Toothdoll

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Toothdoll
by
Xiaodong Han

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Fine Arts Imagine Arts/Computer Animation

School of Film and Animation
College of Imagining Arts and Sciences

Rochester Institute of Technology
Rochester, NY
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ABSTRACT

The 3D short animated film Toothdoll is a master degree thesis film. The film runs five minutes and ten seconds including credits. All the scenes in this film happen indoors. The story is about a little boy, Ushka and his grandmother. After the little boy’s first tooth comes out, he expects a new tooth to sprout. With this little story, I wanted to recreate this normal but important first-time experience in our childhood.

Throughout the entire production, the primary goal for me was to tell a clear and solid story to my audiences. No matter how interesting the story is, I think the most important thing is to make sure it is clear enough for your audiences to understand. Besides the story or the script, I also want to enhance my animation skills during the entire production. Although I am not a technical person, I wanted to try my best to solve every problem on my own.

In the beginning, I spent a few weeks building up my story and planned to animate with a hybrid of 2D animation with 3D animation. I tried to explore some more possibilities via different mediums to make an animated film; however, because of the time frame and also the consideration of unified style, I chose to make use of 3D animation only.

This paper will discuss my entire process and details in my production. I will talk about the problems I came across; and how I got over them.
INTRODUCTION

Nothing can really be done without having any problems, this is especially true for a big project. Many things changed over the entire course of this production, but fortunately I was under the constant supervision of my thesis committee members, Brian Larson, Mark Reisch and Peter Murphey. My workflow for this film was based on a common production pipeline; from preproduction: story development, concept design, character and environmental design, storyboard; production: 3D modeling, texturing, rigging, animating, lighting and rendering; and post-production: compositing, visual effects, credits and sound. This production was completed within one year: beginning in April 2014 and finishing with the final screening on campus at RIT in May 2015.

I spent almost two months on developing and refining my story. Even though it still keeps changing all the way until I really start my production, I made some big and important changes on my story, the medium I was going to make use of and also the length of my story.

The story at first mostly focused on the relationship between the boy and his grandmother; however, because of the deadline, I had to highlight the story itself; how the boy responded to his loose tooth and how the grandmother played a role in helping him. I developed another character, a statue, which ended up being the key to the story. In the end, I simplified my story, and keeping it around five minutes, but still very coherent. This was suggested by my committee members who wanted me to express a clear and simple story. By focusing on one medium I was assured that my piece of work could be achieved in a unified style.
PROPOSAL AND INITIAL ARTISTIC DIRECTIONS

Based on my experience of having difficulties keeping up with deadlines during my second-year project, I realized that my thesis story needed a much easier and more understandable but a strong story. Most of the time, while I working on a story I start with various ideas, and then combine them into one story. This has often made my stories long and tedious, even illogical. In the cartoon series Usavich¹, which really inspired me, each episode just mainly focuses on one simple idea; and the relationship between characters are also very simple. I decided to sort out the main theme of my story and the storyline first. By giving up my old tactics, I was able to rapidly make up a full story from one idea.

After I made up my mind to work on one idea, I felt much more confident and it was easier to work out my story. I was trying to tell a story about a child losing his tooth. To make things simple, I decided to use just two characters, a little boy, Ushka and his grandmother. What I needed to do was demonstrate their relationship within a simple story. This was the first difficulty I had to face during production. I needed something that could really interest my audiences even though the story is simple and ordinary. The key point became how the grandmother responds to the little boy while the little boy feels helpless with zero experience. In my point of view this had to be fun. Every first-time event during our lifetime is important and is worthy remembering.

¹ Usavich is a series of animated short films originally created for MTV’s Japanese mobile service since 2006. It is about an odd pair of rabbits imprisoned in a Soviet Gulag.
After I decided the main theme, the second and also the biggest problem during my pre-production came out: how could I create the adrenaline moment, to help immediately attract audiences to this story. It wasn’t until I went on a trip to Chicago during my spring break that I figured out how to do this. There I visit to the Field Museum and saw a lot of statues and dolls in the American Indian Cultural Hall. These dolls are really well designed and even though they were made for their ritual ceremony in the tribe, they are definitely not the toys for children. These dolls inspired me to create my third figure, Toothdoll.
FIG A: Example pictures of dolls and polls I took on my trip in Chicago. 1) No.31 Doll; 2) Tribal Human Facial Poll; 3) Series of Dolls

I think if someone could protect or comfort the children while they are changing their tooth, it is must be interesting. During my childhood, loosing a tooth was an anxious but exciting moment. When the old tooth came out, I would worry about whether the new tooth will come in or not. In different cultures, people deal with their old tooth in different ways. I remembered in my childhood, when I lost a tooth, my father always told me that I should manage these old teeth well. The rule worked like this: if it’s an old tooth from upper gum, then this old tooth need to be thrown somewhere lower; an old tooth
from lower-gum, it should be thrown somewhere higher like the house roof. Every country seems to have these funny rituals even here in the U.S., there the fairytale of the Tooth Fairy. I decided that I could create a third character based on these dolls and that character could act as a bridge between the relationship to assist in developing the full story, I needed a reason for this character to show up. So I made the third character a holy symbol of the culture in the story. People would keep the statue of this god in a shrine in their living place. This god would be called Toothdoll and he would be responsible for taking care of children; especially the children who are loosing their baby teeth. I then created some rules about how the Toothdoll would function based on the ones I learned from my father. You shall put your teeth into the Toothtray held by the Toothdoll; and followed with the match rule, upper teeth placed on the top, otherwise, lower teeth in the bottom. These rules directly influenced the design of the Toothdoll.
FIG B: My sketches for the Toothdoll 1) The first version of Toothdoll mostly based on the American Indian Culture; 2) The final design of Toothdoll; 3) Sketches based on the figures I see in Field Museum in Chicago

I started with some sketches based on those dolls I found out in the Field Museum as in the FIG B 3) above. And then I shaped out my first rough version of the Toothdoll as in the FIG B 1); however, because of the virtual world I created in my film, I think I shall avoid the audiences can directly regard my design as from a specific style or a cultural symbol. If I have a targeted cultural aesthetic, I need do excess research on a specific culture. This will waste time other than develop my story. So I explore different cultural figures roughly and then create the one as in the FIG B 2). This figure is kind of a hybrid
of Eastern cultural figures. I designed a container for the Toothdoll that allows children leave their old tooth into. Obviously, I needed a space to place the Toothdoll; so I designed a shrine for it. At very beginning, I planned to model some columns, kind of a totem that can accommodate the shrine on its top. I did some research for those totem columns from Mayan culture. Those totem columns have various well designed masks or figures embossed on it; however, in the end I have to simplified the columns without those busy decorations.

In the design stage I also discovered how the environmental layout could solve a number of story problems. During my proposal, there was a problem: Where and how would I introduce my audiences the Toothdoll? At beginning, I placed the column with the shrine right in the center of the living room in the house. You can also regard the house as a tribal architecture in which every other rooms surround the living room. Even though this location highlights the importance of the shrine and the Toothdoll; the uncomfortable part of this setting is that it doesn’t make sense how the Toothdoll could play such important role in a family. The god for children should be part of their ritual culture. There should some other gods exist. I then moved the column against the wall and duplicated it as four to become the support of the roof.

In figuring out how to introduce the Toothdoll, I decided that I needed to make up a backstory for it; so people could learn about its history and its role in the boy’s culture. However, this backstory would have doubled my workload, so I revised it to be part of the little boy’s dream. Using the dream, the Toothdoll is introduced in a much more proper and efficient way to the audiences. In the end, the film starts with this dream.
With three characters and a rough story, I then need decide with which medium I am going to make use of; the 2D animation or 3D or even a hybrid. At first time, I tried to make a combination of 2D with 3D, because of the dream part. I thought it’s possible to achieve some stylistic result in the production. I did two different concept arts for my story. I divided the story into two different parts; one is the real world in 3D animation, another the dreamland in 2D animation. But sadly, due to the tight schedule and also the unified style, I have to pick up only one medium. In the end, I chose to make it a 3D animation even though I found 3D very challenging. I only had about 9-months of experience in 3D animation production, so I had to spend many hours watching tutorials. But this helped me to improve my 3D animation skills rapidly.
PRE-PRODUCTION

Once I finally got past my proposal I failed at the first time, I was ready to push forward with my project, refining my story and sketching out the character, background and concept art and designs. Because I was working in 3D, I also needed to put in a lot of extra effort onto the pre-production items, like modeling, texturing and rigging to ensure the quality.

Protagonists

I have two main characters in my film, the boy and his grandmother.

FIG C: Character design 1) The design of grandmother; 2) The design of little boy, Ushka

Here is the description of the two characters. Ushka is a 6-year-old boy, with two big brown eyes. They are really a symbol of Ushka. He always shows his feelings on his face. Nothing is hidden. Ushka’s grandmother lives with Ushka. Her hearing is not very good. Although she looks very small and frail, she is big and powerful in her grandson’s eye.
I designed my characters based on my research of the South American art, and I mixed them with Asian art as well. Finally, I sketched out my two characters. The little boy’s height plays an important role for building up my story. In my film, the boy is trying to reach at the Toothdoll in the shrine in the column; however, because of his height, he can hardly do it without any help.

I also paid more attention on their decorations, like their clothing, hair or even shoes. Like the images shown above, at last, I got rid of the long hair and shoes. I was trying to make them work well with the environmental settings. So I chose to make them barefoot because of the tribal design. The short hair and those closed fitted clothing piece helps me a lot during the rigging and animating.

**Antagonist?**

*FIG D: Character design 1) The front view of Toothdoll; 2) The side view of Toothdoll*
The picture above is my third character in the film, the Toothdoll. I have to point out; this is not a common antagonist. In most of the films, the antagonist is always doing something against our protagonists. And because of their role, we can easily to create conflict to support our story buildup. But the situation in my film is totally different because of the theme and the story.

At very beginning, when I came out the idea of using the dream to introduce the Toothdoll, I even thought about to make it much more like a horror movie. The original dream is in this way:

The boy is sleeping on the bed, and then the door is opened unpredictable and quietly. Something unknown is sneaking into the little boy’s room. The boy is so scared that he hides himself in the cover sheet.

The main theme of this film is the sweet relationship between the little boy and his grandmother. I felt this idea is not working with my story. I need a milder one. Based on this concept design, a sweet story, a happy relationship and a sacred symbol, I figured out I need the Toothdoll to be something good, not evil or vicious as the common antagonist.

Because the Toothdoll is totally a virtual character I created on my own, I also designed a rule for supporting its function. Put your old tooth into its tray, the big golden tray un-
der its huge hands, and then your new tooth will come out. It is a very simple rule, but it
does greatly affects the entire design.

To avoid having an audience relating to my characters through one specific culture while
they are watching my film, I also mixed the artistic styles from a variety of different cul-
tures. I made their costumes look just average so no could point out where they were
from. The Toothdoll was based on the American Indian dolls, but I also mixed in an
eastern artistic style into it to make it look much more fascinating.

**Characters and Color**

The characters in my film are in a tribal style costume. Everything at first sight looks a
little bit primitive. So I tried to make the color palette a pure hue. I wanted to express
something stable and peaceful; however, after my deep consideration, I decided I could
not use white or grey which I first thought would represent the pureness and innocence
of the boy. I decided on a greenish or yellowish blue, because many scenes happened in
a dark environment, and a brighter color, would help light them up more. I tried to find
an easy color for the grandmother to match the boy’s, so I chose purple for her and yel-
low for my little boy. Purple is the complementary color to the yellow and I thought that
would show the relationship between my characters.

I picked a golden color for the Toothdoll, because no matter which culture it is, gold al-
ways represents the precious and sacred. I also wanted to make sure the Toothdoll
looked hard enough, because in the film it falls from a high placed shrine. The golden
color was the easiest way to make it much more metallic looking.
**Animatic**

At first, I didn’t plan to make an animatic for my film. My original plan is after I sketched my storyboard, I will move onto my production then. But my committee chair, Peter Murphey encouraged me to take part in the upcoming animatic screening in late March 2015. Thanks to this animatic screening and also the animatic itself. I got a lot of useful feedback and critiques. The most important information I got from the animatic screening was about the position of the Toothdoll. The position does really help the audiences understand the story.

Even though it was in 2D, the animatic I was working on has became my rough animation. While working on the animatic, the timing became the most important focal point. I tried to illustrate the key frames to demonstrate my story. The animatic was very rough but I took it as a measurement for my film.

The timing I got from animatic helped me find out some more potential problems I would go through during my production. It helped me grasp the important difference between the little boy and grandmother. Because these two characters were in totally different ages, the ratio of their movement were really a big contrast. The movement of the little boy is more flexible and active; otherwise, the movement of the grandmother is rigid and slow but really balanced. If there were no animatic as a reference, I would have spent much more time on tweaking the animation.

**Environmental Design**
The first picture shown below is my rough environmental design that I used in my animatic. The living room in which the shrine located in is right in the center of the room and the other four rooms as have shown in the second picture surrounded the living room. The third picture, this is one of the big changes when I received comments in the animatic screening. I changed the columns and shrine’s location. I put it directly inside a column against the wall.

In the film, I tried to simplify all of the environmental settings, like in the living room, no more extra props in it. I keep the wall to be a little bit greyish and yellowish to fit for the red columns. I did some test on the color palettes for the environmental design. At first time, I made use of bluish color with a texture on it, like wallpaper; however, it did look uncomfortable and because of the grandma’s purplish color skirt, I have to give up my original concept. When I changed the wall color into greyish, I then realized that the environment is too cool right now. I think I need some warm color, because this story is about happiness and grown-up, not miserable one. I then put a carpet just covering the entire floor of the living room. So the environmental settings in the living room are not tedious anymore. It looks simple, but it’s alive.
FIG E: The environmental design 1) The living room is surrounded by all of the other rooms; 2) The little boy is running from his bedroom to his grandma’s; 3) Top view of the environmental settings; 4) The boy’s bedroom, the character Panda and environmental props I used to decorate the boy’s reading table

Followed up with the same rule, I designed their bedrooms. It’s also simple settings inside; however, like in the living room, each props served its own function. Here I added
some interesting stuff in it as shown above in the fourth picture. It’s on the reading table in the little boy’s bedroom. In the beginning, I considered how I would decorate the reading table, because there are not too many scenes happened around the reading table. The common decoration would be stationary or a lamp. But could a lamp work in this kind of primitive era design? I then remembered my second year project, a film that really failed because of rigging problems. Since these objects weren’t going to move, why not just make them decorate the reading table.

Like you see in the fourth picture, I think the most embarrassed mistake, the metal parts. The table and the chair with the metallic and reflective legs make them a little bit out of the scene. My film like I said is much more of the primitive thing, everything is kept in its natural way, no excessive decoration or materials. I think if the table and desk is much more wooden looking, it will work much better than the one I had right now.

In addition to their living space, the environmental settings in the dream are also important. The dream is the first scene of the entire film; and this part is also the crucial one to present the backstory of the Toothdoll.
To create the mysterious and unreal environment, I firstly neglect the background. I create a world without border. And then, in my point of view, the flowing stuff usually is the easiest way to make unrealistic feeling, kind of anti-gravity. Because this background is showing the unlimited space, I need something to light it up. And then I set uncountable lanterns just floating inside the scene. And there also has hundreds and thousands of light balls that mimic the fireflies just coming out from an unseen floor and floating up higher and higher. I think this all can demonstrate kind of a black hole.

**3D Modeling and Texturing for Characters**

I started my characters modeling after I finished the animatic screening. Based on my past experiences I’ve learned from my second year project, I began with the standard procedure. I first sketched out the 3 different perspective images, the front view, the side
view and the top view for the reference. It’s not like the one I did in character design that includes the front view, side view and 3 quarters view.

With the reference, I can easily start modeling the characters. For simplifying my process, I modeled the rough shape with different joint parts of the body, and then I moved onto another 3D professional sculpturing application, Zbrush to finish the detailed model. This is also the experience I gained from my previous project. Zbrush is really a high-efficiency tool for dealing with the organic models.
**FIG G:** 3D character modeling 1) The topography of little boy; 2) The topography of Toothdoll; 3) Working environment with references pictures; the model is grandma

The most important thing within the entire process of modeling is the proper topography. This is also the technical part. I did a bunch of research on human anatomy. Even though, I had a solid drawing background, I still made some mistakes at first time, especially the joints of the characters’ fingers, neck and knees. I did a lot of revisions until I get the results showed as pictures above. I also did some tiny changes while I was working on the modeling. The original grandma design is without glasses; however, for showing her really aged, I added a pair of glasses with huge frames to her. I have my two protagonists with some decorated props on them at beginning, like the bracelets and rings. I want to make them much more tribal looking; however, because of the rigging problem, those decorations are all gone in the end. I think this is really a pity. But at least, they are still covered by clothing.
I find out that modeling in symmetrical mode, especially working on modeling organic anatomy is a high efficient way. This can almost save almost half of the working. I can finish the model in half firstly, and then I duplicate it and reverse it. The last step I do is to combine them together. The pros of this working process is that the model is going to be high symmetrical. This will make the characters look unnatural. So I always work furthermore on models after I finished the topography. I tweaked its shape to make it look not that perfectly symmetrical.

You will notice that all the models I did in Maya are all the same pose, except the Tooth-doll. This is because of the rigging. To make sure the Characters can be animated after the rigging, I have to keep them in the pose. This pose can ensure the moving will not break its body shape. This pose is kind of some medium position. Like the arm, no matter you move it up or down, forward or backward, the character will not be distorted.

After finish the models, I move forward to deal with its UV maps\(^2\). So to ensure the texture map works well with the model, we usually need do UV unwrapping first before painting the texture maps.

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\(^2\) UV mapping is the 3D modeling process of projecting a 2D image to a 3D model’s surface.
**FIG H:** UV mapping and texture mapping 1) The UV map of the little boy’s upper body; 2) The texture map of the little boy’s upper body; 3) The final result of the little boy’s model with texture map

The key to a successful UV mapping is to ensure the slit is not noticeable. So usually we will cut the model with mostly the hidden part. Like on the head, we usually cut from the back head, the back of the ears and also the back of the neck. Like under the arm or in-between two legs are also the best option.
Story Development

While I have already been working on the modeling, I spared some time to keep developing my story. Even I have already been in the formal production. I still did some change on my story. The original story you will find in my thesis proposal. Here I list my thesis film shot list. This is also the record of my revision of the original script. I broke down the entire film into sequential scenes one by one.

THESIS SHOT LIST3

DSc01 – Ushka wakes up and finds himself in a strange world. He tries to land on the ground, but he gets him fell down and break his tooth.

DSc02 – The shadow comes out and robs Ushka’s lost tooth.

DSc03 – Ushka chases the shadow. In front of the Toothdoll, there is no way to run away. They fight with each other. The tooth accidentally flies into the Toothdoll Toothtray.

DSc04 – The tooth grows bigger as the size of Toothdoll, meanwhile a new tooth grows up in Ushka’s mouth.

Sc01 - Ushka really wakes up. He finds his tooth is really loose.

Sc02 – Grandma tries to wear the false teeth

Sc03 – Ushka runs to grandma and shows her his loose tooth, and he unconsciously pulls it off from gum.

Sc02 – Grandma fails wearing her false teeth. She puts it back to container

Sc05 – Grandma leads Ushka to see the Toothdoll. Ushka is astounded because of the Toothdoll.

Sc06 – Grandma puts his teeth into Toothdoll

Sc07 – Ushka runs to check if his new tooth comes out, but nothing happens

3 The DS is short for Dream Scene.
Sc08 – The other day, Ushka goes to check his tooth.
Sc09 – At night, he sees his shadow and is really afraid of him stealing his tooth again.
Sc10 – He decides to get his old tooth back.
Sc11 – He knocks off the tray of Toothdoll and awakes his grandma. Grandma comes out and finds Ushka is standing there. But the shadow boy covers the tray. Grandma doesn’t notice it.
Sc12 – Grandma walks Ushka back to his bedroom.
Sc13 – Ushka finds the tray is already in his bedroom.
Sc14 – Grandma finds the Ushka’s old tooth. She gives up to scold him.
Sc15 – Ushka wants to put back the tray secretly. But he fails.
Sc16 – Ushka puts back the tray, but almost falls down. Grandma shows up and saves him from falling the chair.
Sc17 – Grandma shows him the old tooth and helps him put it back to the tray.
Sc18 – The boy put grandma’s false teeth into the tray.

Compared to my original script, you will find out that I added up a new beginning, the dream. It has 4 scenes in total to build up the backstory to demonstrate working rule of the Toothdoll.

Even though the story is simple and coherent enough, its quick pace weakens the relationship between the little boy and his grandmother.

**The Most Difficult Part: Rigging**

Rigging is the most difficult part in my entire production. I am not a technical person; however, you have to know especially, some coding will be better deal with the rigging. I definitely can rig my characters with my rigging skills, but the only problem is that when
I was involved in a hard time, like some unexpected problem pops out, I have no idea what cause the problem, no need to say how to solve the problem.

I have to seek for help from my senior. He helped me rigged the little boy with a plugin. And also he introduced me the plugin. So I tried to rig the grandmother, who has less moving in my film under his help.

The plugin is really high efficiency. After rigging, to ensure the move of those joints, I need paint the skin weight. The skin weight will decide how much each of the movements of the joints will affect the area of the skin surrounded. This is within my ability and knowledge compared to rigging. But the skin really does play an important role in animating. A good skin weight painting will give my character a nice unbreakable body. There is a technique in the skin weight paint I’d like to share. When I was working on the weight painting, I paint only one side, and then duplicate it. The key point is that make sure you locked the joints you have already finished painting.
One thing I need mention here is that I didn’t rig the Toothdoll somehow. In my original script, you will find out that there even has some acting for the Toothdoll; however, because of the tight schedule and also for the sake of highlighting the protagonists’ performance, I have to make the Toothdoll a pure statue then. This decision really saves me a lot of time.
PRODUCTION

After I get all pre-production well prepared, I then move onto my production stage. Before I get my final triumph of my production, I still keep down to my business to ensure the quality of my animation.

Animation

In Maya working environment, usually there is a standard working process. I also make use of this mature and safe way to animate my characters.

Firstly, I filmed live action for the references. This is a fast way to get a rough understand of the animation of each scene. I sometimes will add some performance into the live action footage to make it much more interesting. This footage can also serve as a rough measurement for the timing. Besides, I can easily to grasp the key frame of the entire motion. This live action footage is really better than just imagine the movement in the head. In addition to the live action footage, for some complicated scenes, I drew sketches to break down the movement into sequential poses. I usually took some time to do the research onto these poses to make sure they move based on the correct mechanical theory.

After I prepared the live action footage and the sketches, I moved onto animating in the application. Speaking of the animating, there are some rules everyone need obey to. Those previous masters working for Disney concluded all these principles. In my normal working process, I will animate my characters based on my references. I usually set it to Stepped Tangent at first time. So this can ensure there is no weird movement happened
during the entire movement. This is also what I called stepped animating with pose by pose. There is one thing need pay more attention on it, the rotation. This movement you have to take care of its degree. Sometimes, in a heavy daily task, you will ignore the parameter of the rotation; it will rotate over 360 degrees. And then after you spline it, the movement and the model will be distorted.

I think the most important for the basic animation is the anticipation. Every move has its anticipation. The anticipation can make your characters alive because it shows which power or force causes this movement. You can also regard the anticipation as a preparation for the motion. After that, I will keep my character’s move in an arc orbit. This can ensure the movement in a beautiful orbit, unless you need some abnormal movement. The slow in and slow out is also a shortcut to make the animation much more professional. Usually, after I finished the Stepped Tangent animating, I will change them into Spline Tangent mode in the Graph Editor in Maya. Even though this will add movements slow in and out automatically, I still need tweak those control tangents to make sure the movements are not too steady. The power of the movements is shown by its speed.

In addition to the technical part, before animating, I did some analysis on my characters. This is really important, because of the character’s feature. When I were animating the grandmother, I needed pay more attention on her slow but stable movement to show her age but still in a good condition. Even though story mostly plays the key role in a film, better animating means more characteristics on your characters. This will definitely improve your story in the end.
POST-PRODUCTION

3D Lighting and Rendering

3D rendering is the 3D computer graphics process of automatically converting 3D wire frame models into 2D images with 3D photorealistic effects or non-photorealistic rendering on a computer. 4

This is also the last step before the post-production; however, I didn’t spend too much time on it. When I started to light my scene and render them out, it’s already only had 2 weeks left. The lighting is not the difficult part; especially I don’t have any scene involved with any special lighting environment. Like the dream scene, I even didn’t put any extra light source in it, because there are a bunch of light just emitted directly from lanterns and those floating illuminated tiny balls. In most of the scene, I just make use of the standard lighting with main light source and one backlight to compensate the dark part. I need mimic the lighting environment as like in a room. I think the trick here is the shadow. The indoor shadows are not that sharp. They are kind of soft. To make sure the proper softness of the shadow, I have to try my best to maximize the parameters. This will definitely slow down the rendering, so I turned off the GI 5 but still keep the AO.

During the rendering, I came across some problems. Because those tiny balls are all designed illuminating, I turned on their illumination parameter. However, after I rendered

5 Global illumination (shortened as GI) is a general name for a group of algorithm used in 3D computer graphics that are meant to add more realistic lighting to 3D scenes. From Wikipedia Global Illumination
part of the scene to make a test, the light is over exposed. I then realized there must be some bugs in Maya. I have to render them into a different layer. I have had any experiences before to really render in layers, although I did layered rendering with AO\textsuperscript{6} maps. I firstly add each of those light balls into a separate layer; and then I also created a layer and duplicate everything left from the original layer into the new layer. I create a new shader applying to everything in this new layer. Finally, I get a layer I can use it during my compositing to create a layer mask. This can ensure the space, not every light balls floating in the front of the rest of everything in the scene.

**Titles and Credits**

Originally, I planned to have my title directly from a type font, just the pure title on it. Usually this is the safest way to deal with a title. I then realized this must be bored. I had once experience before for using pure type as my title in my second-year project. It does work but not impressive.

I tried design the title on my own in the end, especially when I find out that I still have plenty of time when I started composite my film. I had some graphic design background before. I still started to find a typeface at the beginning to fit for the film style. Because of the story and the theme, I need some cute and fun typeface, at least not too formal and serious. I tried to work in the Adobe Illustrator at first, because I want to have a high definition of image. And then I find out myself much more pursuit of some unusual

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\textsuperscript{6} In computer graphics, ambient occlusion is shading and rendering technique used to calculate how exposed each point in a scene is to ambient lighting. From Wikipedia Ambient occlusion
effect on the type. I switched onto Adobe Photoshop. I find my desired typeface that is sans serif with a curly shape in the end.

After I picked up the font, I then find out the very interesting thing is that the word TOOTH has two Os in it. Why not I make this much funnier? I can illustrate these two Os to make them like two teeth standing there. I finished this design in the Photoshop. And afterwards, I use the filter gallery to make the title a little bit more stylistic. The color white and bright yellow I chose is for compatible with the Toothdoll’s golden color. And then I put this title in a dark background. The story begins with a dream. I think this black background fades out with the boy’s eyes open. It will be more natural and smooth transition.

The title does not really take much time; however, I think the title, like me in my film, does also serve its function. It’s kind of the first impression to your audiences.
CRITIQUE

Throughout the entire production, I have received a bunch of useful advices and comments to my film. From very beginning, I started make up my story. I think the good advices are from my trip to Chicago, I got the real idea directly from the Field Museum. That’s why sometimes, I think we don’t have to communicate too much with people; we can try to speak to the nature and to the history. We can get far more knowledge and concept beyond most people have.

My committee chair, Peter Murphey always gave me valuable comments and suggestions. He is really a cutting edge in the animation education and professional. Beginning with the scriptwriting; he detailed the problems in my story, especially the logical problem of the appearance of the Toothdoll. He also helped me clean up the problems identified during the proposal. I didn’t pass my proposal the first time, we spent more effort to make sure my concept and story can pass the proposal in second time. After the proposal, even though, Peter is not 3D professional, but he gave me some suggestions about my artistic expressions to bring the work to a higher quality and have a unified style. I think the most important event was our weekly meeting. This really helped me keep on a smooth working schedule, which was why I was able to finish everything on time.

My senior graduate, Tang Tao also gave me a lot of suggestions. It's because of him; I can finally work on characters with an easy tweaking. He pointed out my problems on modeling, especially those fault topologies. I was not good at modeling characters follow up with the caricature at that time. Besides, he also offered lot techniques on rigging.
Even though, my characters in the end are all rigged via plugins, I still learned a lot from him.

I have participated into the animatic screening. I also gathered a lot of comments from various audiences, including students, alumni and professors. I still remembered at that time, I still got problem with the structure of my story. My audiences pointed out the problems of the presentation of the background settings. They even offered me some reasonable way of resetting the background to help tell the story more clearly. I think this helped a lot.

In addition to the animatic screening, I took part in the final thesis screening as well. From the screening, I got some more professional advices. I tried my best to simplify my story; however, it seems the story is still too compact to most of the audiences. Some suggested me do some more simplification, short film with higher quality. My film is around five-minute long, although it has been shortened already from a ten-minute idea; however, I am sure that the length still does affect the quality of my film, I had to keep up with my tight schedule. I even have to stay away from my bold and brilliant idea to make sure the film can be done. But the good thing is that the audiences still can understand the story and the theme of my film. This does work well in the end; especially the animation quality was really improved a lot.
CONCLUSIONS AND REFLECTION

During the entire production, the most exciting moment is when I got pass my thesis proposal; it’s really a big thing for me. If I couldn’t pass it, I would wait for another year. The first time I failed my proposal because of note taking issue I guess. Besides, this late idea also made my proposal committee members think I need some more time to refine it before they gave me a pass. My first proposal was just the second week after spring break. Two weeks usually is not long enough for a story to be well shaped. But still thanks to the second proposal, I caught the chance to start to visualize my characters and story while I was working on my story. I treated my thesis project as an approval for my two-year study. The first pass I got from my thesis proposal really means a lot to me.

This is the first film I did everything on my own, from the design to the production. We usually have a lot of options our school gave to us; but I chose to stay on campus to finish my project other than working home. I’ve gained a lot of help from my advisor and classmates. I think this is the biggest advantage work on campus. I’ve learned that learning online is the best option for further studying in animation industry. This is also the first time I watched hundreds of thousands of tutorials from Lynda, Digital Tutor etc., and I found the way for my future self-taught. The most important, studying is endless.

I was telling a story about the first-time experience of the little boy, and also the relationship between the little boy and his grandmother. I made up a virtual figure, the Toothdoll. With the Toothdoll, the story became more much vivid. This was also my special way to memorize my childhood. I cannot stop missing my wonderful childhood.
All in all, I am satisfied with the film I made. The result is not the best, but my pursuit is to make things better. I have learned a lot from this production and gaining wonderful experience.
ACKNOWLEDGEMENTS

Throughout the entire production with almost one-year span, I would like to thank to my fellows who offered me a great help.

My undergraduate study back in China mainly focused on 2D animation. Stop-motion is also one of my mediums as well. My parents really gave me great support to my thesis production. They always encourage me go beyond of my scope to explore more during my life. I set all the skills I acquired during my undergraduate aside and make use of 3D animation techniques to deal with my big project. However, from the first day I started my project, I was new to 3D field; I must thank to Tang Tao who offered me a lot of resources and materials covering every aspects of 3D animation production.

In addition, my committee members, especially my chair, Peter Murphey gave me a really big hand to help me steadily shape and solidify my story. And also because of our weekly meeting, his valuable comments and suggestions pushed me forward especially in my hard time. Peter also provided me with a non-copyright sound website, SOUNDSNAP, from which I sourced all of my music and sound pieces for my film. The other two committee members, Brian Larson and Mark Reisch also played an important role in developing my story from scratch to the final piece.

In the production, mostly I worked on my own, but speaking of the technical part of 3D animation, the rigging, I still need exterior aid. My mentor Tang Tao firstly helped me rig one of my characters. But the good thing is that he then introduced a very helpful plugin, which can achieve high efficient rigging to me. I would like to express my cour-
teously gratitude to him because of the importance of the rigging. Good rigging means the possibility of nice motion tweaking. I would like to thanks to my fellow classmate, Ying Xu who offered me some technical supports to my rendering. This is also a big challenge during my entire production. I will talk about this issue later in this paper.

Last but not the least; even though my classmates did not really put any effort into my project production, because of their encouragement and also some comments that helped me stay calm and to smoothly finish this project. I also thank to Mary Barnard who offered me a great workplace in her office. Thank to RIT School of Film and Animation, which has ensured I can stay to work on my project in various ways.
APPENDIX A

Original Proposal
The Tooth Doll

Thesis Proposal by Xiaodong Han

Masters of Fine Arts in Computer Animation
Rochester Institute of Technology
School of Film and Animation
Rochester, New York
March 2014

Approved for Submission by:

Peter Murphey, Thesis Chair
Brian Larson, Thesis Committee
Mark Reisch, Thesis Committee

School of Film and Animation

Date: March 18th, 2014
Title: The Tooth Doll
Producer: Xiaodong Han
Medium: 3D Animation
Budget:
Time: 10 Minutes

SYNOPSIS:

This is a story about a boy’s growing up and losing his first tooth and the lovely relationship between the boy and his grandmother.

RATIONALE:

In our childhood, we have important first-time events that we never forget. I’d like to recreate one of those experiences in my short animation again. A child’s innocence and naiveté is really important as they grow up. They are sensitive and feel the world in their own way.

During my spring break trip to Chicago. I went to the field museum, and I saw a lot of masks and dolls in the Amerindian Cultural hall. These dolls are really well designed but I cannot believe that they are not toys to children. Children can never touch these dolls, because they are divine, some sort of symbol of gods. The other thing I remember is in my childhood. When I got new teeth, my father always tells me I should manage these
old teeth well. If it’s a tooth from upper gum, I should throw it onto the ground; or if it’s a lower tooth, I should throw it over the house roof. Then the new tooth will come out. These interesting memory and experience help me come up with this story.

Based on my concentration, in this short film, I choose to focus much more on animating. The characters I choose are a 6-year-old boy and a 60-year-old senior citizen. It must be funny that people in different age should be in different mechanics in moving, and also performance.
TREATMENT:

Character Introduction:

Ushka: The protagonist, Ushka is a 6-year-old boy. Those big brown eyes are really a symbol of Ushka. He always shows his feeling outward with no hide.

Grandma: She lives with Ushka. Her hearing is not that good now. She is tall to his grandson at least in her grandson’s eyes.

Story:

One day in the morning, Ushka runs into Grandma’s bedroom. Grandma just gets up and wears her false teeth uncomfortably. Ushka looks nervous. He opens his mouth and touches his left upper front tooth, which is loose. Grandma grabs Ushka’s hand and goes to the huge hall room. Grandma goes to bring a cup of cold water to Ushka. Ushka keeps some water in the mouth to release the ache.

(In the middle of the hall room, there is a shrine and a poll. The shrine is right on the top of the poll. In the shrine, there is a smiling doll, which is called Tooth Doll sitting inside behind the curtain.) Grandma lifts up the curtain to show Ushka the doll. Grandma shows the empty mouth of the doll. (In 2D Animation: A boy grabbing his tooth and puts it into the Tooth Doll mouth. The Tooth Doll shrinks and jumps into the boy’s
mouth. The Tooth Doll plants a new tooth seed in the gum. The new tooth sprouts and grows up.)

The doll is kept in the shrine, which is higher than Ushka. Ushka jumps up. He wants to reach at the doll. Grandma stops him. Ushka is so excited. Ushka doesn’t notice that the doll has one foot broken. Of course in his height, it’s hard to see the broken foot.

At night, Ushka is sneaking into the huge hall room. He is looking at the doll on the top. After thinking for a little while, he moves a high chair near the pole and climbs onto the chair. He lifts up the curtain. Ushka tries to put his tooth inside doll’s mouth. The doll suddenly comes alive and blinks its eyes. The doll jumps off the shrine and lands onto the chair where Ushka stands, and makes a funny face at him. Ushka bends and tries to grab the doll, but the space is too narrow; the doll is hit accidentally and falls down on the floor. The doll is injured and massages its foot. Ushka jumps off from the chair but slips and falls down onto the ground either. He suddenly wakes up to discover he was just dreaming. He is tired and hits the pillow again.

The next morning, Ushka is standing in front of mirror and nervous. He finds his tooth missing. He rushes into the hall room and moves a chair to check the tooth doll. He sees the broken leg. The doll even does not smile. He recalls the doll looking at him with sad face. His grandma comes into hall room and wearing her false teeth. She makes Ushka off the chair. Ushka points at the place where his tooth is missing. Grandma finds the missing tooth, which Ushka bring it inside the hall room accidentally nearby the statue
poll. He doesn’t notice his missing tooth is stick onto his wearing, and falls down onto the floor nearby the statue poll.

Ushka is now really afraid that his new tooth will not grow in. Day after day, he goes to the mirror to check it. After almost four days, nothing has grown in.

Finally, he decides to find some glue to repair the doll. He goes back to his room and pulls a box out from under the bed. Ushka shows grandma his dream. Grandma is smiling. Grandma helps him use the glue to repair the doll’s foot.

The other morning, Ushka is so excited, because his new tooth sprouts. His grandma is still sleeping. He doesn’t want to wake her up. He looks at her side table and sees her false teeth in a glass.

In the film’s last shot, the camera focus onto the tooth doll. The false teeth are inside doll’s mouth.
### BUDGET:

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Year 2014
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Treatment & Script
April
Proposal
May
Character Design & Set Design
June
Storyboard & Animatic
July
Modeling & Rigging
August
Facial Rigging & Rig Test & Blocking
September
Blocked Animation Screening & Revision
October
Final Blocked Animatic
November
Splining Animation
December
Playblasting Animation
Year 2015

January
Refining Animation & Screening

February
Texture

March
Lighting

April
Rendering & Compositing

May
Color Correction & Foley