds. For the head and nose I researched reference pictures of albatrosses for the wings I studied bats as well as birds.

My work began with studying the concept art of the dragons in Dragon age Orgins from that I began to look at different reference pictures that had the features of the dragons. The dragon that I chose to base my dragon model on had some head similarities with the albatross and the body shape of a mammalian quadruped (such as wolfs, bears and tigers.) The long neck is only present in the giraffes today, the shape and mobility works different from the one in a giraffe’s neck however.

Figure 1. Concept art from Dragon Age

3.2 Designing of the body

The body type of the dragon I chosen to produce reflects the body of the High dragon in Dragon Age Orgins, with a slender but muscular body, long neck and a head with a long nose. The basic template for this dragon design was the concept art for the High Dragon that BioWare had released. In the game another type of dragon with the same body type but without wings and smaller in size is present as well as the earlier mentioned High Dragon.

(A) Head
I based the dragons head upon the head form of the albatross. My decision for this was that some of the concept art that from Dragon Age had a similar head shape with the beak of the albatross and nose of the dragon almost having the same proportions and overall form.

Figure 2. Picture of albatross

(B) Neck

The concept art from Dragon Age Origins showed a High Dragon with a long neck and the design was present in the final release of the game. I went on with this design. The height of
neck has been proved to work. The giraffes of today and some dinosaurs in the past have had long extended necks followed by large body mass.

(C) Muscles

By studying muscular anatomy of quadrupeds I decided the muscles of the dragon. I used references from other artists (O’Connor, William 2009 Dracopedia) that had made detailed drawings of dragon anatomy. This is not a scientific study of anatomy but derived from real scientific work on the muscular structure of different animals.

(D) Wings

The wing design of the bat seemed as a good choice as bats do not have the elegant wing folding of birds. A dragon of the sort that is present in Dragon Age does not fold their wings to the body like a bird. The second reason I chosen the bat wing design is that the way it attaches to the body of a bat seems to be similar to how the wings attach to the dragons in Dragon Age world. The surface of a bat wing is a skin membrane also present in the dragon I have chosen to base my design upon.

This image has been removed as the copyright holder has not granted publication permission.

Figure 3. Picture of bat wing

The wing structure of mammals and birds are of a similar nature in skeletal design. The mammals that have wings is bats as they are the only flying mammals of earth today (that is known of). The wings of bats consist of the same bone structure as the human hand and the flipper of a whale as well as the paw of a tiger.

(E) Pelvic and Tail
Dragons is a fantasy of the human imagination and a dragon can look as close to any existing animal or could be something that do not have anything in common with the animals living today. That said, the reptilian look seems to be the most popular as well as of dinosaurs, especially the large and muscular tail that many dinosaurs and reptiles have. The crocodile and alligator both have massive tails that extends from the entire circumference of their body.

(F) Skin

The skin and scales of the dragon I created should have had the looks of a reptilian skin. In Dragon Age the dragons seem to be of the reptilian skin fashion. There are no dragons with feathers or fur in the Dragon Age world.

3.3 Work Process of the CG modeling

I started to sculpt the dragon in Zbrush with Zspheres (see fig. 4) and continued with the Zsphere skeleton of the dragon. As well as studying how the wings will look like from bat wing references. Have begun to sculpt the dragon in Zbrush I used adaptive skin to go from the Zsphere skeleton.

The chest needed some more work to give it more depth. The arrangement of polygon groups took some effort to get them in a usable fashion. The back and front leg groups are especially important as a lot of work will go in to sculpt the muscles and the toes and claws. This keeps the model organized and the masking brush do not need to be used that often with speeds up the sculpting process. The chest now has an acceptable depth and shape. The wing joints fit well into the body.
I constructed the base mesh with Zspheres in Zbrush (See fig.4) to block out the major parts of the dragon. By using Zspheres, the amount of time spent to make the base mesh was shorter than if I had made it in 3ds Max and I could do quick changes to the overall posture of the model. I then converted it in to an adaptive skin. After that I began sculpt on the basic mesh outlining the basic muscle groups. To help I used vertex paint to paint the muscles to have something to sculpt from (See fig. 5).
Figure 5. Polypainted guides for the muscle sculpting and a low polygon model of the dragon, here without the wing membrane.
I began building up the body mass of the dragon at the lowest subdivision level of the mesh, just blocking out the major parts not making any details (See fig. 5). At this stage I did concentrate on the basic proportions of the dragon and how the different body parts worked together as a whole.

At this point I noticed that my mesh had too little geometry to sculpt the toes, fingers and claws. To adjust this I had to go back to the Zsphere skeleton/mannequin and add Zspheres for fingers, (See fig. 6) toes and claws. Another adjustment I did at this stage was to rearrange the shoulders as they did not look like any anatomically working shoulders of a quadruped. I then had to build up the body mass again.

![Figure 6. The Zsphere model with added detail to the claws.](image)

When sculpting the talons (hands, feet and claws) I chose to design the hand and feet around a three toe design. Many of the reptiles today have a three toe structure (reference here).

Creating wings in 3Ds Max.

I began planning for the development of the wings. I decided it would be easiest to make the base mesh shape in 3ds Max by exporting the lowest polygon level of the dragon from Zbrush and then export the wings to Zbrush and make the finer adjustments there.

Begun modeling the wings in 3Ds Max by exporting the dragon from Zbrush using Go Z (A plugin to Zbrush that facilitates fast export of meshes to other 3D programs. From a 3D program such as 3ds Max the plugin works in the opposite direction and back to Zbrush.). Then the wings are done they will be exported to Zbrush for the finishing touches.
After I had imported the mesh from Zbrush to 3ds Max I created a plane to model the wings from. The plane was created from a standard primitive with a preset of edges evenly divided in width and length. The major arc of the wings gives it more triangular shape than the quadratic shape of the primitive. The first plane I used had too much geometry, eight by eight quads and did not look good.

Second iteration of the model, went back to the Zsphere skeleton to add more form to the hand and feet. I used polygon paint to paint in major muscles as guides to sculpt from. I had to redo this process a couple of times to get it right as well as looking at the reference pictures during all the stages of the modeling process.

The front legs were too far apart this made the bone and muscle joints to look strange in the shoulders. I first tried to move the legs with the move brush but that did not work either. To solve this I went back to my Zsphere model moved the legs and made a new skin.

After I had adjusted the number of edges I started to model the wing again the same issues appeared with this but I got a shape I thought worked. Back in Zbrush the wing plane shrunk a bit so I had to make adjustments again.

Posing the finished dragon in 3Ds Max and render pictures.

The first I did was to setup a scene, then created a sphere primitive of large proportion. I then inverted the normals of the sphere. After that I set up some light sources inside of the sphere and created a material that gave a neutral light gray backdrop to the subject at hand. First I placed the reference model and the model I created side by side. This gave a result that did not look good as the models did not take up the space of the image. I tested this with different focal lengths. I decided to present the two models on single pictures. This worked much better to present the dragons in closer detail than had otherwise been possible.
Figure 7. Picture of the final dragon that was presented in the survey. The wing plane as shown do not attach to the wing bones properly.
4 Result of survey

The survey I made was an online survey and it was accessible for three weeks.

The survey had 32 participants and the major part of were males in the age span 20-29 years. Figure 1 and Figure 2 in the comments refers to the pictures in the survey and is shown in Appendix A. The survey question sheet is shown in Appendix A and the response from the testers is shown in Appendix B.
One of the comments from a respondent that thought the dragon did not fit into Dragon Age:

"The production values first and foremost. Figure 1 looks more polished. Though, I would say that the design is dissimilar as well, figure 1 isn't as "busy" in its design while figure 2 have several lumps and smaller details. The first one relies more on silhouette."

Another comment about why the dragon did not fit:

"The dragons in "Dragon Age" are based more as beasts than magestic and intelligence creates. Figure 2 looks like a dragon that would be able to speak such as Shaphira from Eragon or Temireaire from His majesty's Dragon. I would buy that figure 2 could be a shapeshifter from dragon age (such as Flemeth) however I don’t see that type of model as a pure dragon."

Some comments from respondents that thought the dragon did fit into Dragon Age:

"Figure 1 seems inspired by and created to resemble a dinosaur, while figure 2 feels more in line with the traditional notion of a dragon. Still, it probably would not look out of place within Dragon Age"

"Every dragon probably fits in the Dragon Age Universe, the two examples also look pretty similar to each other so I see no reason why it shouldn't fit."

"Figure 2 is very similar to Figure 1. I can see that Figure 2 does not have opposable thumbs and tail spikes, and has another head design, which all contributes to a more reptilian-like look. But overall, I would not react to both designs existing in the Dragon Age world as different species of dragons."
Some of the comments from respondents that did not think the dragon was anatomically believable:

“It is hard to see from the only picture we get to see, but it looks like the wings are attached to the body at the same place as the neck, and that would just not work in reality. Also the head could use more work and a more interesting design to take the model further.”

“The musculature between the upper and lower legs for example looks like they’re not really properly connected and give the impression of "sausage limbs".”

“The wings are an extension of the shoulder muscles. The shoulders of this dragon looks like they would be a bit further back and up. But dragons are a fantasy monster, so you can probably get away with whatever. But I think the wings placement looks a bit off, it feels like they are too close to the forward legs.”

And some comments from respondents that thought the dragon did look anatomically believable:

“As mention before, figure 2 looks like a intelligent dragon from high fantasy. If the fantasy world that had talking dragons in it, model 2 would fit in that world.”

"With the standard of the Dragon Age universe, yes. There is problems with having back legs, front legs, AND wings, as no creature in the real world (currently discovered) have a similar set of extremities. Aside from that, as my previous comment stated, the designs are so alike that they can be different species of dragons in the same world, with Figure 2 being a slightly more reptilian-like variant.”

“If it's supposed to fly I feel that the wings are too small and the arms a bit too big and heavy yet I still find the anatomy believable within the realm of a fantasy world such as dragon age.”
The participants that answered yes on the question “Do you think the character fits into the Dragon Age world?” 62.5 percent thought it looked anatomically believable.

The percent of participants that had answered yes on both those questions 43.7 percent had played a Dragon Age title.

Males 64.3 percent Females 35.7 percent that answered yes on both questions

Of the participants that had not played any Dragon Age title 53.8 percent thought it looked anatomically believable.
5 Analysis and discussion

The preproduction phase of this degree project was not especially long and the background research on the technical aspects of the project could have been better. This is especially true when it comes to all the issues I have had with Zbrush. I could have saved me many hours of work by have made a simple prototype model in Zbrush and import it to 3Ds Max, this to ensure that the scale of the model created with Zspheres would have the right size. This way the model would have had the right scale from the beginning. Another thing that had made things easier would had been to research how alpha masks worked inside Zbrush.

For the background and concept phases, good planning is everything, and in a project like this it has to be thorough. I jumped from the research phase to the modelling without any concept phase at all. I looked on the concept art and did not make any significant sketches nor any turnarounds. A good work practice when planning for a 3D model is to plan ahead by study your concept art and pinpoint areas that will be difficult to model and already at this stage plan the geometry. To make it up as you go along is a bad strategy when you model. Down the line, a 3D mesh that is a patchwork will be difficult to UV map.

In a professional studio many different disciplines work on the same pipeline. The concept artist and the 3D modeler are seldom the same person in a triple A game production. The concept artist most often make a turnaround, in some cases the 3D modeler does the turnaround from the concept art. A 3D artist not employed in a game or film studio has to make his or her own concept art. A 3D artist has to master both 2D concept sketching as well as translate the concept to a 3D environment. Experienced artists that both make their own concept and models often produce lots of sketches and explore different possibilities in the character design. This is something I am still learning and I somewhat missed this phase and started to model the dragon without a clear design goal. The absence of a silhouette thumbnail study showed up in comments in the survey.

The choice of using a dragon design that did not seemed that fearsome but is still in Dragon Age obviously had an impact on the survey. The fact that the dragons in the franchise do not seem very friendly is of no consequence of how the dragon fits in aesthetically as there is no description of how the different dragon species behaves. I know there are novels set in the
Dragon Age world but I have only concentrated on the main video games and not all the things around the Dragon Age franchise as they do not have anything to do with game design and more to do with marketing.

The wings of the dragon seem to be one of the major complaints in the survey. The legs were another point that came up in the comments. It seemed that respondents did not think the legs attached to the body in a natural way. I had some difficulties in translating two dimensional anatomical drawings to a three dimensional object. I did not have any quadrupeds in my close area to study. This is a common problem in 3D modelling that becomes less of an issue with your growing practical experience in the field.

The design decision I made for the wings with the use of a plane was not a good choice for a real time game character. A better way would have been using box modelling as the normals of the faces would have been seen from every angle and the whole wing structure would have been a single mesh. The main opinion also seemed to be that the wings were too small in comparison to the rest of the body.

I used Zbrush for the most part of this project from the simple Zsphere mannequin to the final detail work. Some of the pitfalls during the production phase showed up due to my somewhat limited knowledge and experience working with Zbrush. I should have exported out the raw mesh that was created from Zsphere mannequin to 3Ds Max and clean-up the low polygon mesh as well as add the wing surfaces. At this point I also should have checked that the model was of the right scale. After that stage I could have imported the model back into Zbrush and sculpted the basic muscle shapes of the body continuing detailing the head and extremities of the dragon. When the base mesh was done I could have continued with finer details with the use of alpha masks to create a high polygon model to bake a bump map from.

On the other hand the reference model I used in the survey was presented clean and did not have any maps applied to it while my model had to much detail while also being presented clean. This showed up in the comments from the survey.

Comment 1

“The production values first and foremost. Figure 1 looks more polished. Though, I would say that the design is dissimilar as well, figure 1 isn’t as “busy” in its design while figure 2 have several lumps and smaller details. The first one relies more on silhouette.”

From this I can conclude that I did go into too much detail too soon and a level of detail not needed. Bump maps need UV coordinates to work on a model and UV mapping was beyond the limitations of this project.

5.1 Pipeline

The goal of the project was to create a working pipeline to create realistic looking characters in fantasy worlds that could be used in future projects Pre-production phase:

Gathering ideas

Study references
Decide the aesthetics

Create concept art

Research production technology

Research target technology, platform or scene your model will appear at. Real time game engines or movie CGI, Mental ray or V ray render

Mental ray and V ray are programs for rendering still images or a series of images for static or animation of 3D scenes.

Considering animation requirements – deformation zones on the models joints

Development progression

3Ds Max Zbrush \ Autodek FBX export\import pipeline \ Epic games Unreal Engine 4 \ Electronic Arts Frostbite Engine 3 \ Unity 5 \ Cryengine 3

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Production phase

Iteration

Deployment phase

5.2 The survey

14 of the 32 respondents thought the dragon did fit in Dragon Age and was anatomically believable. It is less than half of the respondents but still a satisfying number as the model did not get any scales or other details that I planned to include. The number that thought that the dragon did fit the Dragon Age world was 75 percent, 24 respondents and that I would think counts as a success on the short amount of time I had to develop the model.

The dragon seems too nice and intelligent was an opinion that seemed to come up. My design of the head I think more reassembles the head from some of the concept art of the high dragon in Dragon Age but it is true I did not make him look particularly fierce.
Head size this point somewhat contradicts itself. The first comment that I would guess refers to Spyro the dragon a cartoon style dragon character in the game Spyro the dragon (published by Activision Blizzard) who has an oversized head almost as large as his whole body.. His neck is also shorter. The second comment is more fleshed out but says the head is too small in comparison to the body.

Comment 2
“Fig. 2 looks like a bigger version of Spyro.”

Comment 3
“It feels like the body is a bit big compared to its head, and the body is too muscular compared to the head. If the head would have more details and look a bit more angry and evil, it would fit the body a lot better. To sum it up, he looks too nice to be a fierce dragon :)”

I have to agree with the third comment that the head could have been larger in proportion to the rest of the body of the dragon. About the level of detail a more detailed head had not necessarily made the dragon look better.

5.3 Problems and difficulties during this project

My experience of working with Zbrush did impact as I am a long way from mastering Zbrush I had to look through countless tutorials and practice sculpting to really get any result at all. Zbrush empathizes on the process of learning classical clay sculpting technics.

An animation rig had helped to place edge loops in critical areas of the model so the deformations had been more natural.

Normally the mesh is finished, then you build up the skeleton and map it to an animation rig. Depending on the project rigs and skeletons that already have basic animations often are reused between characters. But as the process of binding the skeleton or bones to the mesh can be an iterative process, as you gain experience in the field the iterative part becomes less necessary.

My choice to create the wings from plane primitives and not a closed primitive showed the downside. When I did do the rendering I had to switch the normals of the faces depending on that angles the cameras were placed in. The whole wing should have been done in one piece. This seem to be the technique what the actually models inside Dragon Age has been developed with. This was also one of the comments from the survey that my model did not have the same technical specifications as the models in Dragon Age. As the franchise of Dragon Age is the intellectual property of BioWare I did not have access to the technical specifications of their 3D models nor any of their pipelines. This was not the purpose of this project degree paper to study the development pipelines of BioWare. Dragon Age Orgins was developed in the Eclipse engine this engine are not available for education nor independent game development and the asset import pipeline is not disclosed in any public form. Much of that would probably be company secrets protected by non-disclosure agreements and make it legally impossible to base an academic paper on that subject.
Scale issues in Zbrush. I found out that the dragon mesh was too small when I would apply alpha masks for the dragon scales. The process of scaling up the dragon to the point where I could use alpha masks to add any reasonable fine detail did fail and I abandoned scales as I could not get it look god nor did I figure out how to solve this issue in a satisfying way.

As I limited this degree project to pre-production and the base model production phase further research would have to go in to the texturing and animation phases.

6 Conclusion

Dragon Age is not a photo realistic world; it is clear that it is made up and not any existing world. The goal for my degree project was to create a dragon that fit into that world but was anatomically believable. I based my dragon on actual concept art from the development of Dragon Age Origins game. The survey showed that the dragon I designed actually would fit into the world of Dragon Age. The other question about the anatomically believability I do not think I succeeded since many of the comments indicated that the legs did not join the body in a natural way. The wings were another part that showed to be a major point to why it did not see anatomically believable. The number of participants in the survey is somewhat too few to draw any deeper conclusions.

Level of detail. I did somewhat miss the limitations I had setup for this project when I excluded UVW mapping I also rendered the need for a high polygon model unnecessary at that stage of development I had chosen to limit this project to. By trying to solve issues associated with the production of that high polygon dragon I actually ended up with. Time that had been better spent develop the low polygon model. Concentrating on overall anatomy of the dragon and make it look good.

I should have done more research on the type of production pipelines I was planning to improve. I also should have better kept to the limitations of the project. The dragon should have stayed at the low polygon level and have been more anatomically coherent.

Know your tools. This is an important point to consider when you plan for a production. My lack of experience with Zbrush was the major pitfall in this project. To build up any kind of experience with a particular tool, technique or art form takes time, devotion and patience. Good planning is another point to consider but good planning only takes you so far, if you cannot execute or follow your timetable good planning does not matter. But one of lessons I have learned during this project is the importance of good background research and character development in both thumbnail sketches, turnarounds as well as a written description of the character. Good planning and work discipline go hand in hand. Choose your work tools well and have a fundamental understanding of how they work as well and put them to work to create the desired result.

Know your target platform and the limitations of that platform. A 3D model made for a real time 3D game has to conform to the limitations of the target game engine and have a clear polygon budget to work with. Make the low polygon model look as good as it can before you begin to make the high polygon version. At the pre-production stage you have to know what
type of assets you need to produce in order to get to the complete asset that can be deployed inside the game engine.
References

Books

Lindley, Craig 2004 Ludic space

Images

Picture 1 and 2 of my final dragon was rendered with the Mental Ray renderer inside 3ds Max 2012

Figure 1. Dragon concept art from Dragon Age Orgins BioWare Corporation 2009

Figure 2. Albatross head front view Michel Jay

Figure 2. Albatross head side view Wandering Albatross, Falkland Islands, 18 Dec 2012 Steve Copsey

Figure 3. Bat wing


Courtesy the private collection of Roy Winkelman

Figure 4. The basic shape of the dragon made with Zspheres at an early stage of the development. Exported from Zbrush 4 revision 6.

Figure 5. Polygon painted model Exported from Zbrush 4 revision 6.

Figure 5. Low polygon model of the dragon Exported from Zbrush 4 revision 6.

Figure 6. Zsphere model with added detail to the claws. Exported from Zbrush 4 revision 6.

Figure 7. Side view of the final dragon was rendered with the Mental Ray renderer inside 3ds Max 2012

Figure 8. Front view of the final dragon was rendered with the Mental Ray renderer inside 3ds Max 2012
Appendix A - Survey questions

Figure 1. Image above the reference dragon.

Figure 2. Image above the dragon made in this project.

What is your age?
What is your gender?
What country are you from?
Are you familiar with the video game Dragon Age Origins or any of its sequels?
Have you played any Dragon Age title?
Do you think the character labeled Figure 2 fit in to the Dragon Age world?
Please add some thoughts on why you feel that way.
Do you think the character labeled Figure 2 fit looks anatomically believable?
Please add some thoughts on why you feel that way.
## Appendix B Survey responses

<table>
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<tr>
<th>Timestamp</th>
<th>What is your age?</th>
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<th>Are you familiar with the video game Dragon Age Origins or any of its sequels?</th>
<th>Have you played any Dragon Age title?</th>
<th>Do you think the character labeled Figure 2 fit in to the Dragon Age world?</th>
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Please add some thoughts on why you feel that way.

Kinda looks similar.

The production values first and foremost. Figure 1 looks more polished. Though, I would say that the design is dissimilar as well, figure 1 isn’t as “busy” in its design while figure 2 have several lumps and smaller details. The first one relies more on silhouette.

The dragons in “Dragon Age” are based more as beasts than majestic and intelligence creates. Figure 2 looks like a dragon that would be able to speak such as Shaphia from Eragon or Temireaire from His majesty's Dragon. I would buy that figure 2 could be a shapeshifter from dragon age (such as Flemeth) however I don’t see that type of model as a pure dragon. Figure 1 seems inspired by and created to resemble a dinosaur, while figure 2 feels more in line with the traditional notion of a dragon. Still, it probably would not look out of place within Dragon Age.
Every dragon probably fits in the Dragon Age Universe, the two examples also look pretty similar to each other so I see no reason why it shouldn't fit.

They have a somewhat similar feel and overall shape.

I haven't seen the dragons, but figure 2 is more dragon-like?

Fig 2 looks anatomically weird in many ways. It is also much less human than fig 1.

Fig. 2 looks like a bigger version of Spyro.

The model itself would probably need a lot of iteration before it can be placed next to the other dragon models you find in that AAA title. Primarily, the anatomy and the normal maps need work.

Something doesn't feel right about it.

Looks like an awesome dragon that easily could fit in that game (just comparing the 2 pictures) I haven't actually played that game myself.

Figure 2 is very similar to Figure 1. I can see that Figure 2 does not have opposable thumbs and tail spikes, and has another head design, which all contributes to a more reptilian-like look. But overall, I would not react to both designs existing in the Dragon Age world as different species of dragons.

The design over all could fit in, however the mesh could do with some work, look at the original for a good way of fixing the wings. You will want to use the same technical specs as the original when comparing them like this as well. Additionally in the case of dragon age (or any other game really), you should've shown off the diffuse texture for both instead of the untextured version.

Looks like a dragon.

The dragon in the image fits with the title of the game :)

Looks really awesome!

Not sure really.. I just think it would fit because it's a believable dragon.

Because it looks like a dragon and the game is called dragon age. It does look a bit friendly though which might not be to its advantage.
Dragons are dragons are dragons are dragons. You could put that dragon in Dragon Age, Skyrim, Dragon's Dogma, or any other game where there are dragons.

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<th>Do you think the character labeled Figure 2 fit looks anatomically believable?</th>
<th>Please add some thoughts on why you feel that way.</th>
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<tr>
<td>Yes</td>
<td>I like dragons that are massive in structure.</td>
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<tr>
<td>Yes</td>
<td>It is hard to see from the only picture we get to see, but it looks like the wings are attached to the body at the same place as the neck, and that would just not work in reality. Also the head could use more work and a more interesting design to take the model further.</td>
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<tr>
<td>No</td>
<td>The musculature between the upper and lower legs for example looks like they're not really properly connected and give the impression of &quot;sausage limbs&quot;.</td>
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<tr>
<td>Yes</td>
<td>As mention before, figure 2 looks like a intelligent dragon from high fantasy. If the fantasy world that had talking dragons in it, model 2 would fit in that world.</td>
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<tr>
<td>Yes</td>
<td>lack of neck support, see giraffes, lack of chest muscles to beat too small wings in order to stay up in the air, looking at the bulk of the body. see pidgeons/bats/whatev. that dragon weighs possibly hundreds of kilos yet it seems like it has smaller wing area. look at this badass <a href="http://en.wikipedia.org/wiki/Pterosauria">http://en.wikipedia.org/wiki/Pterosauria</a> 127 kgs yet 12 meter wingspan, they also lived during a timeperiod with higher oxygen percentage in the air, which made their muscles more slimmer in terms of size vs power.. the dragon looks to bulky anyhow for being a flight powered being, why would an animal who already have insane troubles staying up in the air(if it makes it up that is) want to bulk up on more muscles.</td>
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<tr>
<td>No</td>
<td>The wings are an extension of the shoulder muscles. The shoulders of this dragon looks like they would be a bit further back and up. But dragons are a fantasy monster, so you can probably get away with whatever. But I think the wings placement looks a bit off, it feels like they are to close to the forward legs.</td>
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<tr>
<td>No</td>
<td>the back &quot;foot&quot;looks strange and the whole back leg feels a bit wonky, how the meat folds over itself by the hip the backwards facing &quot;knee&quot; (heel?) in paricular. The wings also feel too small for the thing to fly by physical power alone (this is also the case with fig. 1) However it might fly with magic or some sort of flight bladder filled with gas</td>
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<tr>
<td>Yes</td>
<td>Because figure 1 has a more humanlike body</td>
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<tr>
<td>No</td>
<td>Short tail. Weird torso. Legs meet body in a weird way. Claws on wings have wrong angle. &quot;thumbs&quot; on hind feet are facing outwards and are placed where the pinky would normally go.</td>
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<tr>
<td>No</td>
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<tr>
<td>Yes</td>
<td>Sure so far as dragons go. But to be anatomically believable it would probably need even bigger wings.</td>
</tr>
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<tr>
<td>Yes</td>
<td>The body itself is too small, too slim. Give him a much larger belly. There needs to be much more fat and meat on the body itself. Also, the dragons hind legs needs much more fat, the thighs needs to look much more like Figure 1. The skeleton for those legs would never be able to carry that body.</td>
</tr>
<tr>
<td>No</td>
<td>(A turnaround would be great, if you want more feedback).</td>
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<tr>
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<tr>
<td>Yes</td>
<td>With the standard of the Dragon Age universe, yes. There is problems with having back legs, front legs, AND wings, as no creature in the real world (currently discovered) have a similar set of extremities. Aside from that, as my previous comment stated, the designs are so alike that they can be different species of dragons in the same world, with Figure 2 being a slightly more reptilian-like variant.</td>
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<td>Yes</td>
<td>It's mainly the way the quadriceps are connected to the hips, check out some pictures of horses, there you can find some great references. The way the front legs are connected to the chest is also a bit difficult to believe, currently it looks a bit as if though the wings are connected to the shoulder sockets, consider thinking of the wings as being connected to the clavicles instead. Other than that, keep practicing and you'll be finding yourself a job soon enough.</td>
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<tr>
<td>Yes</td>
<td>Arms, legs, head, tail, wings... everything needed are there</td>
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<td>No</td>
<td>And yes but the right back foot looks like it belongs on the left side and the chest seems a bit flat to me.</td>
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<td>Yes</td>
<td>It feels like the body is a bit big compared to its head, and the body is too muscular compared to the head. If the head would have more details and look a bit more angry and evil, it would fit the body a lot better. To sum it up, he looks too nice to be a fierce dragon :)</td>
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<td>Yes</td>
<td>If it's suppose to fly I feel that the wings are too small and the arms a bit too big and heavy yet I still find the anatomy believable within the realm of a fantasy world such as dragon age.</td>
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<tr>
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<td>Fairly. The wings are a bit short, though.</td>
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<td>Looks ok but the face is a little weird</td>
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