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Final Review

Game Design: Character Modeling

Fyrestorm: Game Character Creation

An exploration of four characters from a concept game world.

December 10, 2012
Abstract

The objective of this game design thesis project is to create four game quality character models, which consist of two of the dragon types and two of the human NPCs from the concept game world of Fyrestorm, using Zbrush, Maya, 3DCoat, and other programs to create the models, and brought into UDK. Fyrestorm is a game concept I’ve been developing, a third person fantasy RPG game, in which the player character is a dragon. The dragon will change in appearance based on choices made in the game, following a good path or a darker one, as well as whether they fight more with melee or magic. The two dragon models made for this project are two of the four extreme variations, and the two humans are non-player characters that would be interacted with differently depending on the player’s alignment, a Dragonsmith and a bandit leader.

The dragons would originate from the same neutral base model in the game, and so the artistic style and overall structure of each dragon is similar, while still being easily recognizable as their type based on silhouette and design. The humans would fit in the same world and in their respective roles, reflected stylistically and in the equipment they carry. The characters would be of a generally realistic nature, somewhat artistically stylized, but believable, so as to fit in a fantasy RPG targeted at late teens and older. The project assets consist of the four models and their equipment, in Maya and UDK, as well as a UDK executable file with the models placed in a game world.
Synopsis

Like all projects, this thesis began as an idea. The basis for the idea, however, came long before any knowledge of this particular project. When I was young and just beginning to discover the potential of video games, I wondered why no one ever made a game from the perspective of one of the most popular creatures created from the collective imagination of humanity, the dragon. The first response is always that there is Spyro, and while those are well made games that I enjoyed quite a bit, they aren’t in the nature of what I sought. What I thought was missing was an in-depth role-playing game somewhere along the lines of Fable, Oblivion, or Mass Effect, but where one played the life of a dragon. While studying to create art for games, I eventually decided that I wanted to be the one to make that game, and so I have been expanding the idea, and slowly compiling a design document for what I have come to call Fyrestorm. When the midpoint review was approaching, and we had to decide what we would spend multiple semesters working on, it wasn’t a hard decision to choose to create some of the characters from the world I had been envisioning.

I ended up choosing to do two variations of the dragon main character, as well as two of the human NPCs one would encounter in the game. There are multiple versions of the main character because the choices a player makes have an effect on their alignment, and that alignment affects the form of the dragon. There are two axes of alignment, one being the standard good to evil, affected by making nobler choices or more sinister ones in quests and actions, and the other axis is based on play style in combat, whether one uses more melee attacks or more magic. The general idea is that as a player progresses down these axes, they will begin to look the part, so while a good-natured fighter type would be a strong, gallant looking dragon, an evil magic-user would be a slender, intelligent, menacing looking dragon. These were the two extremes of alignment I chose for the project, with the idea of giving the good fighter, or Guardian dragon, a leonine look, and the evil caster, or Warlock dragon, a more serpentine look. Had I made them as well, the good caster would have had a more ferret-like look, along the lines of an eastern dragon, and the evil fighter would have been boar-like in appearance.
The two human characters are also affected by the player’s alignment, as each will have a more important role to different alignments. The first character, Torvald the Dragonsmith, is an NPC that helps the character create powerful armor and weapons. In the game, you can choose to save a dying child by giving him some of your dragon blood, which has powerful restorative properties to humans, but can also cause mutations. If you give him your blood, the boy survives, but grows scales on his arms and face, as well as horns. This mutation, however,
also makes him nearly impervious to fire, and when he grows up he chooses to learn the art of Dragonsmithing, which uses dragon’s fire to forge extremely hard metals, and comes to work for you. There is also a path to a Dragonsmith if you do not choose to save the boy, but it is a very different one, and more suited to those choosing an evil path.

The other human character is Aernwyn, bandit leader of the Iron Wolf clan, and is a person that you interact with from a good or evil alignment, but in very different ways. As part of the game the player is given a village to manage, and the actions of the player will decide if the village grows and prospers, how happy the residents are, and other aspects, including who decides to join your village population. Torvald is one such character that can join the population, and Aernwyn is another. As a bandit, Aernwyn will lead raids on your town, which you have to fight off to protect your town and your treasure. If a player has an unhappy but prosperous town, Aernwyn may offer to join the town with her bandits, and the player can then lead bandit raids on other towns. A better natured player with a happier town, however, can
eventually convince her to give up banditry and become captain of the town guard, which keeps your town safer.

Torvald’s concept drawings were made during a Visual Development class with Christopher Schenck that I took in the summer I presented, the concepts for the other three characters made at the same time but outside the class. For each human and each dragon, I wanted very different styles of characters, with easily recognizable silhouettes. As a smith, Torvald needed to be large and very muscular, but with weight from a comfortable and often stationary life, most of his time spent hammering away. He is a humble man, and wears simple clothing, except for the pieces that have been given to him by the Dragonsmiths, his hammer and his apron. The bandit, Aernwyn, was designed as a lot of destructive power in a small package. As a small woman, her ability as a fighter would have to be unmatched to take control of a bandit clan, and her gear, a mismatch of pieces stolen from various sources, would be easy
to move in with a variety of weapons at hand. The warlock dragon was designed to be sleek and agile, relying on speed to avoid attacks until he can line up a devastating breath attack. As the evil version, he would also have a sinister, devious look to him, always seeking to further his own ends regardless of the cost to others. The guardian dragon on the other hand would be large and strong, with heavy plate-like scales over a thick hide to provide ample defense, and a strong jaw and large claws for times when fighting was necessary. Being good natured, he has a friendlier look to him, more likely to fight to defend others than for himself. The character designs were approved at the midpoint, and I officially began my thesis.

In the semester after my midpoint I took both a character modeling class and a one-on-one directed study with the same professor, Duylinh Nguyen, or Linh, and between those two courses I felt like I learned more about sculpting and working in various modeling programs than in my entire time in school before then. Early on in the class we learned the basics of navigating and using ZBrush and how to start a character with ZSpheres. I’d never used ZBrush before, and any attempts to figure it out hadn’t gone well because of its unique interface, but once I was shown the ropes I quickly began enjoying how sculpting felt in the program. I started in on the smith character, who wasn’t named Torvald until he was nearly finished, slowly building up and defining the anatomy with lots of advice and guidance from Linh. As part of the class we kept a daily sketchbook in which we had to post at least half an hour’s worth of work every day, and this became the start of what is now my thesis journal. This was a great motivator for getting my project done, since I decided I would do at least two hours a day on my thesis for it, often doing much more than that.

Being mostly new to high res sculpting, and completely new to sculpting the human form with realistic anatomy, there was a lot for me to learn and develop as I worked on the smith. He was an interesting character to learn on as his figure was heavy with quite a large belly on him, but also very muscular, which as I found is a difficult balance to achieve. In the beginning I tended towards defined muscles set on a larger body, which looked strange. Linh explained to me how super defined muscles are only really seen on body builders, who use serious dehydration before their competitions to get that look, and that a heavyset but muscular man like the smith would have clearly defined muscles only where they weren’t
covered by fatty tissue, and then they would still have softer contours. The fat still had to be set over muscle, however, to be believable, and had to respond correctly to gravity as well. While looking for more reference, I found that some of the heavier boxers and sumo wrestlers had the closest build to what I was looking for, and started studying those images and applying them to the smith. This showed me where the fat would gather on a muscular form versus where it would be thinner and show the underlying muscle.

Once the anatomy was working, we went over the concept of primary, secondary, and tertiary forms. So far I had progressed through the primary and much of the secondary forms, the next step was to polish up the secondary forms and start adding tertiary detail. Before that though I needed to retopologize the mesh, so that I would have more polygons where I needed more detail and good edge flows. We went over how to retopolgize in 3DCoat, how the edge loops should lie along the form, and ways to make a good mesh for sculpting. Once that was done, I brought the mesh back into ZBrush, projected the old mesh onto the new one, and continued sculpting. Linh showed me brushes that were very useful for defining the forms more clearly, ones that helped to create skin folds and wrinkles, and I also began adding the scales on the arms and face. To make the scales, Linh showed me how to make an alpha and combine it with brushes or masks to create many scales quickly. I made the alpha in Photoshop, imported it into Zbrush, and began placing the scales. I decided to place them as a mask, so I could arrange them all together, and then start building up the scales with some variation. Once the scales and secondary forms were done, I started in on the fine detail, adding even more wrinkles, as well as pores and hairs, using a variety of brushes and alpha
maps. With all three types of forms my tendency was to be overly cautious, not push the forms as much as needed, and frequently I had to go back and make them stand out more.

Once the body of the smith was finished I made base meshes for his clothing in Maya, brought them into Zbrush, and started creating the folds. The smith prefers simple attire, wearing pants and a shirt made from heavy cloth, and heavy leather boots with steel toes to protect his feet from dropped tools. Over his clothes he wears an apron that has been passed down through generations of Dragonsmiths, made from the hide of a lava salamander, which protects the areas not covered in scales from the heat of the dragon fire he works with. This apron is more ornate than the rest of his clothes, with leather straps tooled with knot work and decorated buckles and rivets. Once the folds were sculpted in, I began adding details to give each piece the feel of the material it was made out of, such as seams, stitching, the weaves of the fabric, and the roughness and wrinkling of leather. I also created a hammer for the smith, starting with a base mesh in Maya and then sculpting in ZBrush. The hammer is called Dragonfall and is also an heirloom of the Dragonsmiths, and holds embers inside it so that it doesn’t weaken the super-heated metals he works with by meeting them cold. Once the clothes and hammer were done, the smith sculpt was ready to be turned into a low resolution model and textured.
Partway into working on sculpting the smith, I began on the warlock dragon as well, and met my first major hurdle. Shon Mitchell was substituting for Linh while he was away for a conference, and when I got feedback on the dragon model from Shon, his recommendation was to take a year to study animal anatomy before continuing. This worried me a lot in that, while it would be a great thing to do, I didn’t have time for a full year of practice and that I had so little understanding of animal anatomy as to need that full year. Because of that I paused work on the thesis, started finding references, and did sculpts of a number of different animals that I thought were relevant to creating anatomy for a dragon. I came to understand that a dragon can’t be pieced together; it has to be built from the ground up. I ended up doing dog, lion, iguana, bat, featherless eagle, and Komodo dragon sculpts before really going back to work on the dragon. I then redesigned the dragon and kept changing it until both Linh and I felt it had an interesting silhouette and believable anatomy. Some of the major changes were creating the muscle structure based on the anatomy studies I had done, lengthening and adding a more defined curve to the body, shaping the head from the skull out, and lengthening and increasing the overall size of the wings. It took a few iterations of changes to settle on a design that felt right, but when it got there I was a bit surprised with how much better it was compared to what I had started with.
I was then able to progress onto the secondary forms, defining the model and adding wrinkles, and also created the horns, claws, and the spines along the back and throat. I used the curve surface brush to create the fin between the spines, giving the dragon a bit of a sea serpent look and accentuating the curve of the body, and then it was finally time to start on the scales. I began with the head, sculpting these scales out manually because they did not share a uniform shape, and I wanted them to define and enhance the contours of the face. Skyrim had come out not long before this, and the art book that I got with it was invaluable as a reference for what I wanted the scales to look like, along with photographs of iguanas, snakes, and even turtles. For the body however, based on the design I wanted for this dragon, which involved a lot of smaller scales somewhat like a snake, the method I’d used for the smith’s larger scales was clearly going to be much too time consuming. Instead, I sculpted on a plane a diamond shaped arrangement of scales, several scales across, and created a new alpha image from that. With that, I was able to use a brush with the alpha on it and the drag rectangle stroke to fairly quickly place the scales over the entire body. Because of the diamond shape, I was able to change the size of the scales without an overly obvious transition, and still cover a fairly large area with each placement. After cleaning up the scales and making sure they flowed along the skin the way I wanted, it was time to move on with the project.
Now that both characters had completed sculpts, I created a new low resolution topology for each, this time focusing on how the character would be rigged and animated. I created UVs for each, also in 3DCoat, arranged them to maximize texture space in Maya, and created normal maps using the xNormal program. The smith had a color scheme that I had created during the Visual Development class, but I hadn’t yet decided on one for the dragon, so I did some color tests. I wanted colors that would show that while the dragon was small and slender, it was still very dangerous, so I looked at a variety of poisonous frog colorations. Once I’d found the one I liked, I started working on the base textures for both characters in ZBrush, using the high res meshes.
For the smith I used a skin painting technique that Linh showed us in class where you begin with a base skin color, paint very bright colors with a spatter-like brush over that, and then paint the skin tone over the colors again with the spatter brush while not entirely covering the colors. With this method, using red in areas like the ears and nose, blue around the eyes, green where hair grows, and other colors in various areas, you create the effect of semi-transparent skin. Used correctly, this can create remarkably realistic looking skin, especially once you add things like hairs and skin spots on top. Once the skin was done, I painted base colors for the clothes and hammer, using masking to add in detail from the mesh, and painted the scales on the skin as well. I then exported the texture maps from ZBrush, brought them into Photoshop, and used the normal maps, ambient occlusion maps, and hand painting to finish the texture and add more detail. There was a lot of adjusting and fixing done in this stage, to clean up areas where the maps hadn’t baked well and to make adjustments to the colors until everything harmonized well. The apron had the biggest change from the concept colors, because I wanted to make the hide area look like it had come off of a fire resistant fantasy beast. I kept experimenting with the colors and specular map until it started to look almost like charcoal, but with a fiery sheen to it that stressed the concept and was much more interesting than its original brown leather.

With the dragon I used ZBrush to put in the base colors and start on the scales, then exported the texture and finished it by swapping between Photoshop and Mudbox. I had some problems with my original UVs so I made the necessary changes to them, re-projected the texture, and continued working, using the maps I’d baked and hand painting to define the scales. I also created the inside of the mouth, sculpted it, added it to the mesh, and textured it. At this point I was hoping to be able to make the characters animated inside of UDK, so I began
rigging them. I was now into the next semester, but I was taking another class with Linh, who gave a rigging demonstration and explained some good practices to use. While rigging is not necessarily a modeler’s job, I’ve been told it is still a good thing for a modeler to be familiar with. With that in mind, despite the rigging taking me time to learn and apply to the characters, I thought it was good practice. The dragon wings in particular proved a challenge, since it takes very careful skin weighting to get them to deform well when the wings fold. After getting some advice from a rigging student and friend of mine, Valerie Carmer, I finally got the rigs working. I planned to have an animator do the final animations, but I wanted to try them out myself, so I made a test animation of the dragon hovering in the air. In the end I found animators and sent them my rigs, but between their own workload and my giving too loose a deadline, I never received any completed animations. The hover animation turned out well enough, though, that I decided it was sufficient to demonstrate the mesh in motion. In my final semester I created an anvil to go along with the smith character, and after making some fixes to his rig, I created a looping animation for him, hammering away at some metal on the anvil. That completed the in-game assets for the first dragon and first human character.

At the start of the second semester, while still working on the textures and rigging for the first two characters, I began sculpting the guardian dragon and the bandit. Because of the work I’d already done figuring out the muscle structure for the warlock dragon creating the body of the guardian dragon went more quickly, as it used the same anatomy but made larger and more muscular. Where the warlock dragon had a lower to the ground, splayed elbow stance somewhat like a lizard, the guardian dragon was more upright, closer to a lion. The head
was shorter and much blockier, the wings shorter but broader as well. Once I’d finished the primary forms and started the secondary forms for the anatomy, I also started creating the larger armor scales. Because this character was a virtuous fighter type, I wanted to give him a look along the lines of a knight, with heavy plate-like scales for protection, and smaller pebbly scales in between resembling chainmail to allow for movement. I created a single large scale, and then copied it and adjusted it to create the armoring along the back and stomach. Once all the largest scales were in place, I projected the mesh to include them, and added the various medium and small scales on the rest of the body. While the large scales would invariably cover over some of the anatomy, I tried to have scale groups follow along the muscles where I could, and have the pebbled scales in between, to allow the greatest flexibility and defense. I looked at references for larger lizards like komodo dragons, alligators, and especially the T-Rex from the Jurassic Park movies. From these I saw how the skin would bunch and fold in areas that moved the most, since the hide was thick enough not to stretch well, so I added in similar areas along the neck, under the wings, and around the arms and legs. For the head I looked at turtles as well as the armadillo lizard, which had also inspired much of the plate-like scale design. One of the critiques I had gotten on the Warlock dragon was that the scales were a bit too uniform in shape, which was somewhat offset by the color pattern, but for the Guardian dragon I wanted to create a larger variety of scale types, which meant sculpting most of them individually. After many trials, I came to a scale arrangement I was happy with, and moved on the retopologizing and creating UVs.
The topology was quite different for this dragon from the previous one, as the Warlock dragon’s small scales allowed them to be entirely shown in the normal map, whereas the guardian dragon had large enough scales to affect the silhouette, and had to be shown in the mesh. Once that was complete, I baked the maps and began texturing, using the normal map and ambient occlusion in layers along with base colors, some photographs for randomized detail, and hand painting. For this character I wanted a lion-like golden color, more uniform than the warlock dragon’s bright colors, since there was more variation in the scales. I also made him lighter underneath and darker on top similar to many swimming and flying animals, which allows them to be harder to see against either the bright sky above or the darker land below. Where the warlock dragon has bright colors to show how dangerous he is, the guardian dragon has no need, being more intimidating looking to begin with. I made the pebbled scale areas darker than the plate areas, both based on animal reference and to increase the resemblance to a knight in plate. I originally made the specular map in the same hue as the scales which gave them a metallic sheen, but it looked a bit artificial, and I ended up with more natural looking scales using a contrasting color for the specular. I was able to adjust the rig from the warlock dragon for the guardian dragon and then painted new skin weights to allow me to pose him.
With the smith and warlock dragon, I’d used ZSpheres to begin the mesh, but with both the guardian dragon and the bandit, I began with a dynamesh sphere and shaped the characters from there. After trying both ways, I consider either an acceptable ways to start the sculpt, the ZSpheres feeling more like starting with an armature while the dynamesh seems more like a ball of clay, and which I use will probably be dependent on what I’m making. With both methods, you have to do a retopology for sculpting and later a retopology for the final mesh, so the time involved in either method is fairly similar. I prefer either method to starting with a base mesh in Maya, personally, because it feels more like natural sculpting, and I’m quicker at retopologizing than I am at creating a base mesh. When sculpting the bandit, getting the anatomy worked out didn’t take me as long as the smith, being more used to the program and tools now, but I did run into issues with being used to sculpting male anatomy. I wanted the bandit to be a strong female type, but I often made her overly masculine in body shape. It was often in areas that are less obvious, but combined they tended to make her look
excessively mannish, like the angle of the hips from the side, the thighs being thicker at the top and tapering down, and making the facial features too sharp. With advice from professors, I was able to find these areas and fix them, getting the proper look I’d wanted.

Once I got the anatomy problems corrected, I followed a similar path as the smith, refining the shapes and adding detail, creating a base mesh for the clothes and gear, sculpting each piece, adding in folds, stitching, decoration, and material surfacing. I made the final topology, baked the maps, and made the texture maps in a similar way as well. I tried a different method for the UVs, because I’ve heard that different engines may prefer either all the textures be on one sheet, like the smith was done, or that they be broken up into smaller pieces, so I tried that for the bandit. One advantage to that method is that you can separate
maps by material type, such as skin, leather, metal, or cloth, and adjust the shaders for each. A downside, though, was that it could be more difficult to manage so many different materials when moving the model between programs. Which method I use in the future will depend on what is preferred by the engine I’m working with, though I do somewhat prefer the single sheet texture. The bandit was too different in body shape to use the smith’s rig on, so I made a new rig and skinned her to it for the final posing.

With the models finished, the last stage of the project was getting them all into UDK. I wanted to put the characters into a scene that felt like part of a game, rather than just a white world, but creating a whole environment wasn’t within the scope of the thesis. Instead, I created terrain using a tutorial shown to me by Charles Huenergardt in the UDK classes I’d taken with him that used google maps to create a height map from satellite data and then brought it into UDK as a terrain map. I chose the Los Vaqueros reservoir, roughly 20 miles east-southeast from Walnut Creek, as the location because I wanted a flat area surrounded by mountains and it fit the bill perfectly. Once the terrain was created I painted textures onto it, borrowed from the UDK library. The map still was fairly plain though, just being textured ground, so I commissioned a friend and graduated Academy of Art student, Janice Bell, to
create and place environment assets into the scene. She made grass, trees, rocks, and bushes that gently rustle in the breeze, and has made the landscape look alive and beautiful.

Bringing the models into the scene involved creating fbx files, importing them, and creating the material shaders from the texture files. The normal map often has to be adjusted before bringing it in, both inverting the green channel so it projects the correct direction, and overlaying it onto itself, since normals tend to get flattened out in UDK. There is often quite a bit of adjusting to be done to the specular and texture maps because the colors and specularity tend to look different in UDK and depending on the model there can be emissive, transmission, and sometimes subsurface scattering maps to apply as well, along with any alpha maps needed. For the warlock dragon and the smith, there is also the matter of bringing in the animations and hooking them up. The warlock dragon’s animation was done in Maya 2010, so I was able to use the ActorX plug-in to transfer the animations to UDK relatively easily. After that I had to hook them up to actually play in the scene by setting up a matinee in Kismet, which is something Charlie showed me how to do in the UDK class. When working in UDK, there are bound to be problems that pop up, and this time was not an exception. The smith animation wasn’t importing into the scene correctly, which I suspect may have to do with the fact that they were made in Maya 2013, and UDK no longer supports ActorX for newer versions of Maya.