12-2015

Full Measures

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by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

MASTER OF FINE ARTS

IMAGING ARTS/COMPUTER ANIMATION

SCHOOL OF FILM AND ANIMATION

COLLEGE OF IMAGING ARTS & SCIENCES

ROCHESTER INSTITUTE OF TECHNOLOGY

ROCHESTER, NEW YORK

DECEMBER 2015

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ABSTRACT

"Full Measures" is a 3D Animated Short Film about a pianist's struggle writing the music he desires before his deadline. With musical creatures taunting him, will he defeat his nightmares in time?

"Full Measures" has two meanings, it's literally definition is "to perform a task as well as possible." The second definition is a play on words meaning "Passages with heavily written music." It's a phrase I found through speaking with musician at the Eastman School of Music.

In life we all aspire to achieve what we want to create. Often the greatest obstacles are constructs in our minds. We must overcome these walls to accomplish the things we desire. It is the same with our pianist; this film attempts to represent his struggle through taking the audience through a fanciful journey inside his mind.

This thesis outlines the whole creation process of making this animation from concept to completion. It describes my intentions, obstacles, effort, and successes throughout this entire production.

Acknowledgments

When beginning this film I had two main goals: telling a story clearly with only visuals, no dialogue, and creating stunning visual FX. This would have been a foolish undertaking if it weren't for great guidance and support of my thesis advisor and committee members. During the conception process the first and primary focus is the story. The story must be right, as it becomes the engine for everything else. Tom Gasek, Mark Reisch and Peter Murphy gave me great advice during my proposal. They taught me great principles about screenplay writing, which continued to help me throughout my entire production. Creating such complicated FX would have been impossible if I weren't so fortunate to have assembled such an amazing committee. Shaun Foster and Peter Gend are CGI educators whose experience and knowledge was a gift during my thesis film production. Their skills in advanced rendering, liquid simulation, and particle effects were crucial in making this film.

When creating 3D animations, ambition can become the greatest asset and enemy. My thesis advisor Charles Bandla was my guru in this area. When the desire to create something too complicated met with the realities of schedules and deadlines, his guidance kept the film grounded and on schedule. As I strived to improve my technical abilities it was the help of many that got me through the many roadblocks and obstacles.

Introduction

In the beginning, film as a medium was considered only for the elite. With the complications and cost of sets, equipment, labor and more it was out of reach to common artists. However, with the influence of technology, what once took teams of people a single animator can now achieve. Although, not without a tremendous effort. I have always loved animating. From flipbooks to my first 2D animated short about my grandfather, it has always been my passion.

The process of making my thesis film "Full Measures," began in March 2014, and was completed in May 2015. This is my final project within the MFA animation program of the School of Film and Animation at Rochester Institute of Technology. My work was finished under supervision of my thesis committee members Charles Bandla, Shaun Foster, and Peter Gend. The entire production consisted of three major stages of production: pre-visualization，production and lastly post-production.

With my career focused in 3D animation and visual effects I understood that one of my greatest challenges was gaining a tacit technical understanding of the software needed for this production. Additionally, to avoid unnecessary difficulties I learned how to accomplish many tasks across various programs to merge one software's technical advantage with another. This animation was mostly produced in MAYA 2015, ZBrush, Adobe Photoshop, Adobe After Effects, Adobe Premiere, Pro Tool, and Logic Pro.

Pre-Production

Consist of story development, concept design, storyboards, and 3D animatic. This process took place from March –August 2014.

Story development

The initial idea to make a film about artists was inspired from my family. Some of them are painters and others musicians. When I was a kid I heard them play the piano and fell in love with the unique sound. Unfortunately, at a young age I was told I couldn't play the piano due to my tiny fingers. It hurt me until I found way I could make something related to the piano, such as an animation about a pianist. In the beginning I wanted to make a film about a pianist simply playing beautiful music on stage. However, my thesis committee was not interested in this story and gave suggestions to make the film more meaningful. I later submitted a proposal about first impressions such as a custodial worker who sneaks into a theater and plays the piano, but this would be boring as well. The breakthrough change in my approach came from thinking of the pianist's struggle in writing as I found myself struggling in writing about him. It was then that I overcame my wall by putting myself in pianist's shoes. Behind every magnificent performance by great musicians there is an untold story of how they struggled and overcame their limitation to achieve that performance. In the end, I decided to let this film expresses this untold story, and let the pianist represent the artists.

Plot Summary

The story focuses on a pianist alone in his studio. The studio is a mess with papers and

books everywhere. The pianist is frustrated over his piano when an alarm on his phone alerts him of his deadline. He calms himself and begins playing. Enraptured by his music, fairies begin bursting from the sheet music. A flock of fairies fly around him as he plays the piano. Although, he soon begins disliking his music, getting so frustrated he tears the sheet music up. The fairies then fall to floor forming an ink puddle where they merge into one giant monster. The pianist at that moment must choose rather to finish his work or give up. He rushes to the piano where he performs a resounding piece that explodes the monster into ink that rains onto littered staff papers in his room. He picks up the pages and finds his masterpiece in time for his deadline.

Storyboarding and Pre-Visualization

After the final script the next process is making storyboards. Sketching multiple illustrated panels to pre-visualizing the animation is the first step to test the story. Many directors storyboard their films to gather ideas for cinematography, editing, blocking and even lighting. In some cases, the final film and storyboards are very alike and in other cases completely different. For this thesis, storyboarding mainly aided in editing. Since there is no dialogue, each shot must be used to its maximum potential to tell the story. Many changes can occur in any film. In this 3D animation, changes were mainly due to technical issues or schedule constraints. This led to many shots cut and re-ordered. Without storyboarding this process would become a labyrinth to finish.

Concept and Design

Initial designs and sketches took place in July – August in 2014. Character design is one

of my main focuses in this film. The most difficult character designs were for the music note fairy and music monster. My approach stemmed from wanting a sense of realism. I have a great fascination with Guillermo Del Toro character designs. I find them to be both fanciful and realistic. I became excited with the challenge to seamlessly merge various human and animal characteristics to create my characters. To do this, I gained a firm grasp of physiology. In addition, learning the physiology of the animals I wanted became an important step for rigging and animation.

Guillermo Del Toro Character Design

Character Design

Music Note Fairy

Creating the music note fairies became a difficulty both technical and conceptually. There are no valid references for what I wanted to create in existence. Most designs consist of simple music notes that looked cheap and boring. This would have been the easiest approach but a very unsatisfying one. I wanted the creatures to represent the spirit of the music rather than a literal interpretation. Key areas in the script called for the fairies to behave in a wide array of emotions from mischievous, brisk, cute, and little bit of evil. To accomplish this, I researched many animals' behavior and mannerism for

reference. Having actual fairy-like creatures with realistic features was a big turning point in the overall design of the film. However, critical points in the script demanded foresight in planning for rigging, texture, cinematography, and animation. For instance, the music note fairy is birthed from sheet music the pianist performs. Since they would be very small they would require extreme close ups to show their emotions. The final designs became a merger of a human, pig, moth, lion, lizard, fennec, and wolf. This pastiche of features offered many opportunities in animation allowing for the necessary complicated movement awhile presenting a gateway to the character's internal emotion.

Music note fairy Design

Monster

The music monster is formed from the fallen music note fairies after the pianist tears his sheet music. Although simpler in its design compared to the music fairy, its size, FX, and movement were troublesome for the blocking in the room.

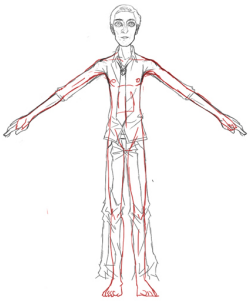
Monster Design

However, it was important to remember while creating these designs its final look was to be a liquid monster. Charles Bandla and Peter Gend were great advisors in how to achieve this look. The goal was to model the monster's general features and use RealFlow to simulate the liquid FX. The idea was that this process didn't require any focus on texture or other minute details due to the liquid FX "filling" the model. What's more, the liquid simulation would obscure movement if the limbs were too small or thin. To avoid this, I focused on creating large, prominent attributes. Its design became a collage of crustacean's claws, turtle, fish head, shark, gorilla, and various dinosaurs.

Pianist

Perhaps the easiest in comparison to designs of the fairy and monster, the pianist was one of the first characters created. First step was picking an age. I wanted the pianist to be an adult around the ages of 28-34. Next for clothing I chose a simple white-collar shirt and blue jeans. The challenge for the pianist laid in finding the right balance between caricature and functionality. For instance, for many shot I feature the pianist's hands over the piano. Therefore, the size of the pianist's hands would have to fit the size of the piano keys. I understood this to be a continuity of design. However, I knew I wanted the pianist to have huge eyes. The paintings of Margaret Keane were a heavy influence in this concept. According to the story, the pianist would spend a lot of time focusing on work and should be very skinny. During my research I watched many videos of other pianists to gain an understanding of their movement. Influences first came from pianists such as Alexander Romanovsky, later it moved towards actor Adrian Brody from the film *The*

Pianist, and finally came to a young portrait of Vladimir Horowitz.



Pianist Design

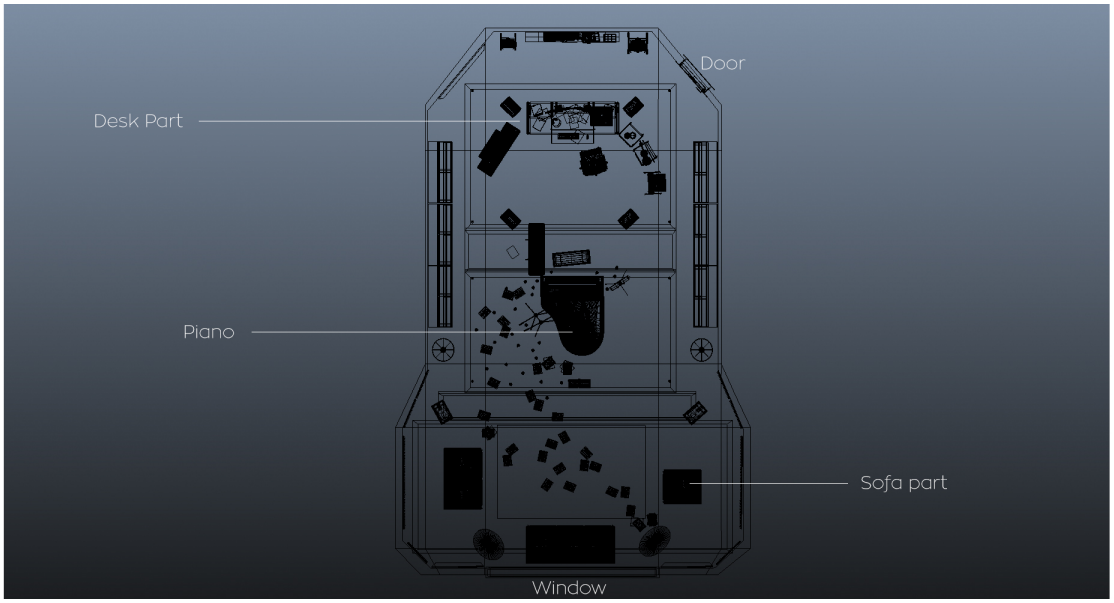
Environment Design/Layout

When and where your story occurs is a crucial opportunity in communicating to your viewers. Once the characters designs were created the next step was the layout of the room. To design an appropriate music studio I needed to research what a music studio should look like; what essential equipment the studio should have, and the finer details a professional audio engineer would incorporate.

References of music studio

In order to design the layout for the room I needed to understand how sound would travel

in the space as to position each speaker. As the speakers become crucial in aiding the Pianist to defeat the music monster. Second, due to the action that occurs in the room the furniture was meticulously placed to avoid clashes with the models. Additionally, the furniture design and placement aided in creating a believable "lived –in," space. Finally, decorating the room with some music props will help the environment's atmosphere, such as music books, music sheets, and some crumpled papers. The process led to many layout sketches and designs throughout the creation of the animatic.



Environment Layout

Prop Design

Other non-musical props were equally important in telling the story. For instance, in his frustration the Pianist throws his cellphone after his alarm alerts him of his deadline. Secondly, Post-it Notes aided in communicating his impending deadlines by means of visual cues for the audience. Lastly, crumpled papers and staff music all over his studio aided in setting up the final reveal. After the monster explodes, inks splatter onto the

littered paper forming the Pianist's masterpiece. Various props soon required additional texture, even motion graphics to appear natural and "alive" in the environment. Other props that reacted with pianist are piano, pen, papers and computer.

3D Animatic

Creating a 3D animatic is the most useful progression to completing the film. Although helpful, storyboards or 2D animatic ultimately don't progress the film towards completion as productively as a 3D animatic. In order to make the 3D animatic, I first needed to finish the modeling and rigging. The animatic was modified many times to account for adjustments in blocking or camera movement. Each modification excelled film into a better experience.

Production

The production stages include modeling, rigging, texturing, animation, lighting, and VFX effects. This process took place from September 2014 – February 2015.

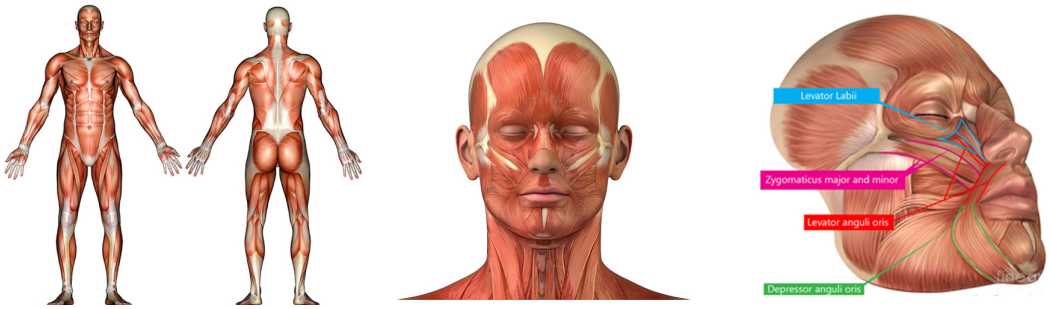
Modeling

This stage included both character and environment modeling. All models were created using the polygon method in Maya with details later built up in ZBrush.

Character modeling

The style of the film is realistic and thusly requires high-resolution models. I first built the basic geometry in the Maya to import into ZBrush where I continued to sculpture the details.

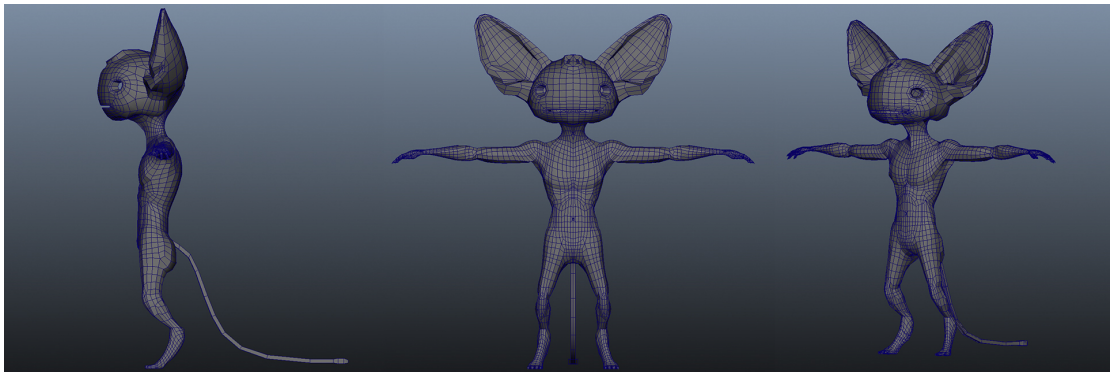
Before jumping to Maya, I need to think about the polygon mesh for the model. As we know a poorly made model is hard to rig and animate. Therefore, a clean polygon mesh and edge flow are very important for entire production. In order to build better polygon mesh I studied anatomy to look at each muscle group to see how muscle function and interact with each other. Edge loop is the process of connecting edges across the muscle groups they mimic. This ensures proper contortion of the mesh if done correctly. Vital edge loops include muscle ring round the eye for opening and closing of eye lids, the chest area, shoulder, the mouth, the hip and so on.



Anatomy study

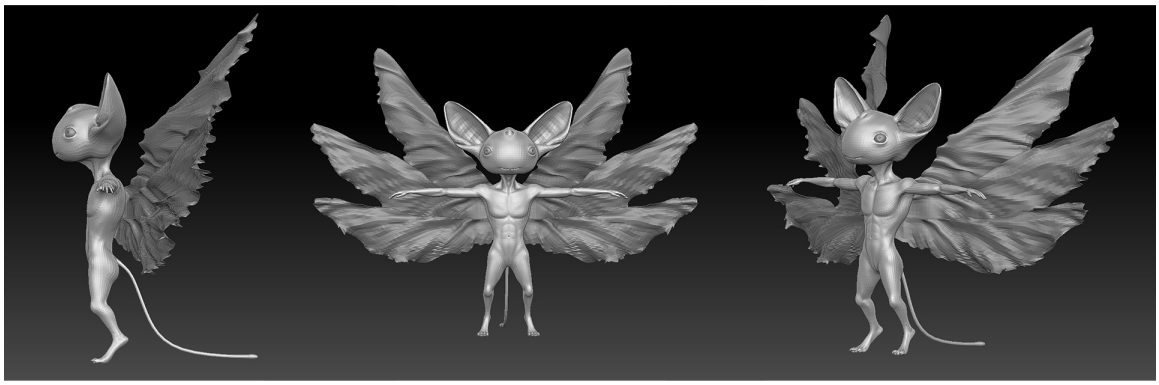
Music Note Fairy

There were few but important steps in building basic mesh for the music note fairy. Based on the 2D design I began modeling the head with the basic polygon geometry, cube. Manipulated multiple vertices and added few loops to get the basic shape of the head. Next, I began creating the edge loops for the eyes, mouth and ears. Then used cylinders primitives to build the body, arms, hands, legs, and feet separately. After I finished all basic shapes of each body part, I connected them to specific vertices. Finally, I could define and add necessary details to each body part, such as the chest, shoulders, hips, and other joints. When modifying these areas, I tried to keep as few triangles as I could since using quads give better results during the UV/Texturing process. Meanwhile, I deleted unnecessary edge loops to decrease the geometry number.



Basic mesh of Music Note Fairy in Maya

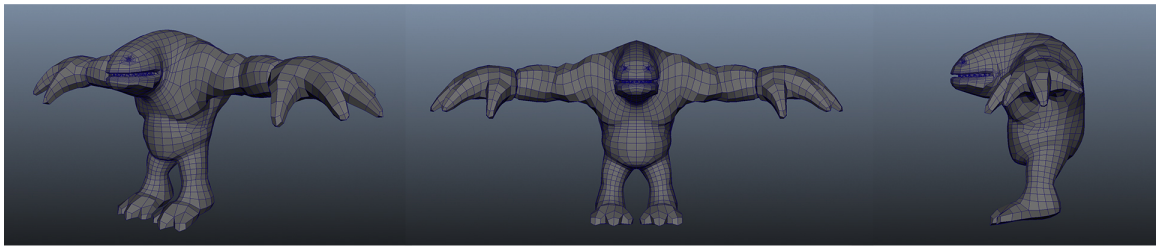
After finishing major parts of the body, I modeled eyes, interior mouth, wings and tail with polygon primitives. Further, I imported individual parts into ZBrush to continue defining the details. By using standard, clay, smooth, move, polish, and other brushes I defined the chest, legs, arms, fingers, feet, ears, and noise. Since the body of the music note fairy should be smooth I didn't use alpha texture for brushes to cerate skin details. Finally, I exported all parts separately into OBJ files. OBJ file is great for transferring geometry from different 3D applications.



Final Model of Music Note Fairy

Monster

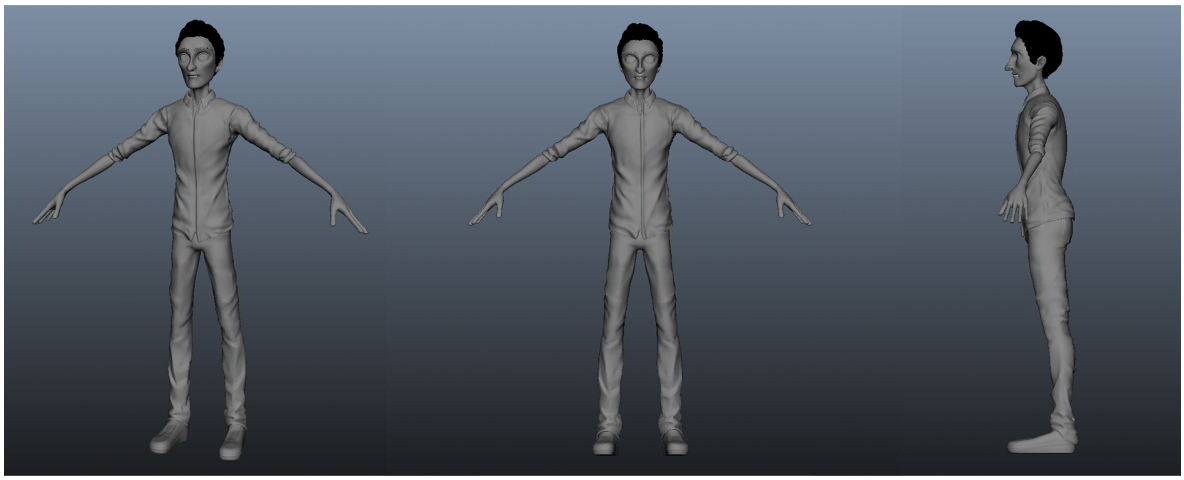
As previously stated, due to the special effects for this character the monster won't have any finer details. After modeling the past two characters this process felt much smoother. Plus, I only needed to create its base mesh, eyes, big teeth, and tongue.



Final Model of Monster

Pianist

After modeling the music note fairy, I have more confidence to model the main character, the pianist. The principle of modeling the pianist is the same as modeling the music note fairy. Model each body parts with polygon primitives. Added as few edge loops as I could to create the body shapes. However, since the pianist wears shirt, jean, and shoes, I didn't model the body parts hidden by his clothes. Nevertheless, the shirt and jean needed to present his body shape. To do this, they were molded to shape his chest, shoulders, and legs. Wrinkles were then added to define the cloth. This process helped keep number of geometry lower. Like the music note fairy, I followed by modeling its eyes and interior of the mouth. After creating the base mesh in Maya I exported the mesh as an OBJ for importing into ZBrush to define the final shape and details.



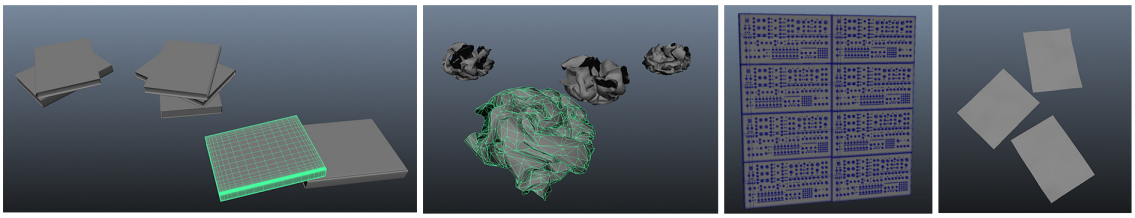
Final Model of Pianist

Environment and Props Modeling

The biggest obstacle was in creating the specialized props that would interact with the characters and aid the mise en scène. The synthesizers that fill the sides of the wall would

have too much detail in its design. In order to lower the number of geometry I decided to use the texture to fix the problem. Because the walls are far away from the camera, the result of the texture is same as modeling individual buttons. The books were created using the same technique.

In order to achieve realistic crumpled papers I used the nDynamic simulation to create the shape instead of modeling them individually. This allowed me to create each paper unique from each other. The process is model a bowl shape and flat plate on top of it. By using the gravity principle I simulate the plate dropping into the bowl, which creates the shape of scrunched paper. I shifted the plate and changed the size of the bowl to get the different looks for each paper. By using this technique I saved a lot of time and discovered a new method to model unequal shapes in an efficient way.

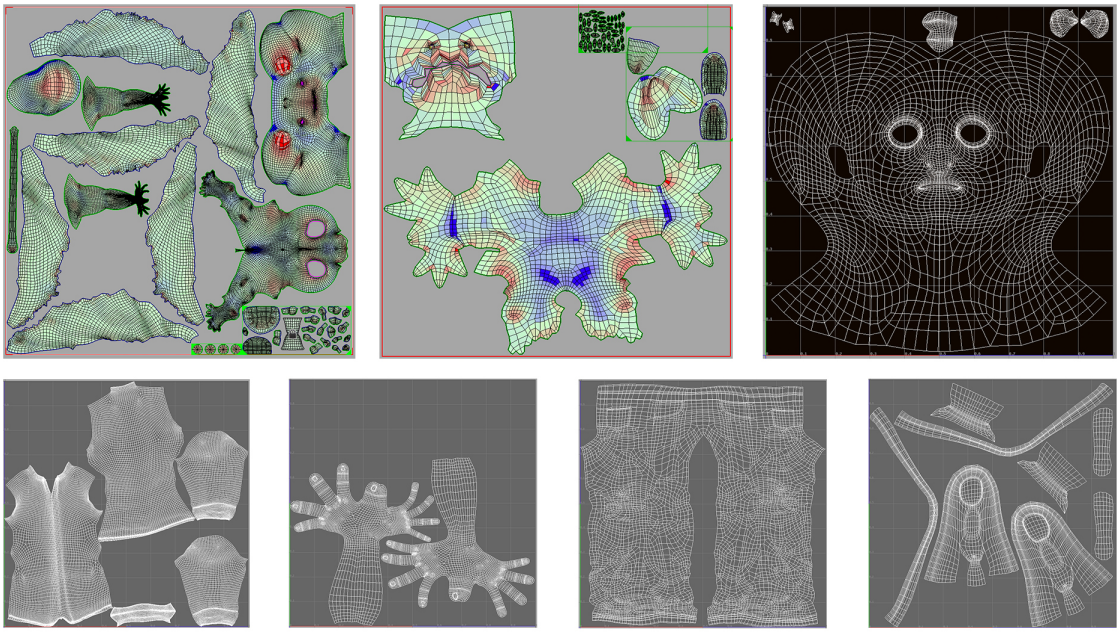


Major Props Models

UVs

Before the delivery to rigging and texturing process, UV mapping comes first. There are multiple ways to create the UVs, such as using Automatic Mapping in Maya, using the UV Master in ZBrush, or using other applications. I first used UV Master, but I was not satisfied with the result. After doing some research I found a third application, called UV Layout.

The processes of unwrapping UVs start with importing the mesh, flattening, and organizing. For example, I imported OBJ file of the music note fairy in the UV Layout. Cut the music note fairy in to different pieces for head, arms, legs, feet, tail, and wings. Flatted them individually with one button in the UV Layout. Finally, I placed them into the order and exported them out.

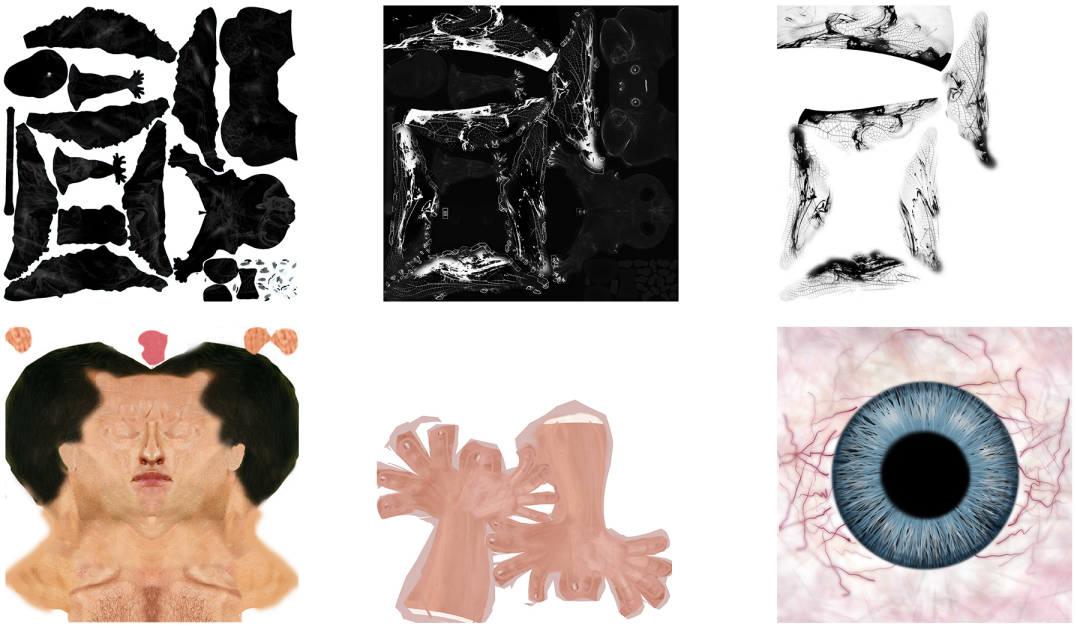


UVs of Music Note Fairy, Monster, and Pianist

Texture

In order to achieve the realistic style, I considered all the elements that will affect the render time. For example, I tried to control the number of geometry and used fewer high-resolution images. For the pianist face, I sacrificed using the Mental Ray Sub-Surface-Scattering Shader to gain more time for visual effects. This was a constant balance in maintaining a professional project under a deadline. However, for my main character I wanted to create a realistic texture. I accomplished this by taking

macrophotography of various facial pours and composited them in Photoshop. For texture of the music note fairy I worked with texture artist, Yolanda Liao.



Main Texture of Music Note Fairy, Pianist

Rigging

Rigging literally puts the backbone into your characters. Rigging is creating digital joints and bones, and bound them with 3D mesh. Without great rigging, great animation can't be achieved. In order to get the movement I wanted I filmed and researched references to plan and detail each character's rigging. The complexity of each character's rigging depends on what kind of movement each character requires in the film. For the most part, joints and bones should be placed anatomically correct to the organism. This made the Pianist the easiest character for rigging since he would only make natural movements. The most complex was the music fairy, as the wings, ears, eyelids, and nostrils all required rigging to perform the wide range of movements and emotional expression.

However, since I had no experience rigging a full character, I teamed up with Tirumalaimuttu Shanmugam to assist me. He rigged the music note fairy and monster since neither have a basic human skeleton. The difficulties with the Monster consisted in creating movement akin to a gorilla. Furthermore, the rigging required a lot of troubleshooting due to frequent issues, such as joint deform and skin weight.

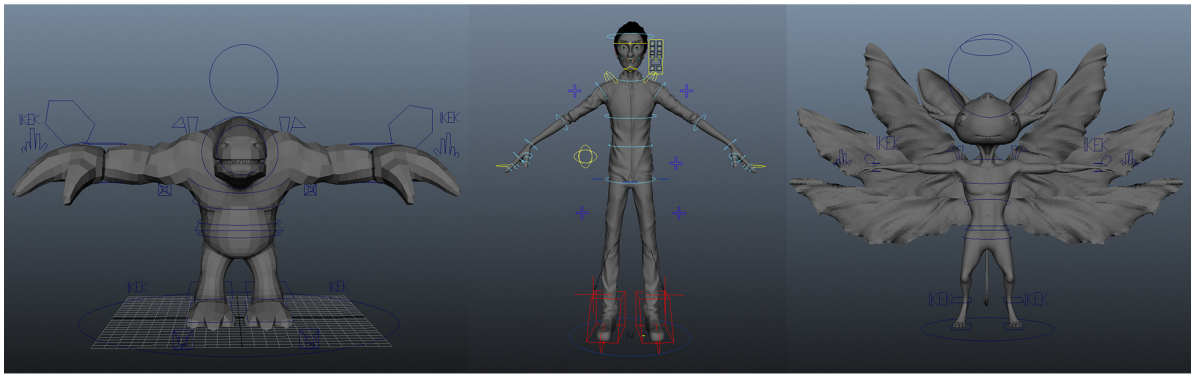
This left only the Pianist's rigging for me to complete. I tried many different rigging methods, but ultimately failed to achieve the effect I wanted. Through research I learned of many Maya Plug-ins with a collection of tools that aid in accomplishing various tasks. One most helpful was rigging plug-in called "Advanced Skeleton," a collection of Maya tools for character setup. It creates a complex motion system from a simple joint chain, called FitSkeleton. Since the Pianist is a human with basic skeleton using Advanced Skeleton saved me a lot of time. The follow lists the steps initiated to complete the Pianist's rigging:

- Import the model, create the body FitSkeleton, and match together.
- The plug-in will automatically build the skeleton based on how FitSkeleton placed.
- Test all the controllers for troubleshooting.
- Smooth bind the geometry with all the joints.
- After I built the basic skeleton, I used SkinCage to define the skin weight of the character.
- Testing all the controllers to see how the character performs.

I used Paint Skin Weight tool to finalize the skin weight of the character to achieve better performance. After finishing the body rigging, I focused on facial features. The human face is the most recognizable for issues since we are so familiar with every minute detail. This plug-in also includes a very detail catalogue for facial rigging. My process in creating the facial rigging is as follows:

- Matching the facial FitSkeleton with pianist's face.
- Select the edge of the character to place the markers of facial control on the character correctly.
- Testing the controllers by using Animate Fit. Then the plug-in can build the facial rigging.

The facial rigging includes skin simulation. It makes the facial movements more natural. The skin simulation is also baked into blind targets. These targets allow for customization in building more interesting and complex facial expressions. The better geometry mesh, the better rigging result we will achieve. The better rigging system we have, the more interesting animation that the animator can make.



Final Rigging of Monster, Pianist, and Music Note Fairy

Animation

Finally, we can begin animation. This is the stage that really brings all the characters to life. One of the biggest areas of animating this film was the camera movement. Animating captivating camera movement to draw my viewers into the story was a challenging but fun process. Although, restrained camera movement allows for simpler character animation, it is a great cinematic tool in storytelling. My film consists of 31 shots and was a great challenge to animate the characters in conjunction with camera movements. Its results were astounding. I began the animation while working on the 3D animatic. The secret to making natural smooth movement is timing and spacing. The key to building the mood of the story is controlling the pacing. Since the style of the film is more realistic exaggerated expressions were difficult.

Animation Reference

Finding appropriate references is important to create natural movement for characters. Scrutinizing films such as *The Pianist*, *The Perfect World of Kai,* and multiple performances from Alexander Romanovsky, Lang Lang, and Vladimir Horowitz garnered enough resources to call upon during the animation process. Additionally, I filmed an actor to perform movements in same camera angle used in the film for animating more nuance detail. For the Monster I watch videos of gorillas to learn of key poses for its behavior. Lastly, I collected multiple video references of starling flocks for the movement of music note fairies for scenes they fly around the room. All references made the whole progress more productive and efficient.

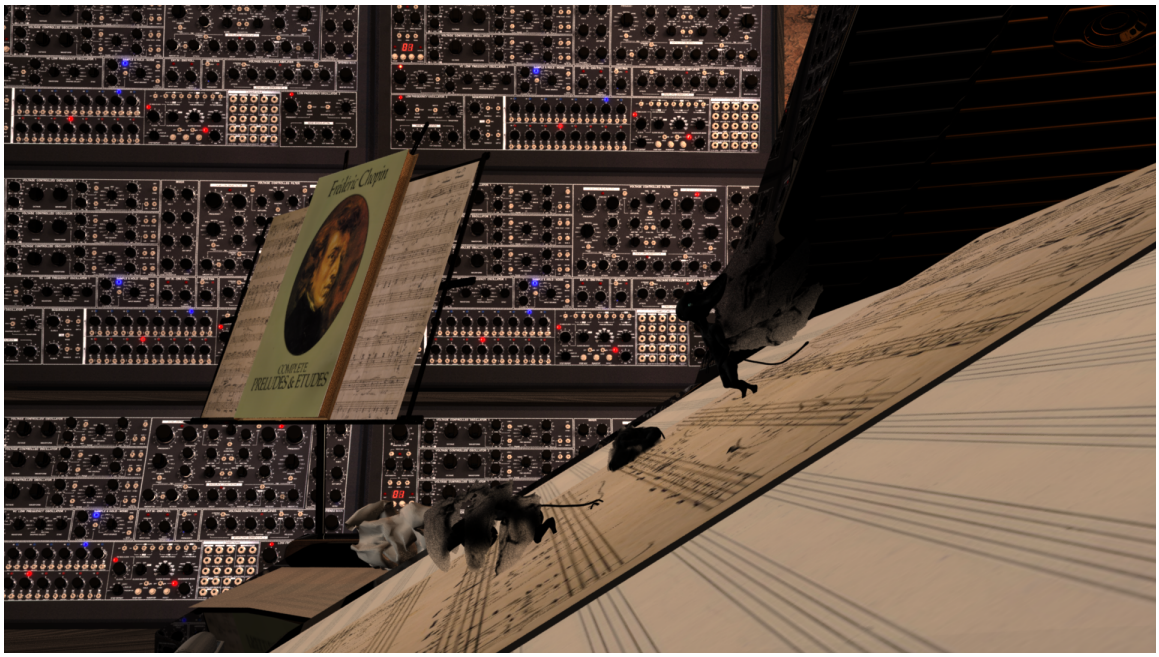
Animation Blocking

Animation blocking is the technique in creating key poses to establish the timing and placement of characters and props within the scenes. With some particular shots the flow and timing were defined by creating in-betweens and breakdowns. I used "step tangents" in Maya for the animation curves to avoid automatic interpolation between animation poses. By only adjusting the step tangencies, it allowed me to efficiently modify the timing without any distraction. Multiple changes were made throughout this stage in accordance to the feedback from my advisors, which greatly improved the result.

Animation Clean Up

It is easier to complete most animation after blocking stage by converting stepped key frames to spline curves. Smoother animation curves make smoother movements for the characters. Sometime deleting the stepped key frames from blocking stage will smooth the curve. Breaking and changing the weights on the tangents can help creates different weight to movements.

However, some scenes required more adjustments. For example, the scene where the music note fairies come out from the music sheet the posture of the music note fairies is in fetal position. At the same time its wings wrap around the body. Its wings then expand as it merges from the paper and flies off. This sequence of animation required checking every frame to make sure that there is no geometry overlay.



The scene of Music note Fairies are coming out the music sheet

Another technically difficult shot as this one is of the pianist crumpling paper. The camera moves in as an Arc Shot, as the Pianist grabs the paper, tears it, gets up and crumples it. This shot had to be carefully planned in order to execute it well and in the scheduled timeline of my productions. Strategically placing the camera assisted in accomplishing a switch between the paper being torn and crumpled. However, the end shot is a close up on his hands as he crumples the paper. Each finger required meticulously studying every frame to add necessary weight, timing, and assure no geometry overlays. To test the result of the animation I created playblasts. Then modified base on the fundamental principle of animation and the style of the film.

The scene of the pianist crumpling the music sheet

Lighting

And then there was light. It's amazing how influential lighting is in creating a realistic world and telling the story. Furthermore, it's equally amazing the teams of people that work to achieve such results. Much of working on any professional project is adjusting from what is desired to what can be done. In order to expand on the areas I wanted to conquer in my thesis, other areas were more strategically planned. Initially we focused on the story occurring at night and therefore mandated minimalistic lighting. The color of the room was to be lite blue by the neon light of the synthesizers. However, to achieve minimal lighting effect deceptively requires a lot of lights. Additionally, when render testing the lighting issue arose in many shots. Since the texture of the music note fairies is black, it was discovered they were reduced to obscurity in the darkness. Taking this into consideration, important adjustments were made to maximize the film's location, mood,

and setting. Since the film takes place in one environment I could create direction light, area light, point light, and volume light. This allowed me to save a lot of time by combining basic environment lighting and characters lighting.

- Directional light is the primary illumination source, which mimics the effect of direct sunlight. Meanwhile, in order to match the warm sunlight outside of the window, I added CIE_D light into the directional light's color attribute and set the temperature to 5500.00.
- Area light is the indirect illumination in the room through using global illumination photons. By using GI, it creates more realistic bouncing light for the environment.
- Point light and Volume light is supplementary light for brightening the other end of the room without over exposing main light sources.

The Lighting of the room

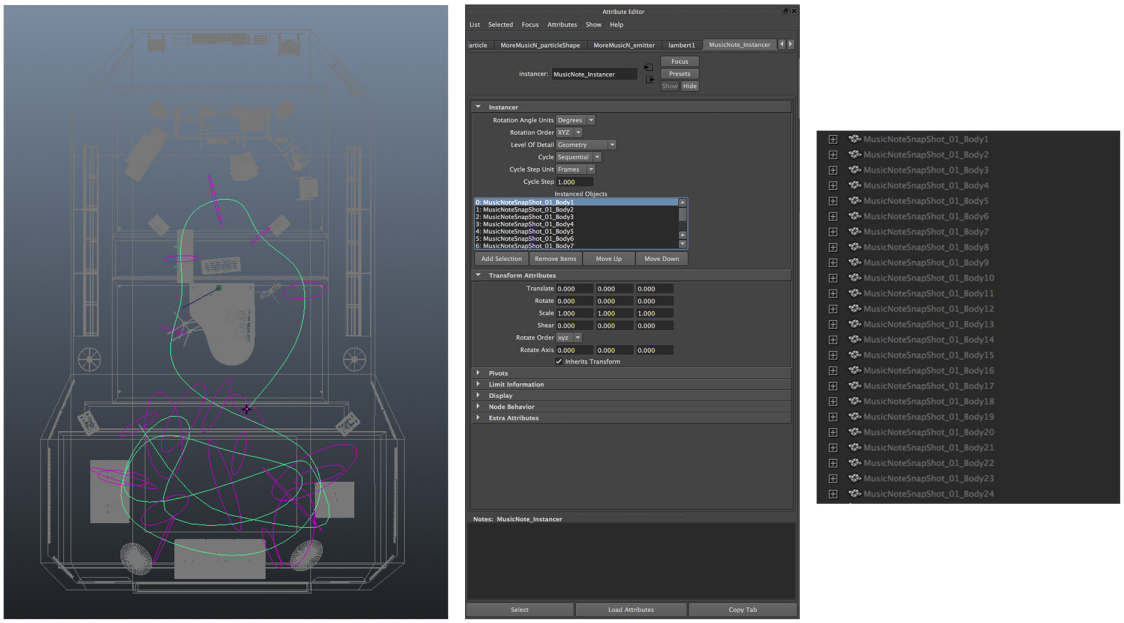
For the characters I used three-point lights, and manually adjusted for each shot's specific need. Building the basic lighting this way kept lighting the same mood for the entire film. Only slightly modifications were made to match each shot with the rest of the environment. By using this strategy, I accomplished the desired lighting effect while using my time and resources available.

Special Effects

This was my first time in the area of special effects. A few of the challenges I had ahead of me were the music note fairies flying in a flock formation and liquid music Monster simulations. To complete the simulation for the flock of music note fairies I learned the dynamic effects in Maya. Based on the research, the method includes animation snapshot, particle simulation, flying path, and particles Instancer. The steps included:

- Create looped animation for the music note fairy as the target.
- Create posed duplicates of animated fairies using animation snapshot.
- Flying path was built by curve.
- In order to have the particles moving in a specific path, I created the Curve Flow with the dynamic effect. The number of the particles was controlled by lifetime in the particle attribute.
- Replace each particle with posed music note fairy by using Particle Instancer.
- In order to make the music note fairy face to the right direction, I have to make sure the local rotation X-axis is pointed in the same direction music note fairies are moving.

After modified the particles attribute, the music note fairies successfully performed similar movement as a flock of birds. Successfully accomplishing these special effects made me more confident and comfortable with future FX work.



FX process of Music Note Fairies' flock

Unfortunately, due to limited time, resources, and budget I couldn't complete the liquid monster by using Realflow. Under advisory from my professors and friends in how to achieve the effects it was concluded that alternative measures would be more beneficial. I soon found ways in creating the same desired effect faster and cheaper using After Effects.

Rendering

Rendering is my last stage in Maya. Generally, this stage requires a lot of time. In every production render time is increased due to the complexity or size of files in each specific project. With great foresight I controlled the render time through planning each stage of

this project. From the number of the geometry, size of the texture, number of particles and more, I was able to decrease my render time as to allow for a safe production timeline for screening. I rendered necessary render passes for the film with MentalRay. For compositing needs in After Effects, I created the render layers for specific scenes.

- Beauty pass
- Ambient Occlusion pass
- Shadow pass
- Monster Layer
- Pianist Layer
- Environment Layer

At this point in the production, we are coming to an end and fighting time becomes another task. This film required a lot research, study, and troubleshooting. This pushed the production schedule further despite all the aforementioned planning. In order to keep on schedule, I rendered each shot immediately after it was finished. By working this way, I would be able to gain more time for postproduction.

Postproduction

Motion Graphics and Compositing

Few motion graphic effects were needed throughout the film. Overall motion graphics were used on the Monster, sound waves, camera focus blur, and monitor displays. However, primary obstacles were in completing the liquid Monster and sound waves effect. The script called for the Pianist to battle the Monster by ferociously playing music that makes him explode. I wanted to communicate this mainly through visuals as oppose to using sound effects or score as a crutch. I felt that the best way was to show sound waves emitting from the speakers. To execute this I researched many different plug-in and processes to accomplish this effect. The final result was a combination of many plug-ins.

- First step is tracking the motion of the camera movement using Track Motion for each speaker in the shot. I then created a new solid layer to apply Radiowave plug-ins. I then adjusted the color and synced to the tracking data to the Position parameter in the transformation settings. I synchronized the waves to begin at the right point by keying the opacity.
- Secondly, I applied Sapphire Warp Bubble effect onto the Radiowave layer and adjusted the Amplitude and Frequency parameters. Once I created the right shape, I used Sapphire Feedback and applied screen under the Combine option to create reverberation for the animation. To center the feedback I applied the same tracking motion data to the Center XY in the Feedback parameters.

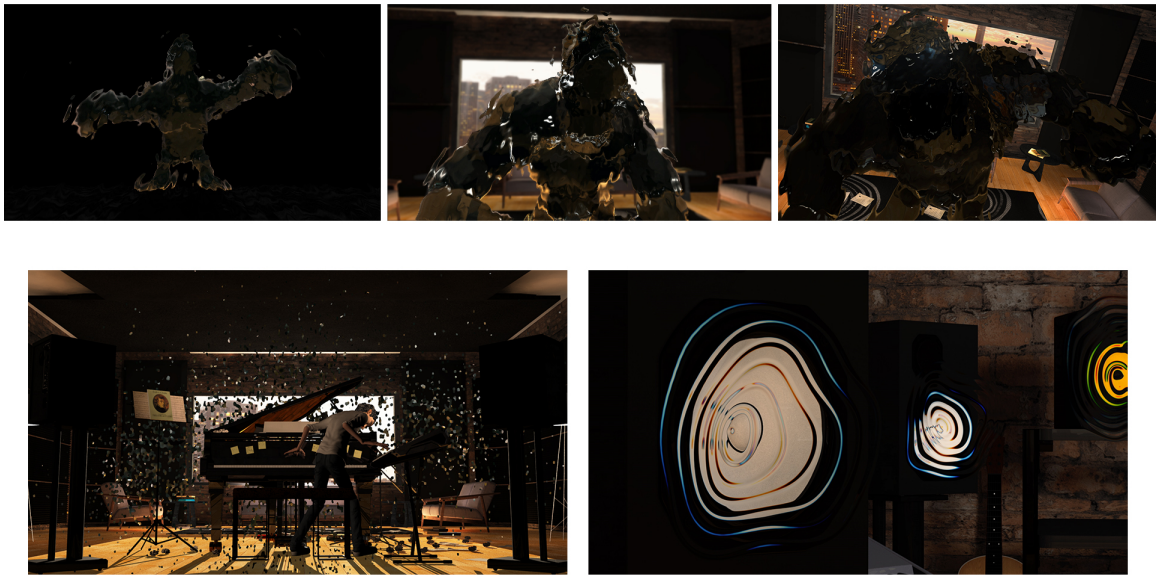
- After creating the animation for the Sound Waves, I pre-composed the layers and added Sapphire DistortChroma to which finally made them look like sound waves.

Since we were not using RealFlow for the liquid simulation I used After Effects. Considering I had rendered all the scenes featuring the monster in separate layers it was easy to apply any effect I wanted to only the Monster layer. The graphics for the Monster can be broken down into the following: liquid simulation, monster bursting, and liquid splatter.

For liquid simulation I quickly found a plug- in called CC Mr. Mercury. After adding this onto the Monster layer in AE, I made adjustments to the birth rate, velocity, gravity, resistance and animation until I achieved the desired effect.

- For Liquid Simulation I adjusted the blob influence to "In and Out," to contain the liquid within the shape of the Monster. I set the animation to Bi-Directional Normalized for liquid to move throughout its body. Since the texture and design of the model was crafted with liquid simulation in mind this effect was very compatible.

To explode the monster I used the Shatter and Simple Choke plug-ins. To synchronize the point of explosion I keyed the Force Depth in Shatter. When combined with CC Mercury, it successfully looked like a water explosion.



Motion Graphic

Lastly, when creating the splatter FX over the sheet music pages I used green screen liquid splatter footage that I then composited over the shot. These FXs were used in other instances such as when the music note fairies fall to ground after the Pianist tears the sheet music. The fairies combine together forming the gregarious liquid monster. I simply applied the liquid simulation method above and animated the monster slowly rising from the floor. I was surprised how the simplest solution yielded the best results

Editing and Cinematography

It has been said that great editing goes unnoticed. The idea behind this statement is when a story is edited smoothly the viewer no longer sees the cuts. Since I have a lot of camera movement, for continuity, each shot was scrupulously mapped out. Due to the lengthy camera movement a single shot was often multiple shots in one take. In some cases, the camera would move from one side of the room to the other. This could cause Eye-Line issues if the next shot wasn't carefully framed and spatial awareness communicated to the

viewer. I used this to my advantage by crossing over the line in one major shot where the story hits its turning point. We cross over the line in one Arc shot when the Pianist tears the sheet music, killing the fairs and thereby turning them into the liquid Monster.

With the use of insert shots and framing I efficiently communicated aspect of the story. For instance, when the Pianist turns the phone over to see the alarm I framed the background to shows Post-It notes reads: “DEADLINE!” I later used a montage sequence by using the source music from the first shot of him playing the piano over edits of him picking up a pen and writing music. This conveys both the passage of time and his process composing.

Moving from one extreme close up to wide shots creates a great contrast in space. The extreme close ups of the piano hammers to the wide shot as the fairies flying out of the page aided in creating a mystical aura in their appearance.

When the monster appears it was important to create a realistic response. Since the Pianist is scared he would naturally run towards the door. However, creating a point of choice in rather he wanted to face the monster or run away must be illustrated since there’s no dialogue. To do this, I used screen direction as a tool. The Pianist faces the door towards screen right and the monster towards screen left. In the end he chooses to fight monster, choosing left. The next shot is a shot moving from inside the piano towards the roaring monster in a low angle showing its dominance.

Finally, after the Pianist defeats the Monster we move between an overhead shot of the sheet music, to a low angle shot of the Pianist. This shows both his success in defeating

the monster and his reward. Simultaneously, as the Pianist leaves the room the camera moves to the side revealing a single music note fairy that breaks the 4th wall by giggling to the audience before flying away. This added a bit of fun and mischievousness of these fantastical creatures.

Sound and Music

Sound puts the viewer in the space of your film, while music adds the emotion to your story. Considering the story, it was easy to conceive of the film become a music video rather than a film about music. This was an important distinction I wanted to illustrate early on in the production process. To assure the film's success I avoided working with music during the process as to focus only on the visual story telling. Sound, however, was discussed and executed during the creation of the animatic. For this stage in the production, I was happy to work with composer and sound designer Stephen J. Bullen.

- Ambience/ Room Tone: For the room tone we combined the sound of a city street, a mother's womb, and apartment tenants arguing. However, due to amount of profanity in the argument much of it was mixed very low. We did this to create a unique environment where the Pianist's studio felt like place that had a life of it's own.
- Foley: Many details such as facial rubbing, cell phone vibration changes, sheet music, pen grabbing and more were all recorded individually for this film. Stephen recorded all these sound effects and many more for this film. A particularly nice effect was the wooden movements for the piano hammers.

Likewise, Stephen used eggshells for the fairies bursting through the page and waving cloths for the wing flaps. For the splatter SFX when the monster exploded Stephen splattered water over a bin to simulate the effect.

- ADR: Stephen voiced all of the Pianist vocal effects as well. He even voiced the music note fairy at the ended without aid of digital modification. We worked together to create right tone in each scene.

As previously mention, music was the last stage I wanted to implement in the film as to focus on the visual storytelling. The end result was exactly as desired. Many people understood the story without the need of music. Unfortunately, there was no time to create a customized score for the film. However, Stephen suggested many piano pieces to use as a temp score for screening. Additionally, he gave insight to hand placements and movement of the arms to match the movement of the music for each scene. This was a crucial step in creating believability in the Pianist's performance and synchronicity of the score.

Appendix

Appendix A: Original Thesis Proposal

Untitled (working title)

Synopsis

A pianist struggles to overcome writer's block, and musical monsters to satisfy his own musical goals.

Treatment

We open to a poor pianist in his messy music studio littered with books and empty staff music sheets. Emotional and frustrated he sits at his piano and begins to write music on one of his empty staff music sheets. The musical notes begin to fly and take form of musical monsters that are clumsily destroying his studio. The musical monsters tries to stop him writing by grab his pen, move his staff music sheets, pick his clothes, and destroy the other stuff around him. Determined the pianist continues writing as the tiny musical monsters merge into one dominating monster. The monster roars and stomps and startles the pianist, stopping him from writing. The frightened pianist attempts to battle the monster by playing music, but fails and is eaten alive.

Inside the belly of the beast, he is transported into abstract space, with stretched wall and many tiny monsters' laughing faces. The pianist punches the wall. The wall will be stretched. From the outside, we see the monster's outline is stretched. The pianist keeps punching until the monster burst to tiny musical monsters.

At his studio, the tiny musical monsters fall on the floor and continue to crawl in the

studio. The pianist uses the empty staff music sheets like a bug swatter swats the little musical monsters. The little monsters stick to the page. The pianist is sweating and seats back to the piano. Finally content, he is at peace as he plays the piano and looks released with smile.

Rationale

I love the piano since I was a kid. The reason that I didn't become a pianist is because many people, who are professional pianists, friends, and families, told me that my pinky is too tiny and too weak to play the piano. I gave up under the pressure of people's judgment. I regretted that I didn't try harder. Since I decided to study animation, I want to make amazing animation. I have been studying and improving my skills to achieve the goal. During this journey, I received a lot harsh critiques from professional artists and families who have high expectation on me. I won't give up like I gave up the piano. I will try harder and harder. Although I received a lot critiques, I am still happy and enjoy making every animation because those critiques will improve my work and my goal is also make the animation that I satisfied. I will overcome all the difficult and create better work. I believe I can make my dream come true with this positive energy. Also, this animation will be dedicated to my dream of piano.

Techniques

This is 3D animation film. It will be focused on music and the movement of character. The main software will be Maya, Photoshop, ZBrush, and After Effects.

Appendix B: Timeline

Spring 2014															
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Finalize Thesis Proposal	■	■	■	■	■	■	■	■	■						
Propose Thesis										■					
Re-propose Thesis											■				
Finalize Script												■	■	■	■
Character Study													■	■	■
Summer 2014															
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Character Study	■	■	■	■											
Character Design	■	■	■	■											
Model Sheets	■	■	■	■											
Short list/Storyboard					■	■	■	■							
Animatic									■	■	■	■	■	■	
Fall 2014															
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Character Modeling	■	■	■	■	■										
Environment Modeling						■	■	■	■	■					
Animatic Screening						■	■								
Texture & Shading								■	■	■	■	■			
Test Rendering											■	■	■	■	■
Animation											■	■	■	■	■
Music								■	■	■	■	■	■	■	■
Spring 2015															
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Animation	■	■	■	■	■	■	■	■	■						
Animation Screening				■	■										
Music	■	■	■	■	■	■	■	■	■	■	■	■			
Lighting & Rendering	■	■	■	■	■	■	■	■	■	■					
Sound										■	■	■			
Color Correction										■	■	■	■		
Credits										■	■				
Editing										■	■	■	■		
DVD/Final Screening														■	■

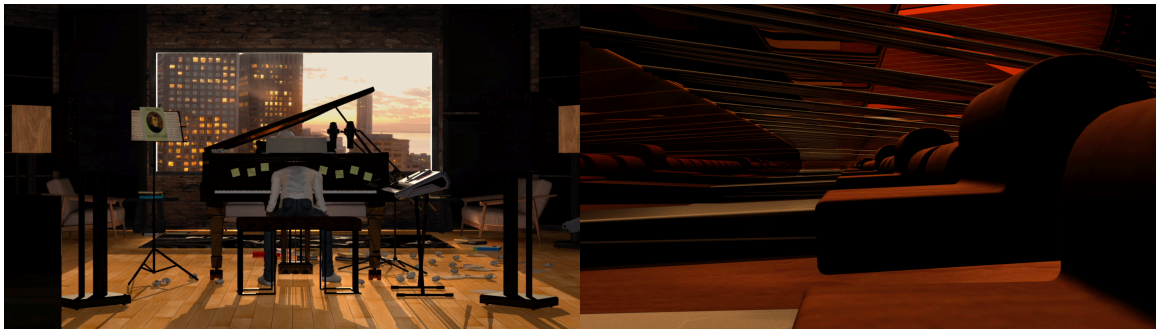
Appendix C: Budget

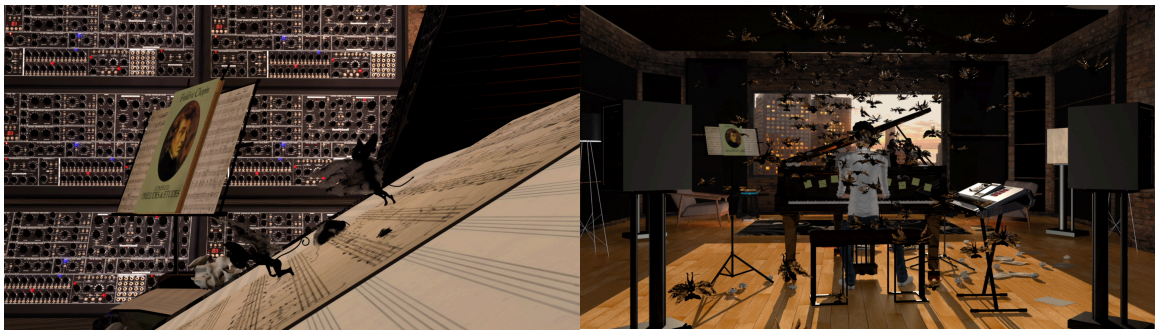
#	Descriptions	Qty	Fee	Subtotal	Total
100	Story				
200	Talent				
300	Production Personnel				
400	Travel & Location				
500	Production Equipment				
	External Hard Drive	1	$150	$150	
	Software	1			
	Adobe Creative Cloud	1	$200	&200	$350
600	Art Direction				
700	Studio Rental				
800	Recording Media				
	DVDs			$25	$25
900	Sound & Music				
	Composer	1		$1000	$1000
1000	Editing				
					Subtotal $1,375
1100	Contingency			15.00%	$206.25
					Total $ 1,581.25

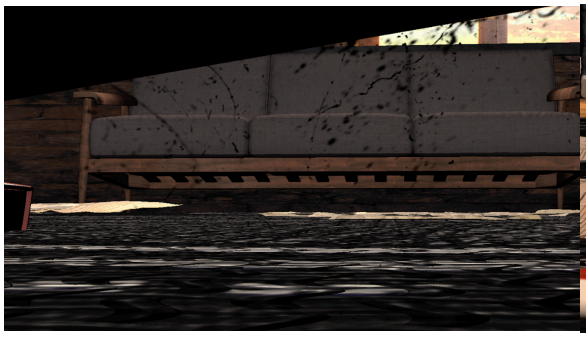
Appendix D: Screening Responses

The final thesis animation "Full Measures" was presented at SOFA screening on May 17th 2015. During the screening I was worried if the audience would understand the story especially without the dialogue. However, not only did the audience understand my film, they were truly enjoyed watching it. Many of my friends and classmates saw it for the first time and were surprised how much work I put in for my first 3D animation film. Others remarked on how much they enjoyed the detail of the sound design. Although, some were able to catch some render issues that occurred in some shots. Overall, they were enthralled by the visuals. Meanwhile, some suggested to modify to the camera for the camera tracking shot of the music note fairies; to which I agree after watching it on a bigger screen. They enjoyed the design of the animation, particularly of the music note fairy and dynamic camera movement. It was truly heart warming to hear all the positive and constructive feedback. I look forward to the opportunity to screen my film in the future.

Appendix E: Production Snapshots








Payne