FOSSEE Fellowship Report On

Game & Animation creation using Blender

Submitted By

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GUIDED BY

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Acknowledgement

I would like to express my sincerest gratitude to **Prof. Kannan Moudgalya** whose vision of FOSSEE has enabled me to unleash my creative side. I extend special gratitude to my project mentor, **Mr.Khushalsingh Rajput, SPSE (Graphics and Animation)**, whose constructive suggestions, empowering guidance and encouragement, helped me to build a successful project.

I thank them for ceaseless support throughout the internship, add to that their valuable feedback, intuitive approaches, and perspective towards working. I also appreciate the guidance given by other supervisors as well as the panel for their support and guidance in the journey of this fellowship.

I perceive this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way and I will continue to work on their improvement, to attain desired career objectives. I also hope to continue cooperation with all of you in the future.

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CHAPTER 1 – INTRODUCTION

1.1 OBJECTIVE

The objective of this fellowship is to create a 3d model that resembles actual objects. These 3d models can be used in creating educational videos so that students can get the gist of how an object would look like and how it would work. Creating a library of 3d models and from those models creating a short animation video and a game is the main aim of this fellowship.

For the process of creating videos, games, and models, the use of Blender – an open-source free software, is preferred to promote open-source software and introduce its power and capabilities to people who are eager to learn and explore animation.

1.2 ABOUT BLENDER

Blender is a free and open-source 3D computer graphics software toolset used for creating animated films, visual effects, art, 3D printed models, interactive 3D applications, and video games.

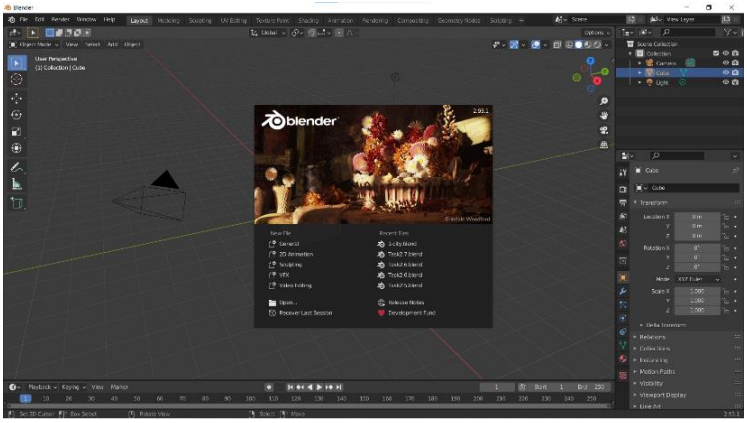
Blender's features include 3D modeling, UV unwrapping, texturing, raster graphics editing, rigging and skinning, fluid and smoke simulation, particle simulation, soft body simulation, sculpting, animating, match moving, rendering, motion graphics, video editing, and compositing.

On January 1, 1998, Blender was released publicly online as SGI freeware. In May 2002, Roosendaal started the non-profit Blender Foundation, with the first goal to find a way to continue developing and promoting Blender as a community-based open-source project.

For completing the tasks assigned during the fellowship, Blender 2.93 version was used, and Cycles engine was used for the rendering process.

In this latest version, blender drops out its inbuild game engine. Hence, UPBGE (Uchronia Project Blender Game Engine) was used for the creation of the game.

UPBGE is an open-source, 3D game engine forked from the old Blender Game Engine and deployed with Blender itself. This unified workflow is its main strength, as you can make your game from start to finish without leaving Blender.



CHAPTER 2 – TASKS

2.1 – Task 1 (Animation on working of Vernier Calliper)

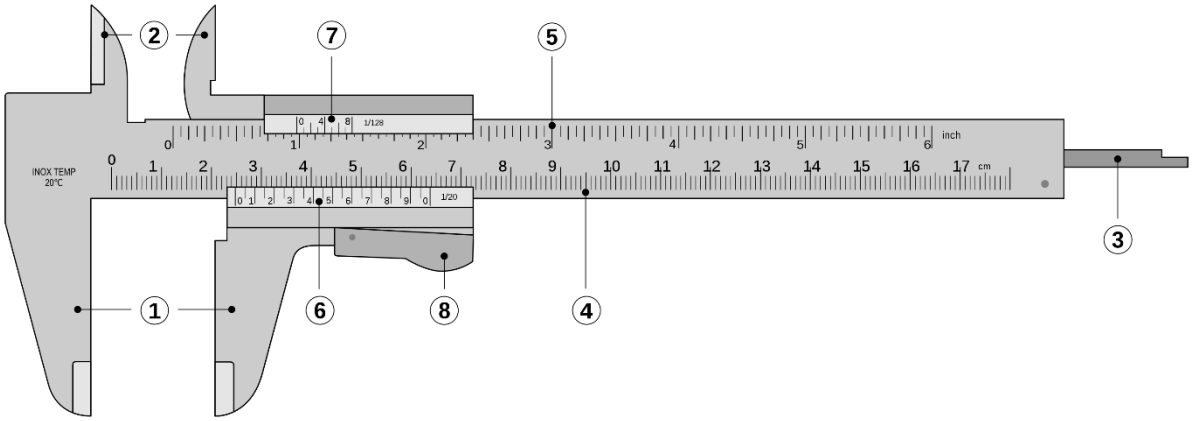
2.1.1 – Idea and Reference finding

As per the initial discussion with the mentor, a goal to create educational content was set out for the participants. The purpose of such a task was to make information about the topic easily consumable by the students.

Wondering what I could possibly create, I found my brother searching for a video that could explain to him how to use Vernier Calipers. It stuck to me that a full-fledged animation of a Vernier Caliper would suffice and do justice to the task assigned, not forgetting that it could help students understand concepts better since it is a fundamental topic.

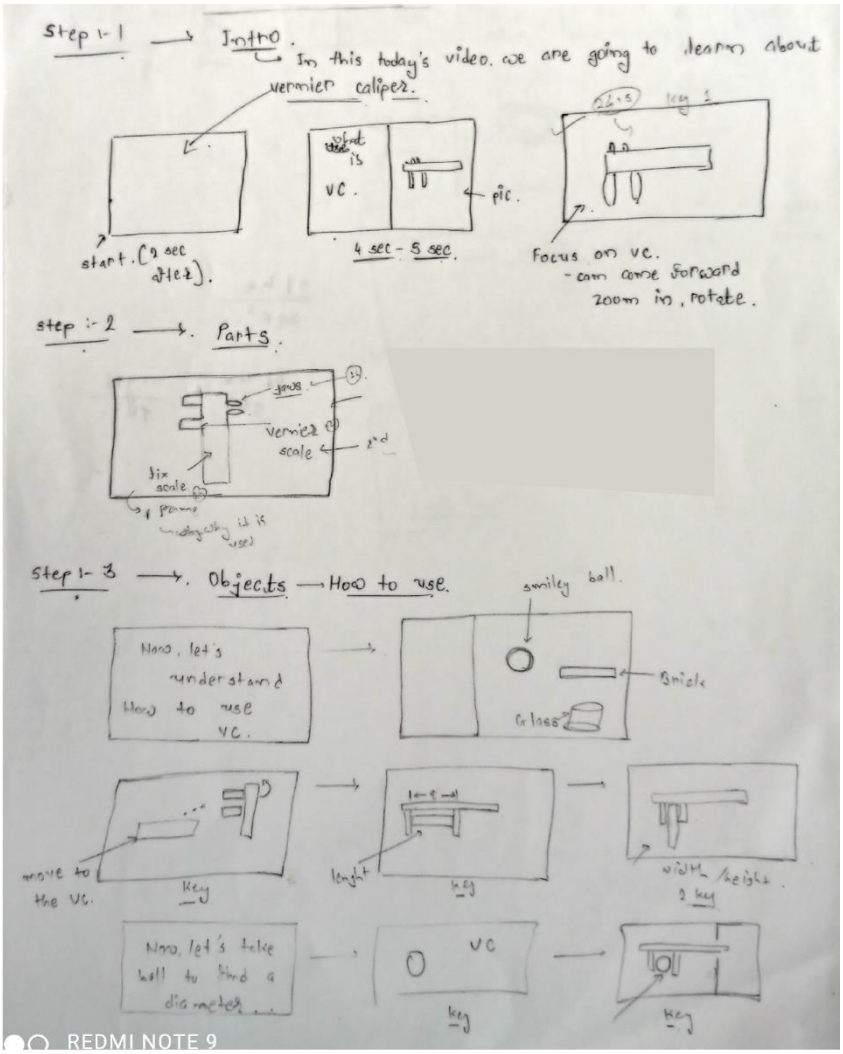
So the basic idea is to create the animation which explains what vernier caliper is and after that by using different real-world 3d objects to portray how to practically use the vernier caliper and how to measure accurately using it.

As a starting point, I found some reference images of vernier caliper on google.



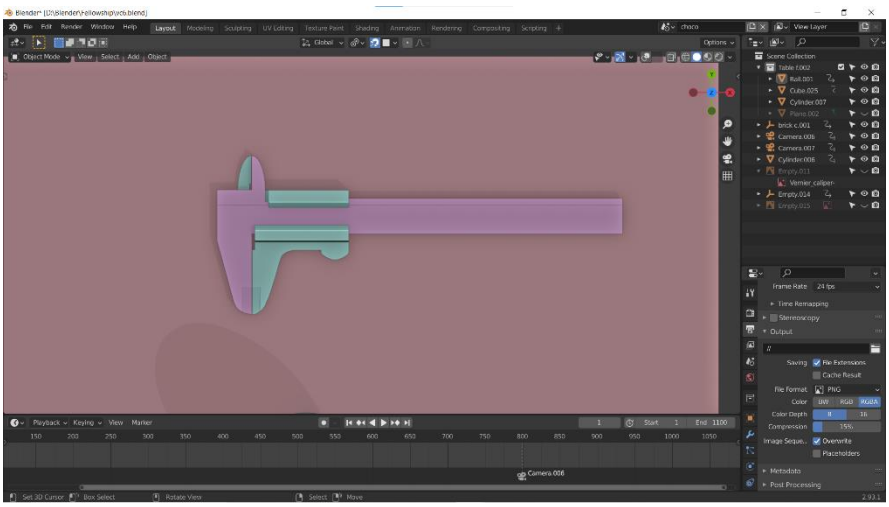
2.1.2 – Scripting and Story Boarding

The next important question was what story to tell through animation. I wrote a small script noting down the important points about how the animation will proceed and outlined a rough sketch for the video.



2.1.3 – 3D Modeling and Texturing

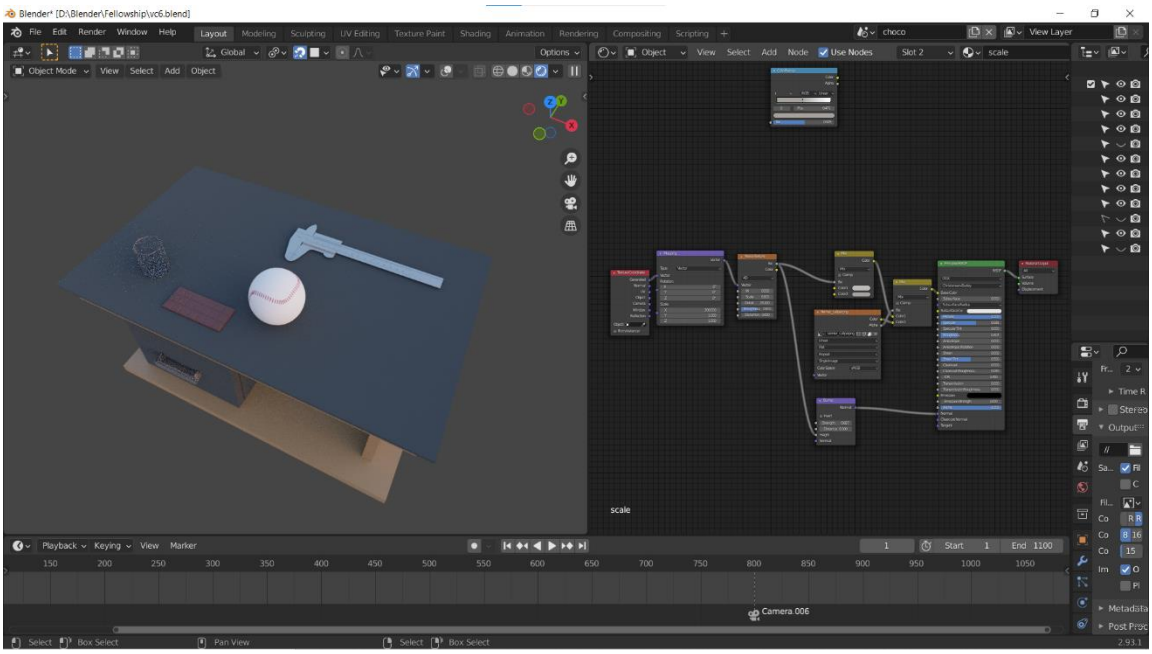
After compiling my thoughts, the next step was to create a 3d model. Using the reference image, I created 3d model of vernier caliper.



Further, I also create some other objects like, a chocolate bar, a baseball, a glass, and a table which were essential for the animation.

Giving real-looking textures to the 3d models was the next step.

For the vernier caliper, I used shaders of metallic steel and on it, I used UV Unwrapping for applying images of different scales to the 3d model. For the other objects, I used shader materials for giving them a nice look and feel. I use HDRI for the lighting of the scene.



2.1.4 – Rigging and Animation

The step that adds life to a model, which is Rigging was the next step now.

First, I created rigs for the objects. The rig is like the muscles of a human body, which can move the parts of the object.

In this animation, every object has a movement so I had created rigs for all the objects except the table.

The next step was to animate the objects frame by frame and complete the animation.

After satisfactory outputs, a single .blend file is created and is put on the Sheepit render farm to let all keyframes render.

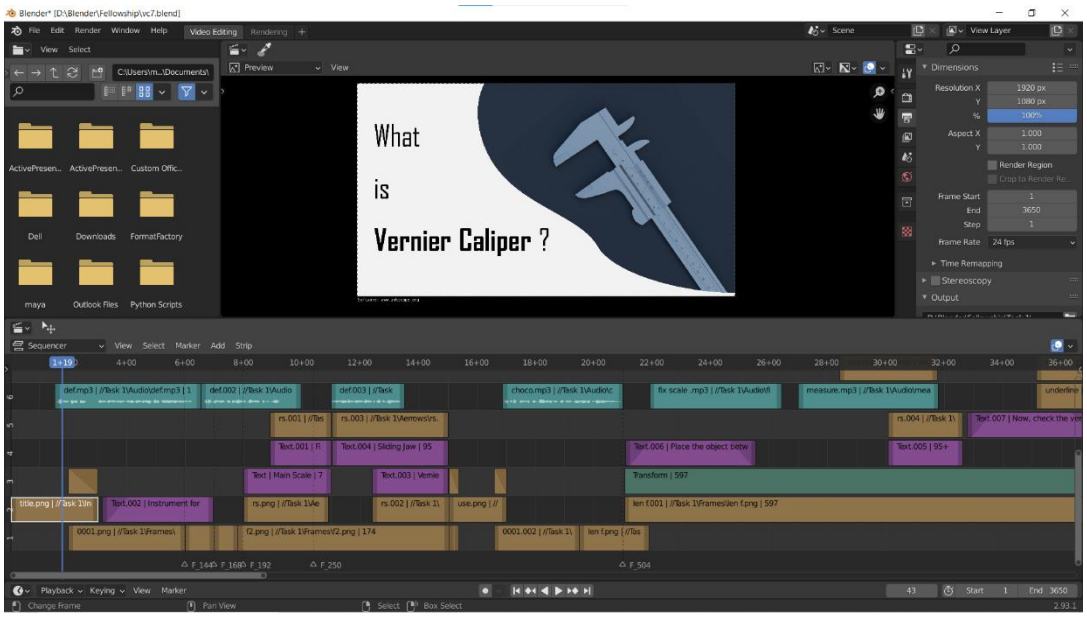
2.1.5 – Audio and Video editing

After downloading all the rendered keyframes from the Sheepit, the next step is to import those as a video strip in the video editor of the blender, following the required editing. Later, subtitles were added for a better understanding of the explanation.

All the images and thumbnails that are used in the video are created in Inkscape, exported as a .png, and then imported into the blender.

For the audio explanation, the AWS Polly service was used, where a pre-created script was converted into an audio file and added to the video.

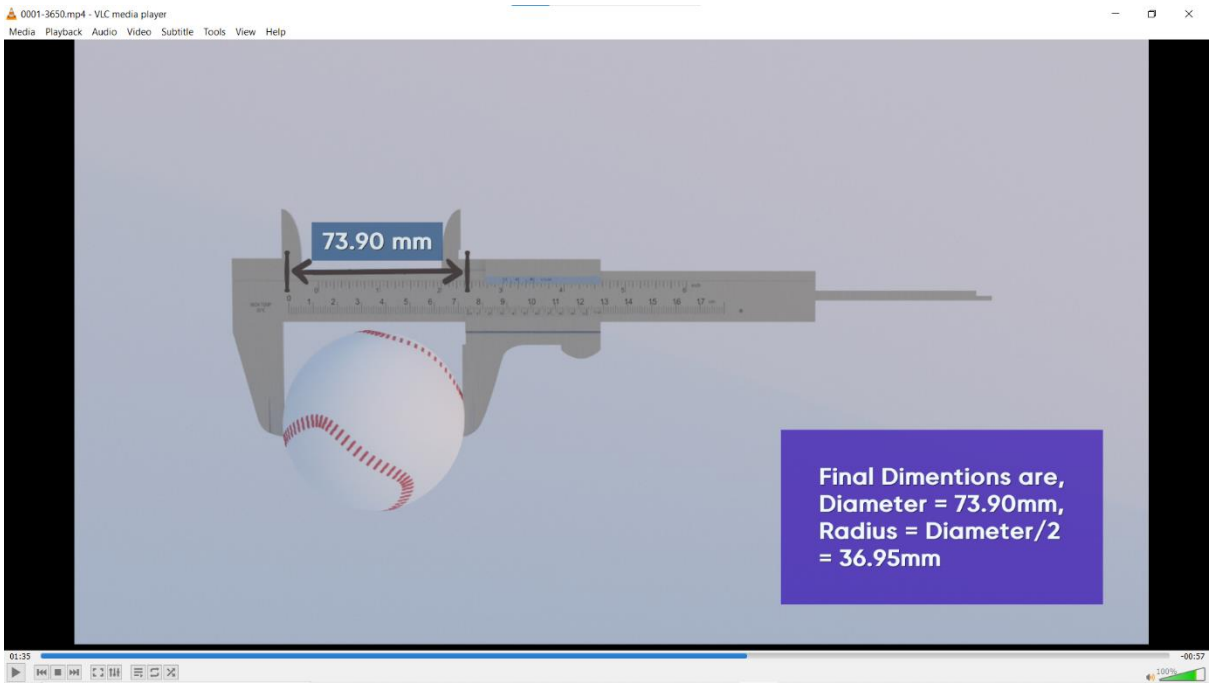
For more adaptation of the video, soothing music was made running in the background.



2.1.6 – Final Rendering

After editing the video, locally rendering the video in FFmpeg file format with mp4 audio was performed. Verses of re-editing and rendering continued until satisfactory results were achieved.

Here is a sneak peak into the final animation.



You can find final output here :

- Animation Video – https://drive.google.com/file/d/1jatI646DDSmEwY-1YLTxLBjNTJhvaXRv/view?usp=sharing

- .Blend File - https://drive.google.com/file/d/1bpKJMZw4Jd6bj_IPHLhuXJxUpoWLRGkj/view?usp=sharing

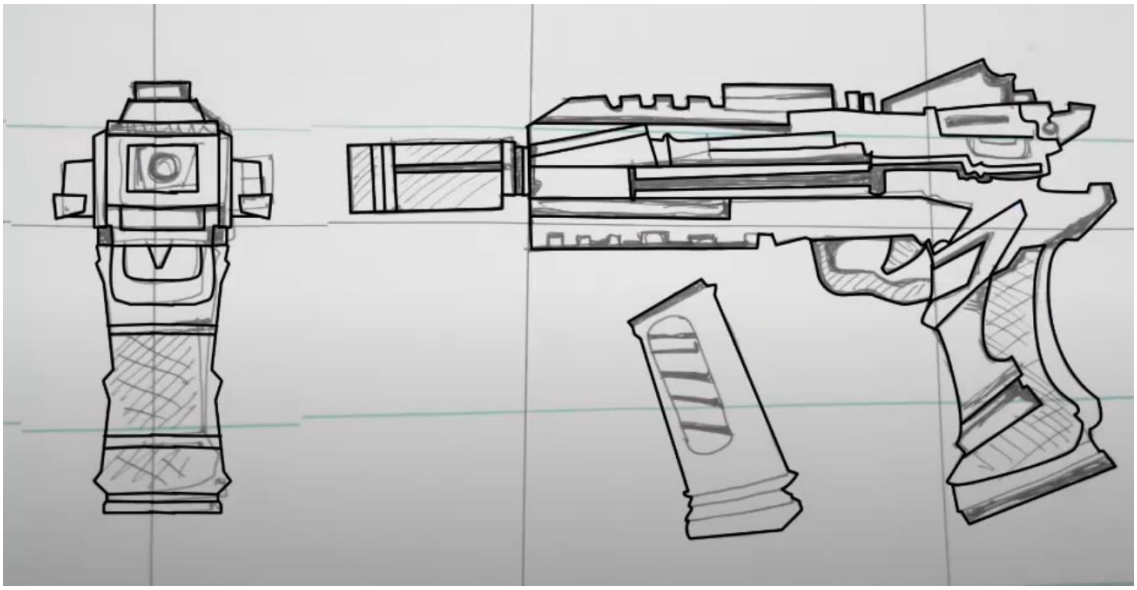
2.2 – Task 2 - Game Assets Modeling

2.2.1 - Ideation and Reference Finding

A small research about the available focal libraries in the blender led to the discovery that there aren't any projects of game creation curated using blender. Hence, the aim of this task was to exploit blender to create some 3d game assests.

The starting plan was to create 3d game assests for the FPS shooting game, which included modelling a sci-fi gun with a magazine and bullets. For the target a archery with a stand was to be created. Along with that a decent city environment which can be used as a map was also to be created.

Following is a reference image that is originally from a course on the Swayam portal for 3d Animation using Maya. Keeping these images as the reference point, a gun model was created.



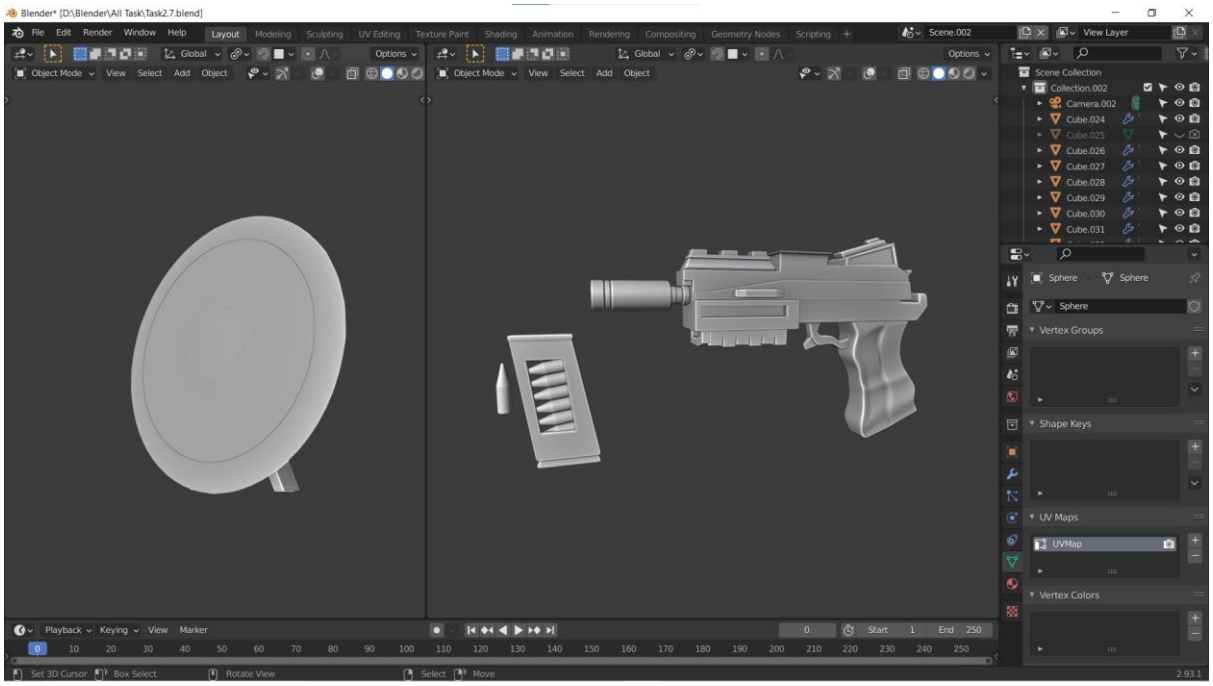
2.2.2 - Modeling and Texturing

After understanding the basic anatomy of the gun, the design was created keeping in mind every minute detail so that the output is realistic and acceptable.

Starting with a basic cube mesh, the base of the gun was created. Following it, the muzzle part was created using a cylindrical mesh. Finally for the handle and magazine, cube mesh was used. Once the basic shape was created, finer details were added to the design.

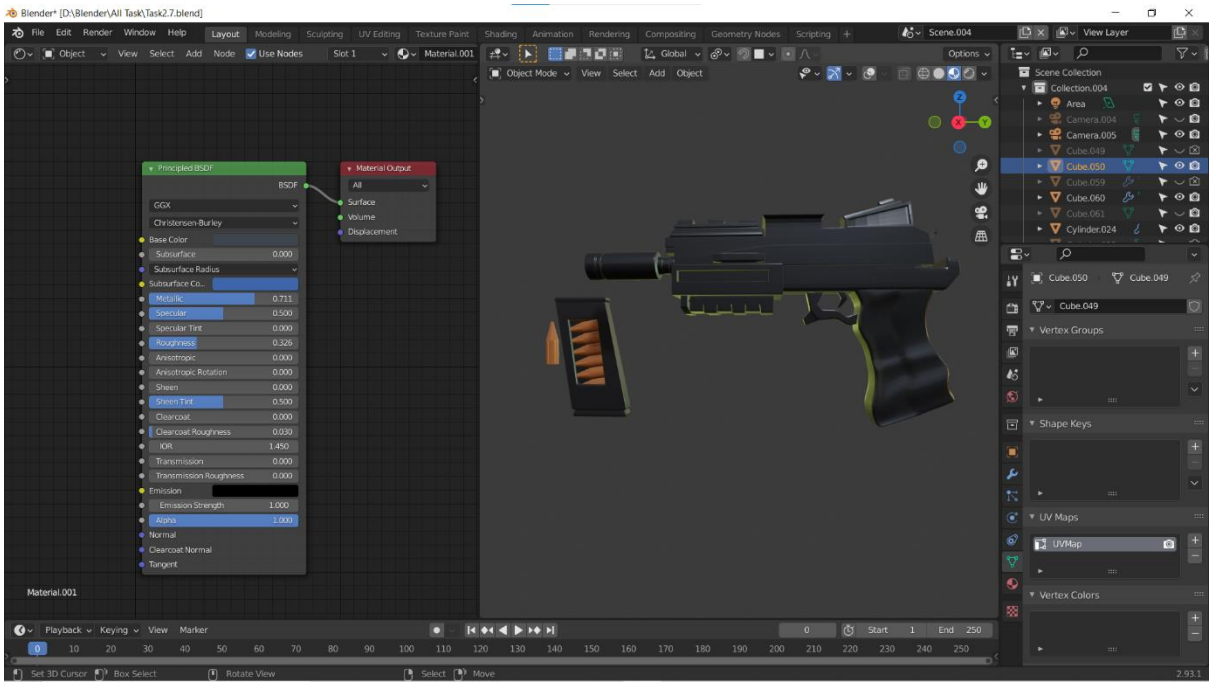
Next task was to model the magazine full of bullets.

For the archery too, a model with a personalized touch was created.

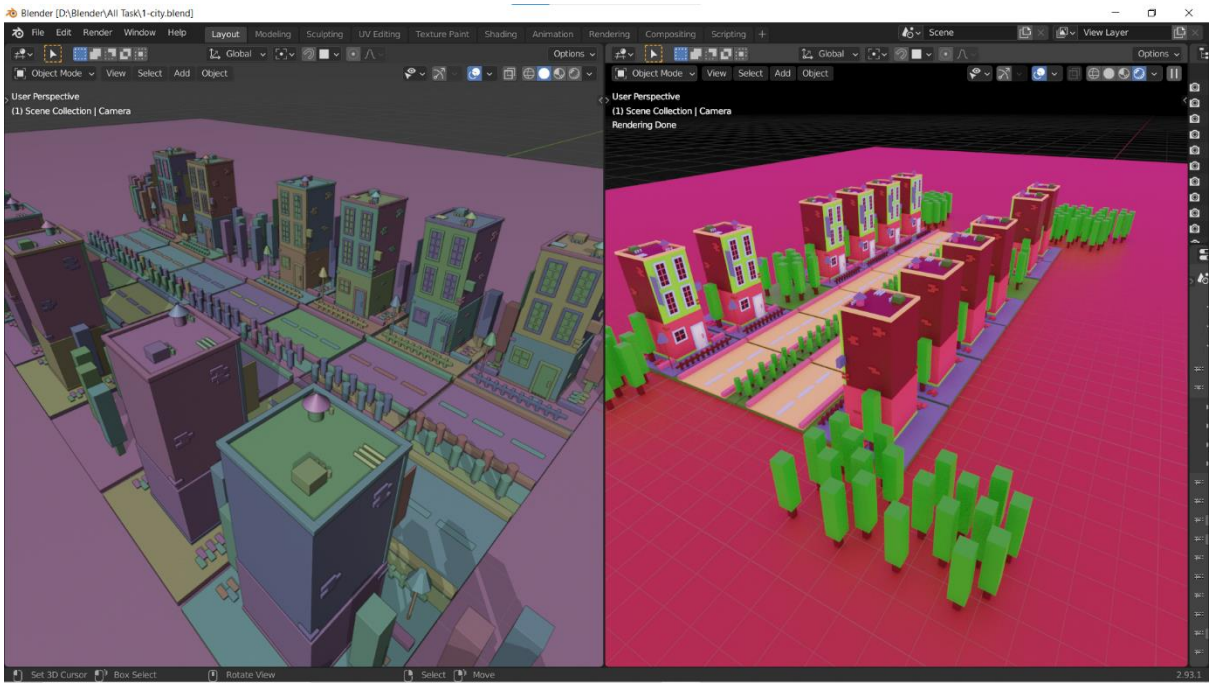


For the texturing of the gun, a simple principle shader with low roughness and a high metallic value was used, to give the gun a real pistol look.

For the archery, UV unwrapping was used and different shaders were applied to all different parts of it.

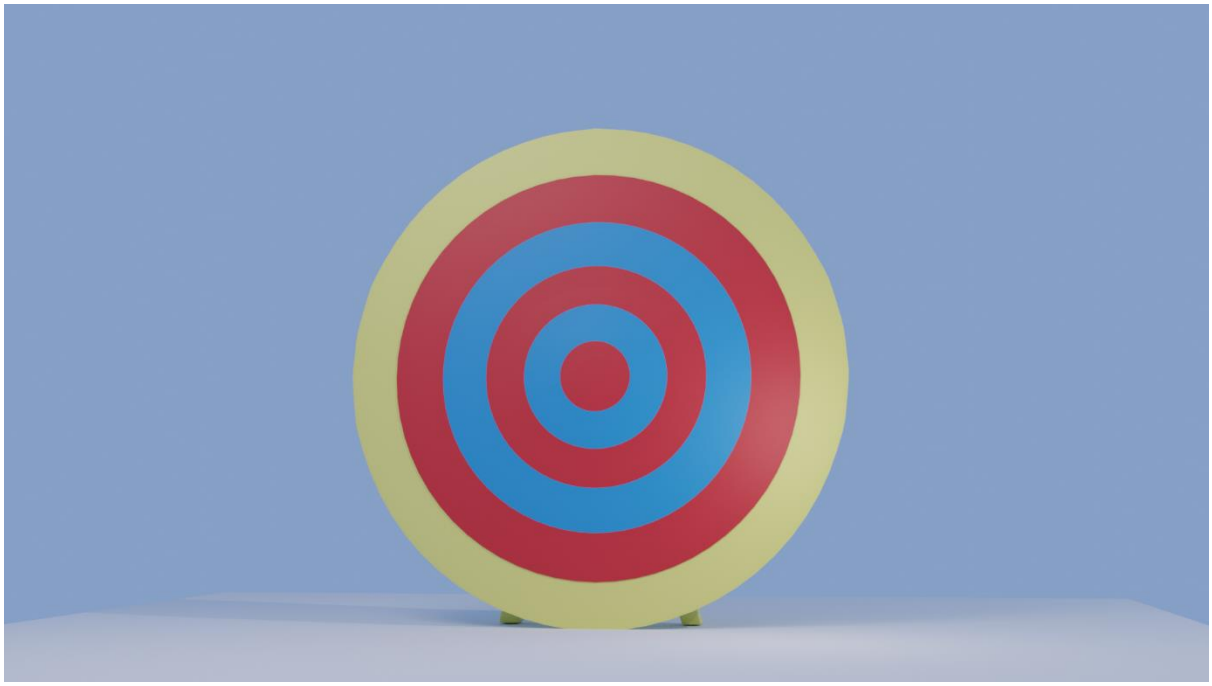


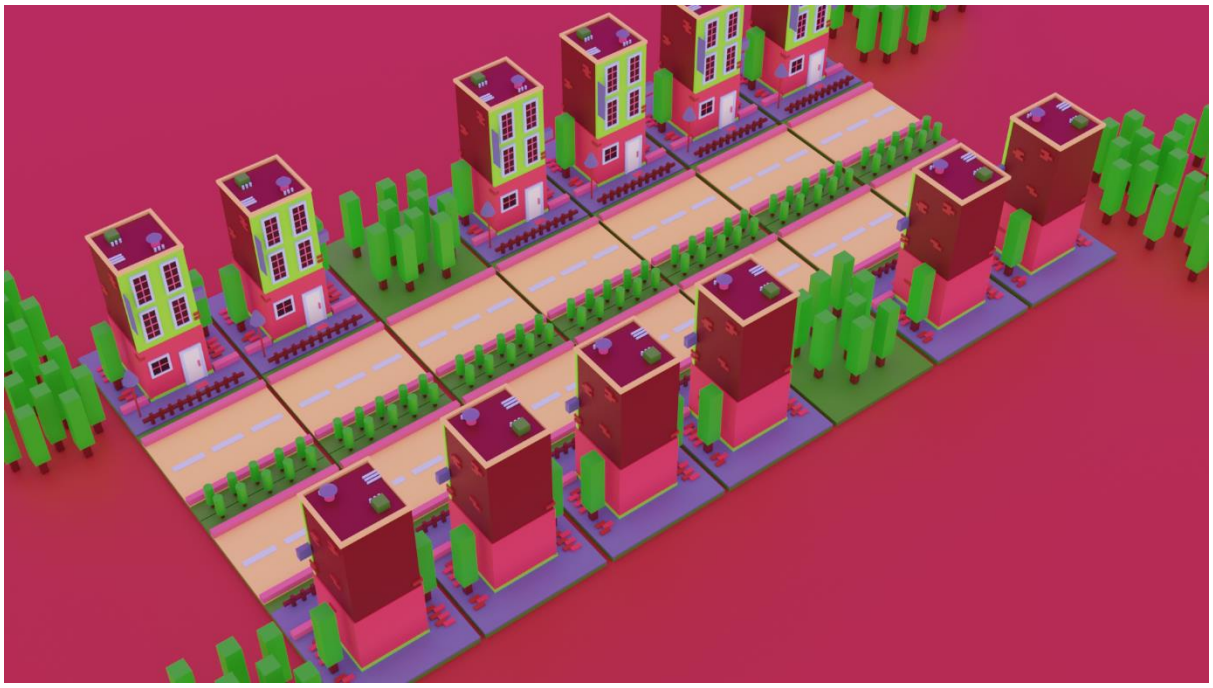
After researching and exploration, the town was modelled which could be used as a small map for the game.



2.2.3 – Final Rendering

After the texturing, rendering was to be initiated. HDRI was used for the world lighting. Then some area light and light spots were added manually for more enhancement of the renderings.





You can view or download the Renders from here -

https://drive.google.com/drive/folders/1AxYzbM8-pOfaSJDOUybFp2JX2H9ZTTeO?usp=sharing

2.3 – Task 3 - Low Poly Car Game Creation (without any script)

2.3.1 - Planning and Prototyping

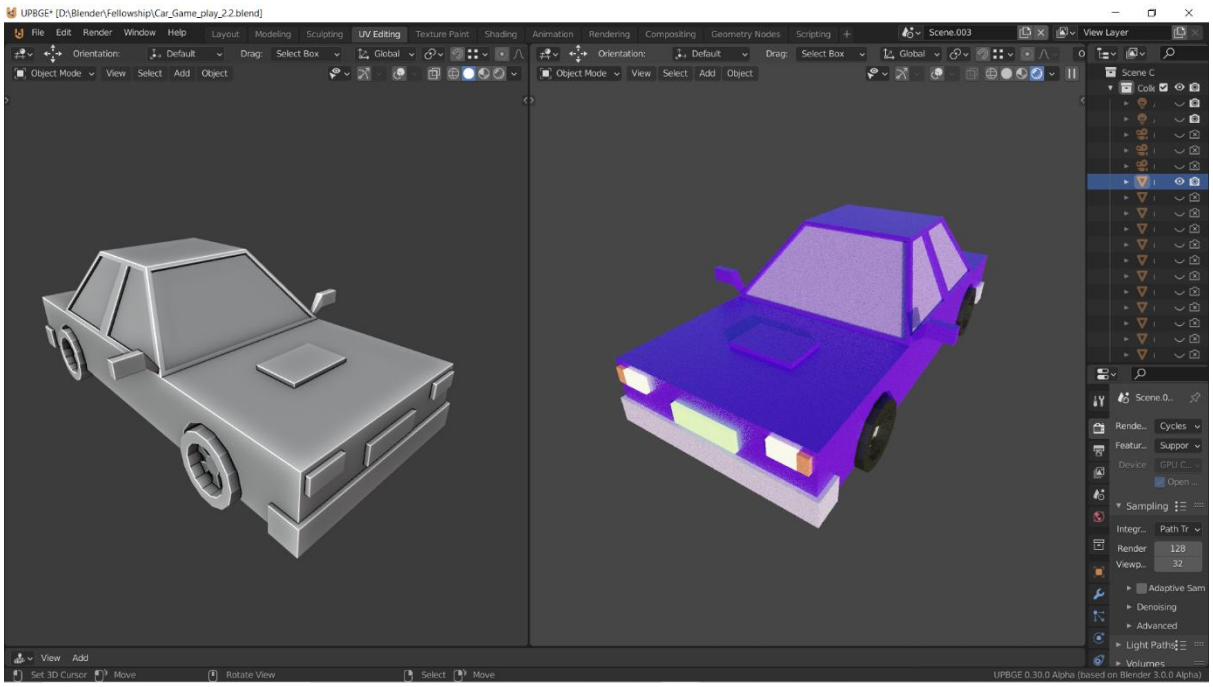
Upon discussions with the mentor, the idea of creating a game using the Blender Game Engine was established. This is reportedly something new and not much developed in the focal library.

Through reseach and exploration, it was found that the Uchronia Project Blender Game Engine UPBGE could be used to accomplish this task. To fulfill the aim of this task, a simple low poly car game using the UPBGE was to be created. This game was to be developed without any scripting and only through the use of logic nodes. No lines of code were intended for use in the accomplishment of this game creation.

This game was to include a car and a track with some hidden obstacles. The player has to complete the whole track without getting knocked out of the track by the obstacles. Moreover, this has to be done with a given time frame to the player. In doing so, the player wins.

2.3.2 – Modeling the Game Assets

To begin with, a car was the first requirement. Hence, a low poly car was created and finally shaders were used to make it look attractive.



With the help of tutorials and research, further a track was created for low poly car game in blender. A green colored terrain was chosen as the ground for the track.

Along with the track, the railings on both of the sides of the road were modelled to direct the player straight on the track. A starting point was laid on the track by giving a different texture over that area. And finally, all the required game assets were ready.

2.3.3 – Logic Node Designing

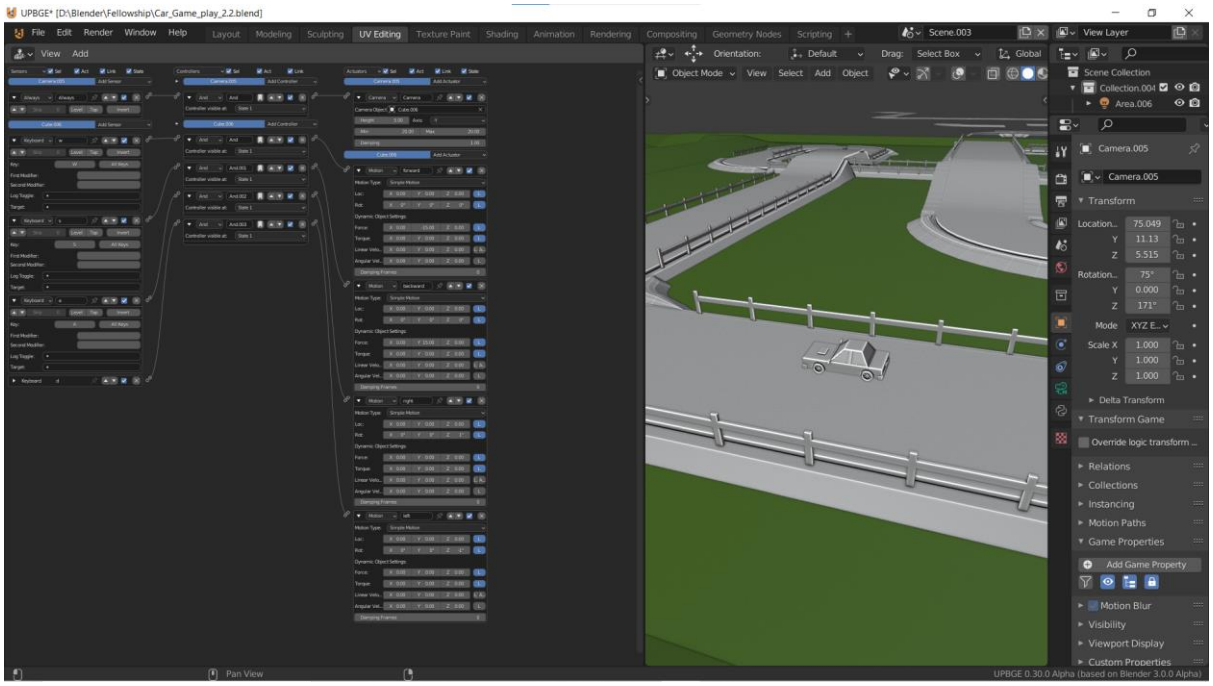
This phase of the task required to instruct the objects what they were expected to do, when and how. It involves giving the intelligence of a player to the game assets.

At first, some rigid body physics were given to the low poly car. Then, increased its mass value and adjusted the friction that it would be created while moving. Then some logic nodes were added to the model.

For example, when the player pressed W on the keyboard, the car moved in the forward direction. If the player pressed S then it moved backward. On pressing the A the car moved on the left side, and while pressing the key D moved the car to the right side.

The track and the terrain were given static physics so it doesn't not move from its place. Railing were made static too.

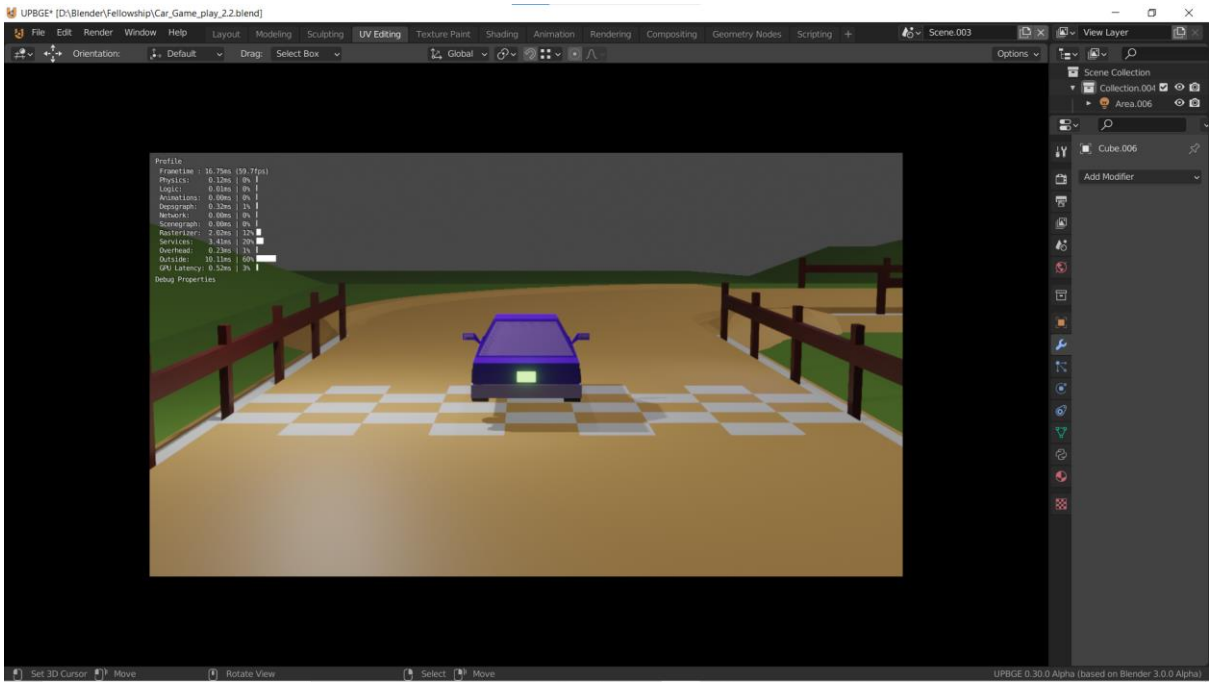
In the next step, a camera was set through which the player will be able to see through the game. This was done by adding some logic to the camera and connecting it with the car. So, wherever the car goes the camera automatically follows it from the back.

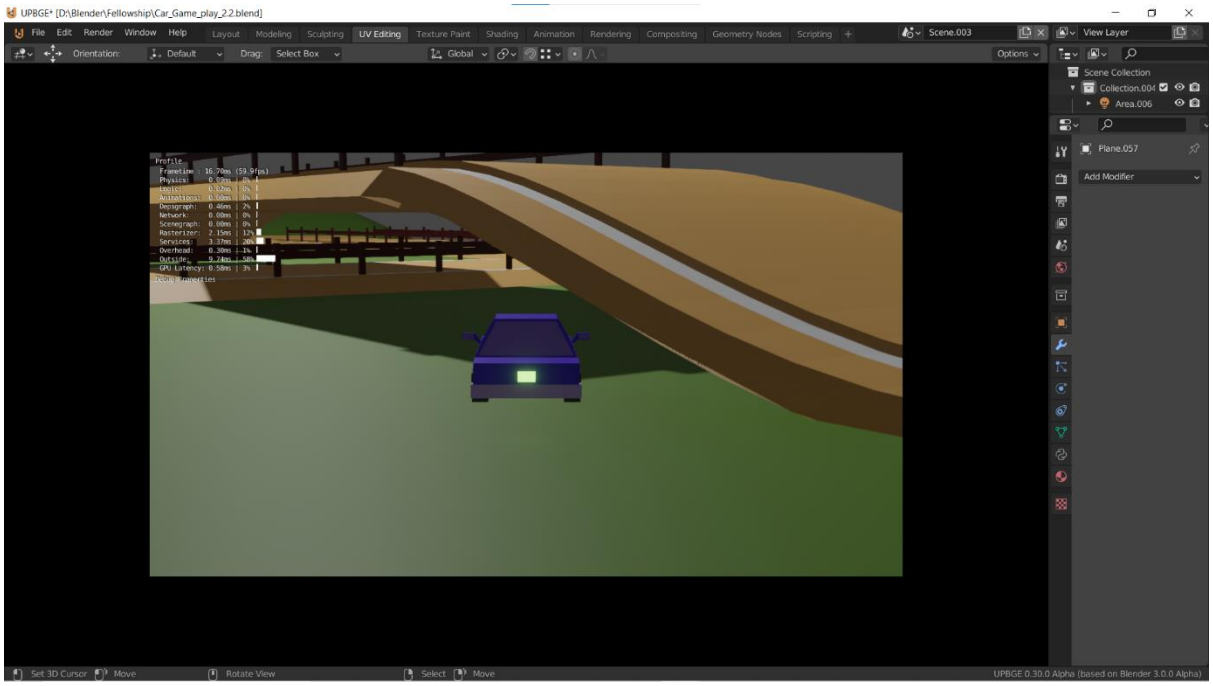


2.3.4 - Testing and Building

After applying the logic nodes, the game was tested.

The movements of the car was thoroughly checked by changing the mass, weight and friction attributes.





Finally, when the game was performing up to a satisfactory level, buttons for the play and exit were added which can be used by the player to start or stop the game. A timer was also added to it. And the wining screen was prepared for display to the players who win the game.

Next task was to build the game for which an executable file through which anybody can play the game without using Blender Game Engine was created.

From here you can download my first ever Game –

https://drive.google.com/drive/folders/1R56bZ2RLtET4BP5j6FRe-Fx9BbGm5ie2?usp=sharing

CHAPTER 3 - ISSUES FACED AND THEIR SOLUTIONS

During the execution of the first task wherein a model of vernier caliper was to prepared, the problem encountered was that it was not easy to get a full 3d view of the object. Mostly, a frontal or rear view was shown on resources. But to create a model all the side views are also important.

To solve the issue, using only the frontal view, a base mesh of vernier caliper was created and inspired by the possession of knowledge of the working mechanism of the vernier caliper, the backside of the object was created and the task was completed successfully.

During the execution of Task 2 modeling the gun was a big task. There was nothing but a rough sketch to begin with using which a fully detailed model of the gun was to be created. Hence, this task was tedious and demanded attention.

The next big issue was the creation of the game itself. With little to no knowledge in the domain of game development or scriting, the task proved difficult. The mentor during the fellowship helped throughout this task by giving valuable suggestions and references that could be chosen as the starting points.

Another problem that was encountered during the fellowship was the droppin out of Blender Game Engine in its latest version. Hence, to quickly solve this problem, a new free and open source software had to be used, which is when the Armory Game Engine was discovered, which shockingly didn’t do well either. Finally, the UPBGE Game Engine which is developed by Blender was used for the game creation process.

CHAPTER 4 – REFERENCES

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  - Animation with Maya by Dr. Abhishek Kumar

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  - UPBGE Alpha 3.0
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- OpenSource Websites
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  - SheepIt
  - HDRI Heaven