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Jerry Fireman: Modeling Characters for a 1930s cartoon

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Fine Arts
Digital Production Arts

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by
Matthew Joyner
May 2021

Accepted by:
Dr. Eric Patterson, Committee Chair
Dr. David Donar
Dr. Victor Zordan

Abstract

Jerry Fireman is concept for a 3D animated cartoon that is based on the style of early 1900s cartoons. It is inspired by the pioneers in early animation, Fleischer Studios and Walt Disney, and designed with the intent to educate people on the social and political environments that influenced the production of cartoons during the 1920s and 30s. During the development of this concept, I investigate different modeling techniques to represent the main stylistic elements of these early animated drawings in a 3D form, and I compare the possible modeling workflows for advantages and disadvantages in this process. In this document I present a summary of the period of influences and my design and models. Rendered poses are also included as a proof of concept.

Artist Statement

I am captivated by the process of creating empathetic characters that connect with people. The type of characters that fascinate me the most are from the style of early 20th century cartoons because of their hyperbolic movements and purity of design. My intention is to dig deeper into the origins of these characters and discover how they were influenced by social and political forces. This genre is a byproduct of the time period of its creation, but it can be universally applied to modern day entertainment. Through my research and practice, my goal is to demonstrate this genre's place in contemporary industry and culture.

In the process of creating my characters, I was influenced by Max Fleischer and Walt Disney because of the expressive movement of their characters. The fluid and exaggerated movements of a character like Mickey Mouse, for example his dancing in Steamboat Willie, is what gives him more emotion. A character that lacks fluidity tends to be more robotic, static, and ultimately less interesting. I am heavily influenced by the simple and pure design of these characters that enable the animator greater expression through articulation of squash and stretch.

Digital modeling lends itself well to creating characters in the style of the earliest cartoons. The many tools used in this field can help create stylized characters that use exaggeration and surrealism. Personalities are important to developing characters and being able to to use squash and stretch makes them more expressive. Without such fluidity a character like Popeye would not have been as successful as he was. *Popeye the Sailor* is known for highly exaggerated and ridiculous fight sequences. Without the ability to squash and stretch, the show would not be nearly as entertaining. Through my work I wanted to show that this style has a place in contemporary entertainment. It is my hope that people will realize that the tools used in animation can further enhance the animating style used by Fleischer and Disney.

In my work I have created three original characters. Each has their own unique personality

and design that was influenced by Fleischer and Disney. I used different modeling techniques in order to see which is best to recreate this unique style. I created one character each to test polygon modeling, box modeling, and digital sculpting workflows for this style of 3D character adopted from the early 2D styles. It is my hope that with this work, we can create creative and emotional characters by combining early animation with modern animating tools.

Acknowledgments

I would like to thank my parents for their continued support.

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Chapter 1

Background

Growing up, I thoroughly enjoyed watching cartoons. I remember the days of waking up on Saturdays and watching cartoons for hours. I had my favorites on Cartoon Network, like *Courage the Cowardly Dog* or *Ed, Edd, and Eddy*. I also enjoyed the Boomerang channel which showed some of the older cartoons, like *Tom and Jerry*, *Scooby-Doo*, and the *Looney Toons*. These were some of my favorite shows that I could watch endlessly. My parents like to tell a story every once in awhile. One day when I was very little, both of them were not feeling well, so they decided to take a nap for a few hours. To keep me entertained, they put me in front of the television and put on some cartoons. They swear that when they came back, I had not moved an inch. According to them, I was hooked on cartoons ever since then. Cartoons are part of the reason that I pursued a more artistic career. I am interested in being a part of something that can create joy like those cartoons could.

I first realized that I wanted a career that is both technological and artistic in high school. Until then, I had taken plenty of the traditional art classes, which were some of my favorite classes. I enjoyed expressing myself through my art and creating whatever I wanted. In high school, I enrolled in two courses, Digital Imaging and Digital Multimedia. In these courses we used two programs, Adobe Flash and Photoshop, to make very creative images and animations. Unfortunately, Flash is no longer supported by Adobe, but to this day I still use Photoshop. My time in these courses influenced me to pursue a computer science degree with a minor in Digital Production Arts at Clemson, and to enroll in Clemson's masters degree program.

My time at Clemson has further refined and narrowed my interests in such a broad field. I

immediately knew what I wanted to do as soon as I started my Digital Production Arts minor. I took a class that was a basic overview of Autodesk Maya, and I knew then that I wanted to learn more about digital modeling. Video games and films also influenced this decision. Whenever I watch movies or play games, I sometimes wonder how digital assets are made. I like to ask myself how I would model objects that are used in games and film. I like to visualize an object and break it down to its basic components to try and see how it would be modeled. This is what got me interested in digital modeling for a career. The masters program has been beneficial to honing my modeling skills. I have learned a lot from the courses I have taken, for example the digital sculpting class and both the production classes. It is my hope that the work shown here is a culmination of the knowledge that I have gathered over the years.

The work that I have done is designed to start a conversation on serious topics. The idea for this cartoon originated a few years ago. I had read that Warner Bros. had started adding disclaimers to the beginning of their cartoons. The disclaimers said that these cartoons contained racial stereotypes that were common during the era of the cartoon's creation and to edit them out would seem like Warner Bros. is ignoring these issues. This is the purpose of my work, to recreate the style of early 1900s cartoons using modern tools and to bring awareness to the many factors that originally shaped these cartoons. I hope people learn more about the time period that revolutionized animation, and I believe the setting and characters of my work accomplish this.

During the brainstorming stage it did not take long for me to decide on the concept for the setting. An urban environment is perfect to showcase this time period because the cities experienced the best of times with the Roaring Twenties and the worst of times with the Great Depression. With this setting, people could learn much about the cultures and problems that could be found in an early 1900s city. For the characters that would be the focus of my work, I made it so that they could interact with many people. I also chose to explore the types of characters that could be found in early Fleischer or Disney cartoons. These shows usually have human characters as well as anthropomorphic animals and objects. That is why I created the concepts of a fireman, Jerry, and his companions, Sparky and Red, a talking dog and firetruck. In the concept these three characters travel to many places within the city, have many interactions, and can get a glimpse of the lives of everyday people in this era.

Chapter 2

Influences

2.1 Artists

Years ago, I read an article about how Warner Bros. was putting a disclaimer before their cartoons. This disclaimer would let audiences know that these cartoons have prejudices in them that are from the time they were screened. They did not want to ignore or censor them because they would be like claiming these prejudices did not exist [29]. I have often wondered if it is because of these prejudices that we do not see much of the old animating styles in modern entertainment. My work, *Jerry Fireman*, is meant to show people that the animating styles of the early 1900s do have a place in modern entertainment and can be used without the associated cultural biases of the time.

The inspiration for my work came from one of the most important people in animation history, Max Fleischer, born in Austria, 1883 [21]. He was an important figure in the early days of hand drawn animation. Not only did he advance this industry artistically but also technologically. Perhaps his most important invention is the rotoscope technique. Max and his brother Dave created the rotoscope technique as a shortcut to animating because it "allowed for the tracing of live-action film" [36]. They could then use those tracings as a foundation for character animation. This was mostly used on the Koko the Clown series where Dave would dress up as a clown for the reference live-action footage. This enabled Max and his brother to animate more fluid movements and produce a higher quality animation in a time when cartoons were entertaining but difficult to watch. Though Fleischer studios moved away from this technique in later years, it was still used for animating dance sequences in later productions.

Artistically, Fleischer is best known for pioneering what is known as the east coast style of animation. The east coast animating style was a popular animating style used from the 1920s to mid 1930s. It is well known for its "bouncy and stylised themes, both in visuals and content, allowing for great artistic licence when it comes to adhering to silly things like physics or social norms" [11]. One of the defining characteristics is the "rubber hose" limbs of characters. This style was used in order to animate efficiently and to avoid character stiffness. Characters would move with a sort of rhythm and flow, and they would always be moving to keep the audience engaged. These cartoons would also be accompanied by popular music of the time. Added music helped to "enrich the other-worldly atmosphere" of the characters[2]. Thematically, this style had more adult themes and innuendos than the west coast animating style. These films were tailored to more adult audiences because, unlike the west coast, they had "human characters that dealt with adult concerns, including employment, sex, and death" [22]. All of this together is what defines the east coast style of animating used by Fleischer Studios. It is this style that I emulated: one that creates surreal characters that the audience can enjoy.

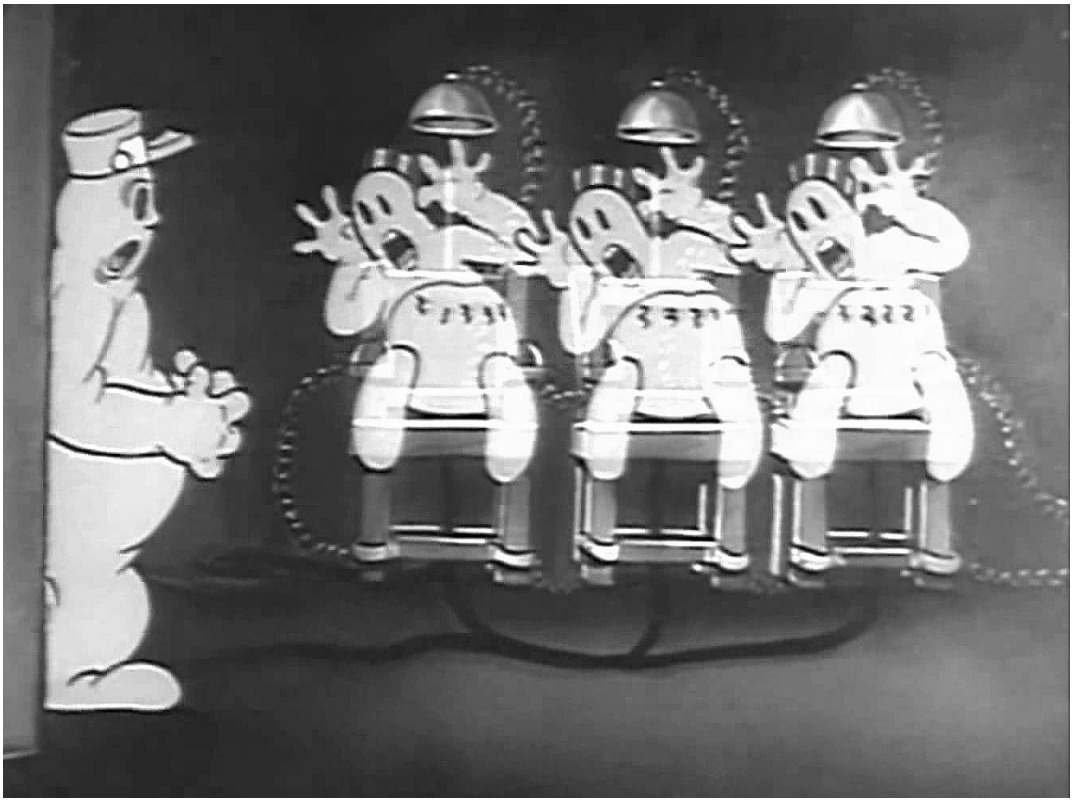

Figure 2.1: Adult Imagery in *Minnie the Moocher* by Willard Bowsky and Ralph Somerville [3]

Another important artist influenced the artistic direction of my work. Walt Disney, born in 1901, allowed me to conceptualize non-human characters [34]. Unlike Max Fleischer, his work defined the west coast style of animation, which focuses on more rural settings and characters. Most cartoons that were created on the west coast involved farm land as the setting. This was because many prominent individuals from the farms of Kansas City, M.O. moved out to Hollywood with Disney. Also during this time, many people left the urban centers of the east for the open farmland and nice weather of California. These things attracted many "directors, actors, writers, producers, and technicians when short days and cold settled upon the original film centers of New York, New Jersey, and Chicago", including Disney[18]. Because the west coast style had a very rural orientation, characters in these cartoons were mostly barnyard animals. While both styles had animal and human characters, the west coast studios were more likely to "keep using animals as continuing stars", and Disney was no exception [22].

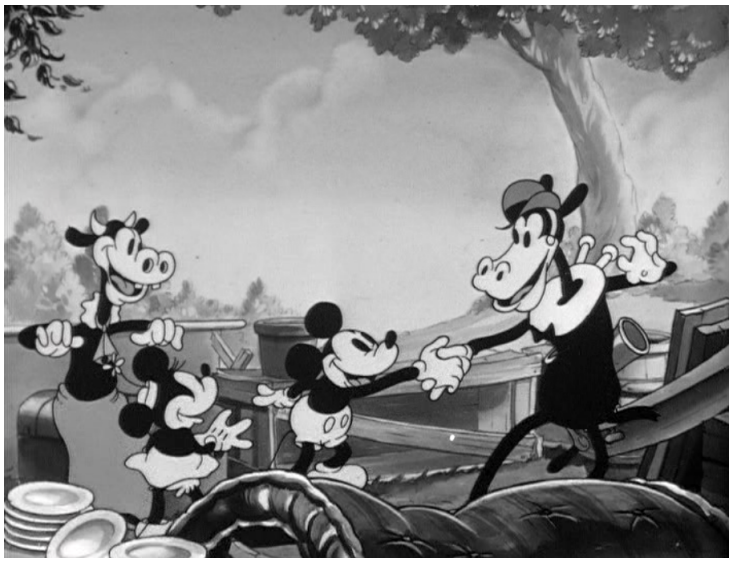

Figure 2.2: *Mickey Mouse* by Walt Disney and Ub Iwerks [9]

One notable difference between these two styles of animating is their themes. The New York style had adult themes and was geared towards an adult audience. The west coast style of animating was more tame and was meant for children. This is largely due to the Motion Picture Production Code of the 20s and 30s. This was used by studios as a "means for self-censorship to avoid state censorship" [25]. This was not heavily enforced until the mid-1930s, but studios, including Disney, made it a point to keep the cartoons kid friendly.

Even though these two styles have many differences, they do share the rubber-like movement and sound synchronization created in the very late 20s. This is evident is some of Disney's first creations like *Steamboat Willie* and *The Skeleton Dance*. Both use music to enhance the rubber-like animation "to take on a stylized grace, most evident when several identical skeletons are dancing identically" [1](Figure 2.3). Like Fleischer's animations, it was this rubber-hose movement that inspired my design, but I also looked at Disney's animations to see how they designed non-human characters.

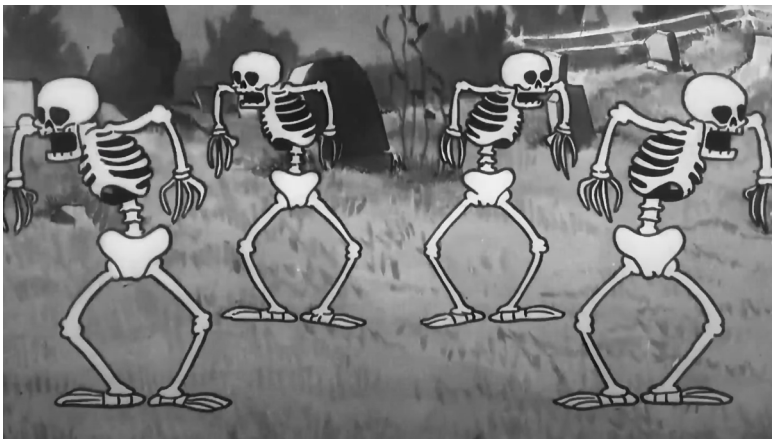

Figure 2.3: *The Skeleton Dance* by Walt Disney and Ub Iwerks [10]

2.2 Historical Context

The east and west animating styles offer a glimpse of the social and political history of the time of their creation. Disney's work is more light hearted while Fleischer's work has more serious undertones. The conceptual setting of *Jerry Fireman* gives a more accurate representation of the 1930s. I chose a 1930s urban environment because it reflects both the height of Fleischer Studios as well as the height of the Great Depression.

The 1930s are often referred to as "The Golden Age of Hollywood". This is because Hollywood managed delay the effects of the Great Depression on the film industry for a few years. Many people watched films as a way to escape the hardships of life. Movie tickets were inexpensive, so "attendance for films in 1930 actually outnumbered those in 1929" [26]. People looked at movies as a way to experience some positivity during the Great Depression. This led many film studios to experiment with new genres.

This also led studios like Fleischer and Disney to make their cartoons as entertaining as possible. People watched their cartoons to get away from their struggles for a short time. Many films at this time were more positive because "very few American films of the 1930s dealt with the plight of the poor" [28]. Only the gangster films of this era depicted people who come from poor surroundings. Even though Fleischer did not directly depict poor people in their cartoons, they were still set in dirty and gritty environments, reflecting common conditions of the Great Depression.

The music used in these cartoons also offered a glimpse of society during this time. Disney was more of a traditionalist and appreciated classical music more than the surging jazz genre. With the creation of music synchronization in film, Disney saw it as a way to expose classical music to a large audience. This culminated in his *Silly Symphonies* shorts, "which were conceived to showcase more self-contained musical scores" [5]. Though Disney was more drawn to classical music, he still appreciated the audience's taste for more popular music. His *Silly Symphonies* showcased classical music while the *Mickey Mouse* series used jazz.

Fleischer Studios was more welcoming to the Jazz genre during this time. Jazz was experiencing its height in popularity during the 1930s and cartoon studios got caught up in the craze. Many studios used jazz as background music for their cartoons. However, Fleischer studios was different. Fleischer studios treated jazz "not as background, but as a musical genre deserving of recognition" [17]. Their cartoons featured many prominent jazz artists, and because of rotoscoping, some even appeared as cartoon characters. Many artists benefited from the exposure, including artists like Louis Armstrong and Cab Calloway.

Figure 2.4: Cab Calloway in *Minnie the Moocher* by Willard Bowsky and Ralph Somerville [3]

Though these cartoons brought joy to many people during this time, we cannot ignore the horrible aspects of 1930s cartoons. One of the things that is closely associated with this type of animating style is the use of negative racial imagery. Since jazz was the primary music choice of animating studios, animators wanted to make it clear that jazz is to be associated with African American culture. Many studios, Fleischer and Disney included, would use jazz in the cartoons, and it would often be accompanied by racial imagery. African American characters would appear, but their design would be heavily influenced by racial stereotypes. Plots would often involve "white characters leaving the shelter of their homes to visit the exciting but dangerous environments of the characters played by black musicians" [24]. In the Betty Boop short *I'll be Glad when You're Dead You Rascal You*, Betty, Bimbo, and Koko explore the jungles of Africa and encounter native Africans while music by Louis Armstrong is playing. Obviously in today's society, these depictions are completely unacceptable. If we were to use this style today, people must understand that racism is a part of its history. It's a part that cannot be repeated, but it also cannot be ignored. Also, this style can be used without the biases of the time.

Another negative associated with this era of animating, is the depiction of female characters in these cartoons. Often, cartoons of this time had male main characters and female characters they had to rescue. Female characters were depicted as overly sexualized and in need of rescuing. In her own show "Betty is a working woman constantly subjected to rape attempts by her employers" [19]. Other characters, like Minnie Mouse and Olive Oyl, are also constantly in need of rescuing. The occupations of these characters also show the difference between men and women of the 30s. Female characters are depicted as being more "stereotypic, performing domestic duties and acting cutes" [27]. Minnie Mouse and Olive Oyl fall into this category.

I bring up these things because it is important for people to know what contributed to the formation of the rubber hose animating style. People should know what factors, both good and bad, influenced this style. With this knowledge, I hope people can appreciate this style more and are more open to it.

2.3 Cartoons

While doing research, I referenced some of the famous works done by Fleischer and Disney to guide my character designs. *Koko the Clown* focused on two main characters, Koko and his

friend Fitz, and how their relationship drove the story [14]. *Betty Boop* makes use of non-human characters and how they interact with human ones [7]. My characters would need to squash, stretch, and bend, and I feel that *Popeye the Sailor* provided the best reference for that with the exaggerated fights that are common in the show [4]. *Popeye the Sailor* also provided a good example of a strong male lead character. For additional character reference, I looked at *Mickey Mouse* because most of the characters used in the show are non-human [9]. Additionally, I also referenced a more recent work that draws inspiration from the Fleischer Studios animating style, and that is the video game *Cuphead*[6].

Koko the Clown is a Fleischer Studios production that uses character relationships to help drive the story. Koko and his friend, Fitz, often get into a lot of trouble. This is sometimes caused by them fighting with each other, or they break the fourth wall and fight with Max Fleischer. How they break the fourth wall creates interesting visuals and story lines for the show. The interactions of these characters influenced the type of personalities I created in my characters.

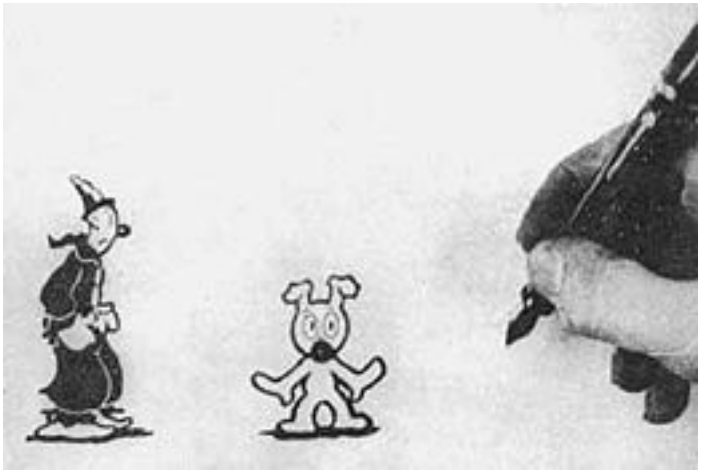

Figure 2.5: Koko the clown and Fitz by Max Fleischer [14]

Betty Boop showcases a lot of non-humanoid characters. When Betty Boop first debuted, she also was not human. She had dog-like features until censorship laws forced a redesign. Betty was not the only anthropomorphic animal character to appear on the show. Her closest friend, Bimbo the dog, shared in many of her adventures. Fitz, from *Koko the Clown*, was taken and converted into Bimbo, and he was marketed at the time as Mickey Mouse's rival.

Popeye the Sailor provided the best examples of rubber hose animation. The fight anima-

tions are goofy and exaggerated to keep the audience entertained. Because of the nature of my characters, it was important to note how these characters move and interact physically with each other. Popeye also showed a good example of a heroic main character that I could base my character, Jerry, off of. Popeye has heroic qualities that I would like to incorporate into my characters personality.

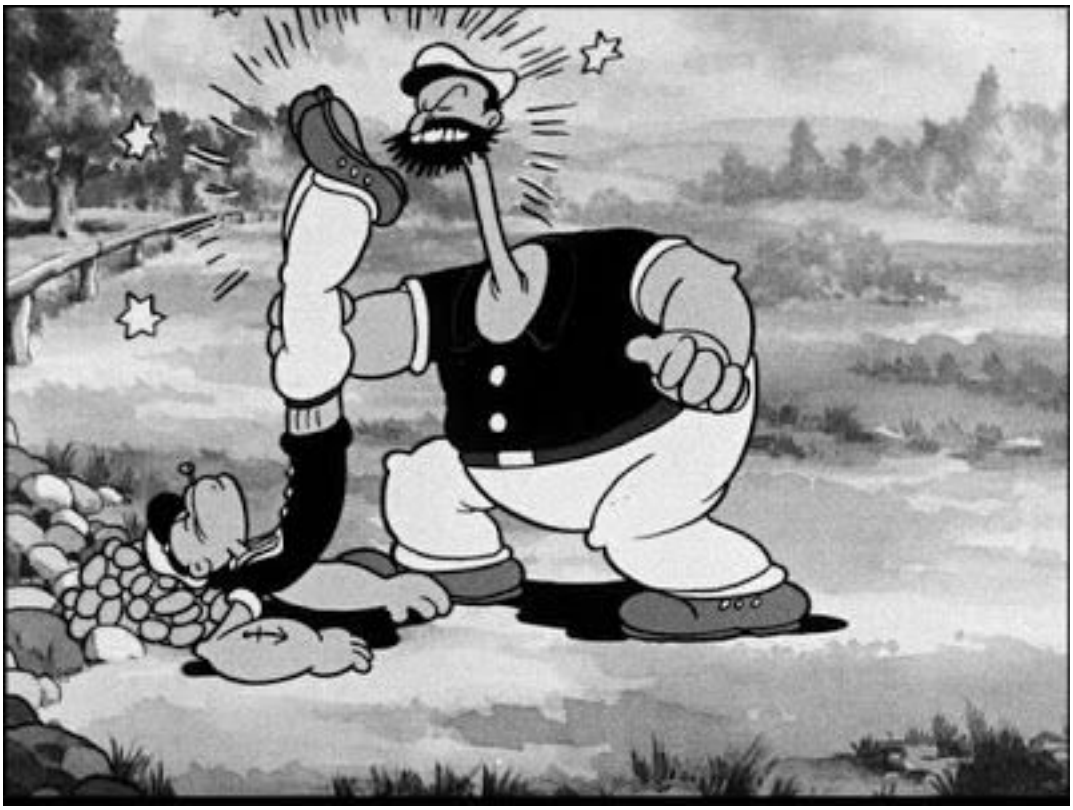

Figure 2.6: *Popeye the Sailor* by Willard Bowsky and William Sturm[4]

Like *Betty Boop*, *Mickey Mouse* also has reference for many non-human characters. Because Disney used the western animating style, there are no major human characters throughout this show. Many of these animal characters are drawn with very simple shapes. It is that simplicity that I chose to maintain throughout my work.

The video game *Cuphead* is a more recent attempt to recreate the east coast animating style of the 30s. The developers made *Cuphead* in a similar fashion to the 30s cartoons. Since it is a 2D sidescroller game, the backgrounds and animations were all hand drawn. The characters cycle between animations to recreate the repetitive animations of old cartoons. Like the Fleischer

cartoons, *Cuphead* deals with adult themes and motifs. For example, the main characters must do tasks for the devil because they lost their souls to gambling. *Cuphead* is a perfect example of how this style can be used for entertainment today.

Figure 2.7: Cuphead and the devil by Chad and Marija Moldenhauer[6]

2.4 Premise

The basis for the narrative is Jerry and his friends, Sparky and Red, are firefighters in a large city. With this as their occupation they are able to meet and interact with many different people. They would be exposed to 1930s city life and how it affects people. They would see how the issues of this time would affect people of all walks of life. These characters are meant to be the audience's point-of-view into this world.

Jerry Fireman is meant to be an educational experience as well as an entertaining show. With it taking place in a 1930s urban environment, it is meant to show audiences a slice of life of this time period. The goal is for people to learn why many cartoons from this time period have adult content in them. Through character interactions, people learn about the social and political factors that shaped the era in which these shows were developed. Like the works of Fleischer and Disney, *Jerry Fireman* is a social commentary that creates discussions about the issues surrounding the 1930s and how they were portrayed in entertainment. Even though certain elements of this style,

like hyperbolic movements, have survived in more recent shows, for example *The Looney Toons*, hopefully, with this exposure, people will be more welcoming to this art style in its entirety.

Chapter 3

Production Design

3.1 Character Profiles

I began the process of working on *Jerry Fireman* by developing the personalities of my characters. This in turn, would influence their visual design within this style. In order to really flesh out the characters' designs, I needed to develop their personalities. I referenced the book "45 Master Characters", by Victoria Lynn Schmidt in order to create a basis for each of my characters. These personalities would influence my characters' mannerisms and how they carry themselves, which in turn influences how they are designed and posed.

I chose the main character of the show, Jerry the fireman, to be a heroic figure. I felt that the messiah character profile was what I was looking for in a heroic character [32]. The messiah is a type of character that will care for himself as well as others. He has a clear goal of saving people and will do anything to accomplish it. His greatest fear is that he will have to watch other people suffer. As the messiah he will face temptation. For comedic effect, I gave Jerry a smoking addiction, and sometimes him smoking on the job gets the better of him. The messiah stands up for his beliefs no matter the cost, and he is willing to sacrifice himself for the good of all. This is the definition of the messiah character profile and is the groundwork for Jerry's personality and motivation.

As a fireman, Jerry is very committed to doing his job. He cares for others and will do his best to save people. This is a result of his troubled past. He lost his mother to a fire, so he became a fireman to make sure other families do not go through the same thing. He also has some weaknesses that he has to deal with. He is very clumsy because of his size and he likes to smoke. This leads to

Jerry having both internal and external conflicts. When Jerry is trying to put out a fire, he makes the situation worse before it gets better because of his clumsiness. He also has to battle against himself because he is not able to overcome his smoking addiction. These weaknesses are what makes Jerry a static character. Throughout the course of the show, he will never learn from his mistakes, and he will never change. I drew inspiration for Jerry from characters like Bluto and Wimpy from the Popeye series. Both of them remain the same characters throughout the show. Bluto is always the bully no matter how many times Popeye beats him, and Wimpy is always addicted to eating. When making Jerry's personality, I decided to make him heroic, but also to have flaws that can be exploited for comedic effect. His clumsiness and happy attitude makes him seem like a jolly character. This influenced his design by making him overweight to exaggerate that clumsiness.

The next character, Sparky the dalmatian, is Jerry's sidekick and friend. I chose an animal friend because there are many examples of animal companions in old cartoons. For example, there are Koko the clown and Fitz, Popeye and Eugene, and Betty Boop and Bimbo. I believe the master character that best fits what I am looking for in a sidekick character is the best friend [30]. The best friend acts as a confidant for main character. He is always there ready to help the hero. He loves the hero and wants to be there for him. One of the negatives usually conveyed in the best friend character type is that the best friend is usually jealous of the main character. Sparky is jealous of Jerry because Sparky is a dog, and people take Jerry more seriously when they are trying to do their job. This leads to many conflicts between the two.

Sparky is very loyal to Jerry because of their shared history. Due to his small size, he grew up with parents who were always concerned with his safety. One day he met Jerry, who showed him the life he could have where he risks his life to save people. Sparky left with Jerry and wants to become the best fire dog in the city. However, he has trouble doing his job because of his size. He cannot use most equipment properly, and he is not taken seriously by bystanders. Because of this, he has a bad temper and will lash out at anyone who mentions his size. All of this is what drives his character arc. In the beginning of the series he struggles to perform, but as the show goes on he finds many creative ways for someone of his stature to do his job. In the end he just wants to gain the respect of Jerry and the people he saves.

The third and final character, Red the firetruck, is also a companion to Jerry and Sparky. With Red, I chose to represent a type of character that is common in early 1900s cartoon, the anthropomorphic object. Often in these cartoons objects will acquire human qualities, so I chose

to make one of my characters to be an anthropomorphic object. For this character I decided to create a personality that is more carefree and free spirited. I believe the master character, the fool, best describes Red [31]. The fool enjoys playing around and is more child like. He cares about his freedom and comes and goes as he pleases. Red will go wherever he wants often distracted by something, and he will have no problem leaving others to do the work. This makes others think of him as if he has the mind of a child.

I feel the most connected to this character because, like me, Red is very introverted. His backstory is that he has always been shy ever since the day he was built. He became afraid of everyone around him until he met Jerry and Sparky because being around them calms him down. Because of his free spirited nature and his shyness, he has trouble with helping Jerry and Sparky put out fires. He will either get distracted by the littlest of things and wander off, or he will get stage fright from people gathering around. This leads to a conflict within himself because he faces certain situations where he must overcome these flaws in order to help his friends. In the end he will always rush to aid Jerry and Sparky.

3.2 References

These characterizations would be combined with reference material to influence design choices in my concepts. I looked at many cartoon character sheets, which are drawings of a character in multiple poses, in order to help influence my design. I chose character references that would help me to maintain the simple forms shown in these cartoons. I believe that because these characters are made of simple shapes, they can be translated easily into a 3D medium. The bodies and heads of 1930s characters are almost spherical, so they can easily be recreated in 3D modeling software. The arms and legs can also be translated well because they are very cylindrical. As for a character like Red, many of the his components can be made out of simple polygon primitives, which will be discussed later. I also wanted to get references for character poses. I wanted to see how the artist would use squash and stretch to make their characters more expressive. I looked for character references that uses the entire body of a character in a pose.

For Jerry, I looked for overweight characters. From Fleischer Studios, I used Wimpy and Bluto as reference. The earlier versions of Bluto were more muscular, but during the 1940s his design was changed so that he had more of a gut. The pear shaped bodies of these two characters matches

really well with the personality I gave Jerry. This body shape gives off a "jolly" impression from the character, which I incorporated into my designs. Wimpy's mannerisms and the way he walks also plays into that jolly impression. Other references include Mr. Bumble from *Mr. Bug goes to Town*, and Pete from Disney. Both of these characters had similar body types that could tie in well with role model traits that I wished to convey in my character.

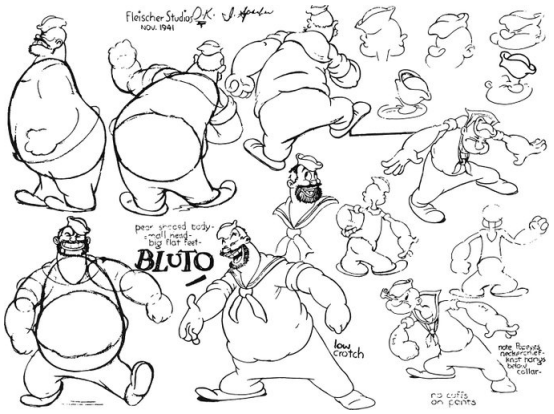

Figure 3.1: Bluto character sheet by Isador Sparber[35]

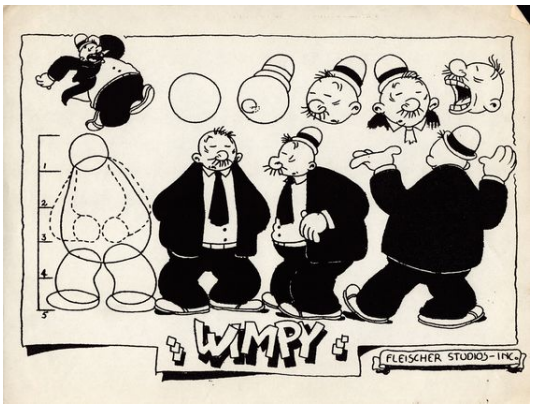

Figure 3.2: Wimpy character sheet by Elzie Segar[33]

For Sparky, I was looking for mostly animal characters. I got a lot of inspiration from the character Bimbo from the Betty Boop series. I was drawn to the big eyes that he has as well as the glove hands that are typically seen in old cartoons. These characteristics help to convey a more friendly appearance. I also referenced other Fleischer characters like Pudgy from "Betty Boop", Eugene the Jeep from "Popeye", and Fitz from "Koko the Clown". Fitz influenced more of Sparky's

personality because he is a bit mischievous. Outside of Fleischer Studios, I also drew inspiration from Mickey Mouse from the original "Steamboat Willy" cartoon and Andy the panda, who was created by Walter Lantz. I used the body shape of these characters in my design to create a rounded body made of simple shapes.

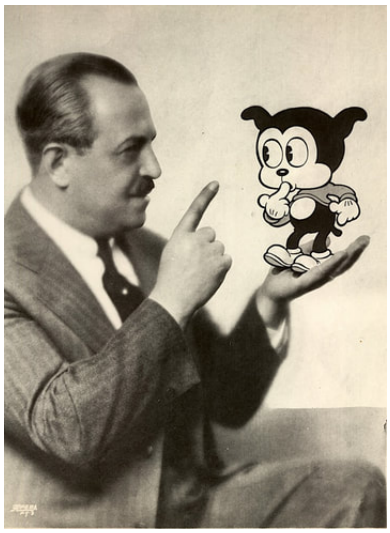

Figure 3.3: Bimbo and Max Fleischer by Max Fleischer[15]

Figure 3.4: Fitz character sheet by Max Fleischer [13]

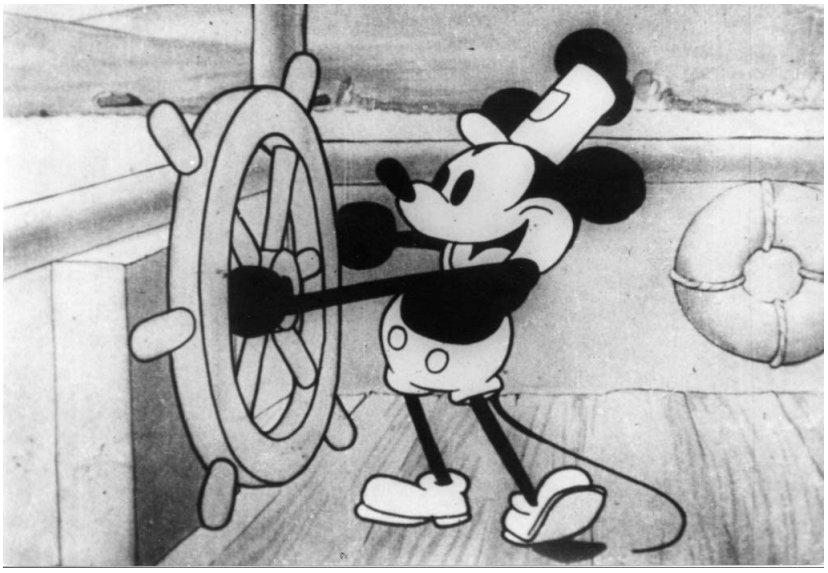

Figure 3.5: *Steamboat Willie* by Ub Iwerks [9]

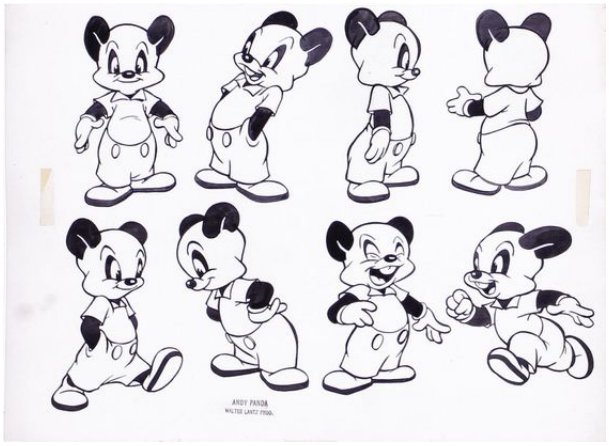

Figure 3.6: Andy Panda by Walter Lantz [23]

Red was a bit more difficult to find related references because there are not many main characters in early cartoons that are vehicles. There are examples of vehicles taking on human characteristics when a character interacts with them. Most of my references came from specific episodes of "Betty Boop" and "Mickey Mouse". In the episode of "Betty Boop" titled "So does an Automobile", Betty works at a repair shop that is more like a hospital for cars. In the episode all the cars are alive and have varying ailments. From this episode, I was able to get a wide range of facial expressions for a character that is a vehicle. I was also able to see how these characters have

human like qualities by using headlights for eyes and the bumper for the mouth. They also used the tires for hands and feet. In the "Mickey Mouse" episode called "Mickey's Rival", Mickey's rival. Mortimer, tries to impress Minnie with his fancy new car. To summarize the episode Mickey's car, which is older tries to outperform the newer car and help Mickey win Minnie back. This episode shows how the parts of a vehicle can be used to create facial expressions.

Figure 3.7: *So Does an Automobile* by Roland Crandall and Frank Kelling [8]

Figure 3.8: *Mickey's Rival* by Wilfred Jackson [20]

I also wanted to get some real life references to help with the design of my characters. Since

the cartoon is set in an urban 1930s setting, I researched what firemen wore at the time. I noticed that firemen during that time period wore trench coats and overalls, so that influenced the design of Jerry's clothes. I also looked up firemen hats to give the design for Jerry's hat some reference. I did not use any real life references for Sparky. I used the design of characters like Mickey Mouse and Bimbo, who have very minimal clothing. As for Red, I referenced a 1930s firetruck in order to get the base for what Red should look like. I also referenced a hand crank siren and a brass bell to add some accessories onto Red. These real world objects really helped to finalize preparations before beginning the concept art phase of my work.

3.3 Concept Art

When designing the characters for this cartoon, I chose to maintain the style of early 1900s cartoons. This style makes use of simple shapes within the character design and I made sure to take that into account when making the concept art. For example, Jerry's silhouette is comprised mostly of circles translated into spheres for the 3D representation. He has a happy or jolly personality, and that is reflected in his design. I also made sure to include features that defined the early cartoon style like big glove hands, big eyes, and other exaggerated features. These design choices are meant to use shape theory. The large and round features of this style is meant to create characters that appear friendly to the audience.

Admittedly, my first concept drawing for Jerry was not the greatest (Figure 3.9 and 3.10). Really the purpose of the first concept drawing was to get the idea onto paper. Then I looked into the references and started again. For my next iteration, I started with recreating Bluto's body as a base. I then used Wimpy's head as a guide for Jerry's head. I used Wimpy because I believe he and Jerry have similar personalities and would share physical characteristics. Then I gave Jerry the glove hands and big feet. Finally, I finished off the drawing with the fireman's clothes (Figure 3.12). The most important feedback I got from this drawing is that Jerry looks like he has a mob boss attitude. He was too hunched over, and his head was too low, so the next iteration addressed that. I made these changes in order to give him a happier appearance (Figure 3.13). In the final iteration, I added more pull to the straps in his pants, gave him a bigger hat, and adjusted the direction of his nose so that it does not droop down (Figure 3.14). The angle of his nose was changed to further avoid the "mob boss" look.

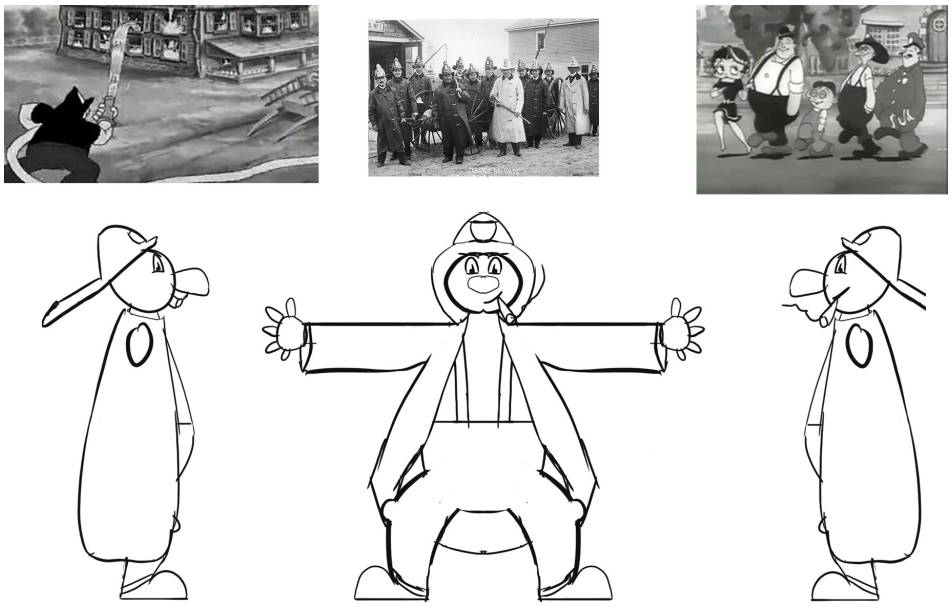

Figure 3.9: Jerry Concept 1

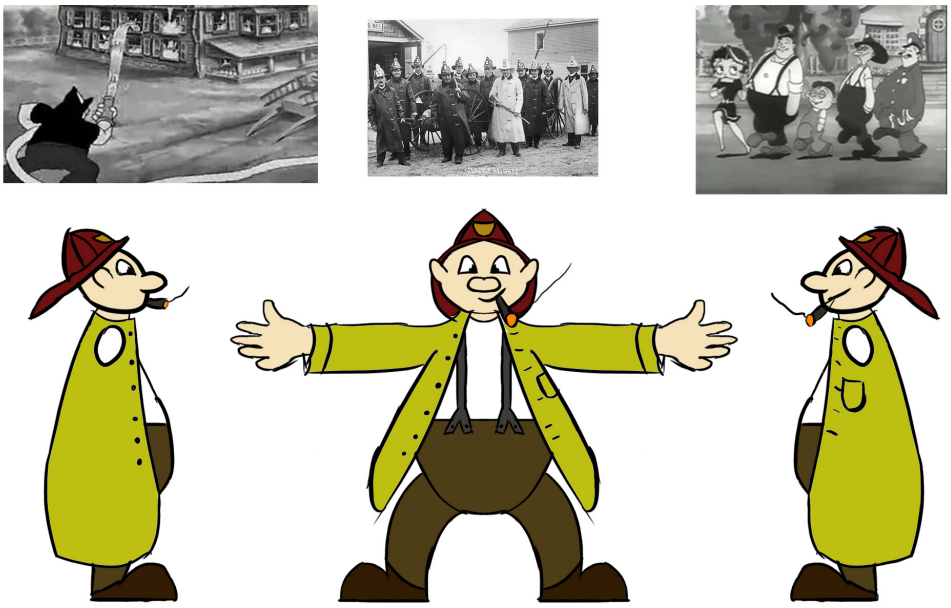

Figure 3.10: Jerry Concept 2

Figure 3.11: Jerry Concept 3

Figure 3.12: Jerry Concept 4

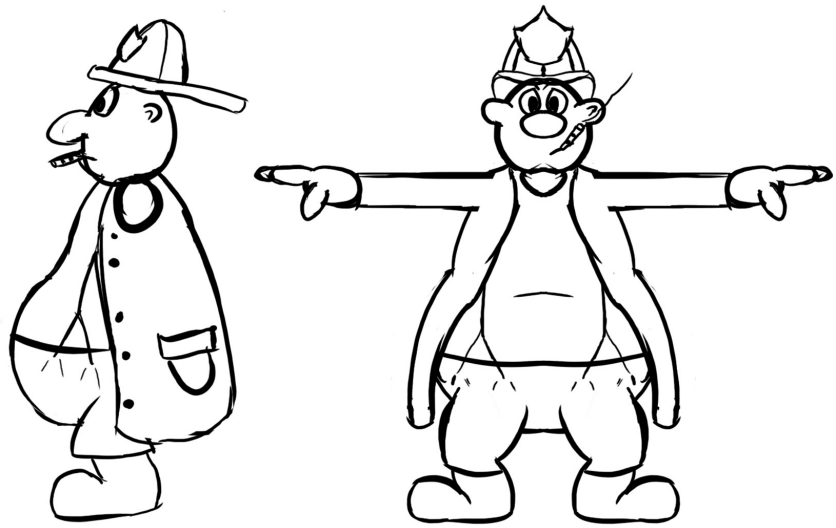

Figure 3.13: Jerry Concept 5

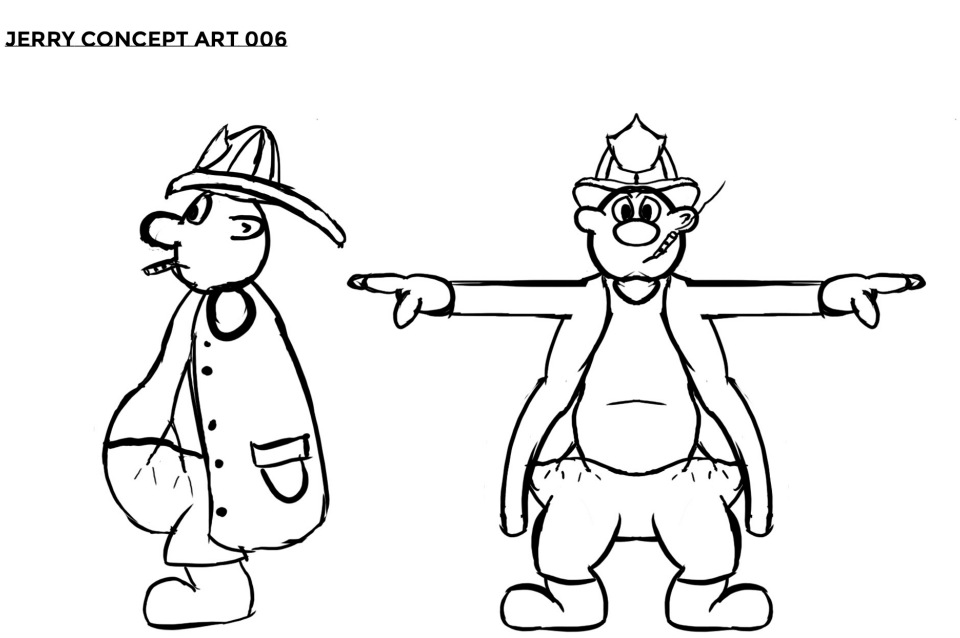

Figure 3.14: Jerry Concept 6

The same design principles I used for Jerry also applied to Sparky. The goal was to design him using very simple shapes. I designed Sparky so he would appear as a friendly character to the audience. I based a lot of his design on Bimbo, Betty Boop's friend. I gave Sparky features that would be appealing to viewers: a rounded head and mouth, rounded body, and large hands and feet. These features contribute to the shape theory of circles to give off a friendly appearance.

Like Jerry, the first drawing for Sparky was also pretty rough (Figure 3.15). Again, it was just to get my ideas down before I forget them. In order to improve the concepts, I started with Andy Panda's body as the base. Like I mentioned in the references, I used Bimbo in my design. More Specifically, Sparky's head was influenced by Bimbo's design. I drew his head using a circle followed by a sideways oval for the mouth. Then, I added features like the nose, mouth, and ears. I used tubes to give Sparky arms and legs, then finished the drawing with large hands and feet.

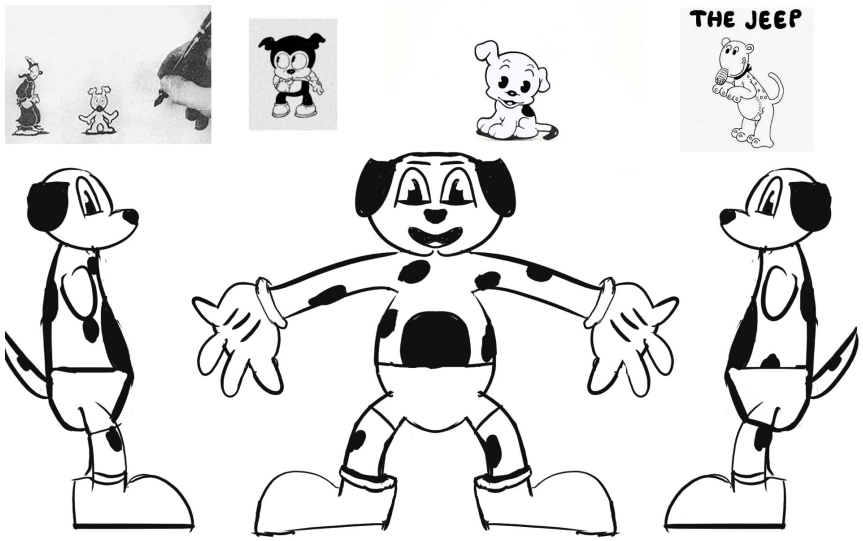

Figure 3.15: Sparky Concept 1

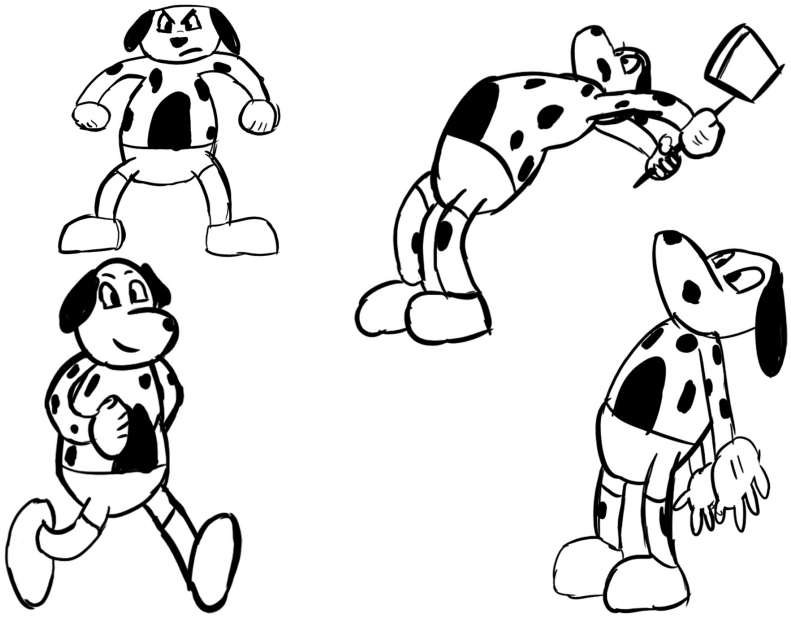

Figure 3.16: Sparky Concept 2

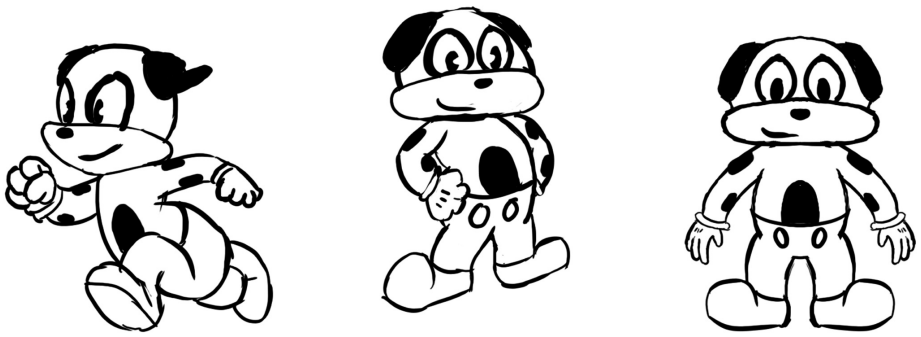

Figure 3.17: Sparky Concept 3

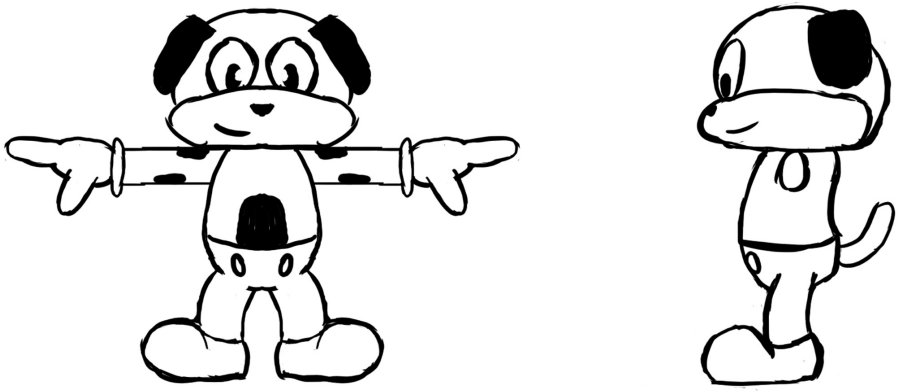

Figure 3.18: Sparky Concept 4

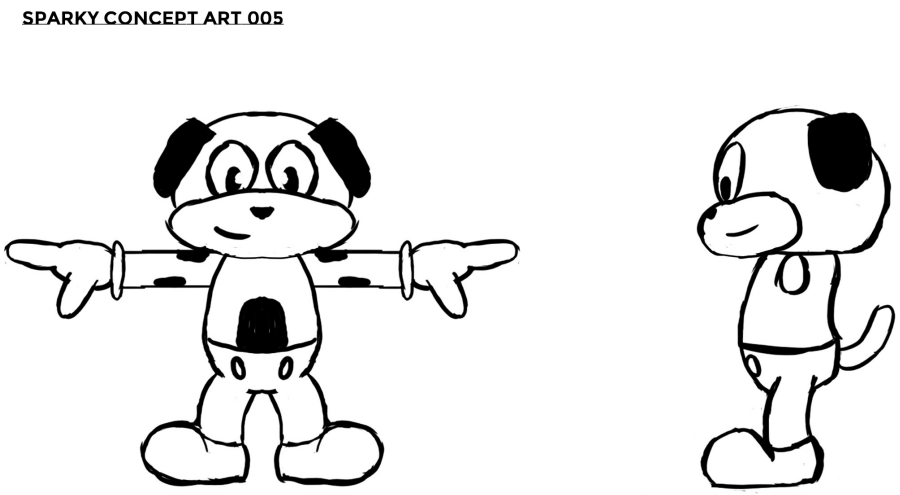

Figure 3.19: Sparky Concept 5

Now, Red was a bit different because he is mostly based off of something that already exists. Since he is a firetruck, most of his design is based off of a 1930s firetruck. The simple design of characters in Fleischer and Disney cartoons can also apply to vehicles. Cars in these cartoons usually have a simple shape and do not really have any outstanding features. They have attachments that help the audience tell the difference between vehicles, but that is about it. When drawing the concept art for Red, I made sure to emphasize features that could help the audience see that this character is a firetruck. I took the reference of a real life firetruck and stripped it down to the base. Then, I only added the ladder, bell, horn, and hose. After that I added the facial features using the headlights and bumper. Then, to finish the design, I gave Red a fireman's hat to give him a more human-like appearance.

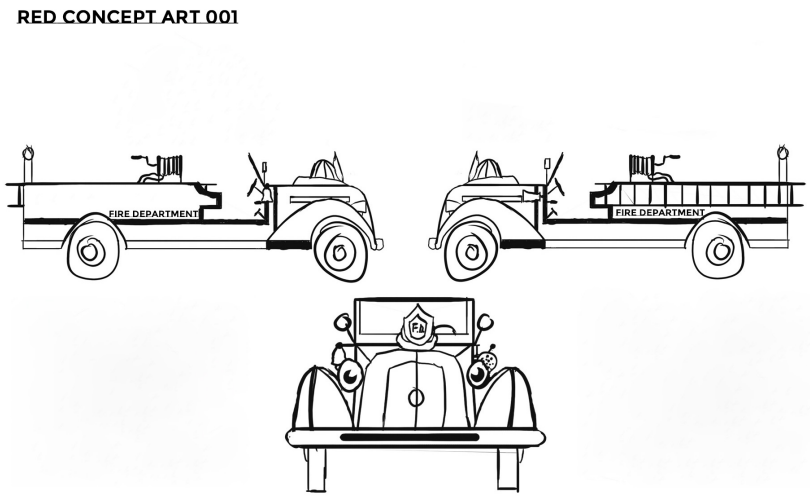

Figure 3.20: Red Concept Art

3.4 Polygon Modeling

I began making my characters by determining which one to work on first. I ultimately decided to work on the models in order of ascending difficulty. I have the most experience with polygon modeling, so the first character I made was Red in Maya.

Polygon modeling offered the quickest and easiest method to making a hard surface character. When I start making a hard surface model, I look at the reference and try to visualize it in its most basic components. Then I try to see how I can make those components out of simple shapes. I began with a cube and used the edge loop tool and extruding in order to get the shape of the rear of the firetruck. I made sure to stay true to the reference image I was using. Then I extruded the front and scaled it along the z-axis in order to make a point on the hood. Next, which was the most difficult part of this model, was modeling the wheel wells. After trial and error, I found the best way to make the wheel well was to use the multi-cut tool to cut the shape in the side of the truck. Once I got the desired shape, I extruded it out and moved the vertices some to smooth out the shape. Then I bridged the two wheel wells together.

Once I got the main shape of Red, I started working on the details of the model. I extruded a place where I could insert a plane to use as the windshield. Cylinders were used to make the

tires, and they were beveled so that they did not appear too rigid. I used extrusion to give the tires some treads. Once I was done with that, I started working on the eyes, or headlights in this case. I simply took a sphere, flattened one end of it, and scaled it slightly in order to get that old fashioned, rounded head light look. For the pupil, I flattened a cylinder and deleted a piece of it like cutting a piece of pie. After that I started working on the fire hose. I used a cylinder to make the rounded part, and I utilized NURBS surfaces in order to make the part that connects to the truck, the handle, and the hose itself. The rest of the work was just using simple primitives in order to make the rest of the details. To get the shape of the hat, I used half of a sphere and extruded it to make the brim and the ridges. I then modified the vertices of a subdivided cube to make the shield on the hat. The ladders were made of cubes and cylinders, and the bell was made using half a sphere for the shape. Curves were used to make the bell's rope and the arch that connects it to the truck. Finally, I finished it off by using cylinders to make the fender/mouth.

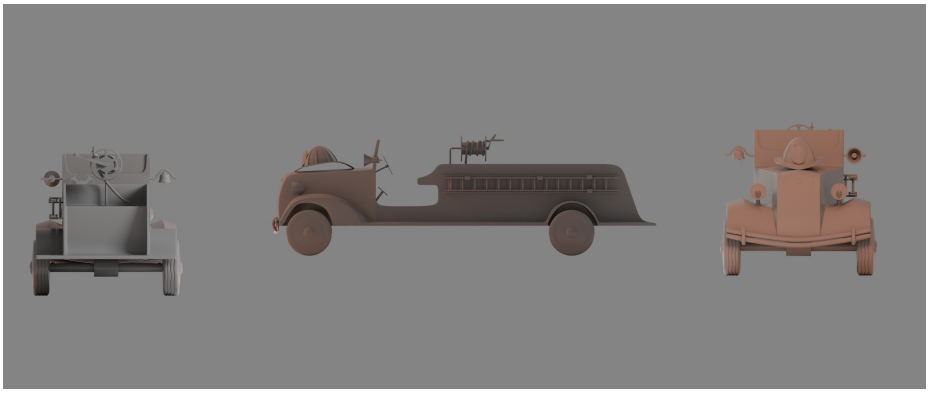

Figure 3.21: Red Turnaround

Rigging Red was quite simple. Since this is a cartoon, I rigged Red in a way that gives me some control over the squash and stretch. To achieve this, I applied a lattice deformer to the entire model. With it I am able to bend and twist the model similar to how the characters are warped in the cartoons. I also added a lattice deformer to the mouth. That way I can use it to make various facial expressions. (For screenshots of progress see Appendix A)

The poses I chose for Red were based off of personality or the narrative concept. The first pose was made to look like he is jumping as if he was startled by something in front of him (Figure 3.22). The second one was made to look like he is afraid of something large that is in front of him (Figure 3.23). The third pose is Red looking around at his surroundings (Figure 3.24). The final

pose is Red rushing somewhere as if he is running to aid his friends (Figure 3.25).

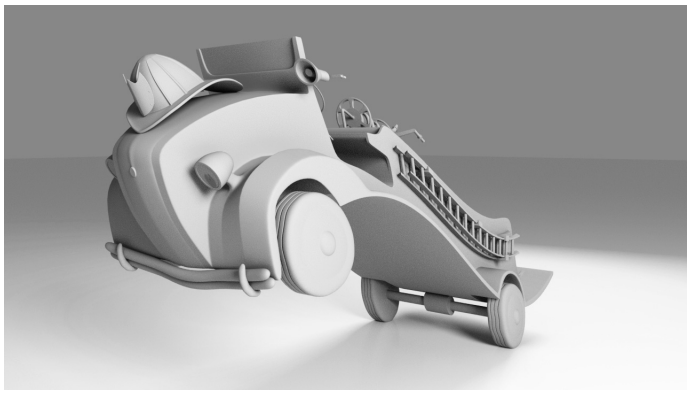

Figure 3.22: Red Pose 1

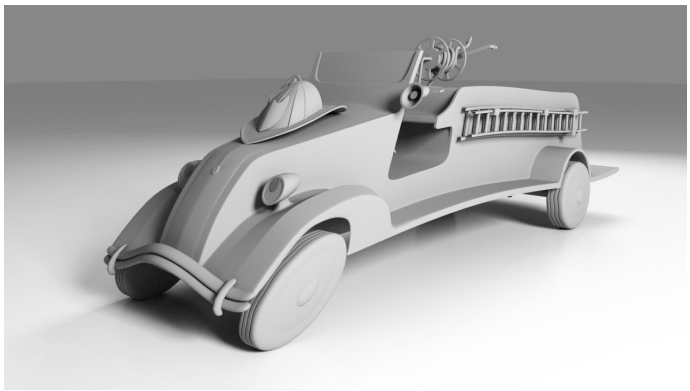

Figure 3.23: Red Pose 2

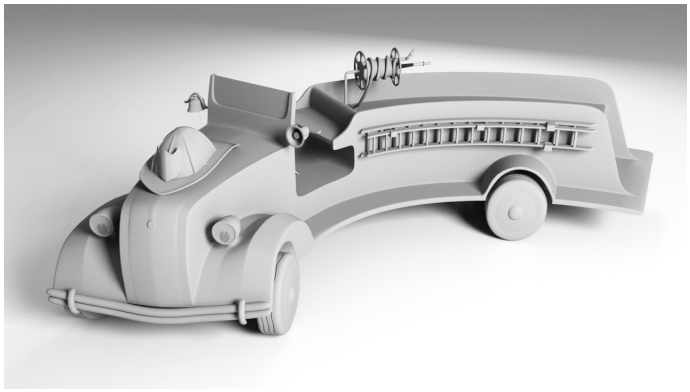

Figure 3.24: Red Pose 3

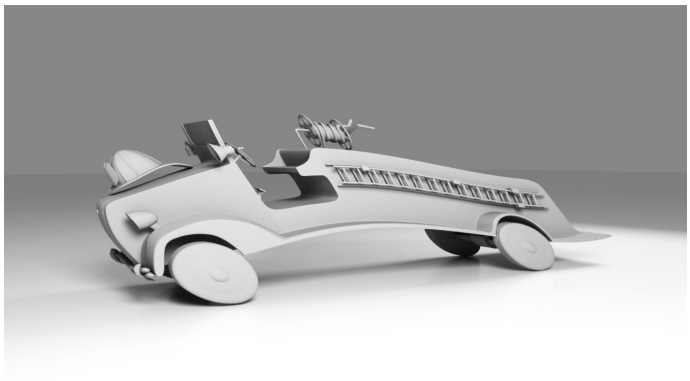

Figure 3.25: Red Pose 4

When trying to recreate the Fleischer/Disney style, I found there to be some positives and some drawbacks when using this method of modeling. Polygon modeling works well for this type of character and for making props and set pieces. When using polygon modeling, modelers can make props and hard surface characters very quickly and efficiently. The down side to using this method is that modelers will have difficulty making more organic characters. It would be difficult to try and make people and animals with this method. Also setting up a rig for animators may prove to be challenging. You cannot use a typical skeletal structure for anthropomorphic objects. Riggers would have to be a little more creative in order to rig the character for animation.

3.5 Box Modeling

For one of the characters, I chose to use box modeling because I believe that box modeling is more effective for making organic characters. I started with a cube, added some edge loops, and I tried to match the shape of the abdomen in my reference. I extruded the arms and legs and made sure they were the length illustrated in the concepts. Then I subdivided once in order to get some smoothness in the model. I chose to emulate the smooth and round shapes found in the characters like Bimbo and Andy the Panda. I also tried to use the same lengths of their arms and legs in my model. Next, I started to work on the feet in order to make them very big and very round. Then I modeled the hands, and I made sure to keep the same characteristics found on old cartoon characters. Sparky's hands are big and almost spherical. He has only four fingers, like other characters, and his hands are designed to look like gloves. These traits are commonly found in character designs of the

early 1900s. Sparky's head was made from a subdivided cube that I shaped to match my reference drawings. One of the challenging areas was modeling the jaw area that bulges out from his face. It took a lot of manipulation to get it to the shape shown in my drawings. Then, to finish off the head, I cut out the eyes and extruded the ears. To make the pupils, I used the shrink wrap operation, which projects one object onto the surface of another. I used that to project the pupil onto a sphere to make the eyes. I finished the model by extruding around the waist and feet so that it looks like sparky is wearing pants and shoes.

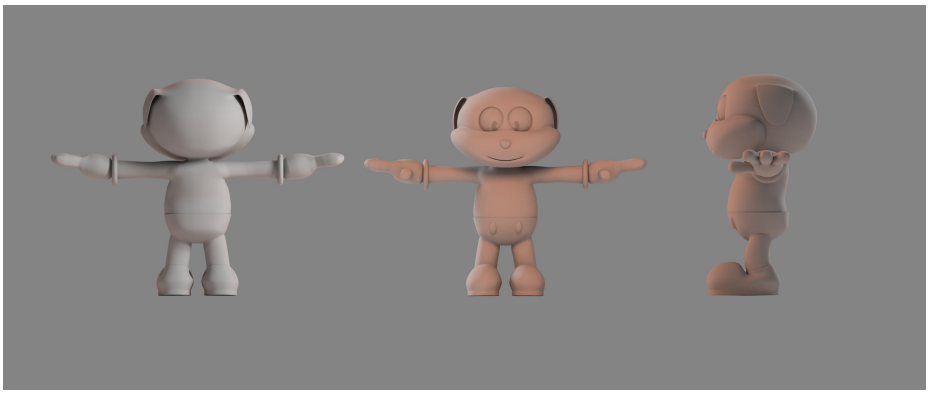

Figure 3.26: Sparky Turnaround

Rigging Sparky was a bit of challenge, but that is due to my lack of experience rigging characters. I knew how to rig rigid characters like a robot, but not one that required skin weight painting, so rigging Sparky was a new challenge for me. I started with a typical skeletal rig to bind to the model. Then, I began the tedious task of painting the skin weights. I used the replace and smooth brush in order to get the right amount of weights painted for every joint in the skeleton. I moved and rotated every joint just to see what each joint was affecting in the model. I kept working at it until I was satisfied with the results. I used a combination of stretchy IK handles and a ribbon rig setup in each of limbs in order to create the "rubber hose" effect [12]. This rig setup allows me to squash, stretch, and bend the limbs. (For Screenshots of progress see Appendix B)

To setup the ribbon rig I first needed to make the stretchy IK handles. IK handles let you move an arm by moving a controller attached to the wrist, but it does not stretch the arm. I used the distance tool to measure the distance between the shoulder and the wrist. This number is stored in a distance node in the node editor. The distance node is connected to a condition node that states if the distance is greater than the default distance then it will scale the shoulder and elbow

joints by the new distance divided by the old distance. This lets me stretch the limbs beyond the starting length.

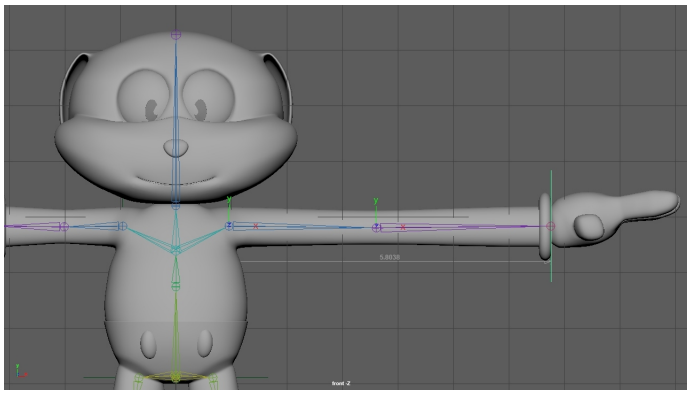

Figure 3.27: Sparky Stretchy IK

After I implemented the stretchy IK, I worked on the ribbon rig setup. To start I used a NURBS plane that is the same length as the arm. I used nhair to add follicles to the plane. This is just to add a point that is at the center of each section of the plane. Then I parent constrained joints to the follicles so that they snap to that point. Finally I added control joints and control curves to this by parent constraining them to the joints. I added this to the rig by parent constraining the first, middle, and last control joint to the shoulder, elbow, and wrist joints (Figure 3.28). Then I bound the skin to these joints and painted the weights to smooth out the areas they can control. This in combination with the stretchy IK allows me to recreate that rubbery feel of old cartoons (Figure 3.29).

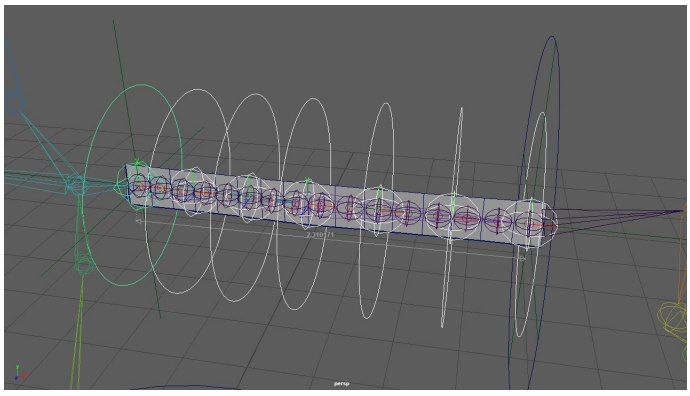

Figure 3.28: Ribbon Rig

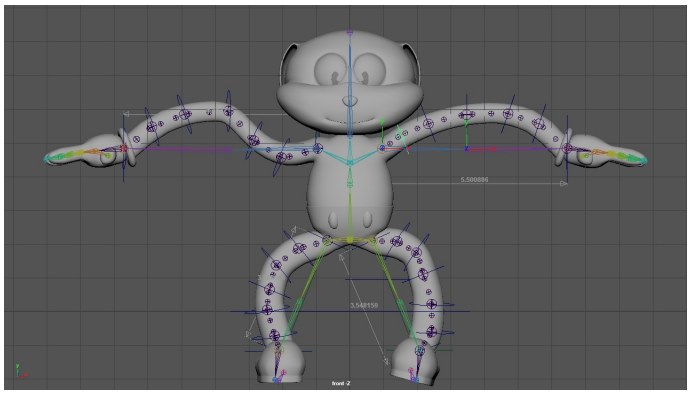

Figure 3.29: Ribbon Rig Example

The first pose I did for Sparky was meant to show the audience his high energy as well as to show off the ability to stretch and bend his limbs (Figure 3.30). The purpose of his second and third poses was to show how he would carry himself if he were walking or running (Figures 3.31 and 3.32). His final pose is meant to seem like he is in a fight with someone (Figure 3.33). I chose this pose to really show the hyperbolic movements of this style.

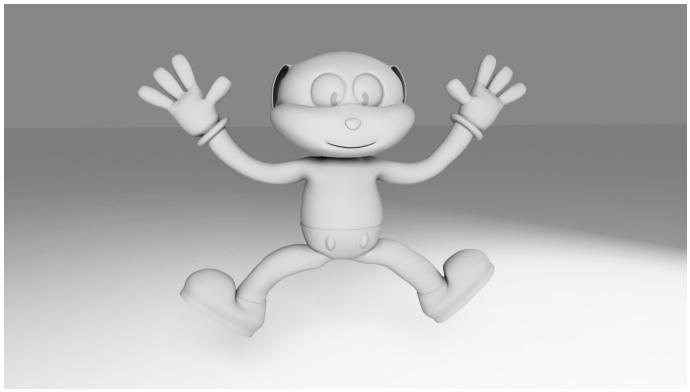

Figure 3.30: Sparky Pose 1

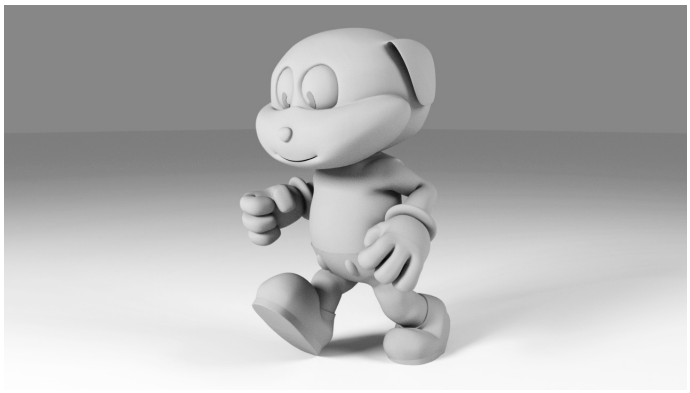

Figure 3.31: Sparky Pose 2

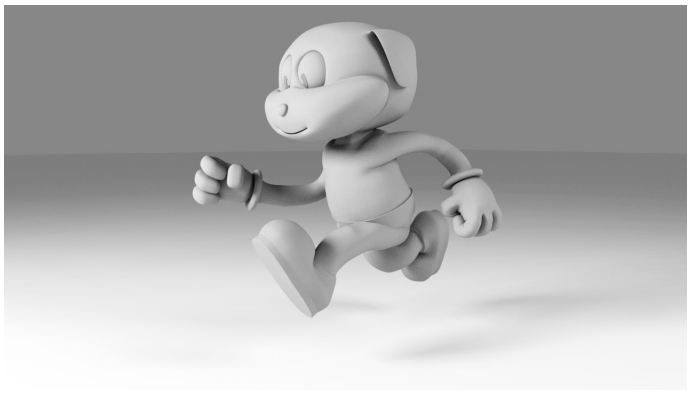

Figure 3.32: Sparky Pose 3

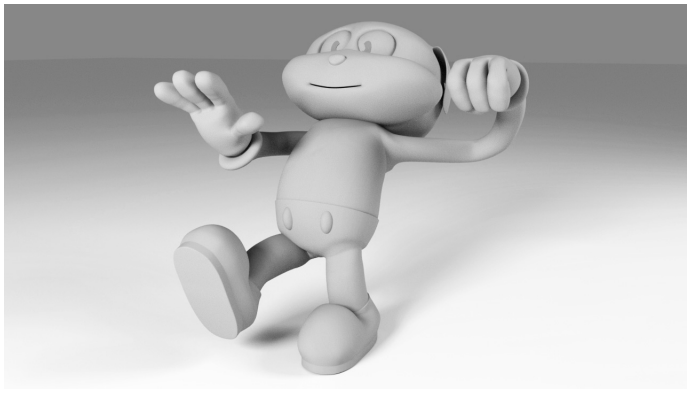

Figure 3.33: Sparky Pose 4

Overall, I believe this method works well to recreate the style of early cartoons. Modelers

are able to shape the characters how they want and can easily pass it off to riggers. Topology is not much of an issue because modelers will be working with minimal polygons, and the flow of topology is very even. The only problem I can find from using box modeling is the level of detail. Depending on the level of detail they want, modelers may prefer to use other programs like Zbrush to design the characters how they want. Using enough subdivisions, a box model can get very detailed, but details are sometimes best covered using texture maps exported from Zbrush or other preferred sculpting software.

3.6 Digital Sculpting

The final model I decided to make using Zbrush. Going into making this model, I knew it would be difficult due to my lack of experience with digital sculpting. I had only taken one digital sculpting course prior to doing this work. However, modeling Jerry was certainly challenging but also a valuable learning experience.

To begin the process of modeling Jerry, I started with a sphere and used a combination of move and smooth brushes to get the rough shape of his abdomen. Making the legs was achieved by masking then moving the bottom of the abdomen. Like the references, I gave him very big and rounded feet. Cylinders and spheres comprised the arms and hands. I used the the dynamesh feature to combine these primitives together. Then I used clay buildup, smooth, and inflate in order to get the glove-like shape of the hands. Using dynamesh again, I attached the arm to the abdomen and smoothed out the shoulder area. The head was shaped using a sphere, and the nose was a separate sphere that was later attached. The mask brush was used in order to make the eye sockets. The eyebrows and ears I created using clay buildup. After I finished the main body of the sculpt, I worked on the clothes and accessories.

Extracting was used for a majority of the clothes. I masked the parts of the body that needed clothes and extracted the masked area into a separate geometry. With this method I was able to create Jerry's jacket and pants. The hat required more effort. I took a sphere, pulled out some faces to make the ridges of the hat, and then I dynameshed it with a separate geometry to make the brim. Using the move and smooth brushes, I finished off the shape of the hat. I was able to download some insert brushes of buttons and straps from my Zbrush class' box folder, and I used those in the sculpt. These brushes were given to the class by professor Insun Kwon as a way to

quickly make buttons and straps on a sculpt. Inserting geometry was much more time efficient than having to try to make the buttons myself.

Since this model was made using Zbrush, and I had to bring it into Maya, I had to retopologize the sculpt. Retopologizing involves taking a Zbrush sculpt, which is an image based sculpt translated into a poly mesh algorithm, and giving it more prefered topology. For this project I used Topogun to retopologize. In Topogun, the user "draws" new topology on top of a reference. Using the sculpted pieces as reference, I gave each piece new topology and re-imported it back into Zbrush. Projecting in Zbrush allows me to take the details of my sculpt and add it to the retopologized geometry. After that, the mesh was UV'd and a displacement map was generated to be used in Maya. With the displacement map and .obj files, I was able to import my sculpt of Jerry into Maya to begin rigging him.

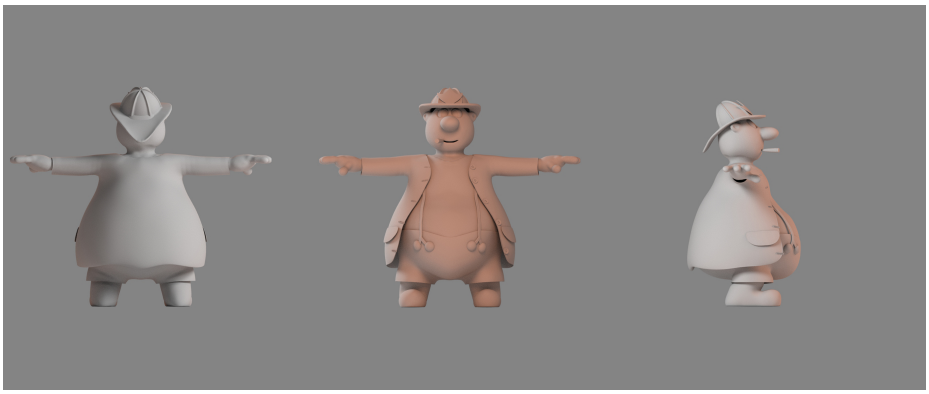

Figure 3.34: Jerry Turnaround

The process of rigging Jerry was similar to rigging Sparky, but it went a bit smoother because of my experience with the last model. The model was bound to a skeleton, and the weights were painted. To weight separate objects like the jacket, pants, and straps, I simply copied the weights from the body to those meshes. The parent to point constraint allowed me to pin the buttons, buttons holes, and the pockets to a point on the mesh. When the mesh moves, these objects move appropriately. The hat was simply parented to a joint in the head, so when the head rotates, the hat moves with it. Like Sparky, I also added ribbon rigs to Jerry to be able to control his arms and legs. (For screenshots of progress see Appendix C)

The first two poses for Jerry are similar to the two poses for Sparky. They are designed to show how a character like Jerry would walk or run (Figures 3.6 and 3.6). His third pose is meant to

show more of his attitude by making him seem like he is greeting someone (Figure 3.6). The final pose shows how he would defend someone, and it shows off the squash and stretch of the character (Figure 3.6).

Figure 3.35: Jerry Pose 1

Figure 3.36: Jerry Pose 2

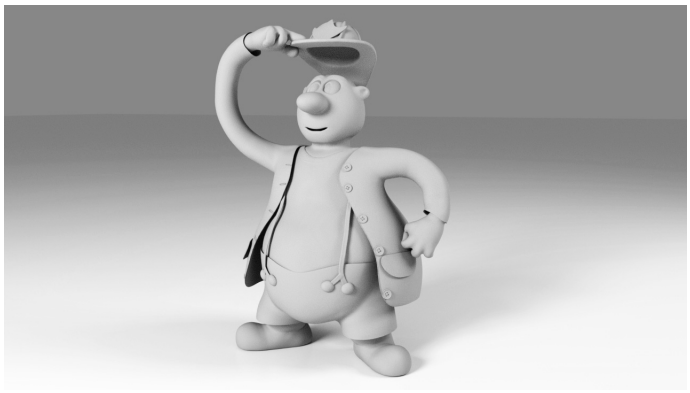

Figure 3.37: Jerry Pose 3

Figure 3.38: Jerry Pose 4

I believe this method of modeling to be quite effective, but it is also more time consuming than the previous methods. With digital sculpting, modelers are able to have much more control over the shape and detail of their characters. With the brushes available in Zbrush, I could achieve a level of detail that I could not get in Maya. However, the model must be taken into some sort of retopologizing software. Otherwise, the model would be too dense to use in a production. This also may complicate texture layout workflow which may be accommodated more simply earlier in polygon workflow.

I also took one of my characters and recreated a series of poses from a cartoon. I did this to further show how these cartoons can be translated to 3D. In Figure 3.39 Bimbo is in unfamiliar surroundings. He is lost and confused, and he is trying to find his way out. I recreated this feeling of confusion with my character Sparky. I was not able to make a facial rig due to time constraints,

but I believe how the body is posed shows this emotion well.

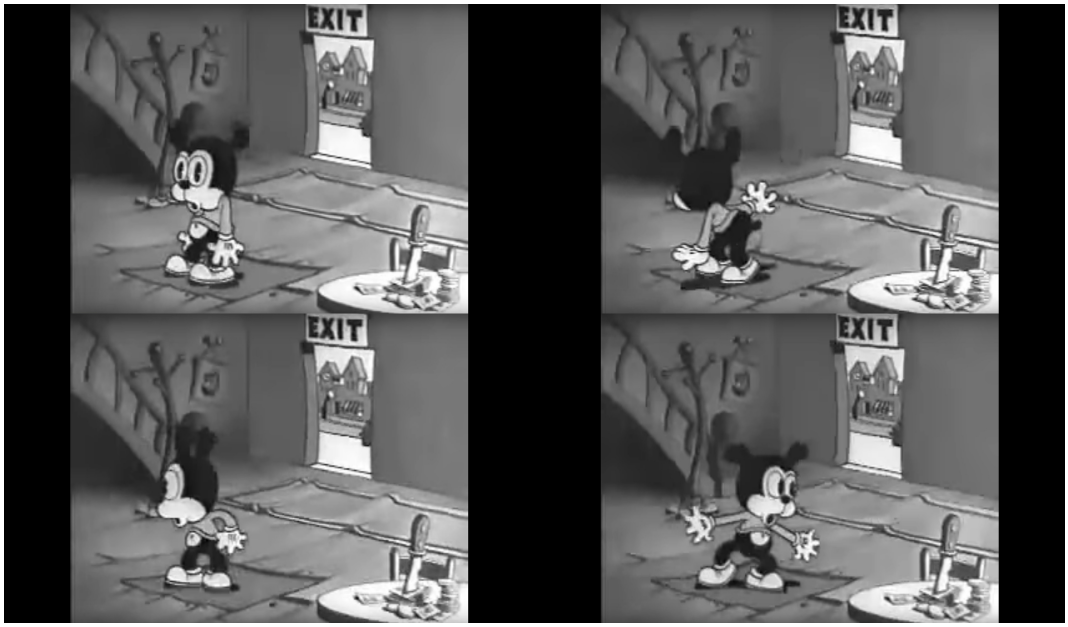

Figure 3.39: *Bimbo's Initiation* by Max Fleischer and Grim Natwick [16]

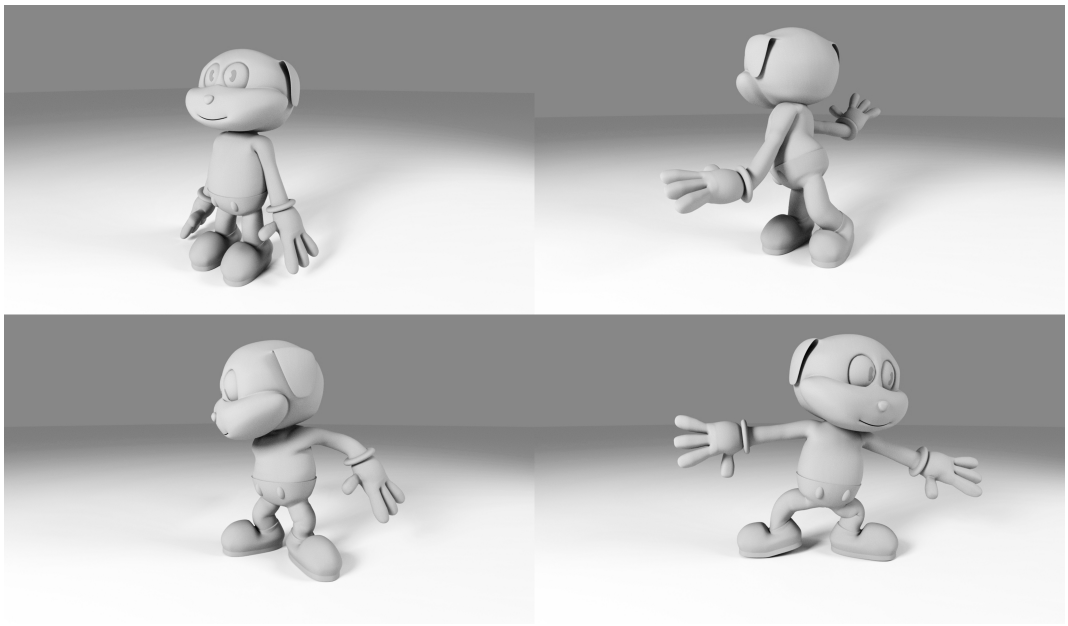

Figure 3.40: Confused Pose Sequence

This final pose is used to show how these three characters would interact with each other

(Figures 3.41 and 3.42). As part of the story concept, these three characters are rushing somewhere to get to a fire. In this pose I chose to convey how they would get there. Red is angled more to show how fast they are going. Jerry is driving, and by using his stretchy limbs, I have him ringing the bell off to the side. Finally I decided to have Sparky hanging off the truck in some comedic way. To really show the rubber hose style, I have Sparky trying to hang on to Red because they are going so fast.

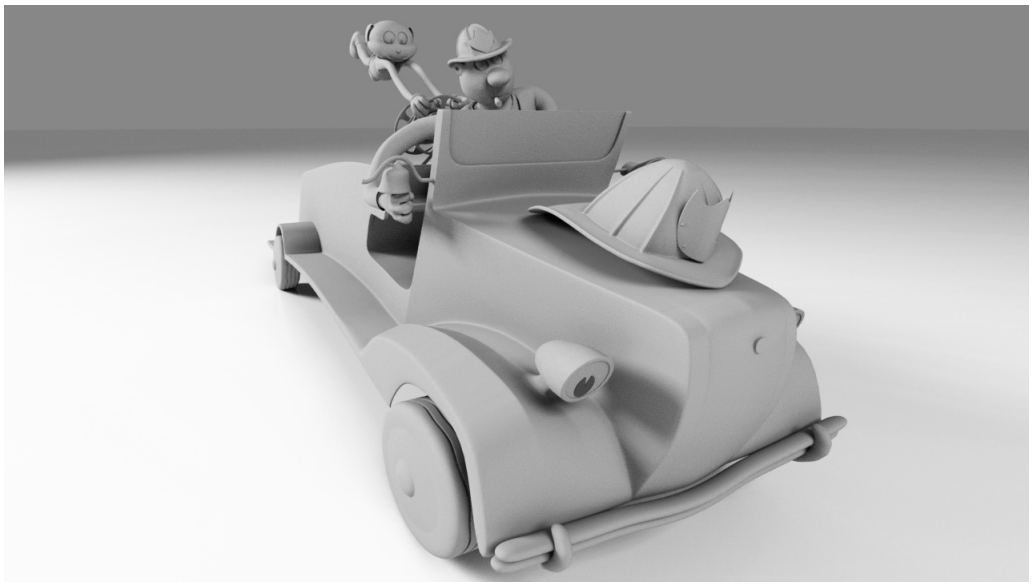

Figure 3.41: Final Combined Pose

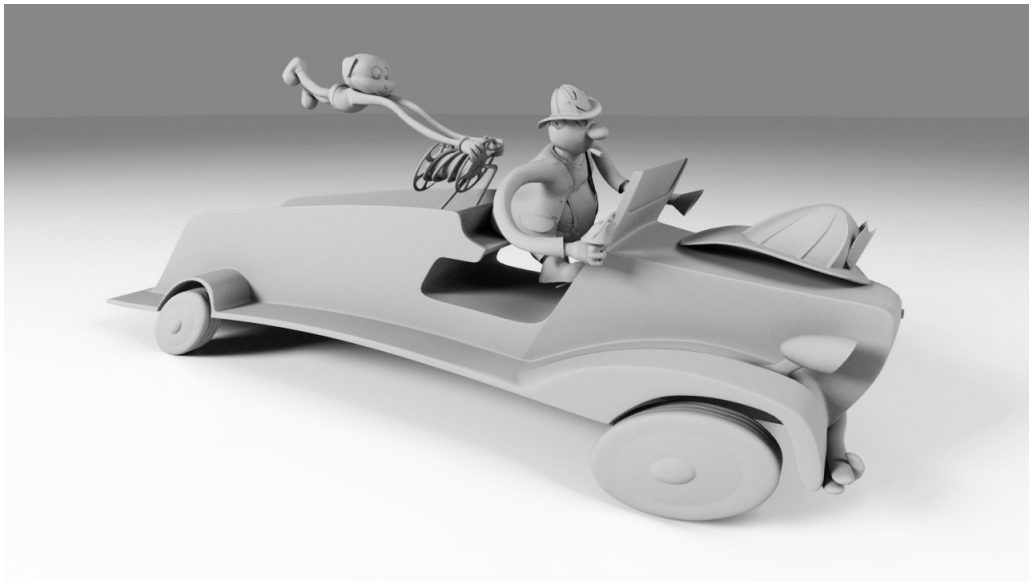

Figure 3.42: Final Combined Pose

Chapter 4

Conclusion

I view the work Jerry Fireman as an achievement. I started this work with the goal of creating three characters using a specific style. Using the knowledge I have gained in my years in the Digital Production Arts program, I believe I have accomplished that goal. I feel this work succeeds in using an old 2D animating style in a 3D medium. It does well to recreate the simple silhouettes of characters. Simple 2D shapes can translate well to 3D due to the use of polygon primitives in 3D software. Modeling and rigging this style in 3D also enhances the squash and stretch aspect of 1930s design. Where it lacks is the use of polygonal modeling. Polygon modeling can really only be used in specific areas like set design and making very specific types of characters. Whereas box modeling and sculpting work well to create other types of characters. This is something that must be considered in a hypothetical production using this style.

This project did not come without challenges. Due to my lack of experience with the rigging process, I feel the rigging could be improved. I have gained a new appreciation for many stages of the pipeline process. Modelers must consider the work that riggers and animators do when doing their own work in order to ensure a smooth transition between each stage of the pipeline. I feel this knowledge will be invaluable in future projects to come.

The work that I have done makes use of simple forms in order to create emotional characters. By using a specific style, I had a clear goal to work towards with my character designs. Every step of the process, from concepts to finished product, was done with the purpose of creating relatable characters with stylistic guidelines. It is my hope that with these characters, people will gain a newfound appreciation for the old ways of designing characters.

Appendices

Appendix A Red Production Screenshots

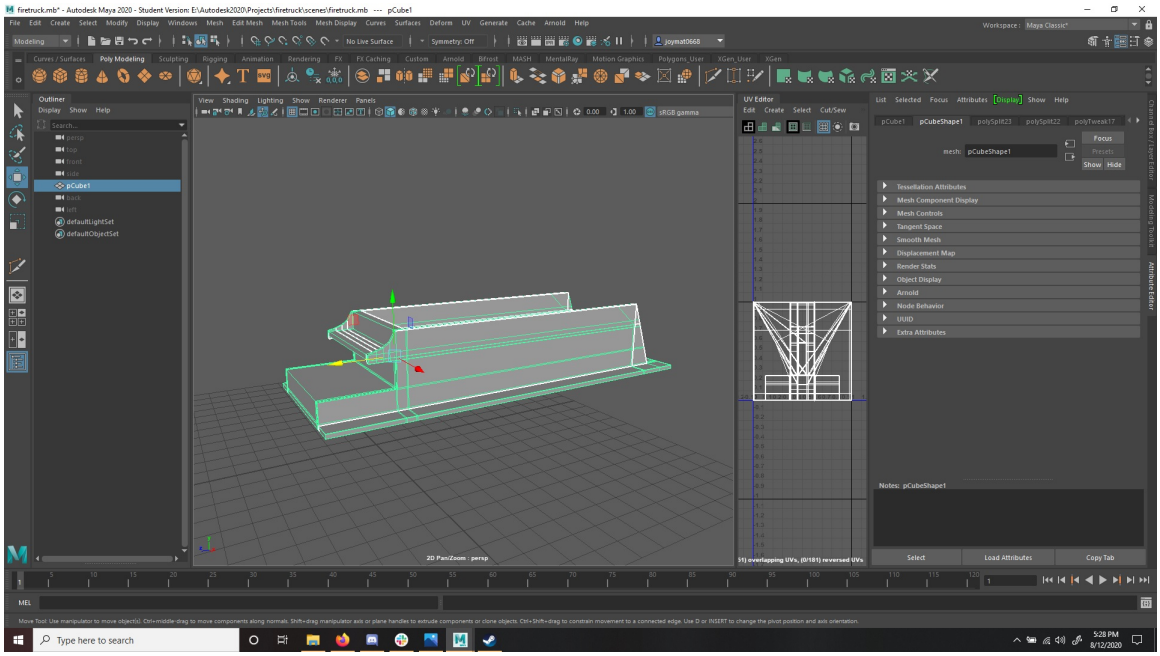

Figure 1: Making the truck bed

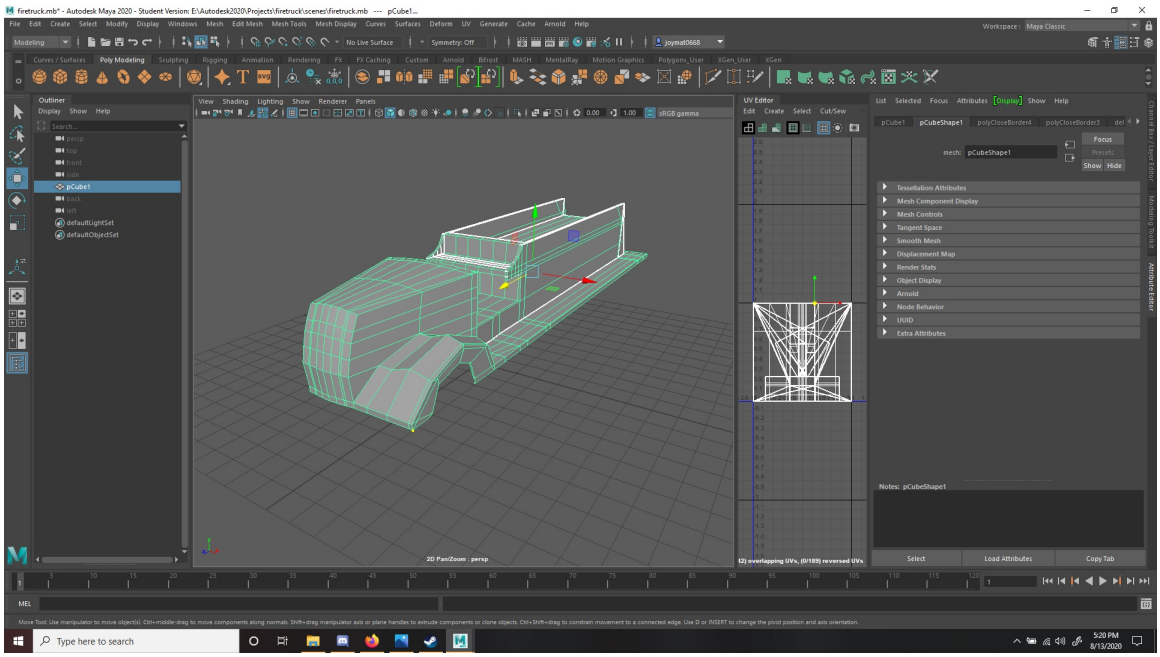

Figure 2: Added front and wheel well

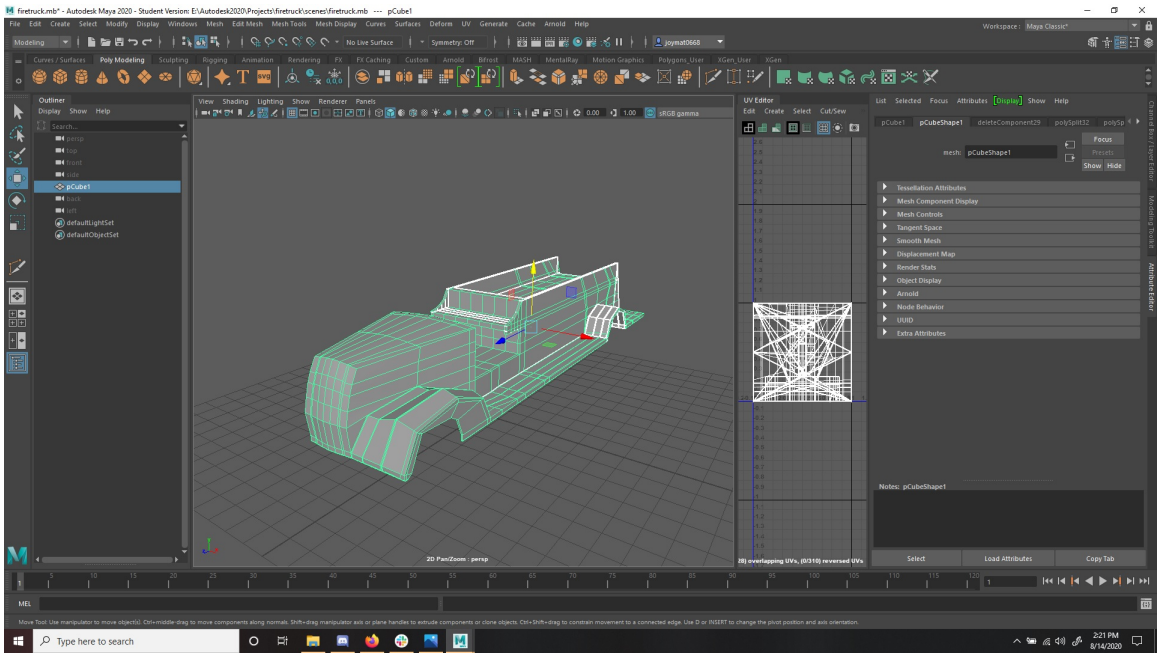

Figure 3: Added rear wheel well

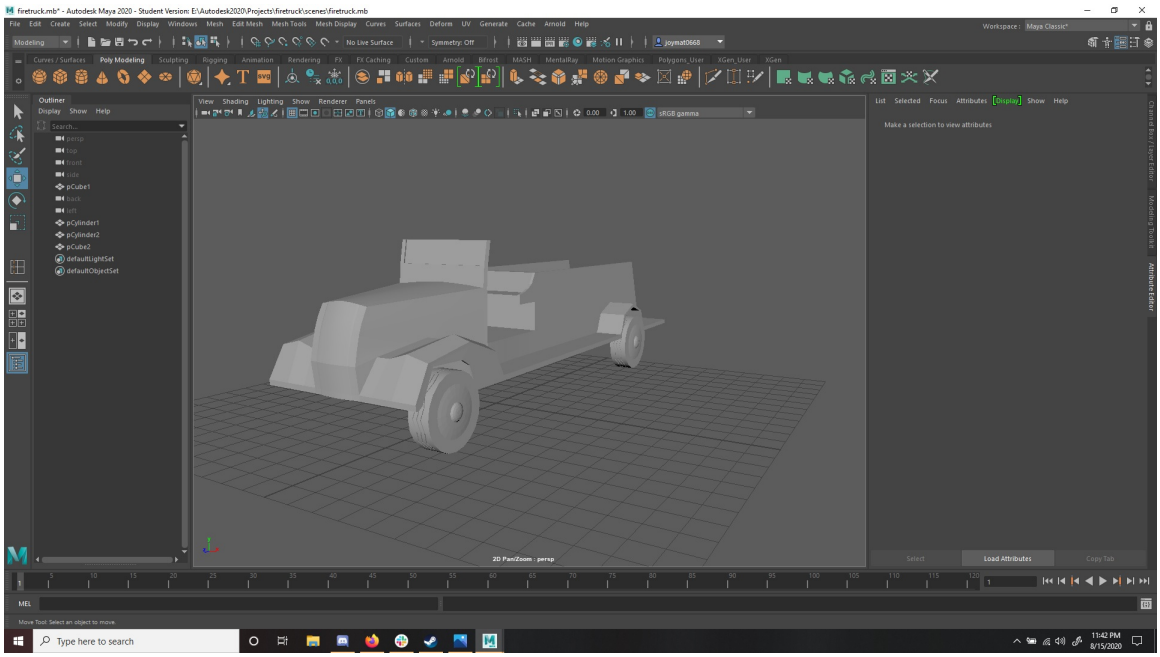

Figure 4: Windshield and wheels

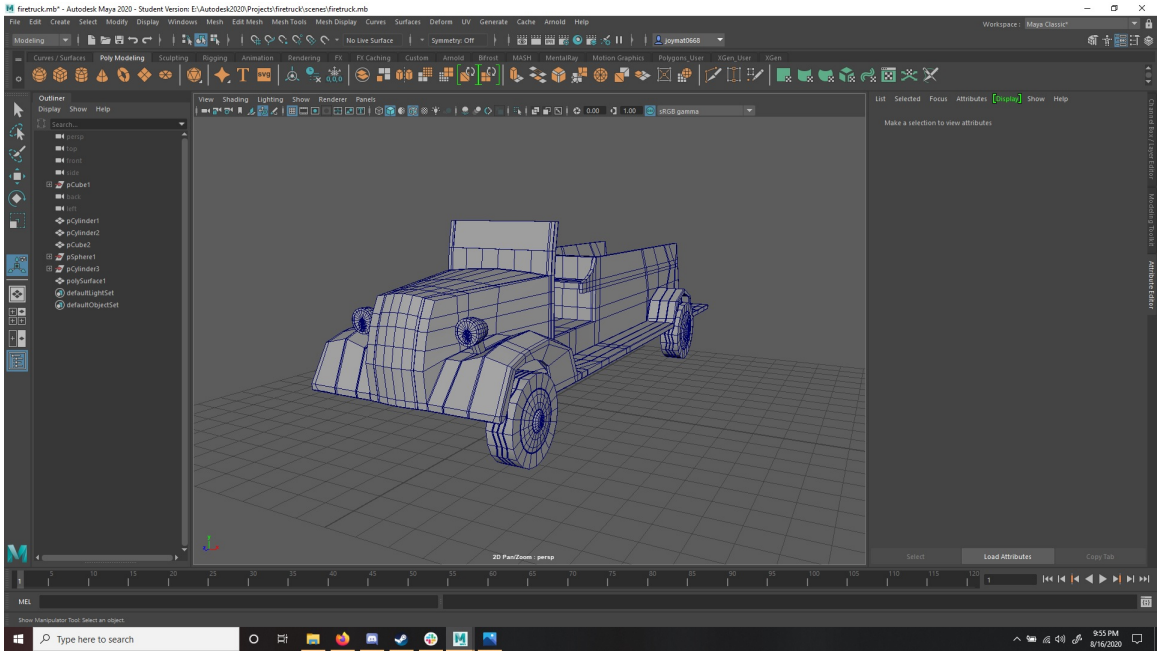

Figure 5: Headlights

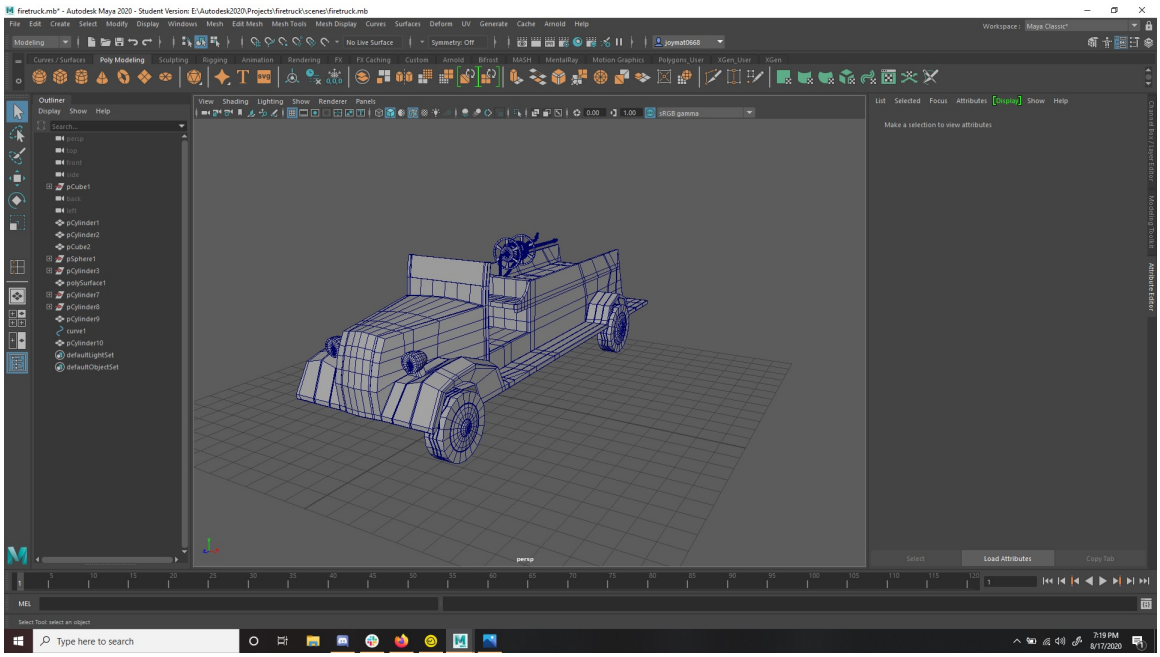

Figure 6: Added firehose

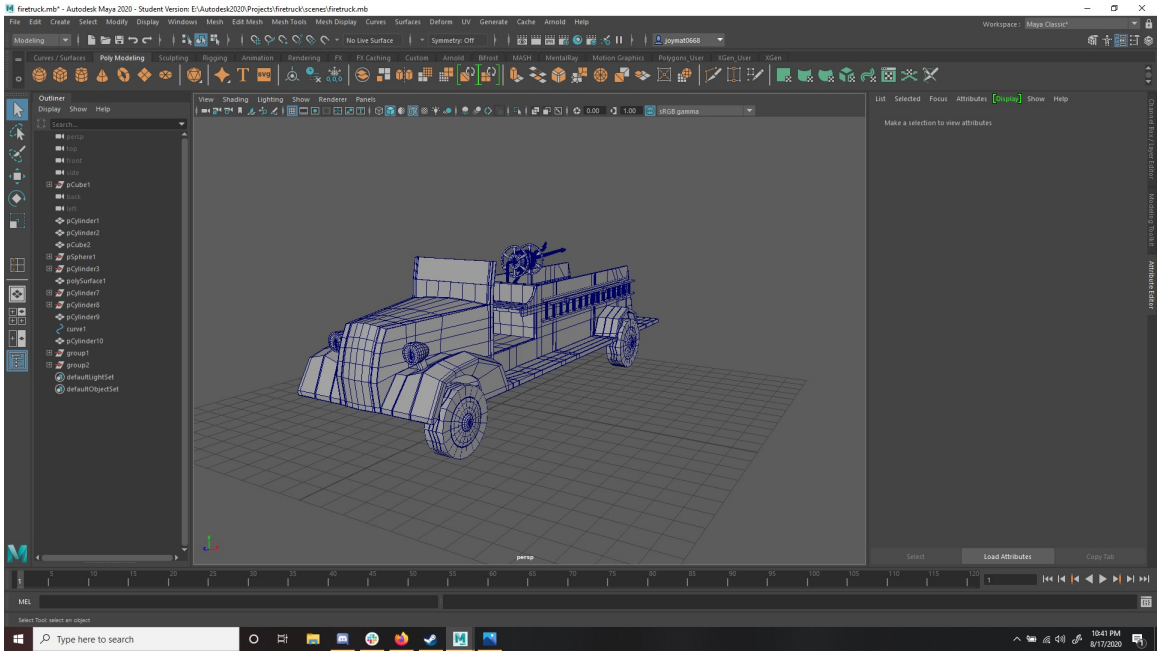

Figure 7: Ladder

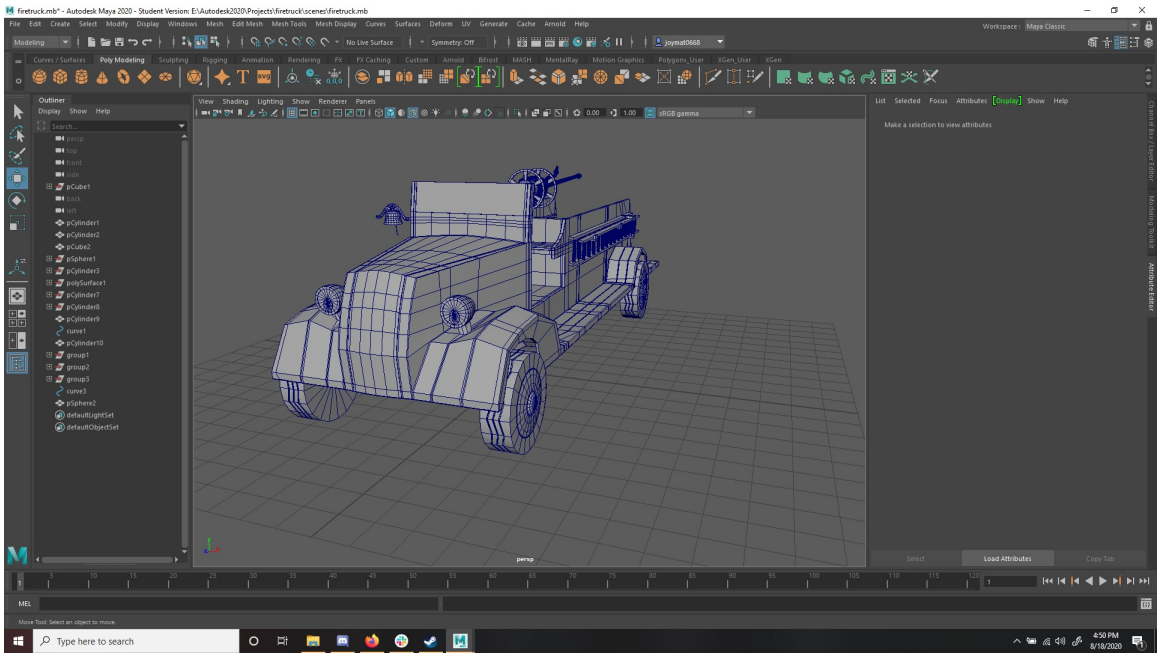

Figure 8: Added the bell

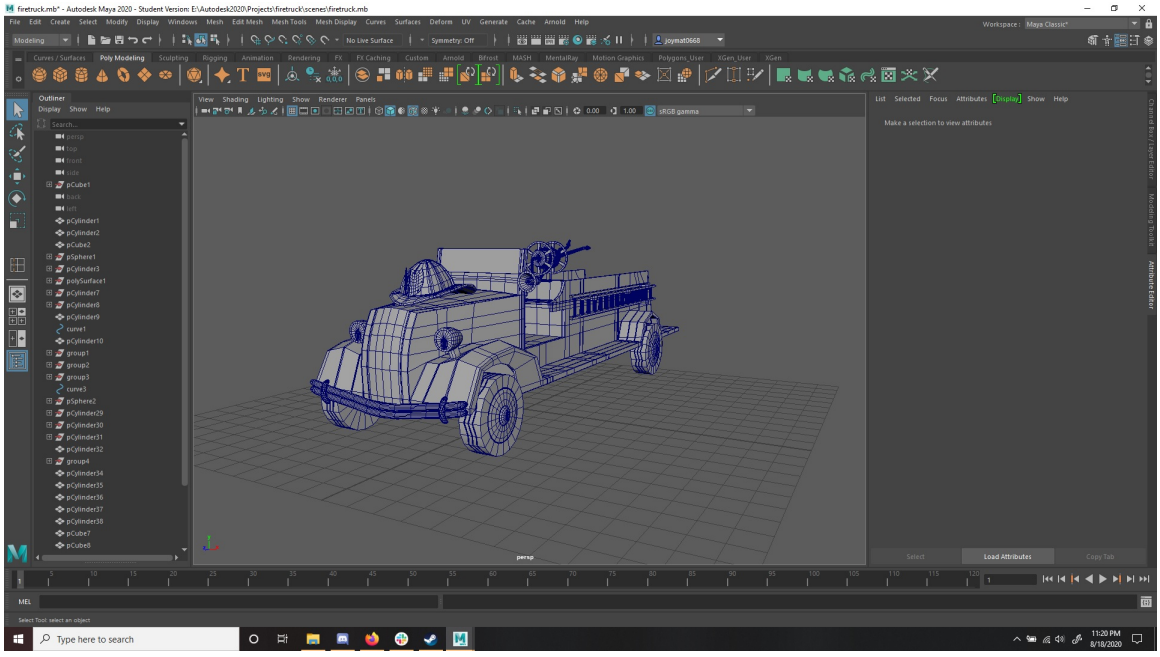

Figure 9: Added hat, mouth, and siren

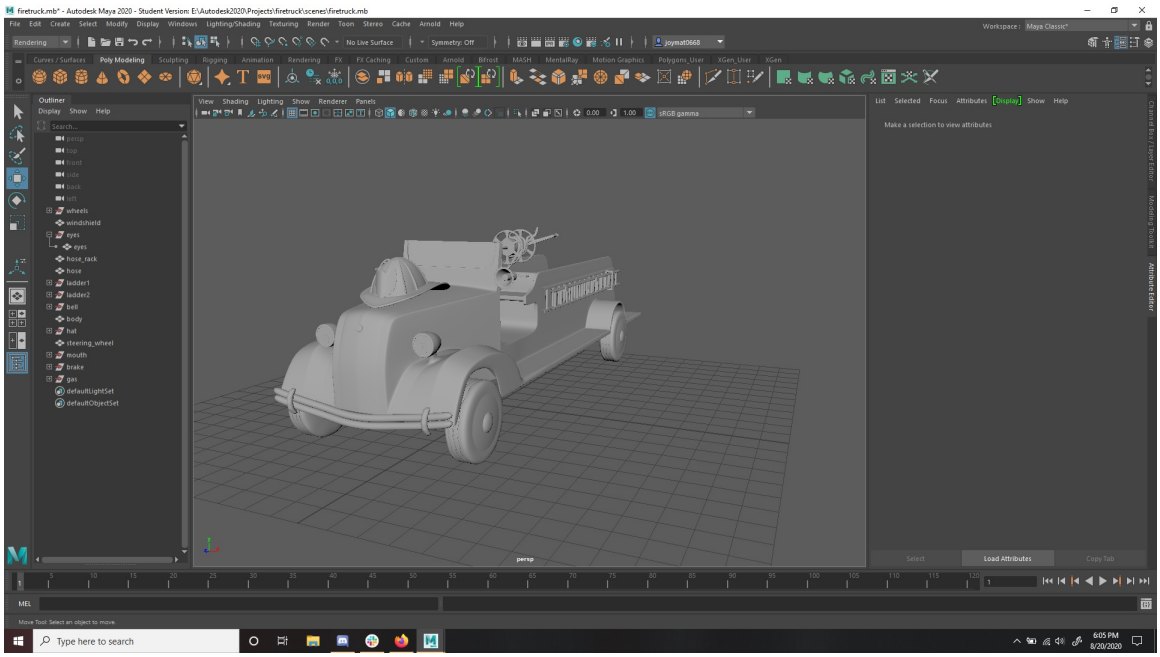

Figure 10: Finished model

Appendix B Sparky Production Screenshots

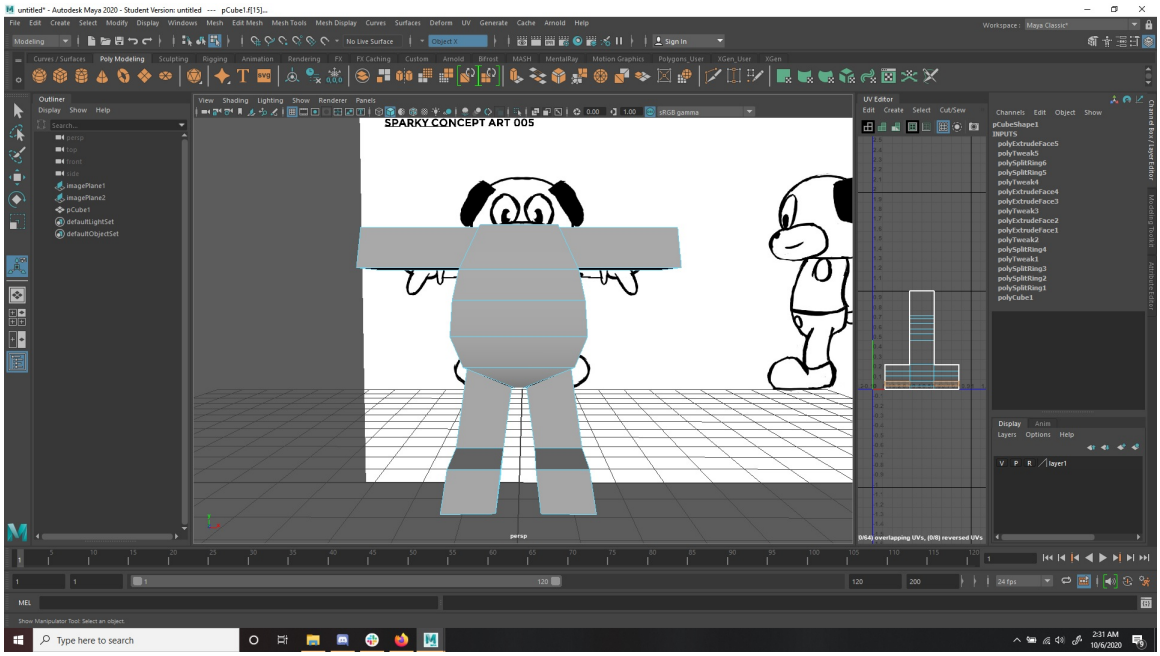

Figure 11: Starting shape

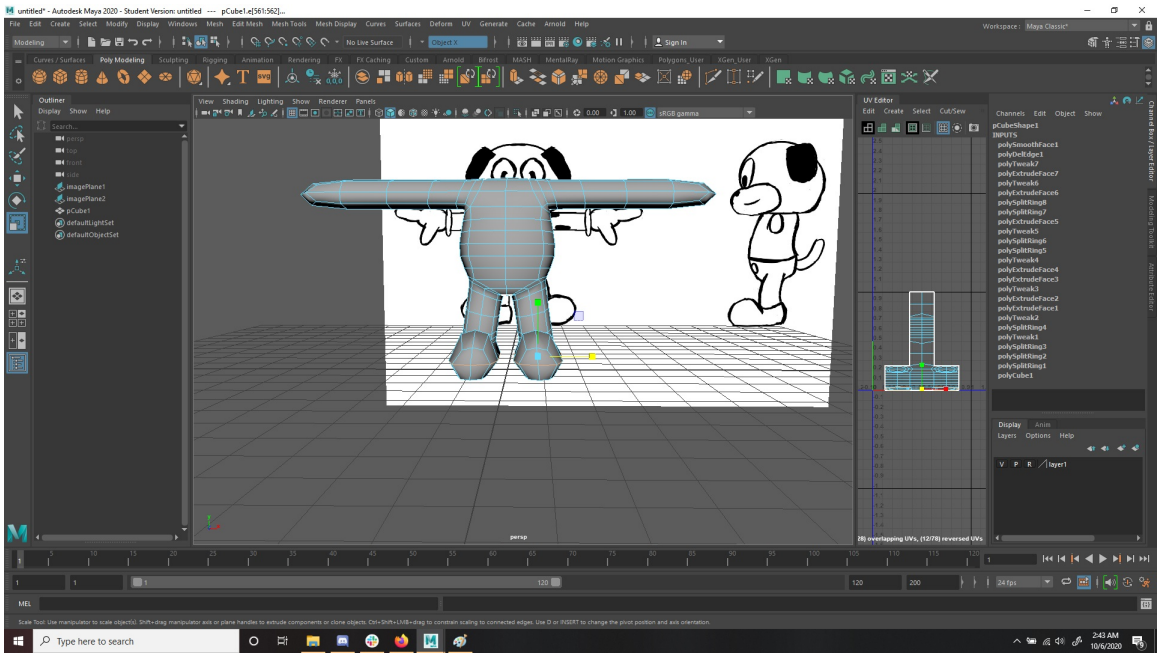

Figure 12: Subdivided mesh

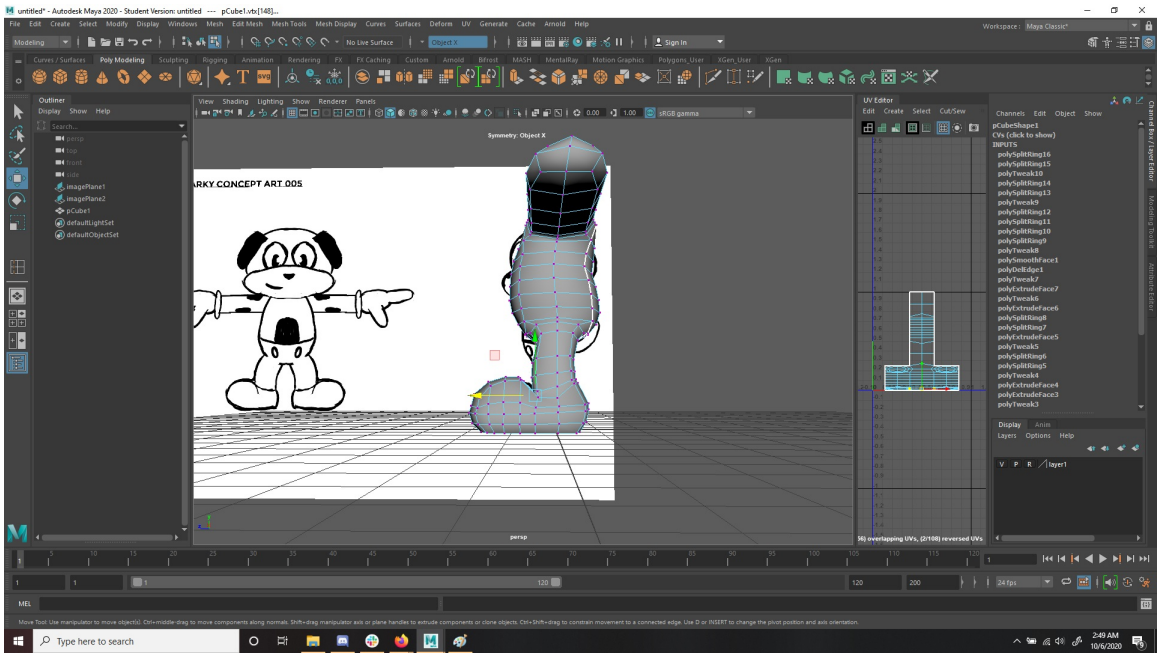

Figure 13: Shaped the feet

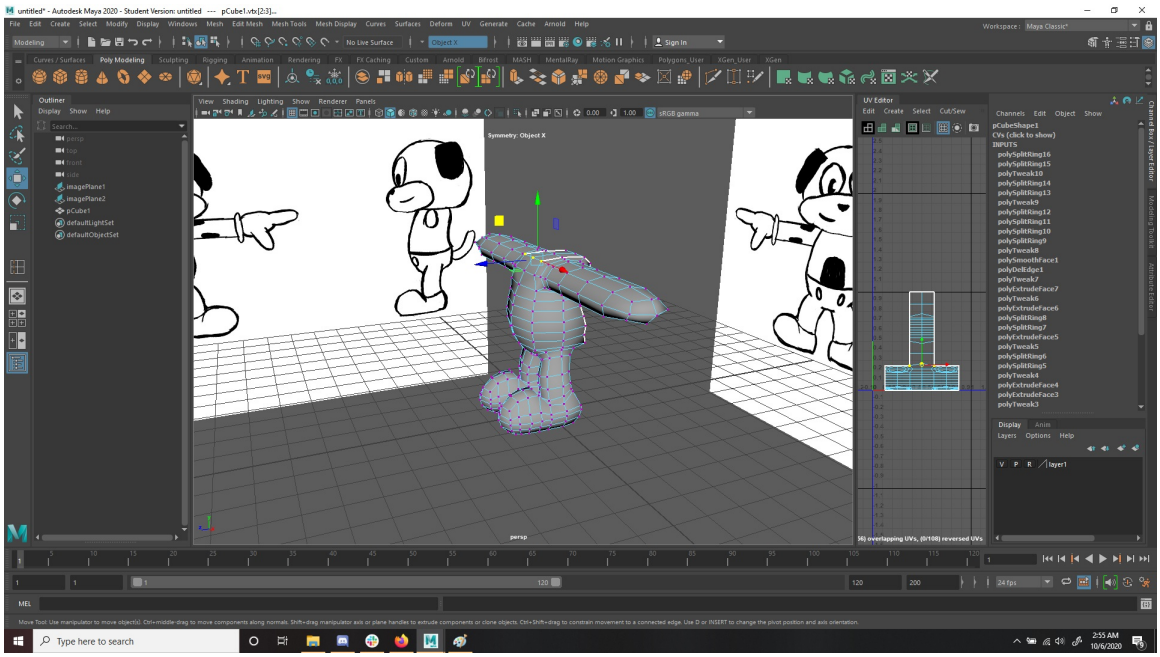

Figure 14: Another angle

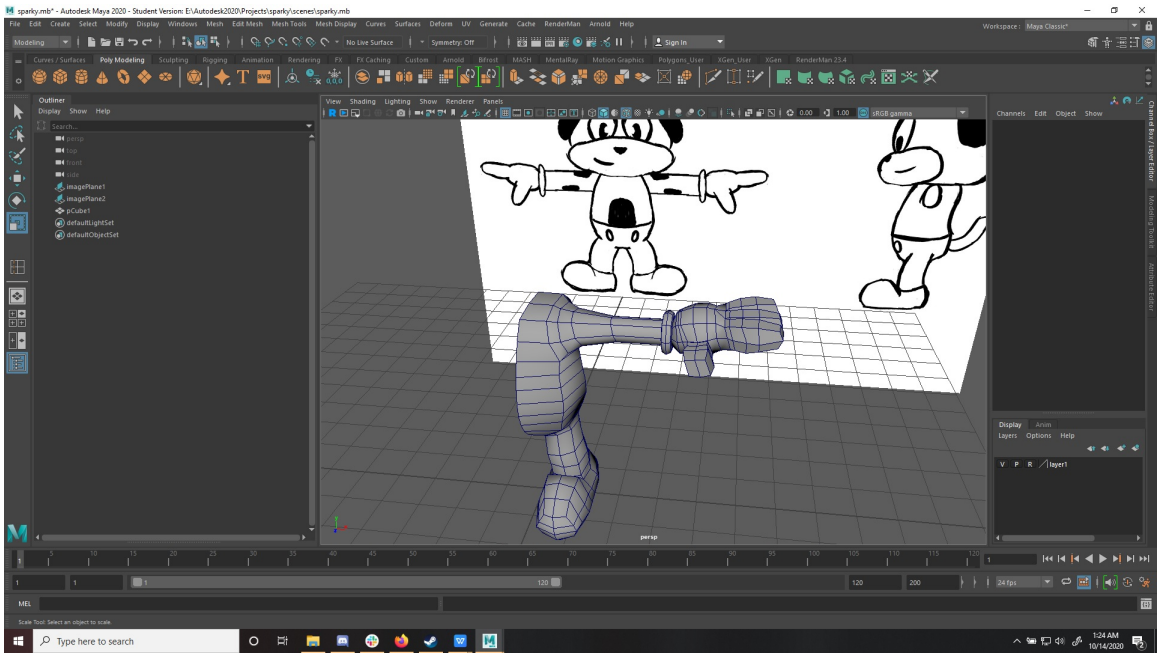

Figure 15: Making the hands

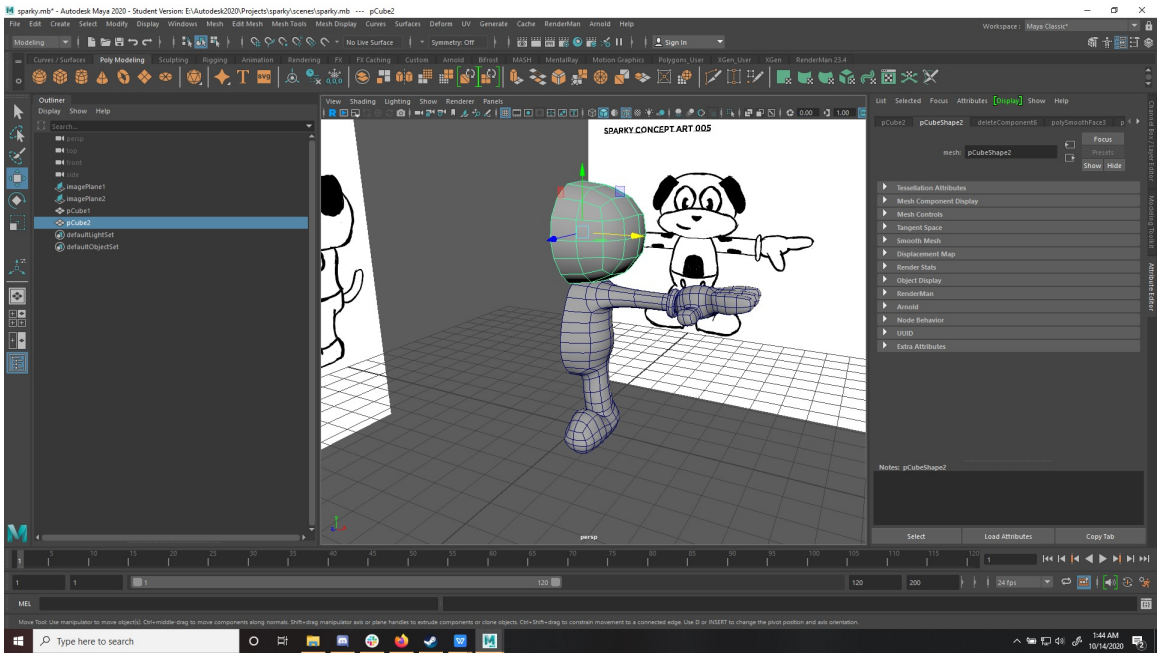

Figure 16: Base of the head

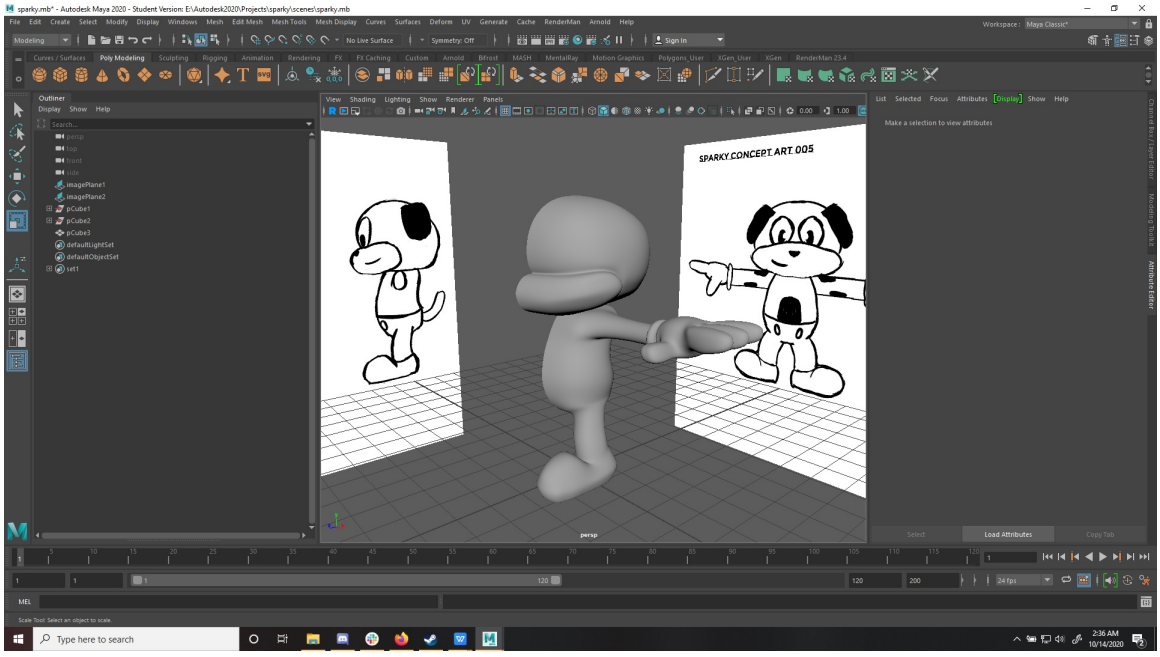

Figure 17: Creating the mouth area

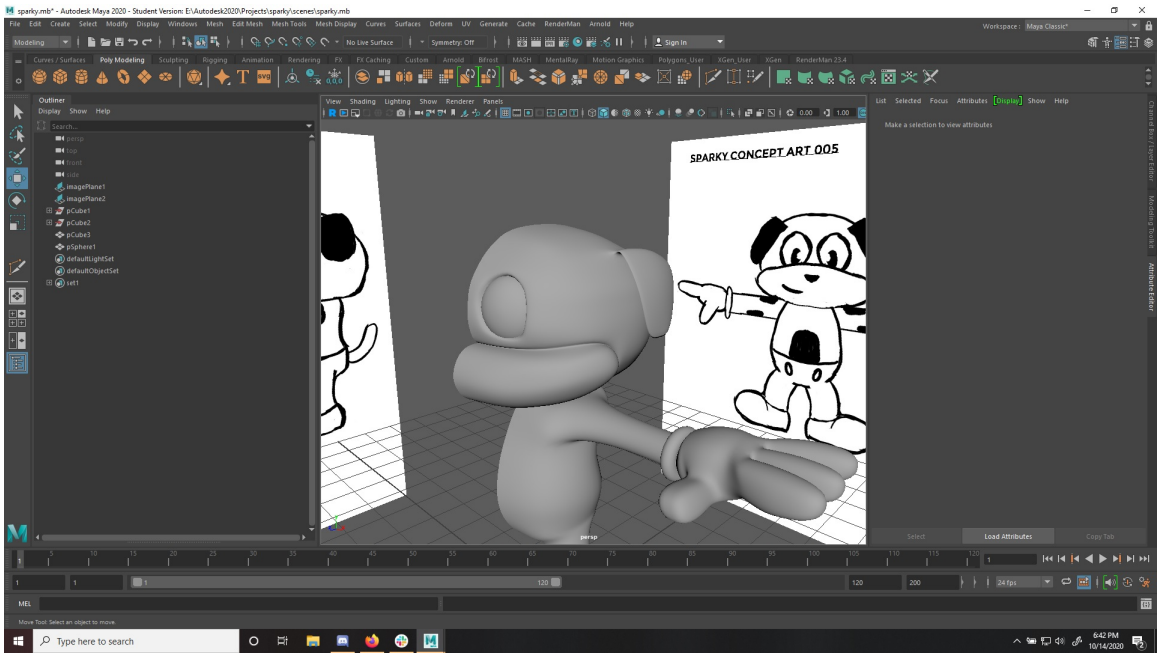

Figure 18: Making the eyes and ears

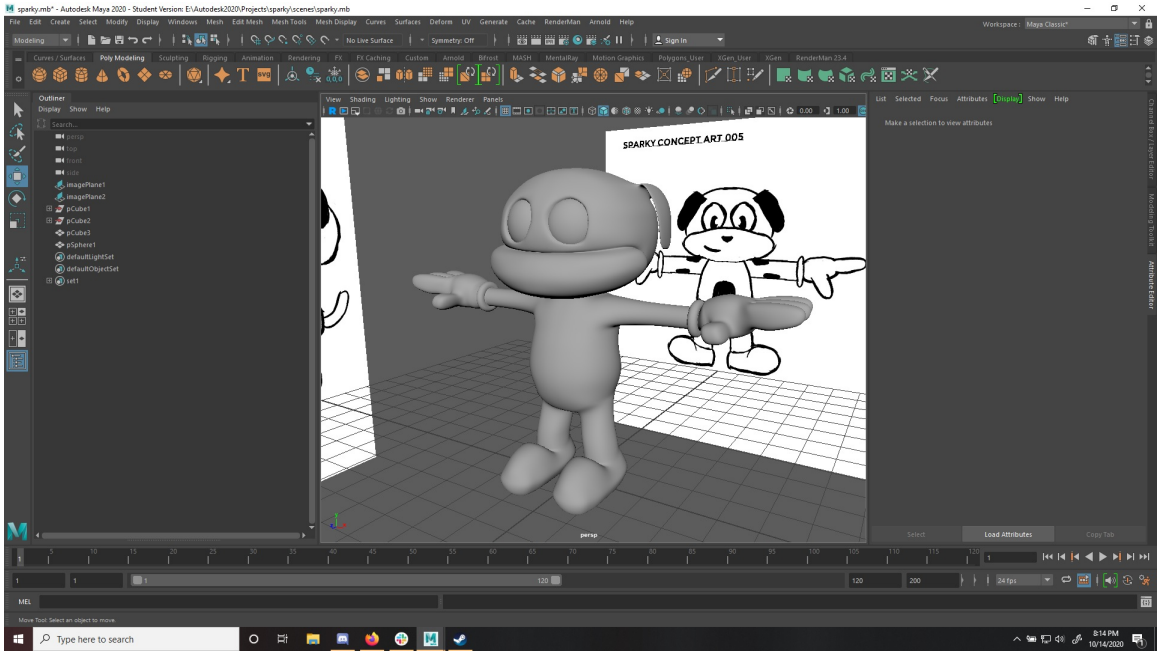

Figure 19: Mirrored the model

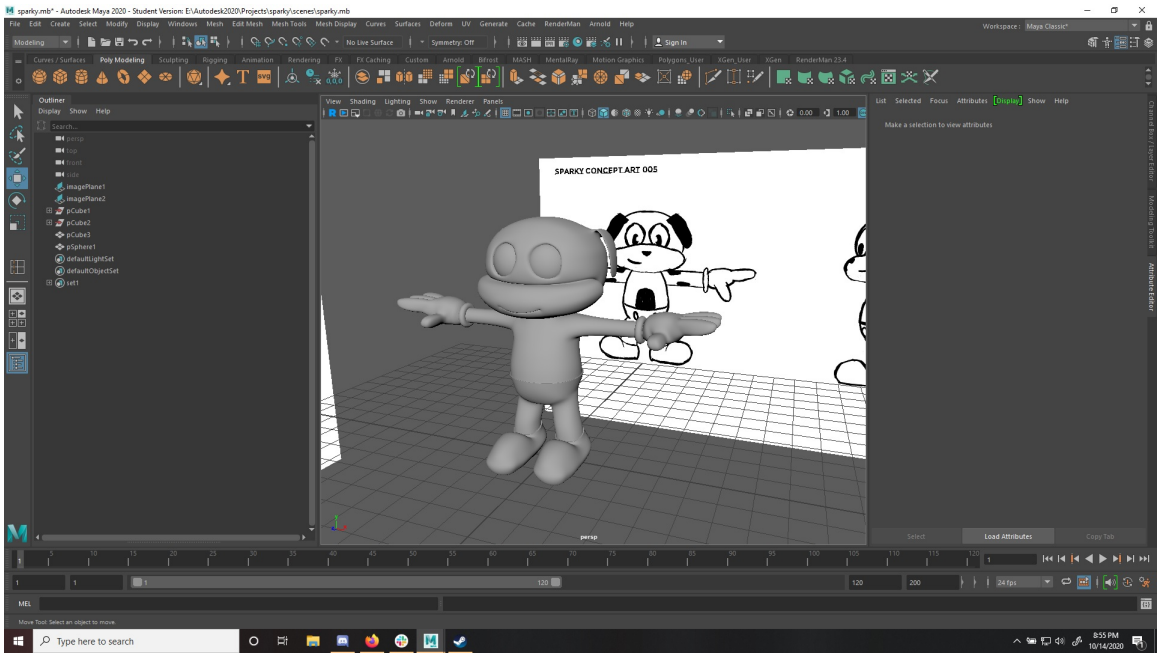

Figure 20: Added mouth and clothes

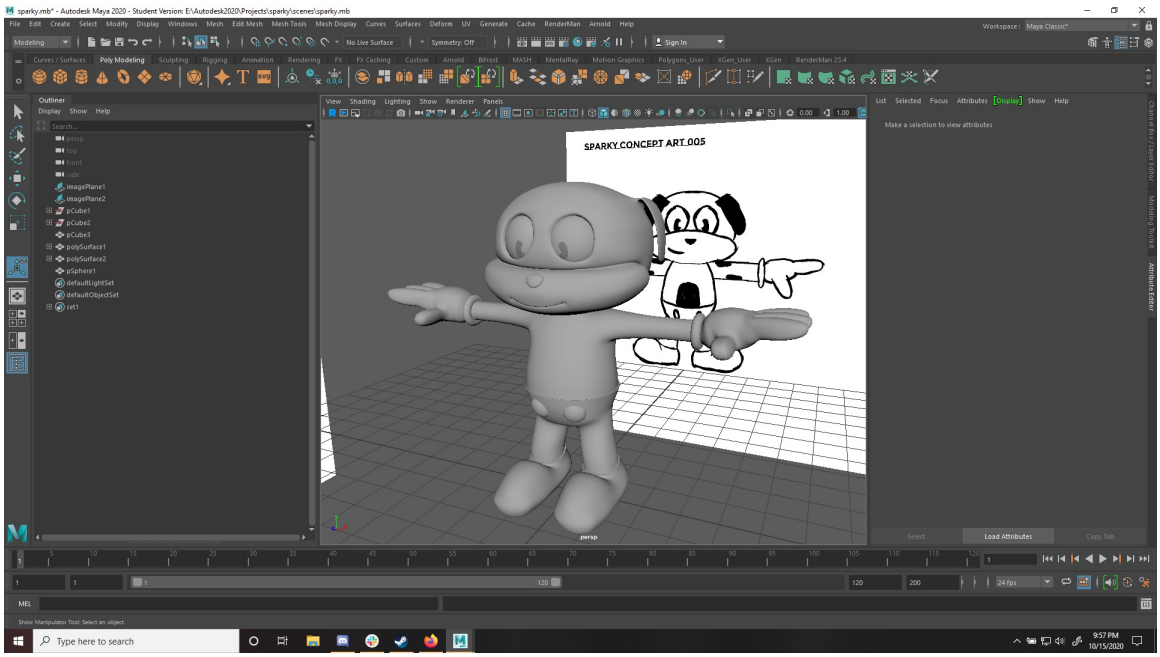

Figure 21: Added pupils, nose, and buttons

Appendix C Jerry Production Screenshots

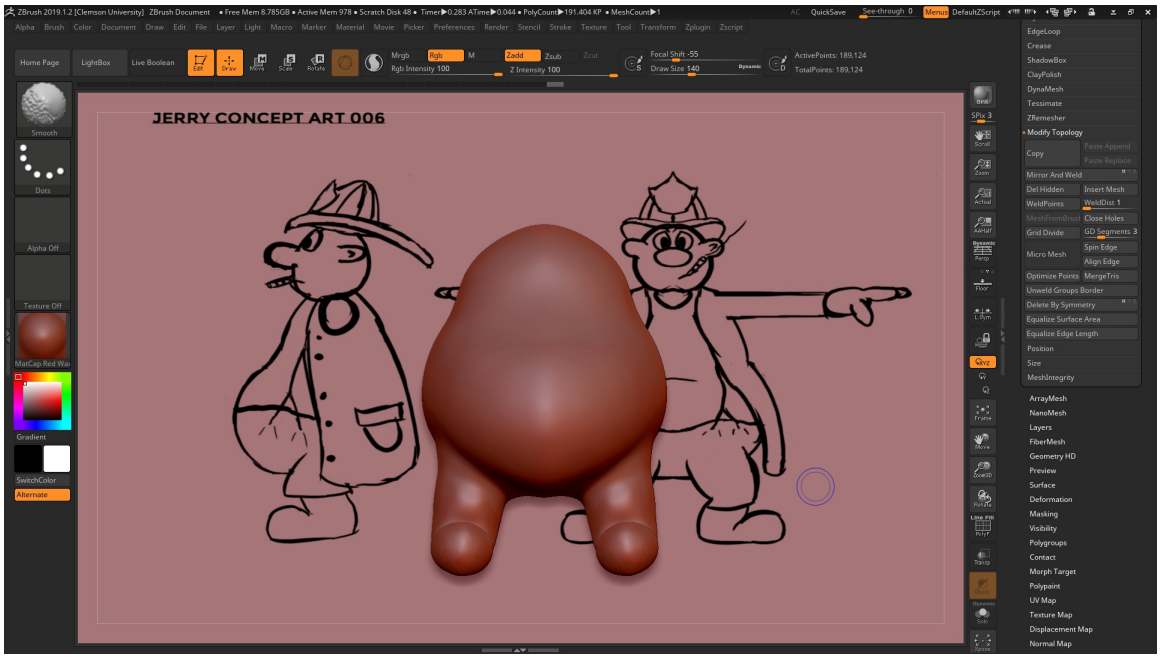

Figure 22: Starting shape

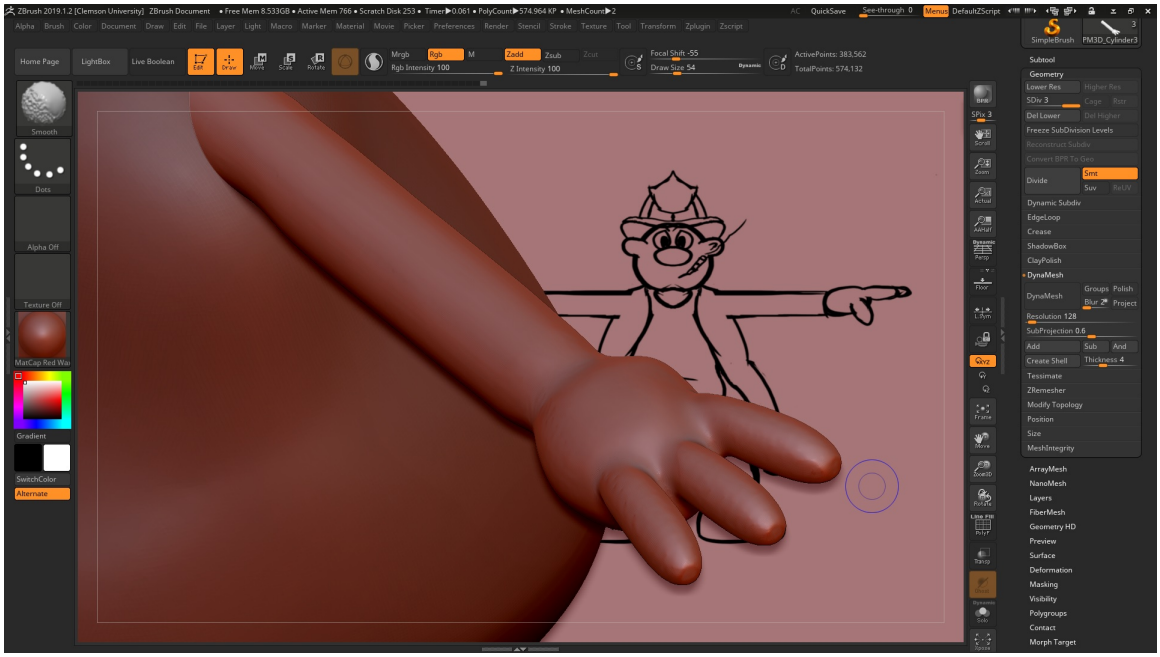

Figure 23: Modeled arms and hands

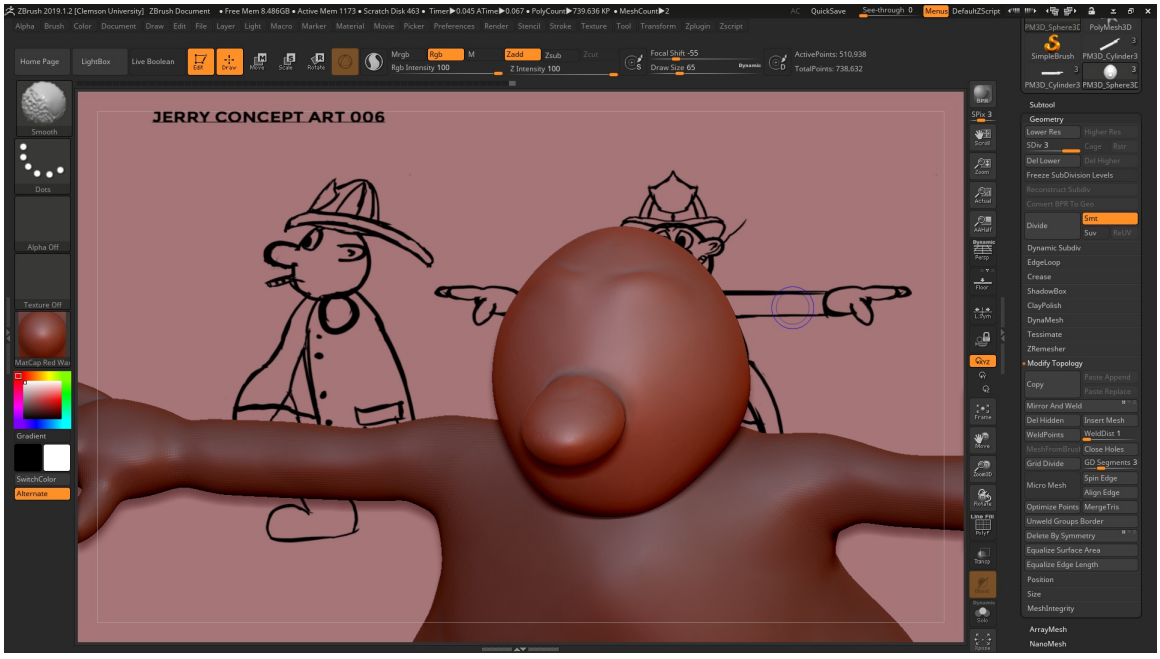

Figure 24: Modeled head

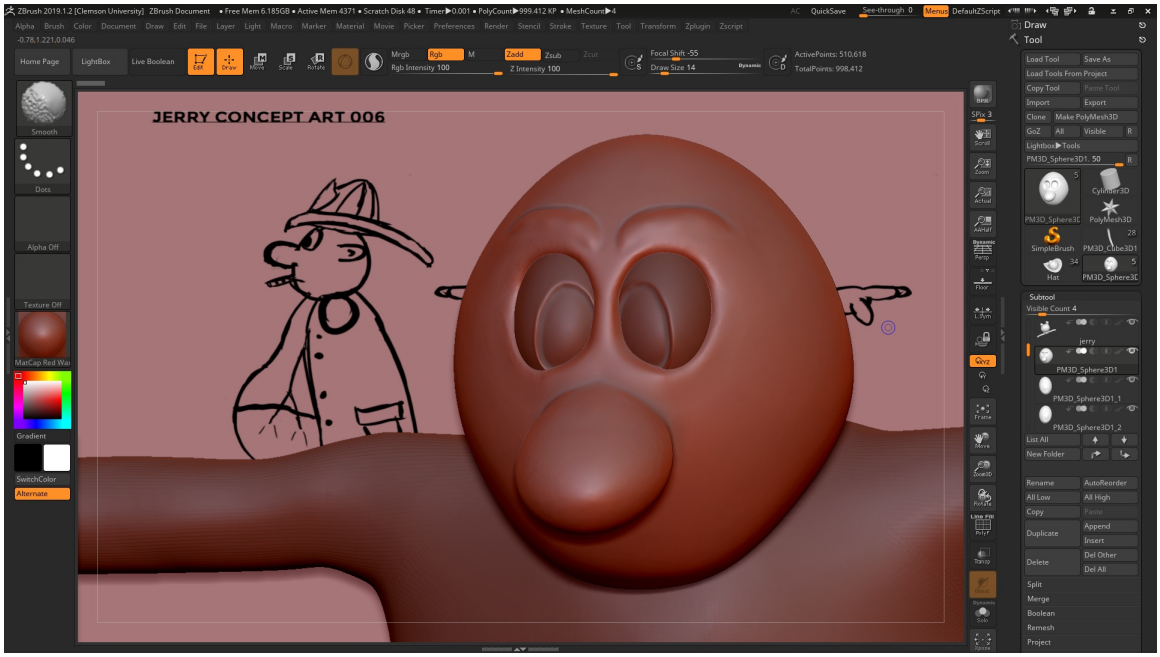

Figure 25: Sculpted the eyes

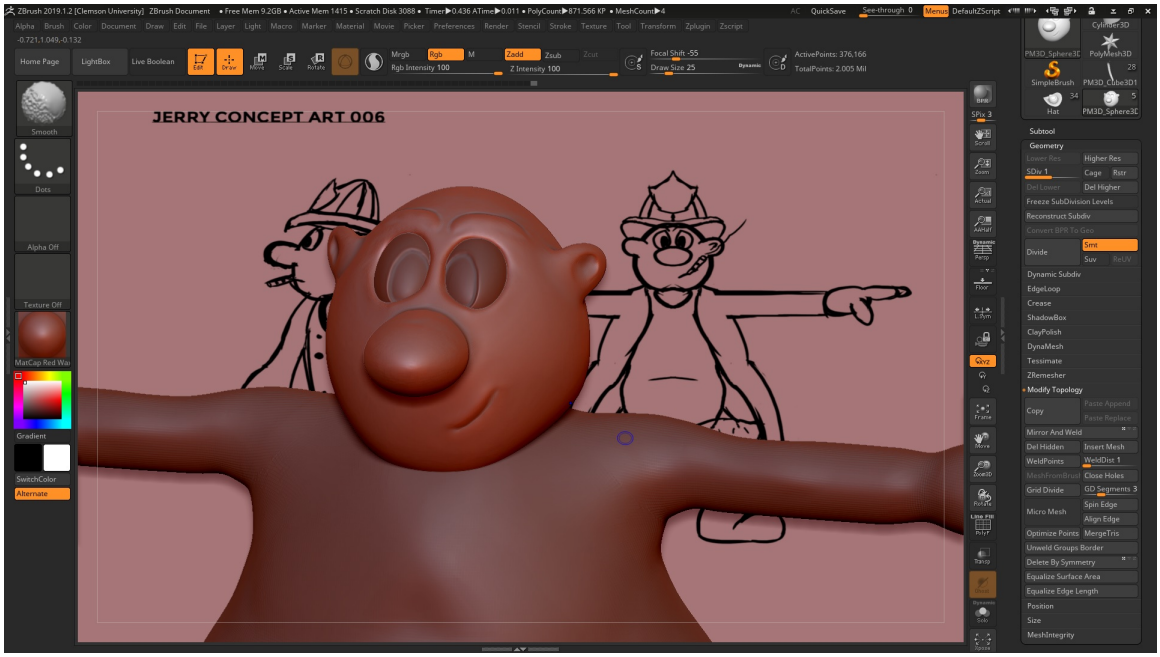

Figure 26: Added the ears

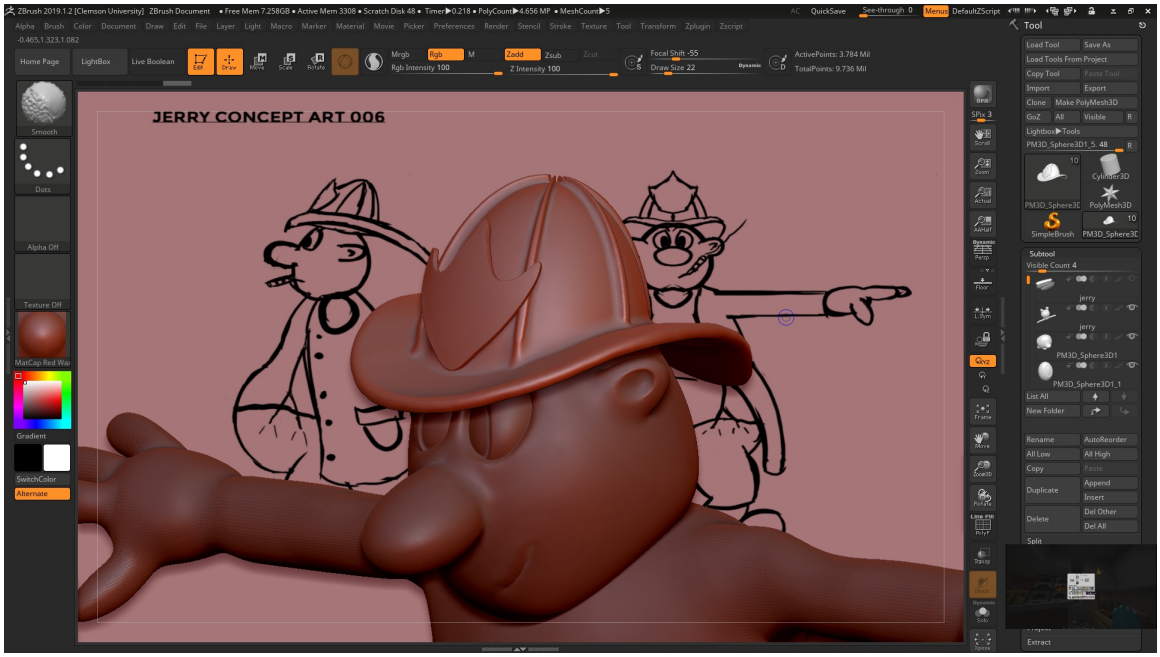

Figure 27: Sculpted the hat

Figure 28: Added Clothes

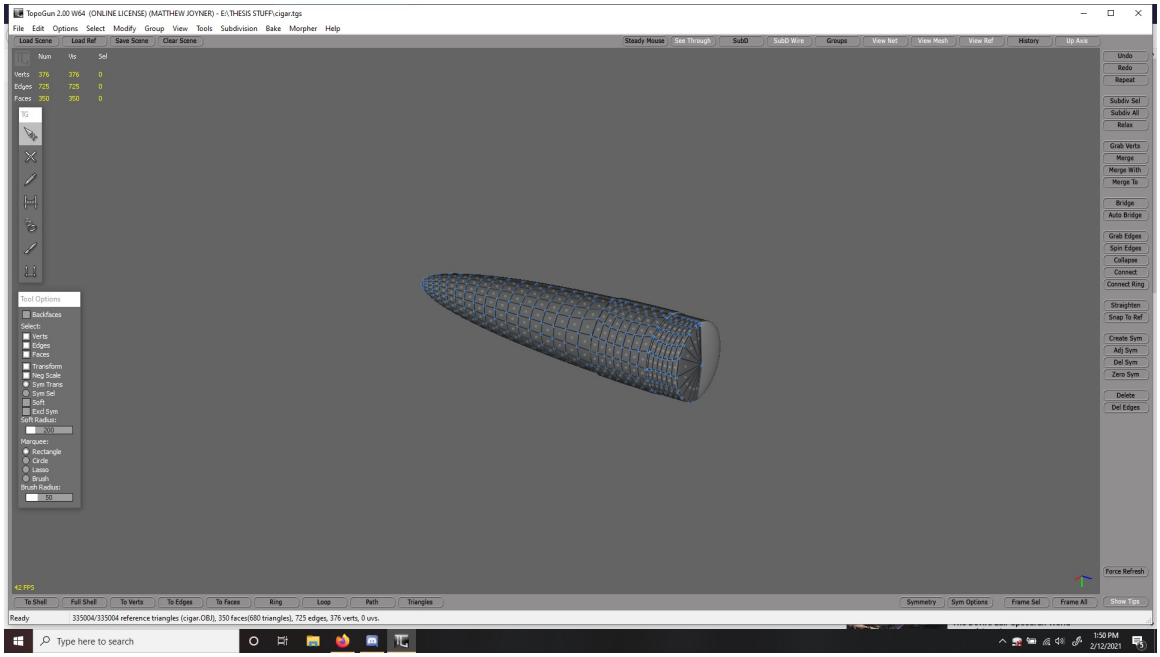

Figure 29: Retopo cigar

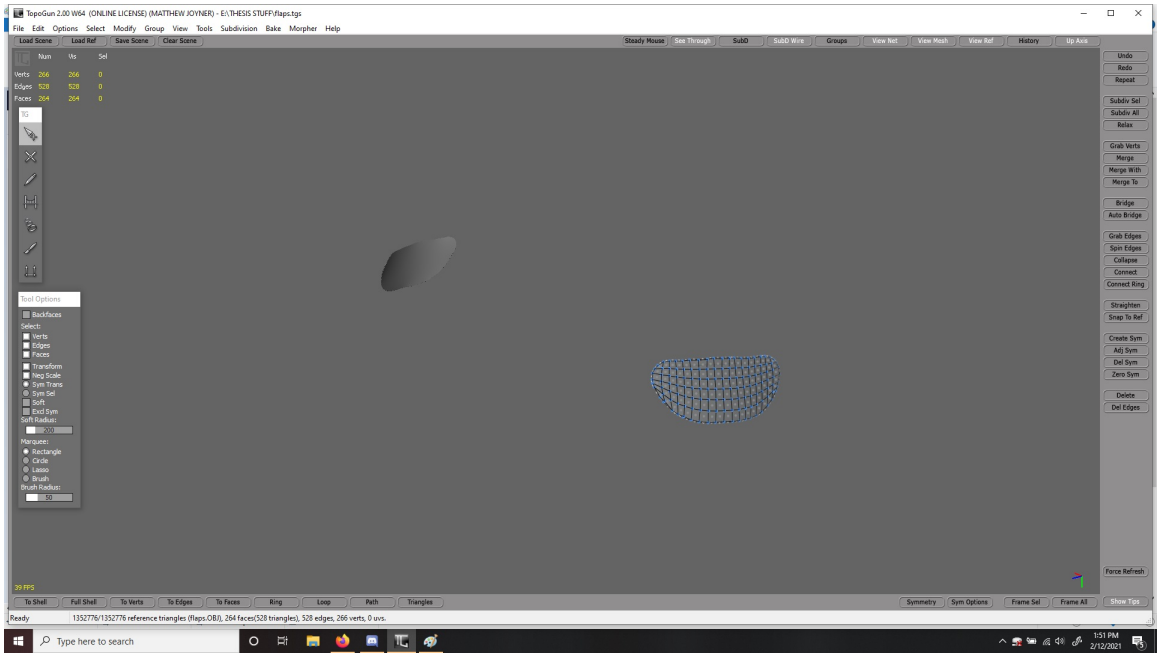

Figure 30: Retopo pocket flaps

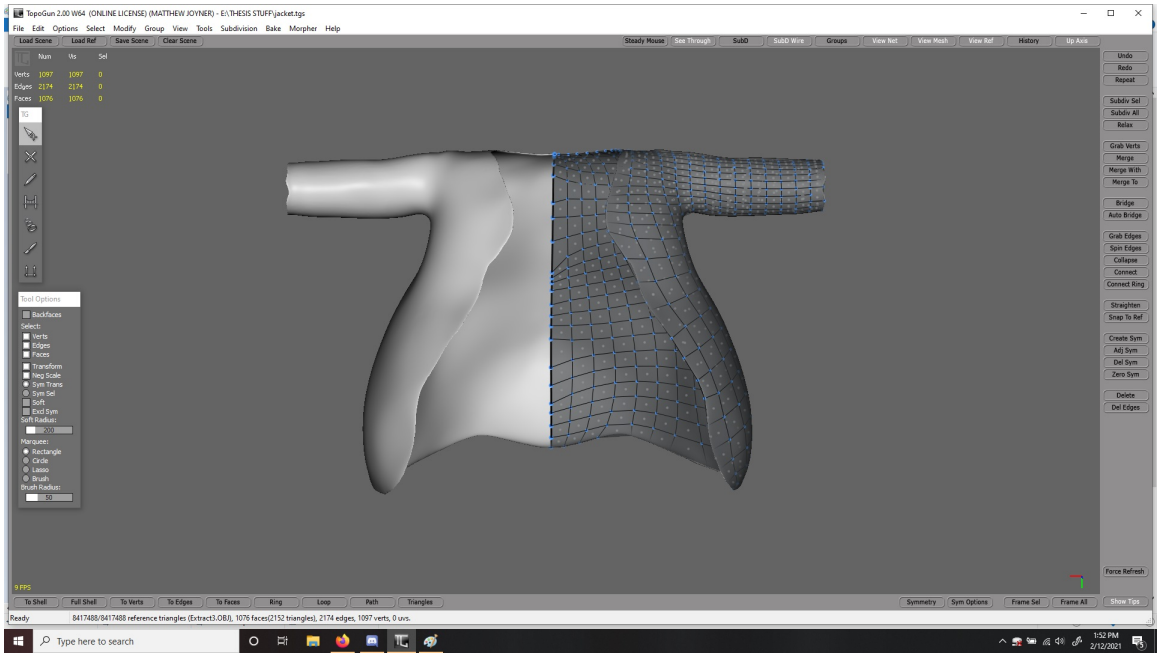

Figure 31: Retopo jacket

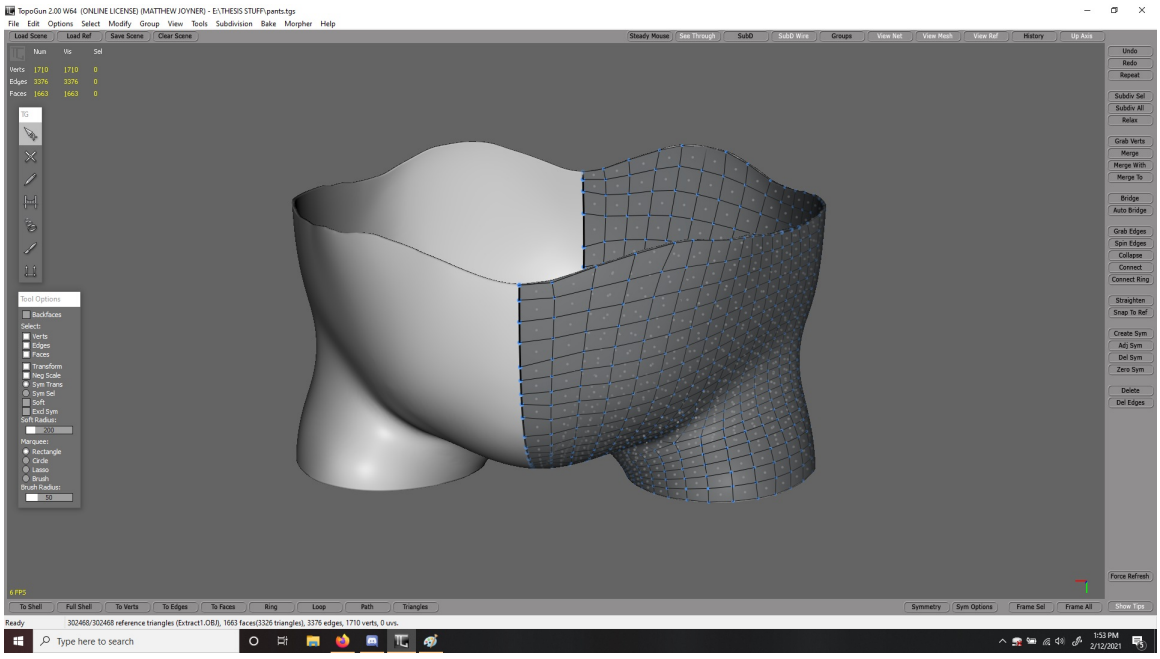

Figure 32: Retopo pants

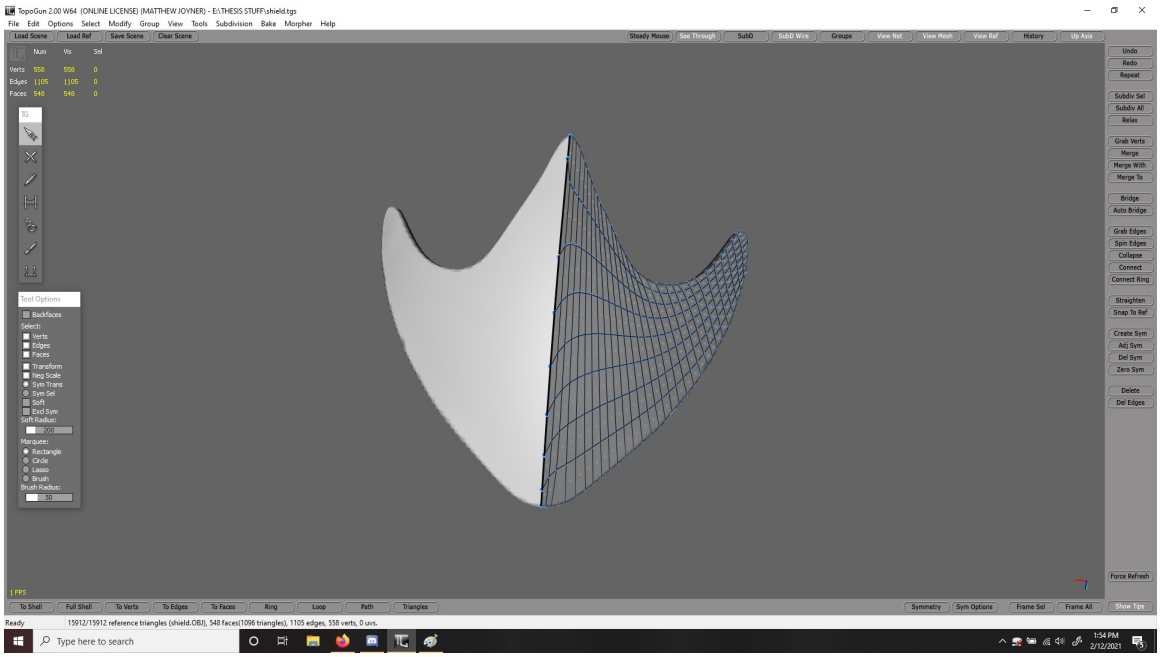

Figure 33: Retopo hat shield

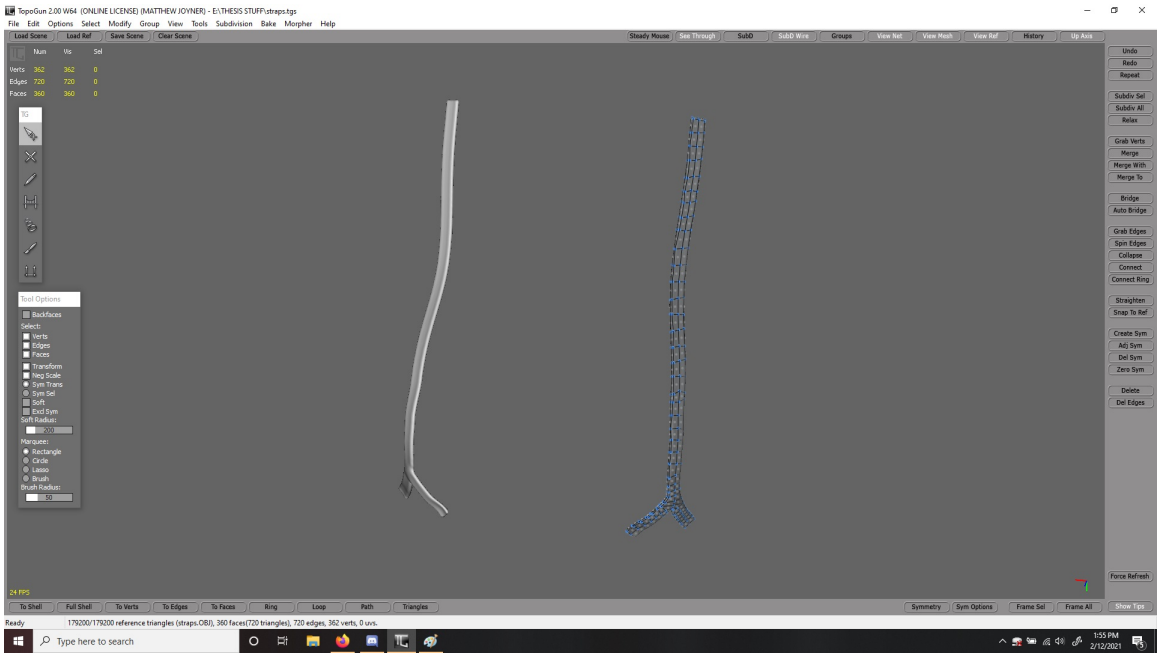

Figure 34: Retopo straps

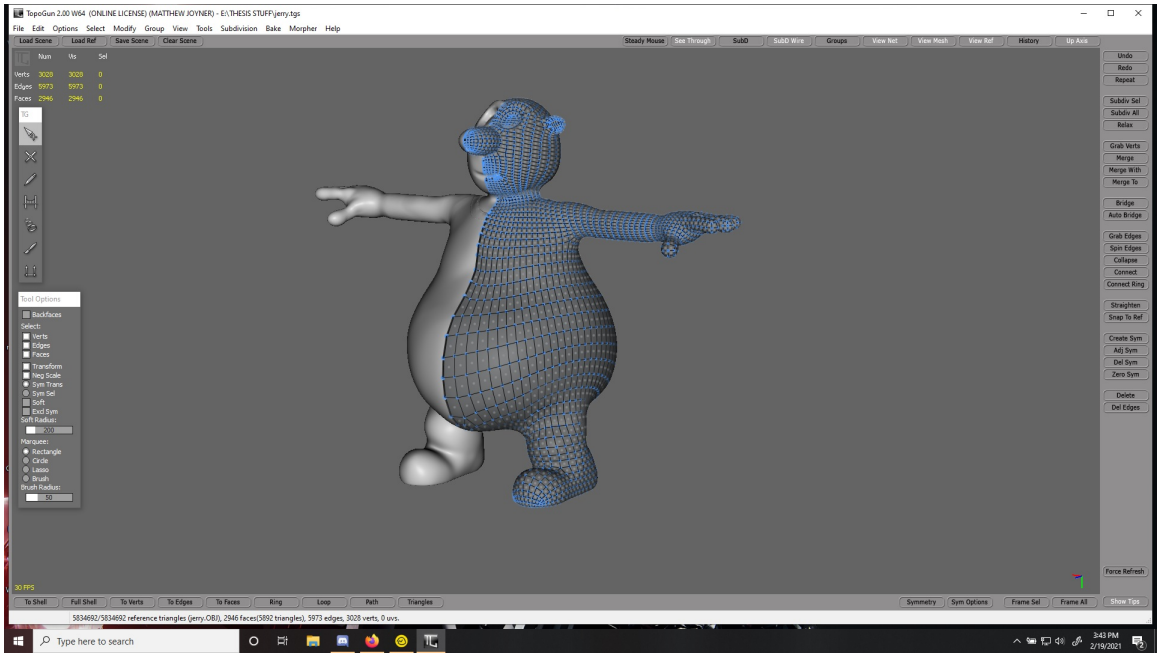

Figure 35: Retopo Jerry

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