

**FINAL YEAR THESIS**

**Shot Division, Animatic, Texturing, Scene Setup,  
Camera Animation, Compositing & Sound Mixing of  
“Through the Window”: An 3D Animated Short Film**

**BY**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of  
Bachelor of Science in Multimedia and Creative Technology

Supervised By

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**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

**DECEMBER 2019**

## APPROVAL

This Project titled “**Through the Window**”, submitted by Shah Noman Khan, to the Department of Multimedia and Creative Technology, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Multimedia and Creative Technology and approved as to its style and contents. The presentation has been held on 26<sup>th</sup> December, 2019.

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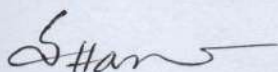
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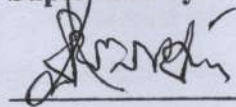
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## DECLARATION

We hereby declare that this project has been done by us under the supervision of **Mr. Arif Ahmed, Associate Professor, Department of MCT, Daffodil International University**. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

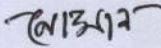
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## ACKNOWLEDGEMENT

First, we express our heartiest thanks and gratitude to Almighty God for His divine blessing makes us possible to complete the final year project successfully.

We are really grateful and wish our profound indebtedness to **Mr. Arif Ahmed, Associate Professor**, Department of MCT Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of “**3D Modeling and Animation**” helped us to carry out this project. His endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior drafts and correcting them at all stages have made it possible to complete this project.

We would like to express our heartiest gratitude to **Dr. Shaikh Muhammad Allayear, Associate Professor and Head**, Department of MCT, for his kind help to finish our project and also to other faculty members and the staff of MCT department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discussion while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

## **ABSTRACT**

The way people express their thoughts is changing day by day. 3D animation is one of the new variations of these mediums. As modern technology is in its peak position right now, 3D animation process is now competent enough to express any story with the looks, colors and emotions of any real-life object or character. While our interest was in 3D animation, we also wanted to convey a message through a story relatable to our culture and society around us. So, we chose a story around child labor, which is a complex social problem in our country. It was our goal to articulate the story in a dynamic yet deep and understandable way through the whole process from story building to modeling, sculpting, texturing, rigging, animation, light setup, rendering and post processing. The final output of this project is a video footage that combine all the work that is done hopefully expresses the idea behind making it. We hope, this project will redefine the idea of 3D animation in our country.

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# CHAPTER 1

## Introduction

### 1.1 Backstory:

Animation by definition is created by generating a chain of drawings or pictures taken by some sort of simulation procedure for creating movement. It creates an optical illusion through which we are able to see still images or drawings moving. 3D Animation is animating objects in a three-dimensional space, usually created via software which can be rotated and moved like real objects. A motion picture is considered one of the most common methods of presenting animation.

The story we developed titled “Through the Window” was decided to be made as a 3D animation because it was the most efficient way to convey our message. This project was heavily inspired by some animated short films by independent artists and studios like “In a Heartbeat”<sup>[1]</sup> from Ringling college, “Piston”<sup>[2]</sup> from ESMA Productions, “Coin Operated”<sup>[3]</sup> Written & Directed by Nicholas Arioli and “Mr. Indifferent”<sup>[4]</sup> from BadStache Animation Studio.

“Through the Window” is a one and a half minute long 3D animated short film which contains cartoon style characters in two different realistic environment or sequences. First sequence will be a school environment with adequate lighting and the second sequence will be a small congested old town cheap toy factory environment in dark lighting.

The story of the short film will portray the incidence of child labor in our society. In the first sequence a school boy plays with his new toy car on his way to school and on his way home from school he stumbles upon another boy of his age who was having a hard time making that very same toy car in a factory. This project will bring out the brutal reality of our socio-economic situation in front of people's eyes, about how regardless of age people have to work for minimum wages even when they are school-going age.

## **1.2 Motivation:**

Now-a-days child labor has become normalized in our society. In this project both realities of the lives of privileged and underprivileged children will be shown side by side for comparison. This stark comparison will effectively communicate the circumstances that cost the basic right of education for an underprivileged child to the viewers.

In our society it is not uncommon to see children working instead of going to school just to feed themselves. Some employers make them work so much as though they were adults while they would never let their own children go through the same situations. It is the hypocrisy of the people with lower morals and no ethical standards. This regular but pathetic sight was the motivation behind developing such a story and make it into a 3D animation.

## **1.3 Objectives:**

Objectives of this project are:

1. Create different prop models
2. Create 3D characters with attractive, adorable features
3. Create two different environments to portray the story appropriately
4. Texture the models to make them look as close to real objects as possible
5. Rig and skin paint the characters to make them workable models for animation
6. Animate the characters with proper body language and facial expressions
7. Light the scenes properly for the maximum resemblance with real environment
8. Render the animated frames in proper quality and format
9. Color grade and assemble the scenes
10. Add sound effects to enhance the experience
11. Portray the social situation of child labor through 3d animation
12. Create awareness about child labor in a relatable way

Although the output of this project is a 3D animation but it is not necessarily targeted towards children. The target audience of this project are people of age thirteen and up but people of any age can watch the film and enjoy it.

#### **1.4 Literature review:**

Several 3D animations have been consulted to offer an in-depth analysis of the best methodology for the film. In the film "In a Heartbeat" Beth David and Esteban Bravo used a specific pattern for the environment in their film. Everything had a "Heart" shaped feel to them. The idea of selecting a pattern and stylizing all the props and environment according to that was inspiring. Some films use semi realistic environment style such as "Piston" of ESMA productions whereas others use super realistic background environment like that of Badstache studios "Mr. Indifferent". Luke Snedecor & Sarah Heinz at Chapman University created "Preheated" <sup>[4]</sup> which portrayed a child character, which is a wonderful reference. The animated short film "Alike"<sup>[5]</sup>, directed by Daniel Martínez Lara & Rafa Cano Méndez, used a minimal but stylized background environment with the unique idea of rounded edged buildings. "Watermelon A Cautionary Tale"<sup>[6]</sup> by Kefei Li & Connie Qin He had amazing animation and lighting but the background props were not much detailed and there were some noticeable mistakes where surfaces which were supposed to collide goes through each other instead. Problems like these inspired us to be looked into to eliminate in our film. 3D animated short film "The Present"<sup>[7]</sup> was based on a great little comic strip by the very talented Fabio Coala. This film has excellent texture and lighting. Most of these films had a subtle depth of field as per needed in each scene which gives us a challenge to obtain. By studying all of these films and more we have chosen the best combination of designs, textures and environments to portray our story vividly and comprehensively.

## CHAPTER 2

### Methodology

#### 2.1 Shot Division:

Each angle, movement and shot distance of the camera is listed to highlight the mood, tone and meaning of this story on screen. It also has short descriptions of the shots, so that the shots are easily understandable and have the advantage for the storyboard artist.

In this project shot division is not detailed, only an important scene has done. because after the shot division we made storyboard and animatic for a better understanding of the story. For this project initially list down total 16 main shots but, in this film, we use total 24 shots to tell the story.

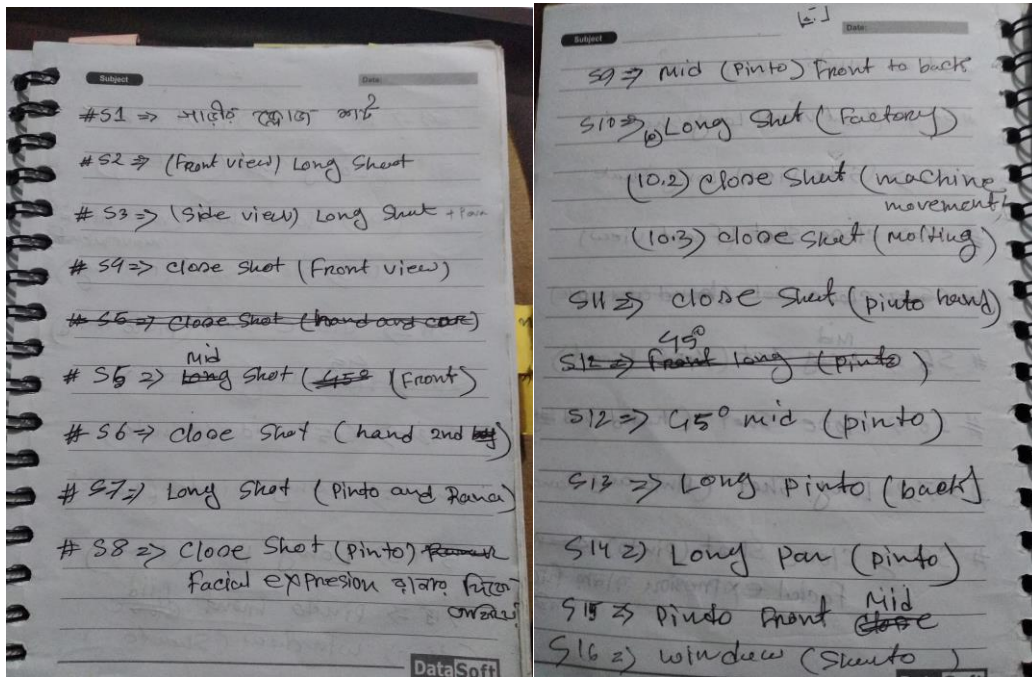


Figure 2.1 Shot Division

Before the shot division, some animated short films have been seen so that our shot selection is accurate and understandable.

## 2.2 Animatic:

It's the combination of the storyboards, audio and timing. Animators will take the shot angle, duration, certain actions, and timings as a starting point for their work on each shot. This is the guideline to the entire film. Animatic helped us to see the blueprint of the short film. The animatic was basically created by adding sound in conjunction with the pictures on the storyboard.

The whole animatic has been done in three steps total. The software and tools used to create the animatic in this case are:

1. Adobe Photoshop<sup>[10]</sup>
2. Adobe Premiere pro<sup>[11]</sup>.
3. Graphic tablet

First, the pictures on the storyboard were drawn to Adobe Photoshop<sup>[10]</sup> using a graphic tablet. Photos of each shot in Adobe Photoshop<sup>[10]</sup> are arranged in a separate layer so that a simple animation can be created using those images in Adobe Premiere pro<sup>[11]</sup>.

Finally, Adobe Premiere pro<sup>[11]</sup> is taken for animation by exporting images from Adobe Photoshop<sup>[10]</sup>

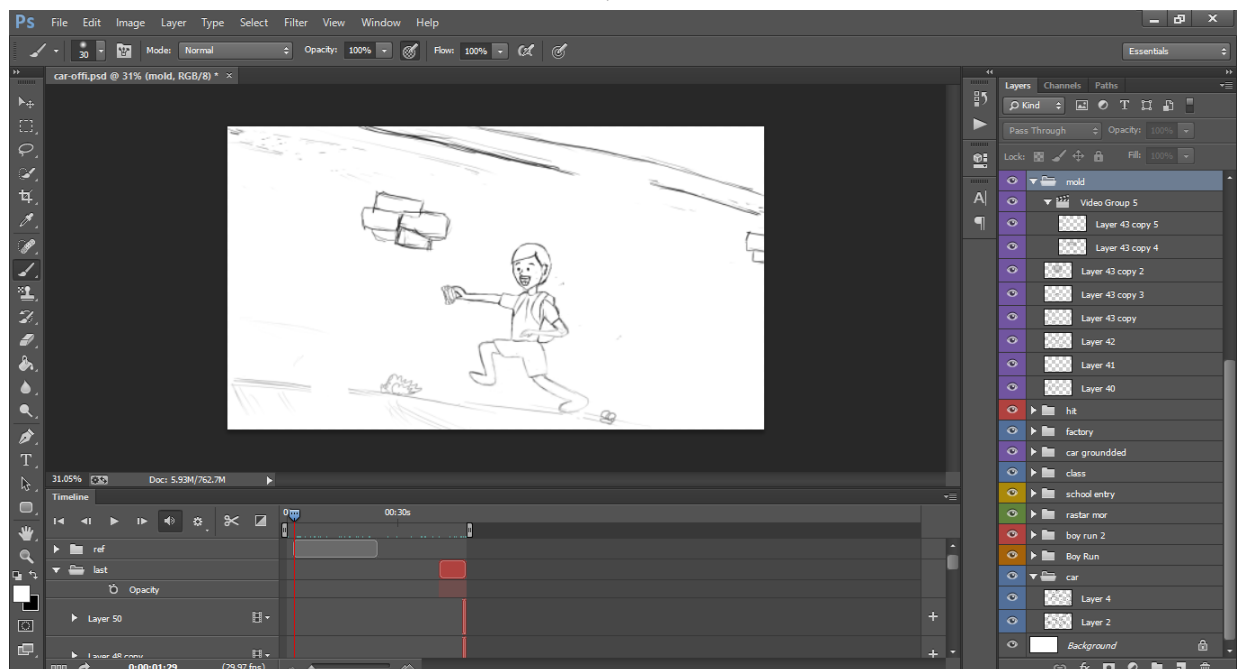


Figure 2.2 Adobe Photoshop Drawing

Images are arranged according to the sequence on Adobe Premiere pro<sup>[11]</sup> and the animations have been animated. In this case the images were scaled in some places and the position of some images was animated. The timing of the animated shot is fixed.

Sound mixing is done after animation and timing. In order to use the sound, the sound has been downloaded from various sites of the Internet. Adobe Premiere pro<sup>[11]</sup> is used for sound editing.

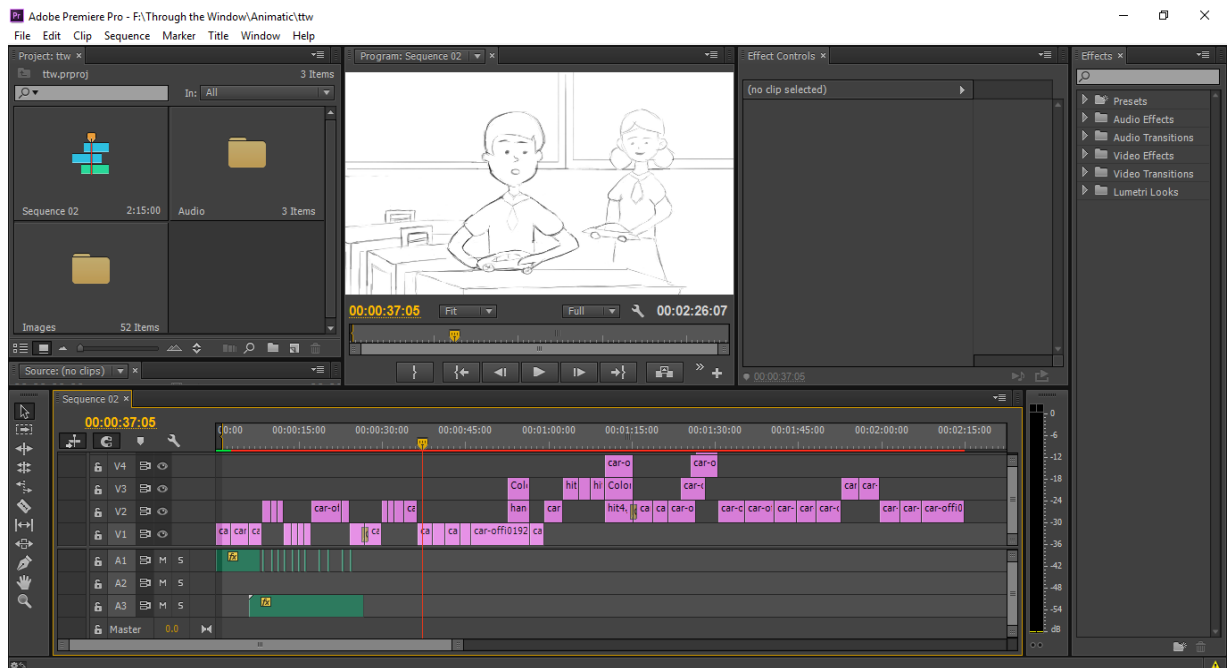


Figure 2.3 Adobe Premiere pro Editing

Usually it takes a lot of time to create an animatic, based on the duration of the story. It took about 1 week to create this animatic. In order to make the story understandable through animate, a lot more pictures have to be drawn from the pictures on the storyboard.



## 2.3 Texturing:

### 2.3.1 Character Costume:

The boy working in the factory is Pintu. He is one of the main characters in this short film. The clothes he wore are textured through Photoshop. In this case, UV's picture of Pintu cloth is exported from Autodesk Maya<sup>[8]</sup> in PNG format and taken in Photoshop.

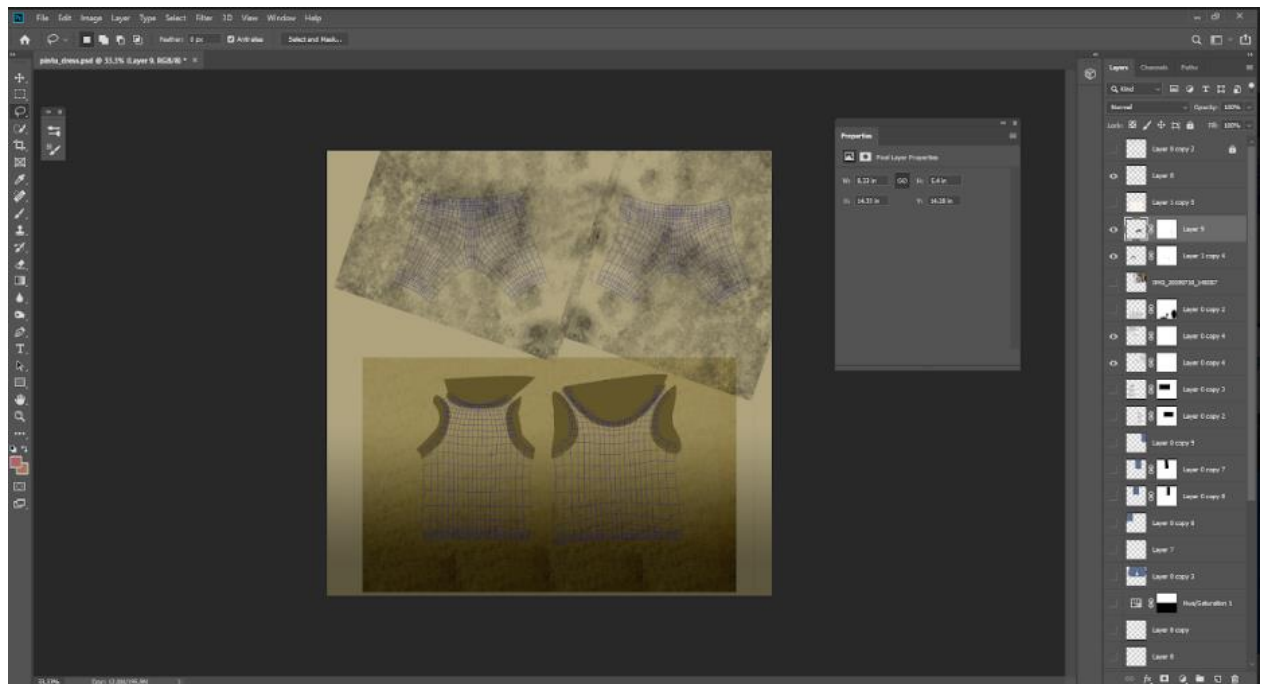


Figure 2.4 Pintu cloth Texture

Two different colors have been used for Pintu's t-shirts and pants. The t-shirts and pants are given color according to the marks on the UV of the Pintu cloth. Dark color gradient has been used to create dirt. It uses small colored splashes on top and blends it with all the other layers and finally the texture of the cloth is applied on it.

In the case of pants, the dark color gradient has been used to create dirt. Using a small color splash on top of it, it has been blended with all the other layers and the texture of the jean's fabric has been added to the pants.

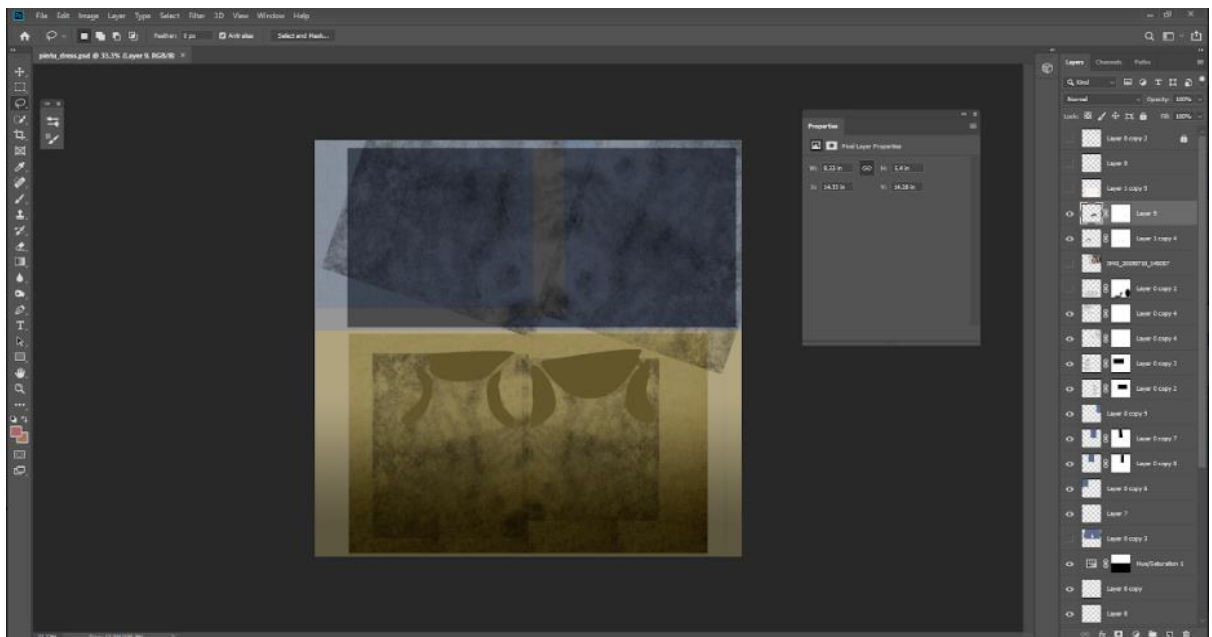


Figure 2.5 Pintu cloth Texture

Created image in Photoshop black and white with curves and levels to create reflection and bump. maps.



Figure 2.6 Pintu Cloth Texture

### 2.3.2 Box:

First pictures of cardboard and dirt were downloaded from the Internet and Adobe Photoshop<sup>[10]</sup> was used to texture the box. The picture of the UV was taken in Photoshop and the downloaded cardboard picture was cut according to the marks of UV.

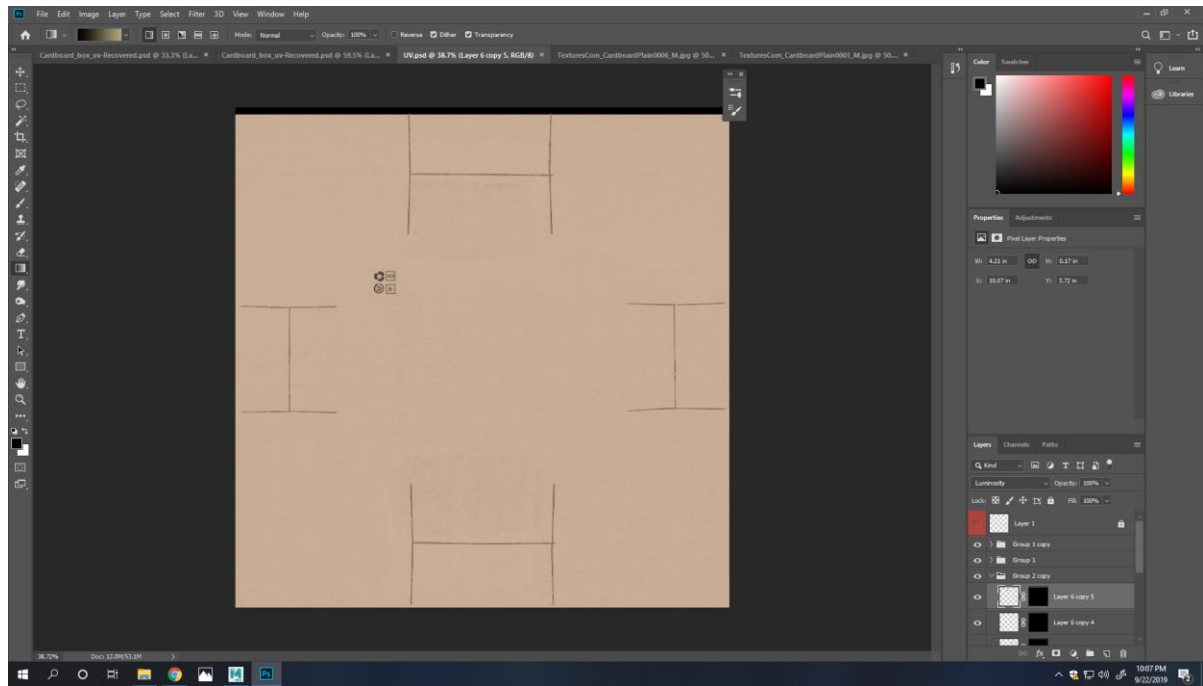


Figure 2.7 Box Texture

To make the box match our scene and make it more believable, various stickers according to the marks on the UV's picture and then dirt has been added to it. The sticker layer has been blended with a cardboard layer to make the stickers look real. The stickers blend in well with the cardboard image.

To add dirt, both the cardboard and sticker layers have been blended with the layer of dirt so that the dirt has been reliably mixed.

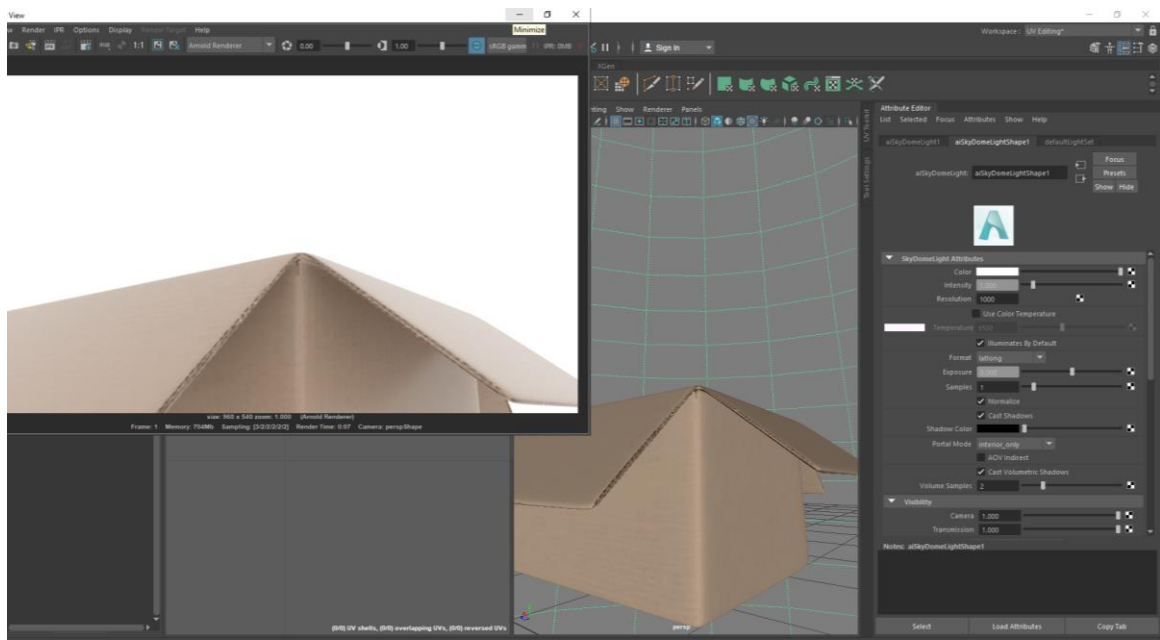


Figure 2.8 Box Texture in Maya

After making the texture of the box, it is applied to Autodesk Maya<sup>[8]</sup> and reflection and bump map have been created. Black and white images were created using Photoshop's curve and level to make bumps and reflections map.

### 2.3.3 Bags:

In this project, the bags are designed for “Shanto” and other students in the class. UV photos of the bag models are taken from Autodesk Maya<sup>[8]</sup> to texture the bags. As a result, the model has to put different designs through a 2D image. To create the texture, UV image has been designed with Photoshop.

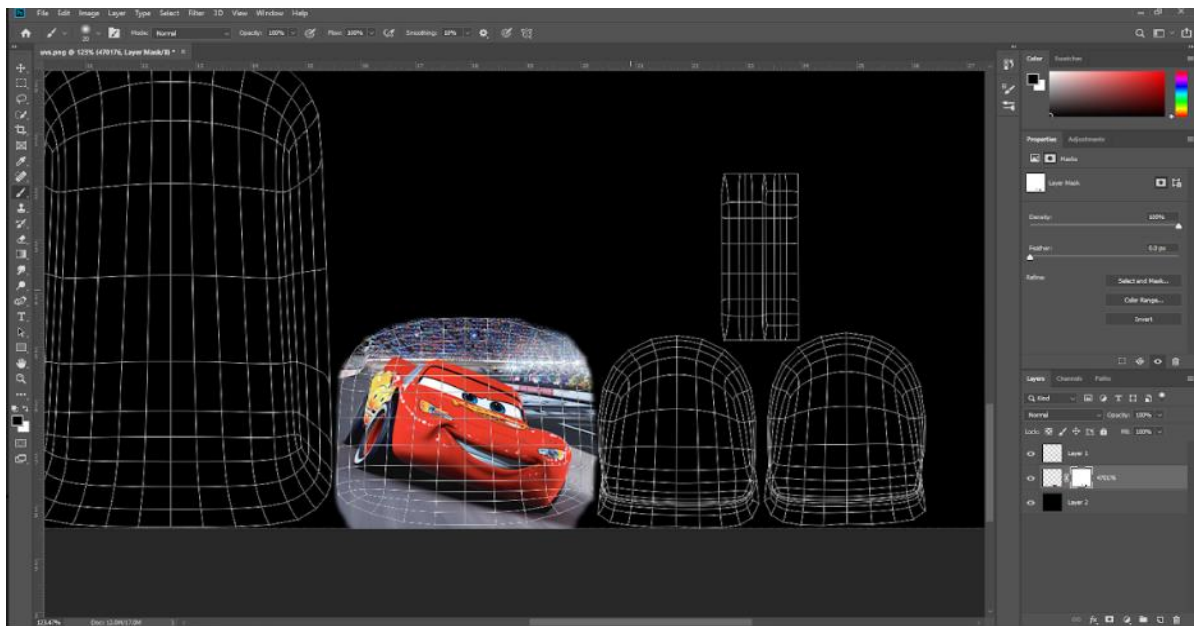


Figure 2.9 Bag UV Image into Photoshop

The bag of Maine Character (Shanto) has been designed in the Car Movie theme. For this, a picture of a car movie has been downloaded from the Internet, and the image is cut in the upper pocket of the bag according to UV. Two stickers are used for the side pockets.

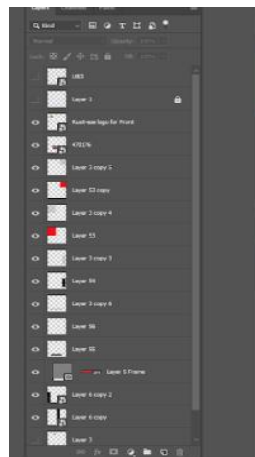


Figure 2.10 Bag Texture layer in Photoshop

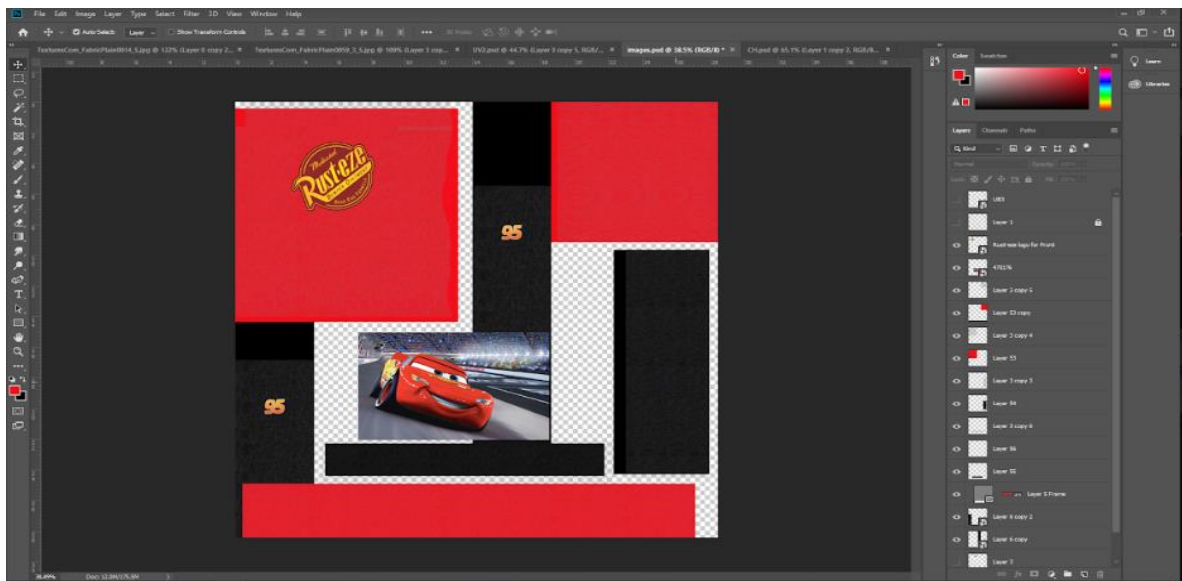


Figure 2.11 Shanto’s Bag Final Texture in Photoshop

According to the color theme of the car movie, the main colors of the bag were used red and black. Due to the black and red background colors in the design, the UV has been adjusted accordingly.

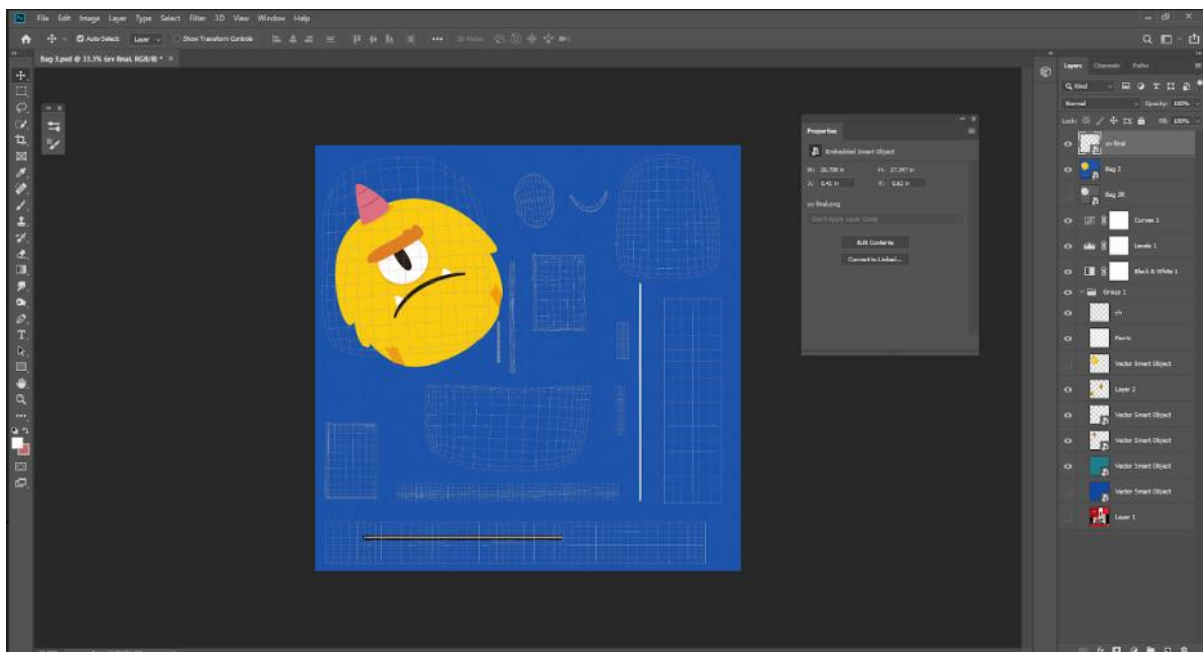


Figure 2.12 Other Bag Final Texture in Photoshop

Since the rest of the bags are used as scenes props, these are designed with kids in mind. For this reason some cartoon character pictures have been used and the bags have been colored.





Figure 2.11 Shanto's Bag Final Texture in Maya

For the zipper of the bag, the first zipper picture was made according to UV. After all the designs have been applied, the texture of the cloth has been applied to the bottom layer of the sticker, picture and zipper to bring the cloth to the bag.



Figure 2.12 Other Bag Final Texture in Maya



### 2.3.4 Drum:

The drum is one of the many props made for the factory scene. To drum texture, the UV image of the drum was imported by Photoshop. It was then created according to the lines in the picture.

For this, first add a layer and add color to the drum. To make the drum realistic, add dirt to it. To add the dirt, paint the dirt on the color layer using the blend option with the drum's main color and create the dirt

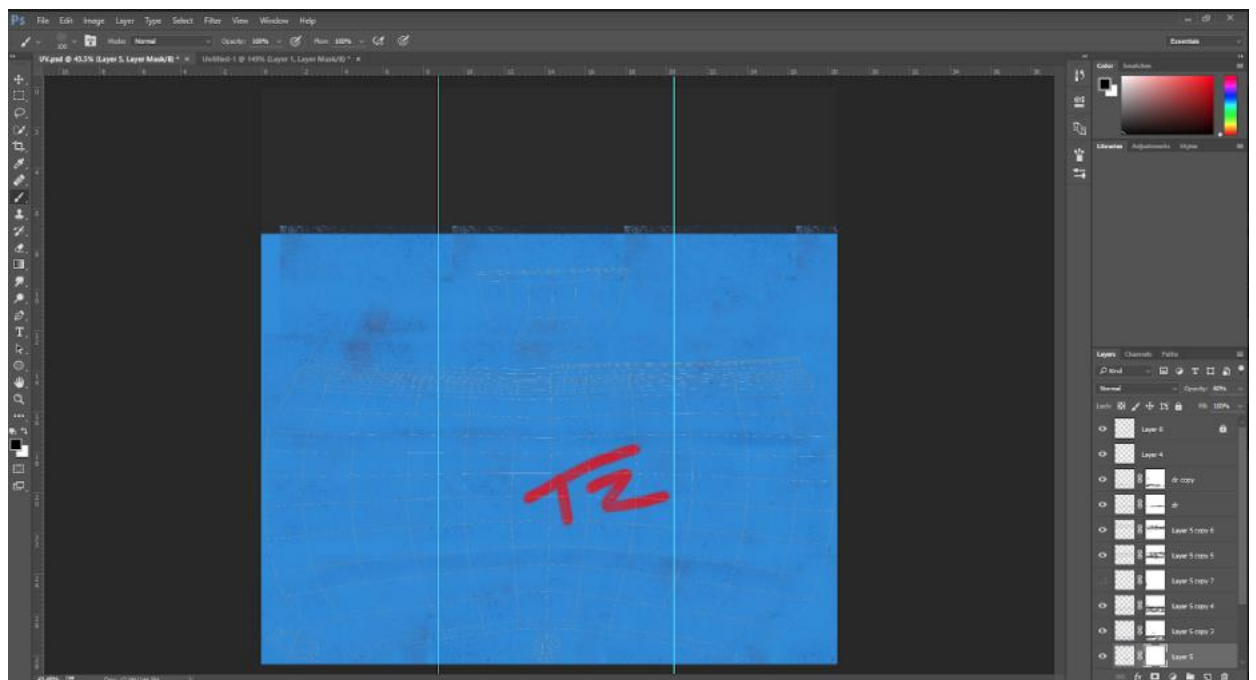


Figure 2.13 Drum Texture in Photoshop

Usually an old drum has different textures using different colors, according to which Photoshop brush for writing in this drum has been written on top of the new layer and blended with the rest of the layer so that the text is mixed with all the layers below.

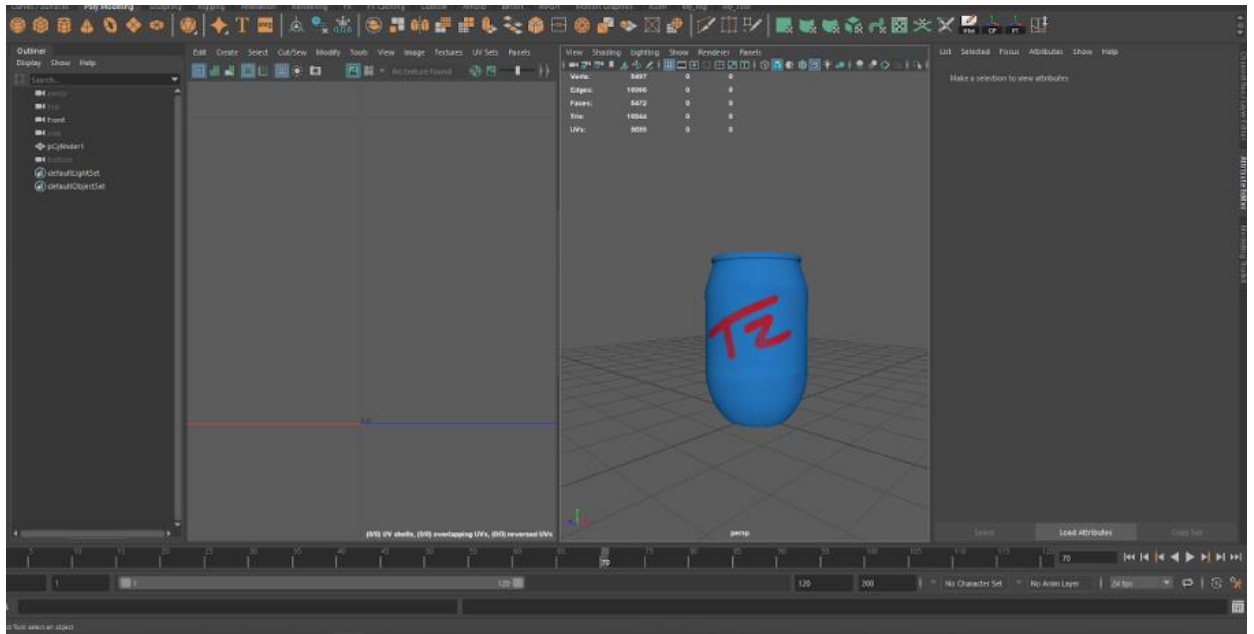


Figure 2.14 Drum Texture in Maya

After being textured, the drum's color texture has been bumped and ruffled to make the drum bump and roughness black and white.

### 2.3.5 Table:

The table is modeled for a factory scene. Tables were used to assemble the toys at the scene and store the belongings in the storeroom. The table is textured in “substance painter”<sup>[13]</sup>.

Since the table has to be textured for a factory scene, different types of dirt and stains have to be added to the table. For this, the High Poly Model of the table was first exported from "Autodesk Maya<sup>[8]</sup> " to "FBX" format. The "FBX" file has been imported into “substance painter”<sup>[13]</sup>.

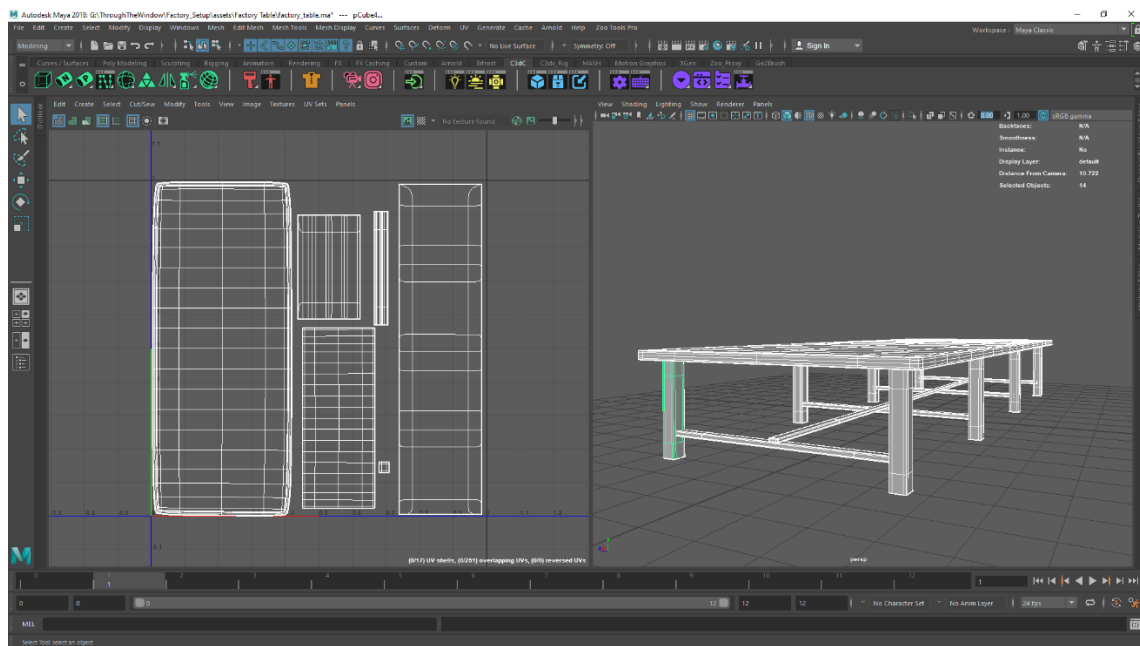


Figure 2.15 Table UV in Maya

The table model was first baked in “substance painter”<sup>[13]</sup> for texture. And it has been selected what the map will need to get the desired output. The maps selected in this case are base color, meatless, roughness and bump map.

The texture "Pirate wood" is used for table textures from the material library of “substance painter”<sup>[13]</sup>. This is a smart material.

A new layer is taken after baking to apply it. After giving the material a new layer, another layer has been taken over it which has been masked white. Then the various areas of the table were stained with brass containing “substance painter”<sup>[13]</sup> to give a rough feeling.

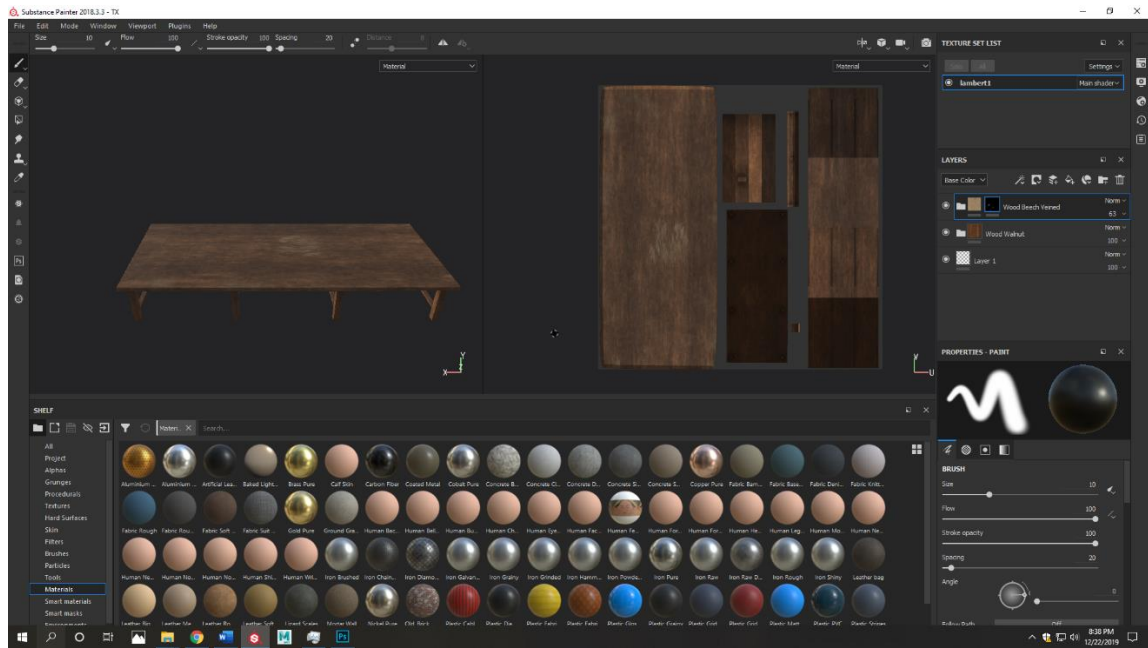


Figure 2.16 Table Texture in Substance Painter

Another mask layer is placed on it and a black dye stain is placed on it. When the final texture has been textured, the maps have been exported to Autodesk Maya<sup>[8]</sup> by “substance painter”<sup>[13]</sup> and they have been applied to the main model.

### 2.3.6 NT Cutter:

The NTcutter is another factory-made prop. The two parts of the cutter are a plastic blade of steel. For texture it was first painted red in a layer in Photoshop according to UV for the plastic part, and the plastic texture on the red part was blended with the main color layer on top to bring the plastic fill.

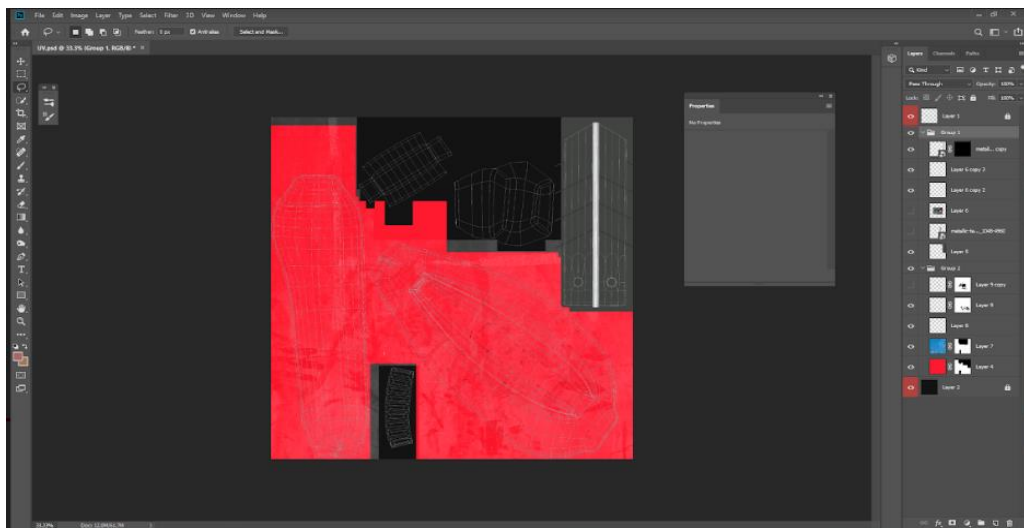


Figure 2.17 NT Cutter Texture in Photoshop

Black and white gradients are used for the blade. The stains on the NTcutter blades have been applied using black paint. Finally, the texture of the dirt has been blended with the rest of the layer with a new layer to make the cutter realistic. The color version has been converted to black and white for the bump and roughness map.

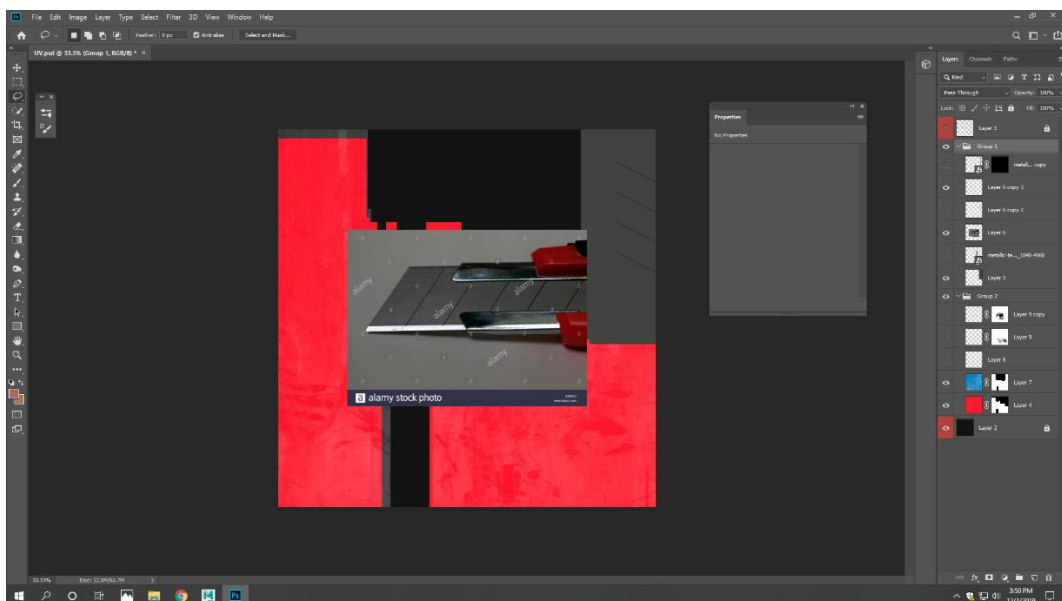


Figure 2.18 NT Cutter Texture in Photoshop

The exported textures are applied on the normal resolution model in Autodesk Maya<sup>[81]</sup>. Because of this, the entire model is selected and applied to Arnold's AI standard shader. And maps have been captured in the attribute of AI Standard Shader.

### 2.3.7 Calendar:

The calendar was created to sort the factory scene. Calendar is one of the many common models. It was kept hanging on the factory wall. One is on the back wall of the mold machine and the other near the store room door.

The UV of the calendar was very simple, so a calendar photo, some dirt pictures were needed to make it textured.

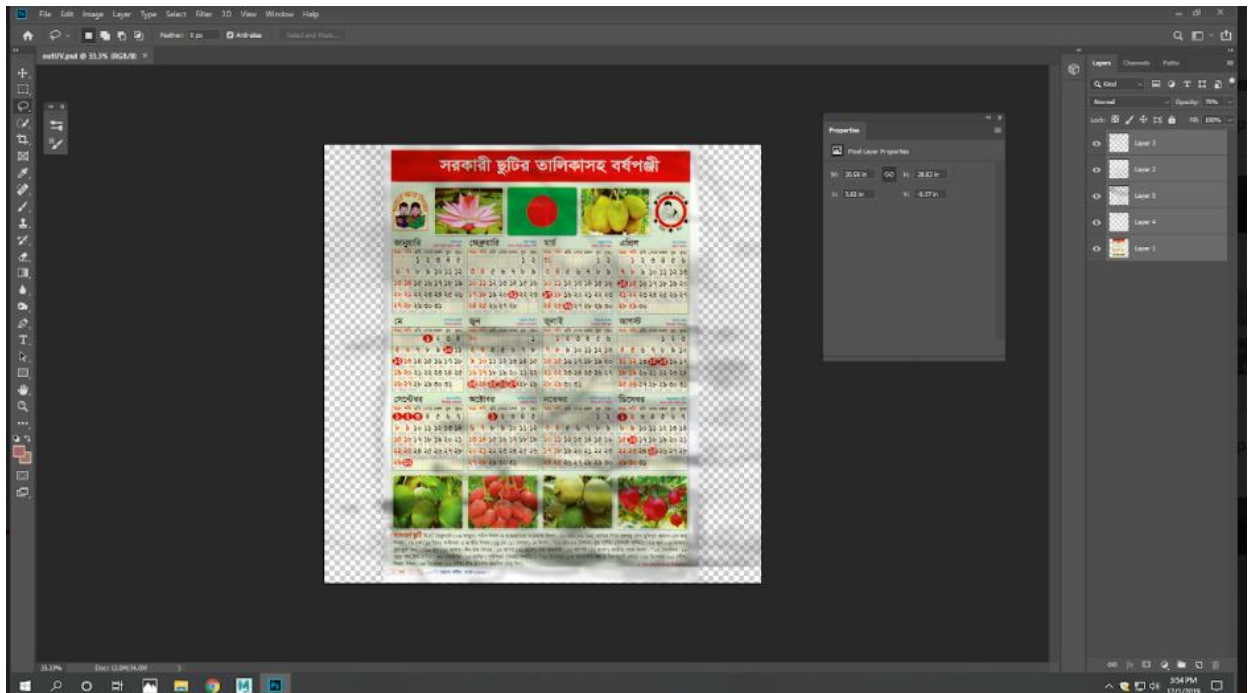


Figure 2.18 Calendar Texture in Photoshop

Calendars and pictures of dirt have been downloaded from the Internet. After that they were cut off the UV illusion of the calendar in Photoshop. Black stains and dirt have been added to the calendar to make it look like the old one.

After all, a reflection map has been made to make the calendar appear in unnecessary places.

### 2.3.8 Dustbin:

The dustbin is placed next to the pavement. There are four parts in the dustbin. The UV image has been taken in Photoshop for its texture. According to UV, the outer frame is painted yellow and green on the bin. And finally, a picture of the city corporation logo is placed on top of it.

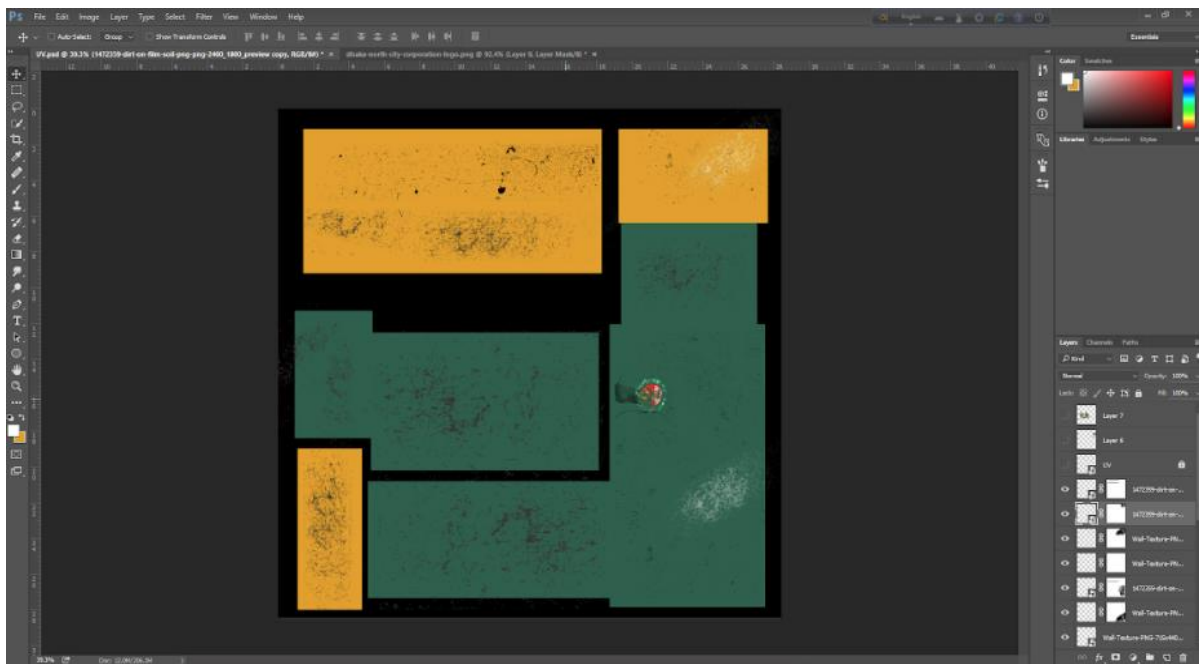


Figure 2.19 Dustbin Texture in Photoshop

Since it is a dustbin, many types of dirt have been added to it to make it realistic. According to the UV, the dirt has been blended with everything underneath with a new layer to cover the dirt. And since the whole thing is metal and old it has rust on it.

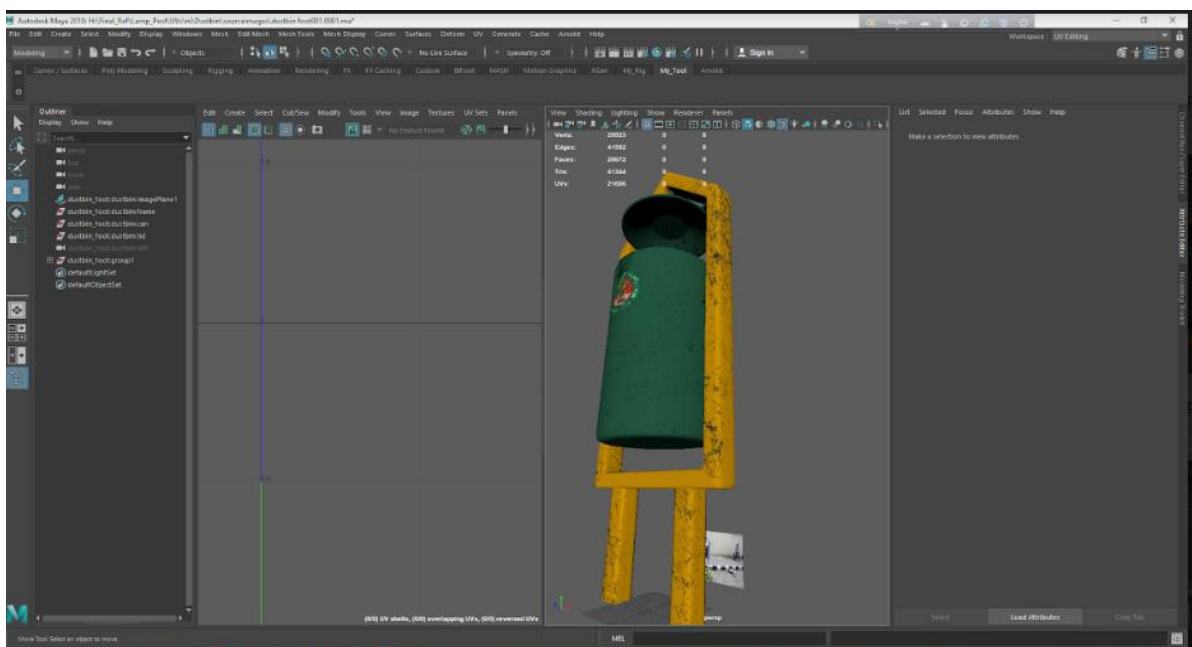


Figure 2.20 Dustbin Texture in Maya



For this, a rustic picture has been downloaded from the Internet and it has been cut off as needed. After that the picture is bolted on top of the rest of the picture so that Jung doesn't look different. After all, bumps, roughness and metalness maps have been made for its dustbin.

### 2.3.9 Plastic Box:

Since the toy manufacturer factory is shown in our project, some boxes have also been made to hold the toys. The plastic box is made for the factory scene in which the toy cars are kept and they are kept in various factory locations.

To make the plastic box texture the resolution of the UV model from Autodesk Maya<sup>[8]</sup> has been increased and it has been exported in FBX format. The FBX model of the plastic box was taken on a “substance painter”<sup>[13]</sup>



Figure 2.21 Dustbin Texture in Substance Painter

The FBX model of the plastic box has been baked for texture on “substance painter”<sup>[13]</sup>. Subsequently, one of the plastic textures from “substance painter”<sup>[13]</sup>'s library has been applied to it. The green color is selected from the base to give color to the box. Another texture is applied with a new layer to add some dirt to the texture.

The brush on the “substance painter”<sup>[13]</sup> is written with white paint on top of the box. After all, textures have been exported from “substance painter”<sup>[13]</sup>.

The exported textures are applied on the normal resolution model in Autodesk Maya<sup>[8]</sup>. Because of this, the entire model is selected and applied to Arnold's AI standard shader. And maps have been captured in the attribute of AI Standard Seeder.

### 2.3109 Tin:

The tin factory has been used as a roof. Our project factory is old and unsafe so the tin has been shown to be rusty and dirty. A high poly version of tin has been exported from Autodesk Maya<sup>[8]</sup> for FBX format.

The FBX model was taken on substance pointer. After that the model has been baked to texture. The mapping required for the texture is selected first. Base color, metalness map, roughness map and bump map have been selected.

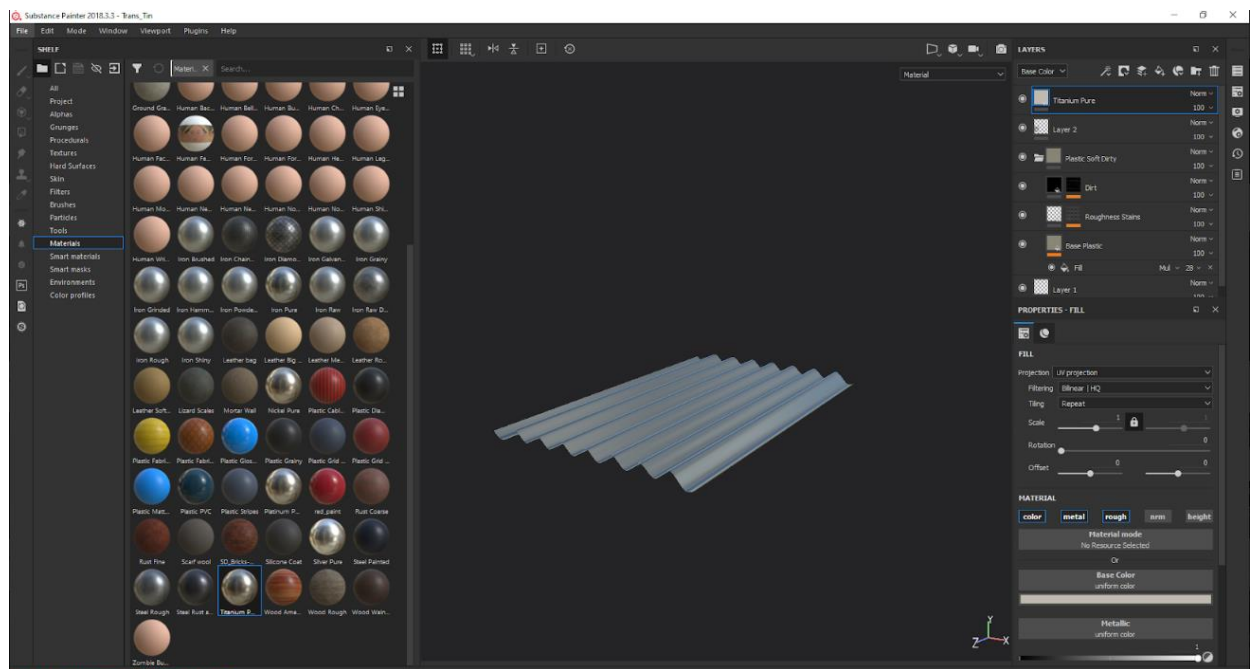


Figure 2.22 Tin Texture in Substance Painter

Subsequently, the "Rusty Metal" texture was applied from the "substance painter"<sup>[13]</sup>'s Smart Material Library. Since smart materials have been used in this field, the texture has been created with only some modifications to its parameters.

### 2.3. 11 Pole:

The pole substance has been textured on the painter. For this, the High Poly model was first exported from Autodesk Maya<sup>[8]</sup> to FBX format.

FBX Model has been imported into “substance painter”<sup>[13]</sup>s and the model has been baked. All the maps needed are selected. The model has "Edgeworn Metal" material applied from its Smart Materials Library in “substance painter”<sup>[13]</sup>s.

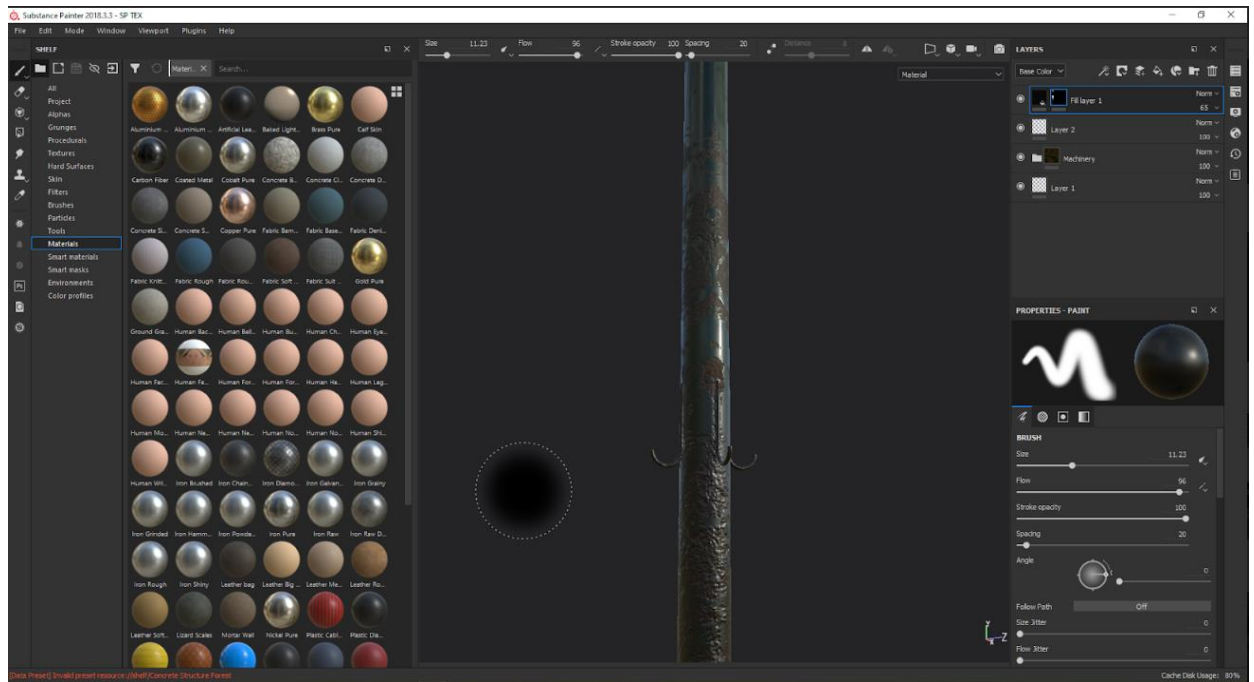


Figure 2.23 Pole Texture in Substance Painter

Due to the factory polls, it has given a lot of rust and dirt to make it look realistic. Various changes have been made to the value of the material layer to bring the desired look. After creating the texture, its resolution size is selected and exported.

## 2.4 Scene and Camera setup:

In this project we have divided the Scene Setup into three parts. Outdoor shots, classroom shots and factory shots. Outdoor cinema total 3 shots, 2 shots in the classroom and 5 shots in the factory. For each of these shots, the stage and camera were ready to work. Adjusting the props for the shot, the camera position and the focal length of the lens have been fixed.

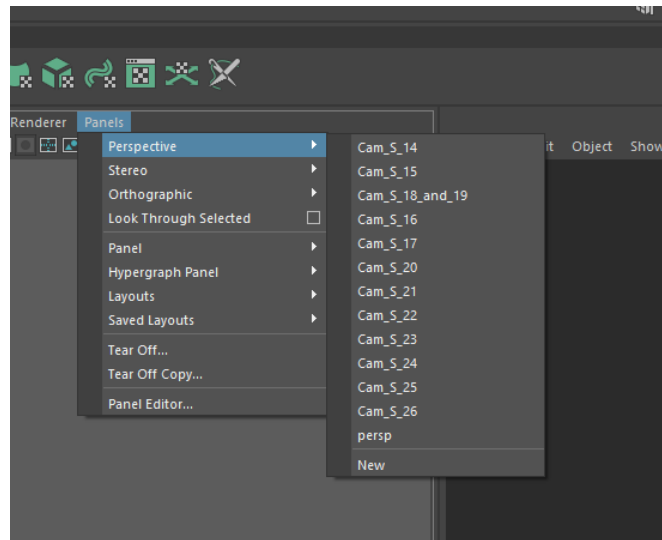


Figure 2.24 Camera for Factory Scene

This was done after all the modeling and texturing. Since the first three shots of the short film are in the same location, a separate project file has been created. Of which only the models needed for that shot were taken.

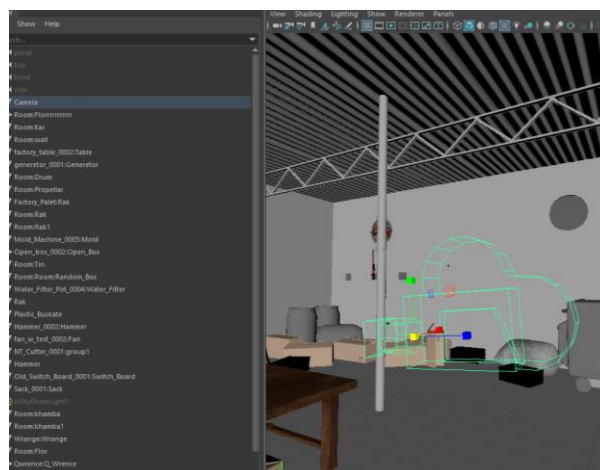


Figure 2.25 Camera for Factory Scene

The shot was outdoors and it needed roads, sidewalks, buildings, dustbin, lampposts, etc. The texture files of all the models were copied into the new project file's source image before importing the models into my new project file. This means that when you open the file on any PC, you get the textures correctly.

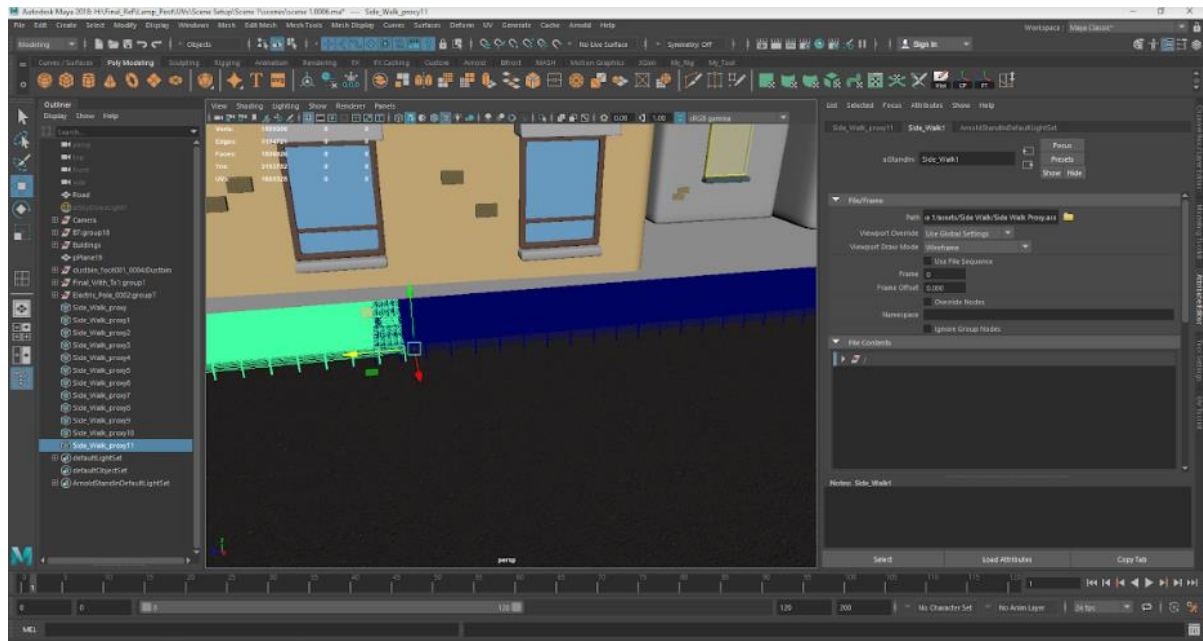


Figure 2.26 Outdoor Scene setup

Subsequently, each of the models has been imported into a file and according to Scene a section of a city street has been created.

The next scene was in front of the school. Since there was an aerial shot of a school, many models have to be imported into this scene. Such as school building, road, footpath, wall, school gate, tree etc.

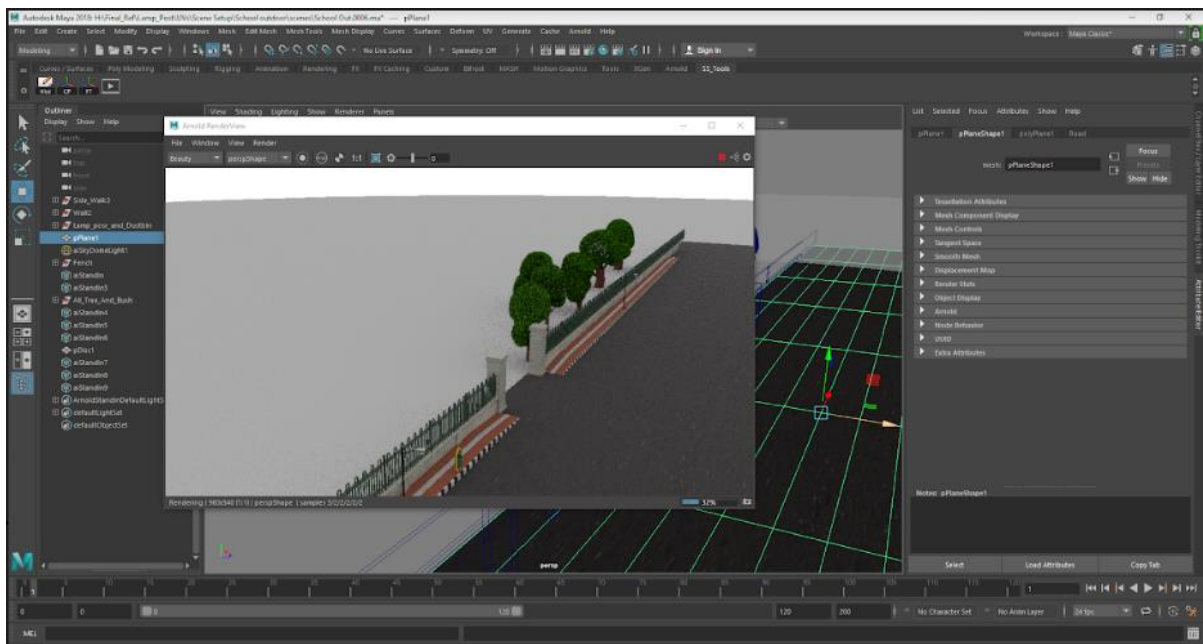


Figure 2.27 School Outdoor Scene setup

As a result, the number of polygons in this file increases and the file become very heavy and unusable. For this, all models in this file have been used by Arnold's Stand-ins. It acts as a proxy for the stand-in's model which reduces the file size.

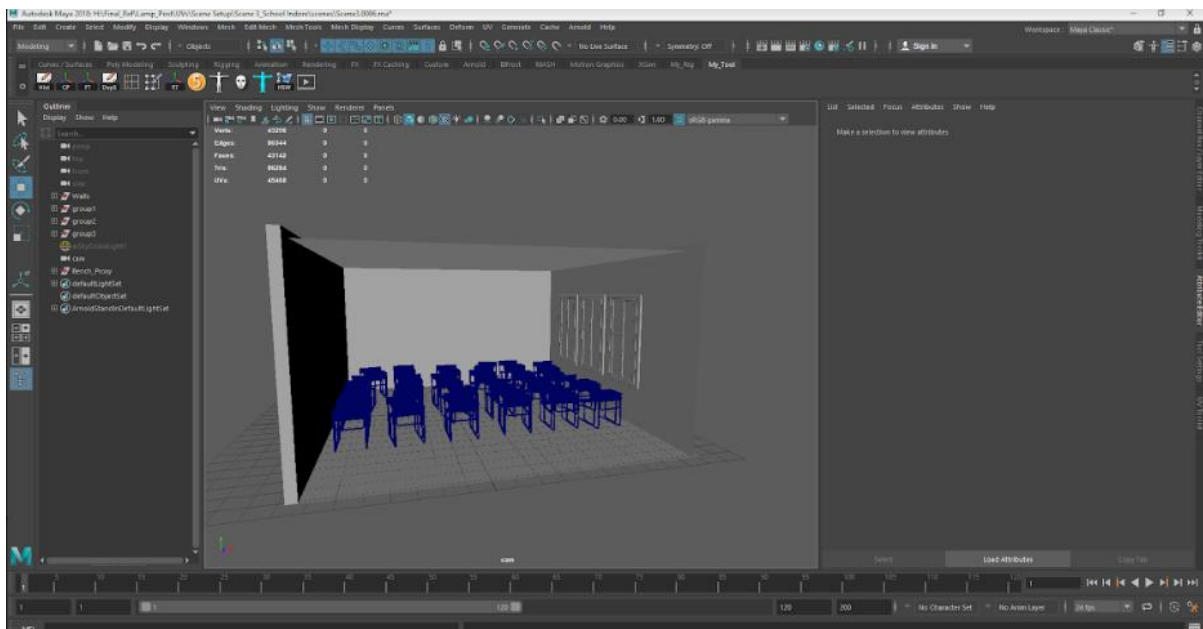


Figure 2.28 classroom Scene setup



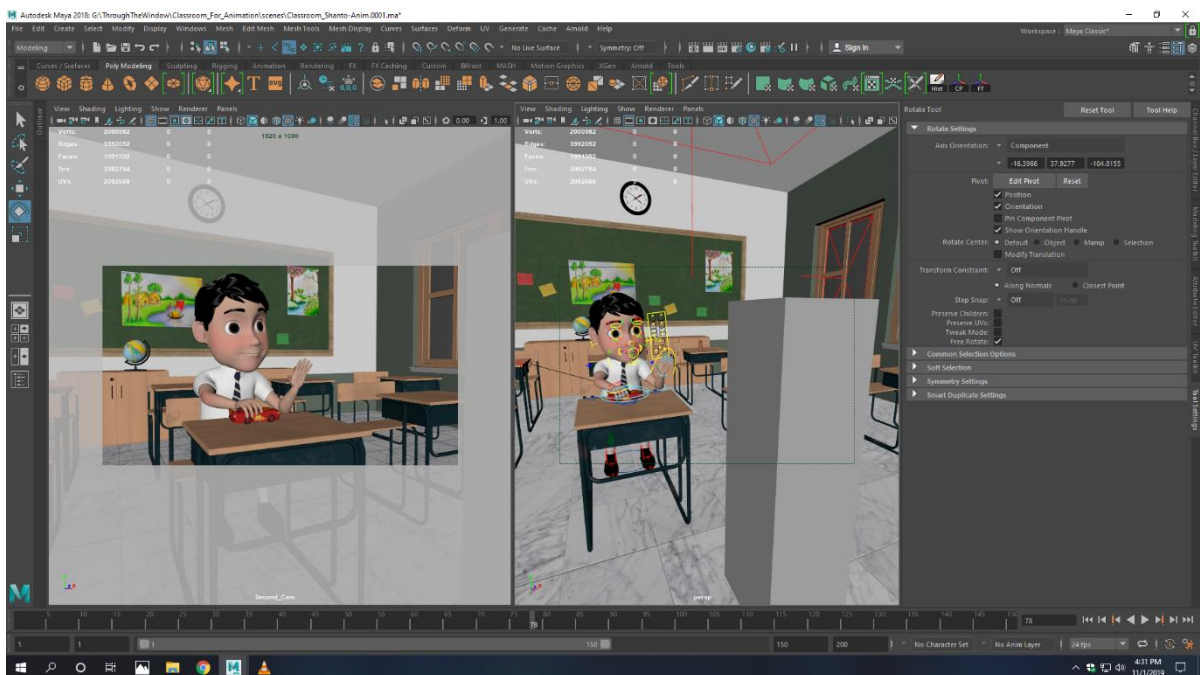


Figure 2.29 Classroom Scene and camera setup

In the classroom, models for the classroom such as benches, boards, clocks, windows, bags, boxes, etc. have been set up. The relatively small model had to be imported because the shots in the classroom were on a small angle.

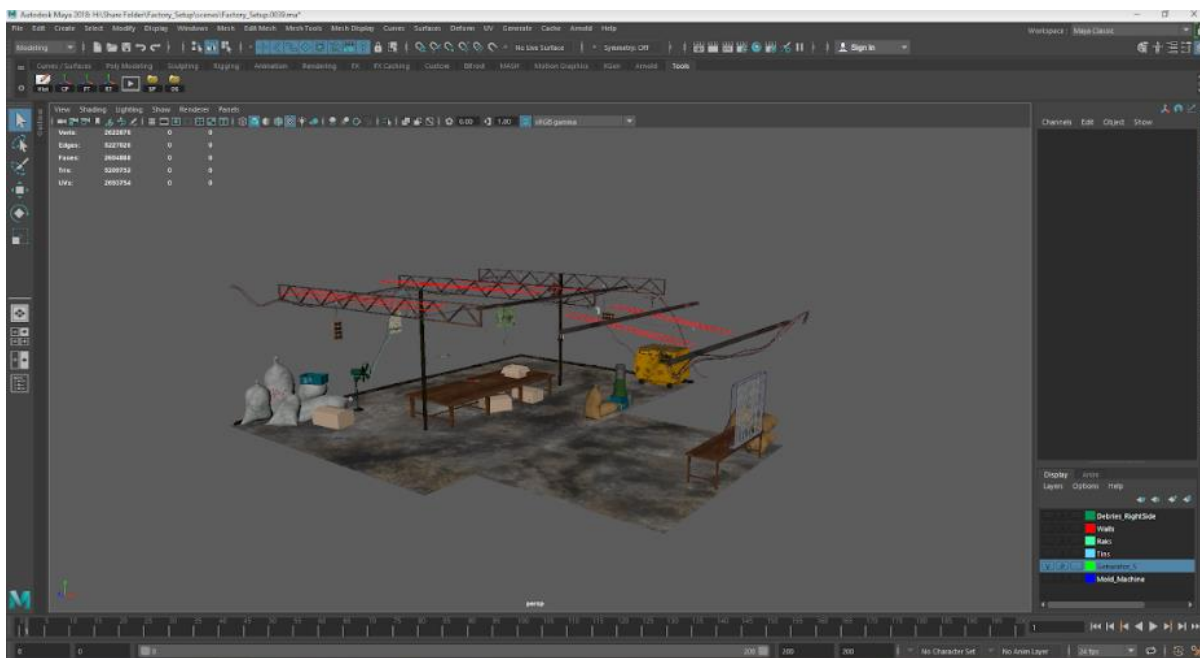


Figure 2.30 Factory Scene setup



One of the biggest scenes of our project is the factory, which has resulted in many more files being imported into this file. The factory had to import a total of two rooms and all the heavy models, making the scene very expensive. The models of this scene are mold machines, tables, generators, fans, sacks, etc.

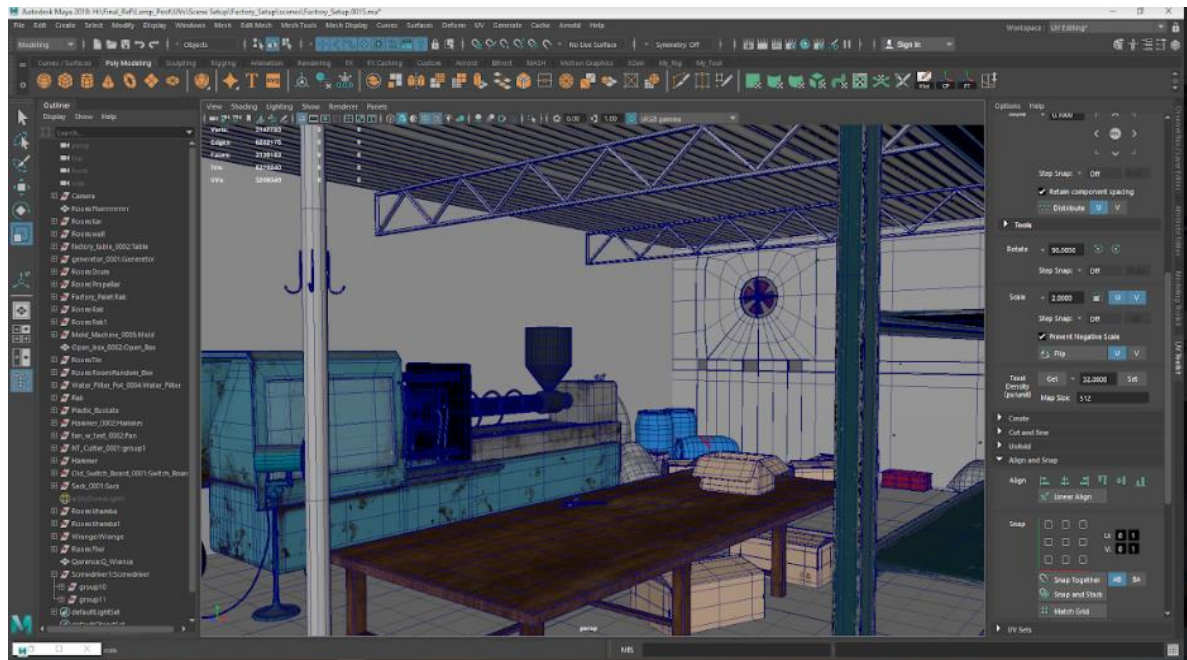


Figure 2.31 Classroom Scene and camera setup

After taking all the models in the camera, the camera has been fixed and adjusted according to the camera's view. Here the camera and stage are arranged for animation. The main task was to put the required models of each scene. This was done after all the modeling and texturing. The scene was then imported into a new file and the camera was placed. The camera is set to follow the animatic shots. Each camera shot is taken separately. Camera focal length is fixed on shot.

## 2.5 Compositing:

The final step is composite after modeling, rigging, animation and rendering. Composite under-editing, color grading, VFX and motion graphics. The entire output is visualized through the composite.

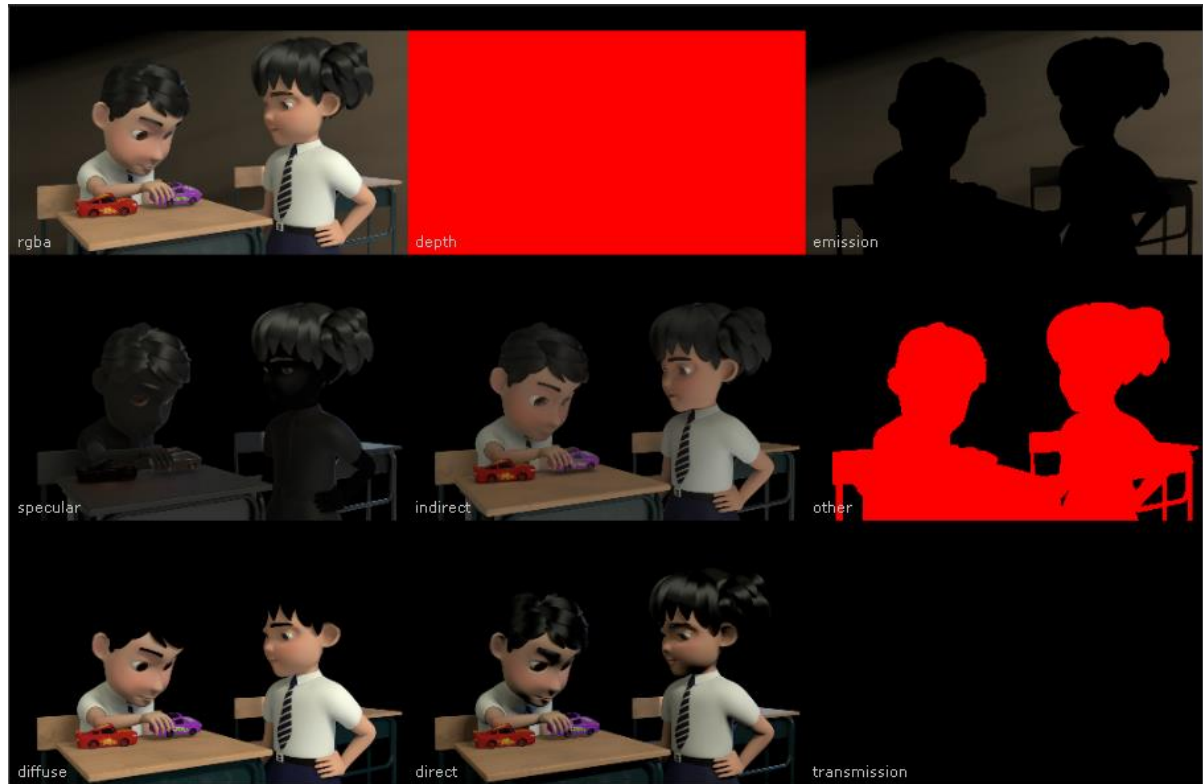


Figure 2.32 All the passes of render image

Compounding this project, " Foundry Nuke<sup>[12]</sup>" "Adobe After Effects<sup>[9]</sup>" and "Adobe Premiere pro<sup>[11]</sup>" were used.

### 2.5.1 Editing:

This project has been rendered in (.exr) format which preserves a picture pass information. With which many options can be worked in post-production and any rendering problem can be solved very easily. There was a total of eight pass information in our (.exr) file.

- ID
- RGB
- Alpha
- direct
- indirect

- specular
- emission
- Zdepth

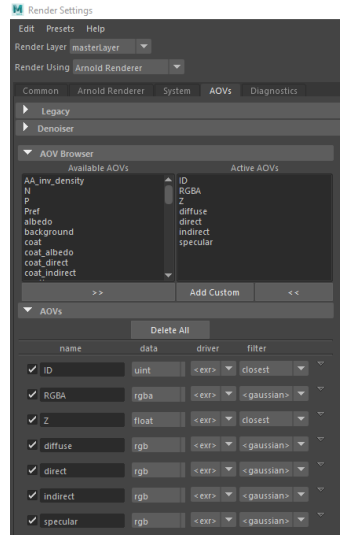


Figure 2.33 Render Pass's in Maya

The first rendered image sequences are taken in " Foundry Nuke<sup>[12]</sup>" for pass control. For this, souffle notes are used on the first imported image sequences. The passphrases in the attribute of the souffle note have been captured. Separate souffle notes are used for each pass.

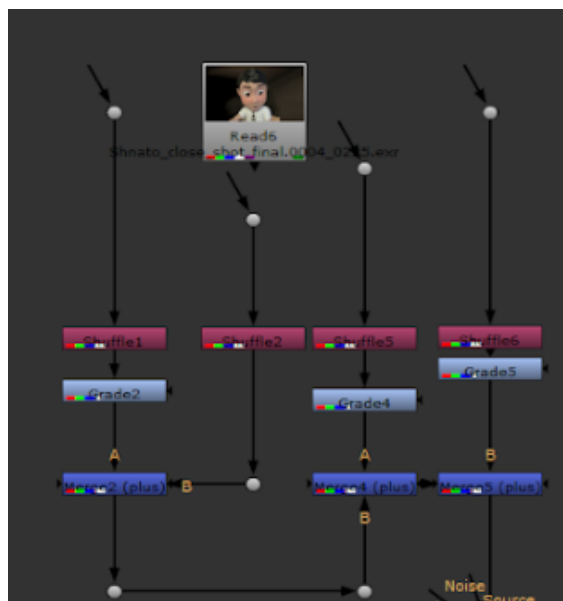


Figure 2.34 Pass Extract in Nuke

After separating the passes with souffle notes, grade notes have been applied to the souffle notes that need to be adjusted. Grade notes are used for basic color correction. Extracted souffle notes have been added to each other after all adjustments to the grade note.

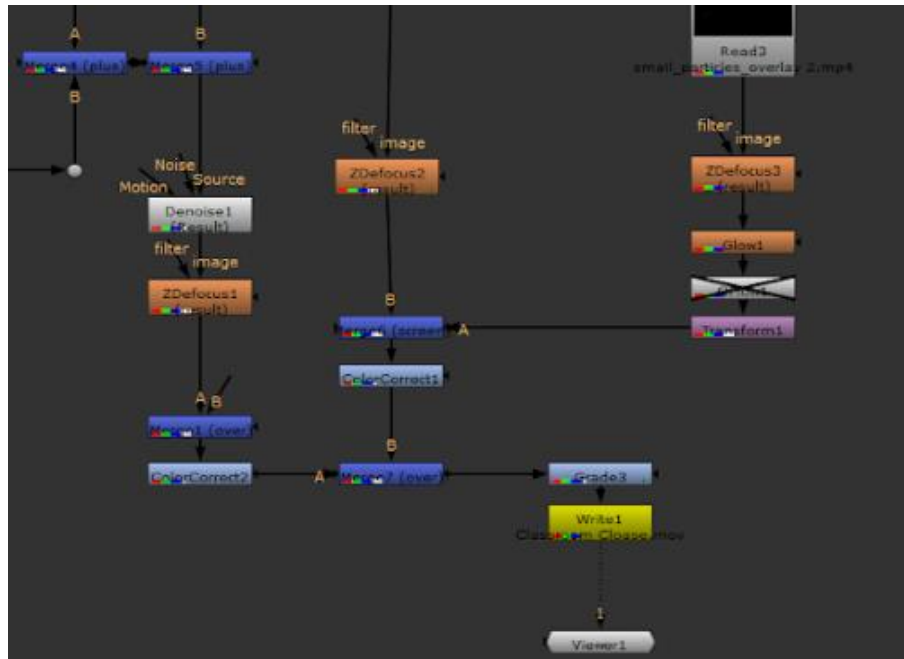


Figure 2.35 Note's in Nuke

Merge notes have been used for this. The function of merge note is to (a) add note to note (b). In this case, the first souffle note's (RGB) pass has been added, and another souffle note's (emission) pass has been added. And with this result another souffle note's pass has been merged. In this way all the passes are added to one another and a beauty is passed. Surface works have been done to fix lights, inspector IDs, and so on.

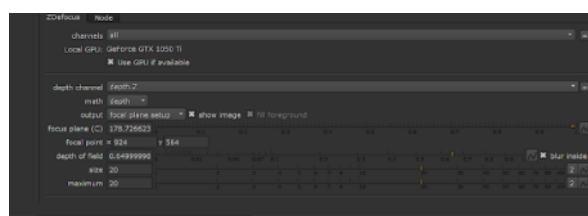


Figure 2.36 Zdepth Attribute in Nuke

After this the “Denoiser” note is used to reduce the noise of the result. As a result, the noise on the video was removed. After removing the nozzle, Z defocus notes are used on top of it to control the depth of the video. Through this video Depth of Field has been worked on.

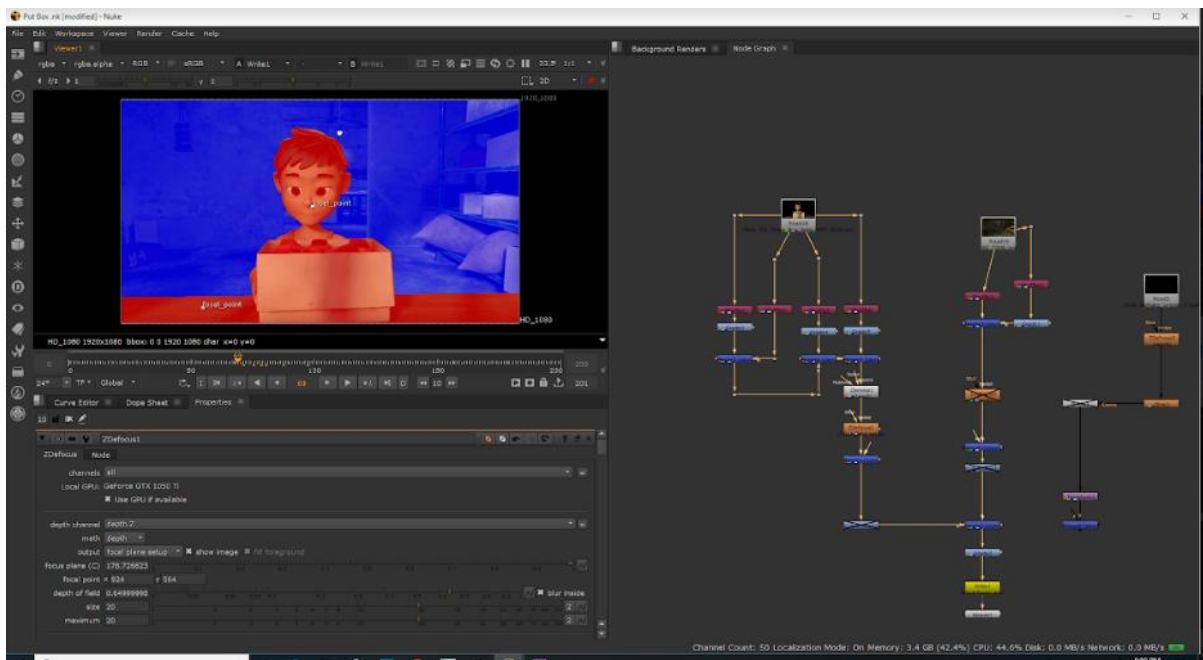


Figure 2.37 depth Composite in Nuke

The background and foreground of some sequences are rendered differently. For this, another merge note was taken after the Z Defocus note above and added a background.

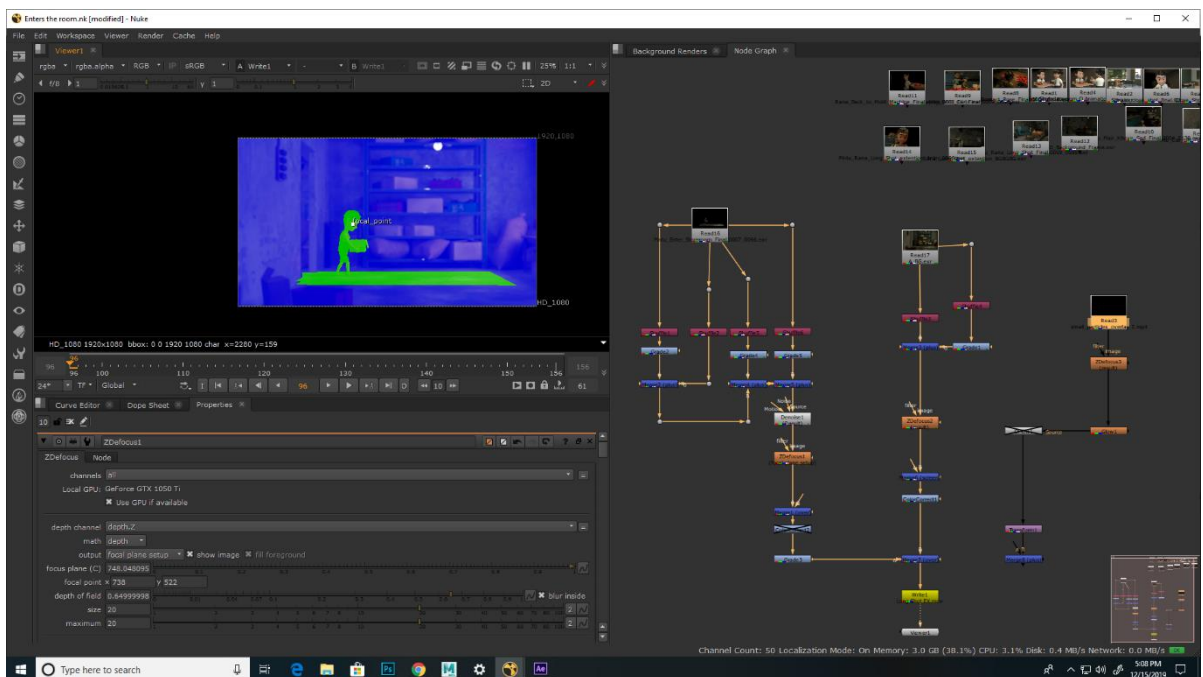


Figure 2.38 Composite with Alpha Footage in Nuke

In the case of backgrounds, a pass has also been edited. In the case of some shots, the final note of the background has been added through the merge node to add dust to the background.

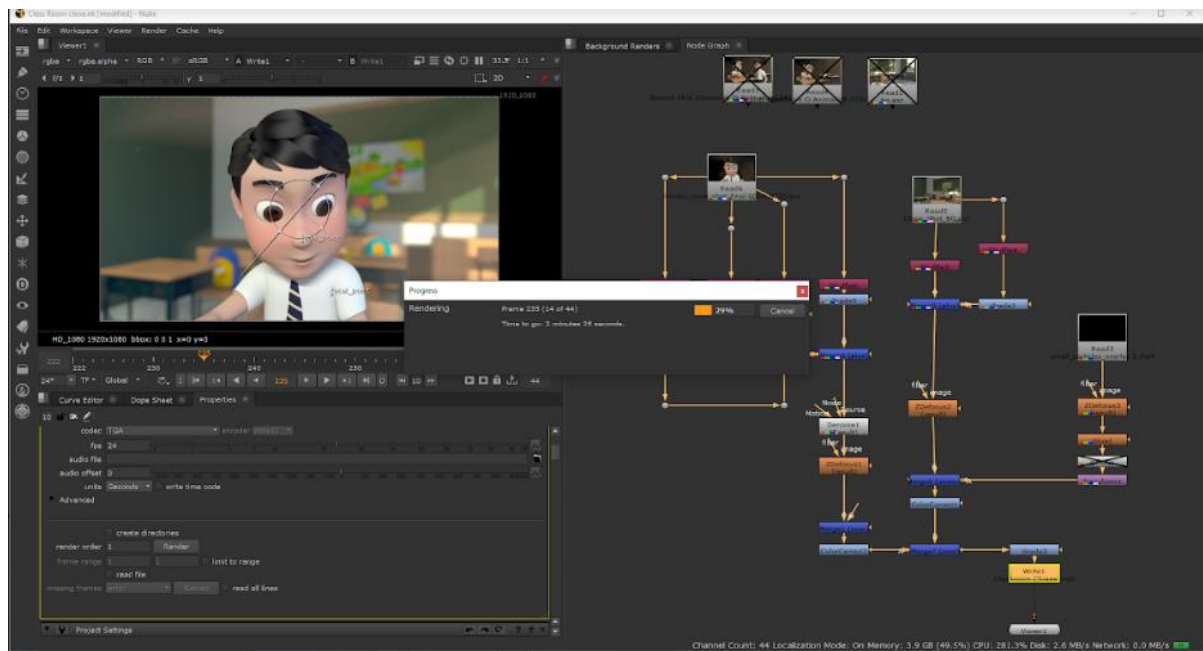


Figure 2.39 Rendering Footage from Nuke

All the final notes have been put together and another grade note has been applied, resulting in the white balance and basic color correction of the entire video.

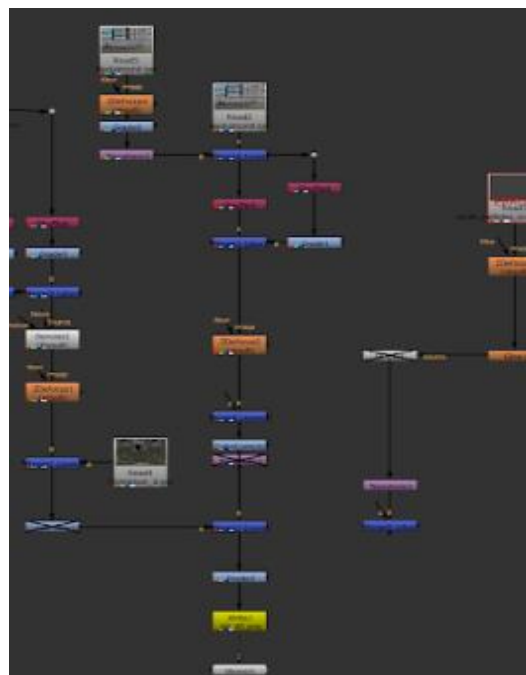


Figure 2.40 Notes Are Use for Composite in Nuke



Some footage has to be masked in small pieces for this, using the Roto Note on the final note masked. At the end, each scene is rendered differently with a write note.

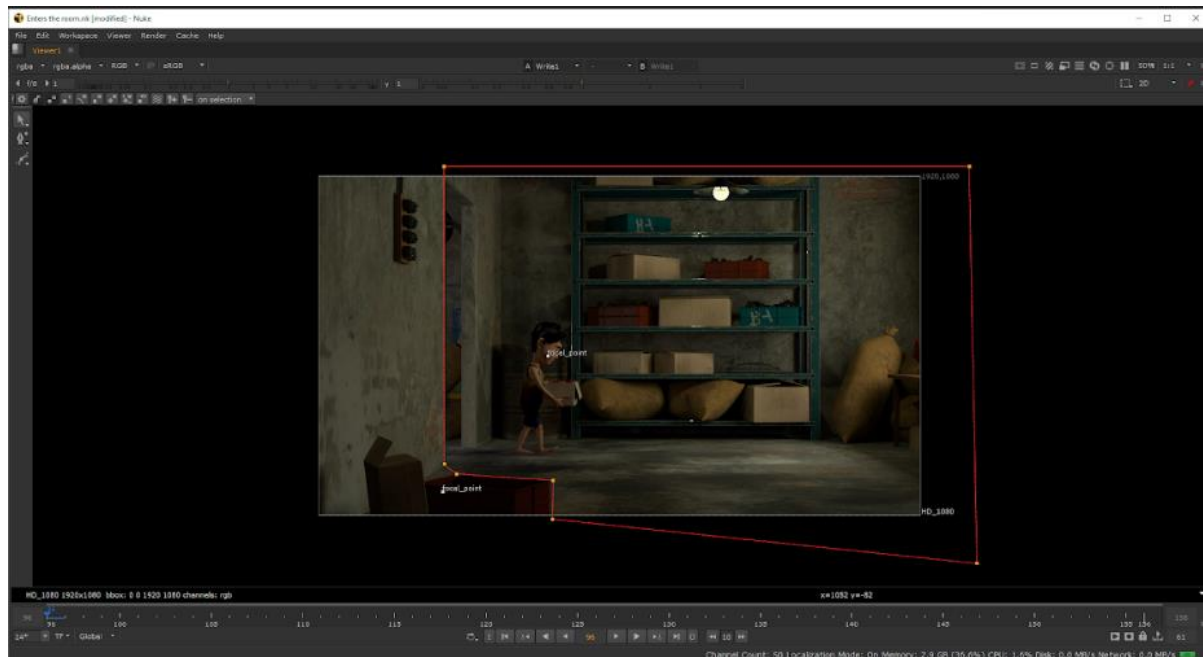


Figure 2.41 Masking in Nuke

## 2.6 VFX:

Editing the pass from " Foundry Nuke<sup>[12]</sup>" has brought the video files to " Adobe After Effects<sup>[9]</sup>" to add different effects. In this case, a separate project is filed for each shot.

To add dust, camera shake, volumetric lights, masking and more to the different shots based on "Adobe After Effects<sup>[9]</sup>".

Camera Shake has been used in the first two scenes. This effect has been used because of the car's close-up shot and the car's camera. This has led to an attempt to increase Sean's credibility. To do this effect the "Camera Shaker" effect of the "Red Giant Universe<sup>[14]</sup>" plug-in has been used.

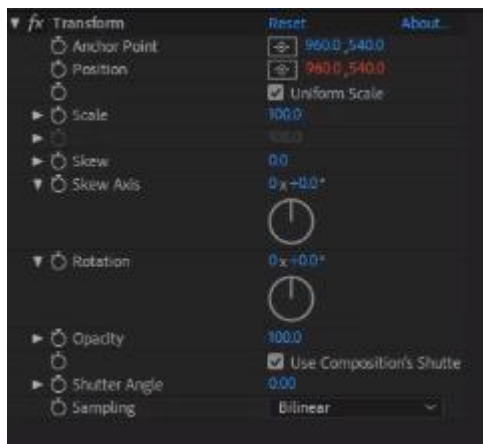


Figure 2.42 Camera Shake Attribute in After Effects

In order to increase the brightness of the part of the light, a round shape is placed over the light to give it a glow effect. This results in an optical flare on all four sides of the lights and the four sides of the lights look reliable.



Figure 2.43 Masking and Glow Effect in After Effects

Factory Scene has a volumetric volume above the character. Dust overlays and masks have been used for this. First, the dust overlay video has been positioned on top of the lights in the main footage. This time the video has been masked with the Directional Pen tool. And the mask feather has been provided for dust to be seen just below the lights and to be reliable.



### 2.6.1 Color Grading:

The Adobe After Effects<sup>[9]</sup> have been taken to Adobe Premiere pro<sup>[11]</sup> software for color grading via dynamic links. Then all the project files are sorted according to the sequences. For color grading, first to adjust the white balance from " Foundry Nuke<sup>[12]</sup>", Premier Pro no longer has to balance white.



Figure 2.44 Color Grading in Premier Pro

So according to the sequence, the color correction was done on the video through "Red Giant Bullet Look"<sup>[15]</sup>. The color palette of "Red Giant Bullet Look"<sup>[15]</sup> has been preset in the shot and added some more options.

### 2.6.2 Motion graphic:

Motion graphics included title animation and a credit list. Adobe After Effects<sup>[9]</sup> has been used to do this. Titles and credits lists have been created using very simple options.

Animation has been made using the title logos Adobe After Effects<sup>[9]</sup> in the title logo for its position rotation and opacity options.

Credit lists have also been animated using position rotation and opacity keys in the same way. In this case, due to the amount of text in the credit list, the product text has to do different animations.

After the animation has been done, the project file is taken to Premiere Pro and the rest of the video is integrated.

## 2.7 Sound Mix:

Sound is very important in this project. This project is nothing but sound. Adobe Premiere pro<sup>[11]</sup> has been used in this project for sound editing.

The sounds used in this project and most of the background sound are downloaded from the YouTube audio library<sup>[17]</sup>. Royalty Free Sound has been downloaded from some other sound effects ZapSplat<sup>[18]</sup> site.

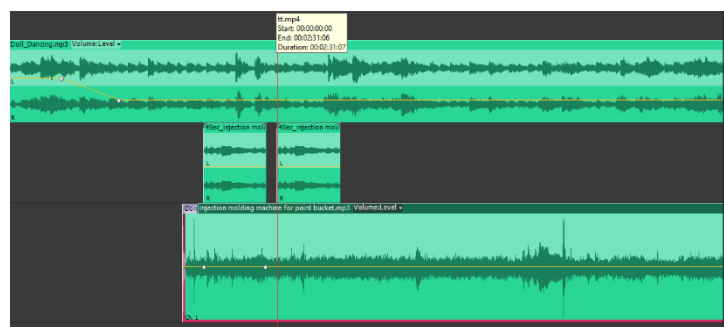


Figure 2.45 Sound Mixing in Premier Pro

According to the scene, after setting the sound, the sound frame is designed by bending the key frame in the proximity of the scene and updating the audio level of the sound. Various sound transitions have been made in different parts of the scene so that the sound can be matched to one.

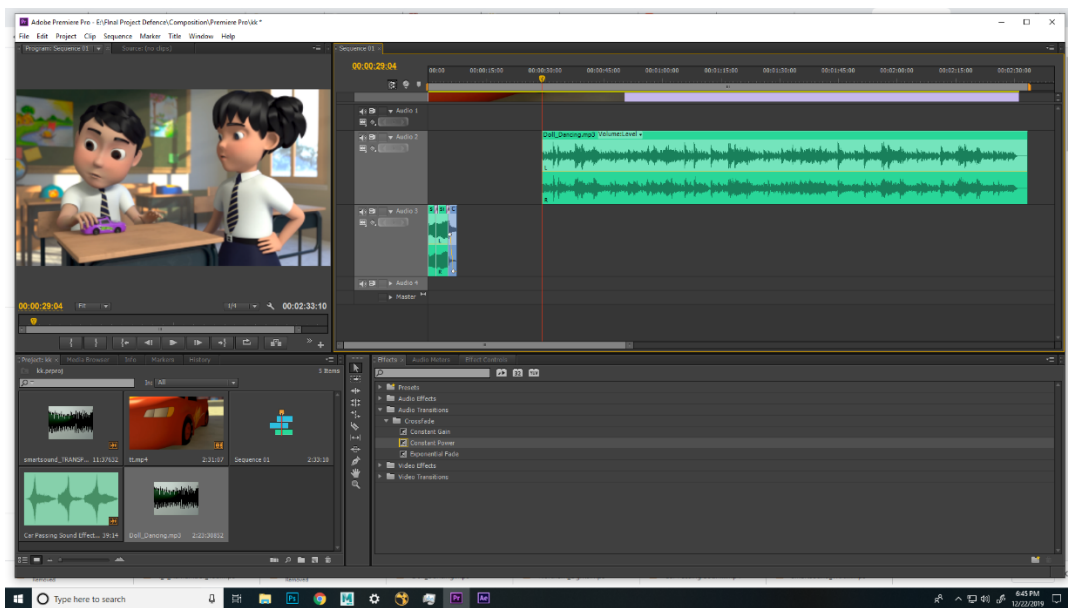


Figure 2.46 Sound Mixing in Premiere Pro

Some sound was recorded for the project. And that recorded file was used in the project of Noise Reduction using “Audacity<sup>[16]</sup>”.

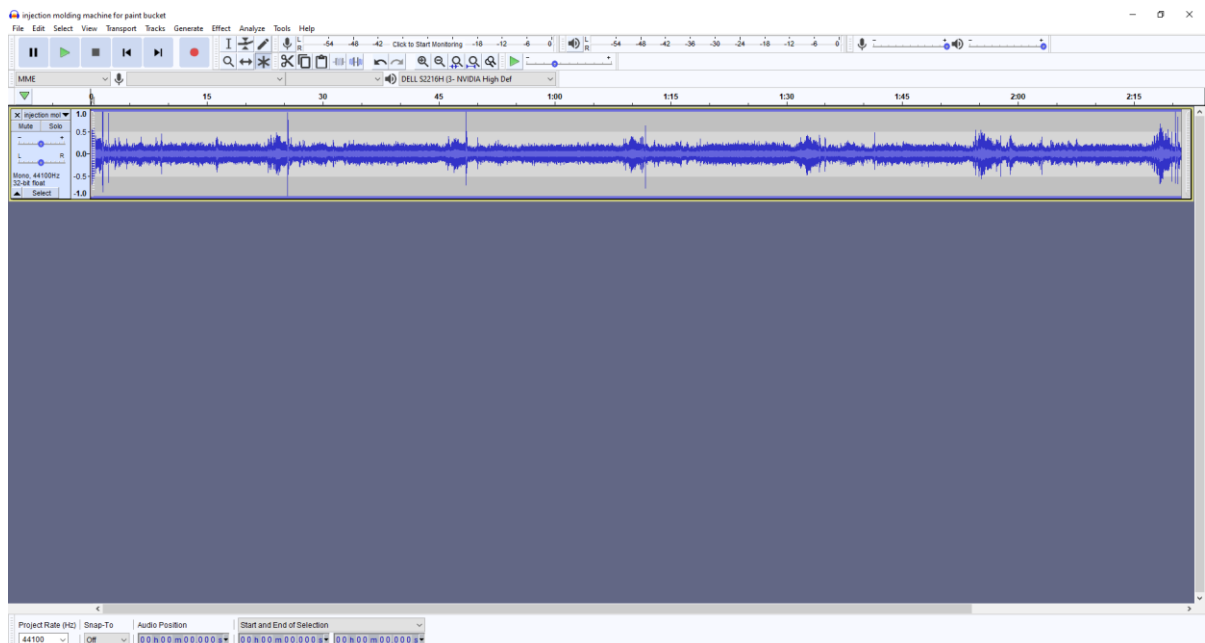


Figure 2.47 Noise Reduction in Audacity

After completing the sound and all the other corrections, the entire video from Premiere Pro has been rendered final.

## **CHAPTER 3**

### **Limitations and Challenges**

#### **4.1 Limitations:**

A lot of intangible limitations were faced while working on this project. These limitations affected the output of our project in one way or another. Some of these are discussed below.

The most intangible limitation was the lack of experience. There were some experiences in all the steps in this process but the proper pipeline was never followed. Also, the scope of skill implementation was also limited. When it came to such a big project with a proper pipeline was to be followed, we fell short on experience we fell short on experience which affected time management and finding solutions to problems faced.

3D animation is a form of art which combines a lot of other forms of art. For initiating a project like this a lot of things from the artistic angle needs to be considered. Such as the color palette of the film, the looks of the characters, forms of different models, postures sense, perspective sense, a sense of composition etc. For this reason, a strong hold on fine arts category is much needed. Unfortunately, this skill is inadequate. Being a student work there were no fixed budget for this project.

## **4.2 Challenges:**

As this is a group project it was important that all the members work together with close proximity so that whenever any member faces a problem they can reach out to other members. This makes problem solving much easier and obtaining approval faster. Living in different homes at first there were no fixed spot where all four members could work together but eventually a room was rented and the challenge was met.

All the software used for 3D animation and rendering require high configuration computers. In this case the higher the configuration the better the quality. But for our average quality computers we faced a lot of challenges to work with. The software kept crashing or getting stuck. Sometimes they became slow and could not read the commands and execute them properly. Sometimes files would take several minutes to even open up. These kinds of problems wasted a lot of time which would not have been an issue if there were better quality computers available.

Computers with higher configuration can decrease render time exponentially. Render time a big factor when it comes to producing any computer graphics. Keeping computer limitation on mind sufficient time slot needed to be allocated for the rendering segment.

In order to create the desired outputs a few new software and commands from known software were needed to be learnt in a very short time. As the knowledge of these software were limited so problem solving became a big issue.

## CHAPTER 4

### Some Problems and Solutions

**UV Unfolding:** The default unfold option sometimes does not work properly while unfolding the shells. For eliminating this problem sometimes, the default unfold method needed to set to legacy in the options box beside unfold in the UV toolkit.

**Rigging:** as the project was done mainly in Maya 2018.6, the plug in we were using for rigging did not work properly. The skeleton build process could not be completed. To solve this problem the rigging was done Maya 2017<sup>[14]</sup>.

**Maya Mash:** The threes in this film were made with Maya Mash. While doing this sometimes the leaves were not attached to the surface of the mesh they were input on. They would scatter by offsetting around the mesh. It was then figured out that if the main leaf was freeze transformed at 0, 0, 0 point of the gridline then it would work properly.

**Leaf Texturing:** The leaves were made with a PNG file on a plane to make the trees low poly. But the leaves were not rendering transparent. By assigning maps in the parameters of the plane this problem was fixed.

**Arnold Stand Ins:** some heavy objects were made proxy by the Arnold Stand In options to the scenes would be less heavy. But these Stand Ins did not receive texture files when transferred to a different computer. Several methods were tried but the result was the same. We couldn't solve this problem entirely but it was decided the scene with Stand Ins will only be rendered with computer they were made in.

**Source Image:** while rendering the files were distributed to a number of computers. But some of the models did not receive textures directly from source image. So, they rendered without texture. This caused us system loss and a lot of rendered files were discarded. So, every file needed to be checked thoroughly before rendering in every single computer. This added to the total time allotted for rendering and created a time crunch.

**Texture loading failed:** as there were a lot of heavy models in most of the scenes and all of them had high resolution textures, the GPUs in our computer failed to load them eventually

causing software crash sometimes. So, texture mode was turned off while working on heavy scenes.

**Viewport loading failed:** Some of the scenes were so heavy that the computers with lower amount of RAM failed to load them on the viewport. To temporarily fix this problem extra RAM was borrowed and added to the computers.

**Storage problem:** the entire project was approximately 1.5 TB in size. Some of the files also needed back up. To meet this challenge portable hard drives were managed.

Render time optimization: Each frame required 20 minutes to render on average. In this rate the total rendering time would exceed 2 months. We could not afford this much time so rendering was distributed to 29 Computers in total. This reduced render time exponentially leading us to finishing our project in time. Some of the scenes were also rendered in alpha channel where background could be a still image. This also reduce render time.

**Manual Subdivision causes PC freeze:** for giving a high poly look to the character hairs more subdivision was needed to be added. But by adding more subdivision the file size increasing a lot causing software crash. So instead of increasing subdivisions physically on the model, the iterations were increased in rendering within the Arnold tab which gave the model the desired high poly look without actually adding more subdivisions.

## **CHAPTER 5**

### **Conclusion**

Due to the weakness of the law and mass poverty, the number of child laborers are increasing day by day in our society. These children are subjected to harsh and dangerous working conditions, even in some cases physical abuse and sexual harassment.

This animated short film is a small attempt to expose all these inconsistencies of society with child labor.

While doing this project we had some unique experiences. We learned a lot of in-depth knowledge about 3D animation pipeline. This project gave us the opportunity to learn a few new software's and more about the software's we were already familiar with.

We faced various issues while working on this project but solved most of them by consulting and researching together. Although there are some problems, we were unable to solve but we are keen to learn about them in the future.



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