



Summer Fellowship Report

On

VR Animation using Blender

Submitted by

Praduman Sharma

Under the guidance of

Prof.Kannan M. Moudgalya
Chemical Engineering Department
IIT Bombay

July 10, 2019

Acknowledgment

I would like to express my deepest appreciation to all those who provided me the possibility to complete this report. A special gratitude I give to our project mentor, Mr.Khushalsingh Rajput, SPSE(Graphics and Animation), whose contribution in stimulating suggestions, guidance and encouragement, helped me to coordinate my project as well as our project head Prof. Pramod Murli, Department of Electrical Engineering, IIT Bombay who planned all this idea, and gave me an opportunity to do this wonderful project on Virtual Reali, which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to them.

Furthermore I would also like to acknowledge with much appreciation the crucial role of the staff of FOSSEE @IIT-Bombay, who gave the permission to use all required equipment and the necessary materials to complete the task "VR-Animation tutorial ". A special thanks goes to my teammate, Siddeshwar, who help me to assemble the parts and gave suggestion when ever needed. Last but not least, many thanks go to the head of the project, Prof.Kannan M. Moudgalya whose have invested his full effort in guiding the team in achieving the goal. I have to appreciate the guidance given by other supervisor as well as the panels especially in our project presentation that has improved our presentation skills thanks to their comments and advice.

Contents

- 1 Introduction** **4**
 - 1.1 Objective. 4
 - 1.2 About vr. 5
 - 1.3 About Blender. 6

- 2 Work Flow** **7**
 - 2.1 Studying about topics 7
 - 2.2 Scripting. 8
 - 2.3 Story board. 9
 - 2.4 Animation. 10
 - 2.4.1 Modeling
 - 2.4.2 Animation
 - 2.4.3 Adding Material
 - 2.4.4 Testing
 - 2.4.5 Adding Sound
 - 2.5 Rendering. 15

- 3 Video Titles** **16**
 - 3.1 Gauss Law. 16
 - 3.2 Ampere Law. 16

- 4 Issue faced and their Solution** **17**

- 5 Reference** **17**

1 Introduction

1.1 Objective

One of the less frequently considered benefits of VR is its use in education. We here today were aiming to make the old fashion school learning into a more engaging, motivating and interesting. There is so much potential in bringing VR to classroom , to give children an unparalleled opportunity of learning so they can truly inhabit the perspective of others. Imagine the understanding and emotional experience a student could gain from standing in the outer space, in dangerous places like volcano , or may be in an environment where atoms are bigger in size and floating around him.

Learning electric fields and all from text book work just fine - but adding a little magic to it by taking the student to stand between a pair of charge particle and letting him see how those electric field form in his surrounding will create an invaluable experience which will help him to explore more.

Or you can take students on a field trip to the moon, well not actually but with VR u can do it easily and let the children see and learn how the earth actually look from space or may be holding a pumping heart in your hand.

Well the opportunities in itself are uncountable.



1.2 About VR

Virtual reality is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. On a computer, virtual reality is primarily experienced through two of the five senses: sight and sound.

Other, distinct types of VR style technology include augmented reality and mixed reality.

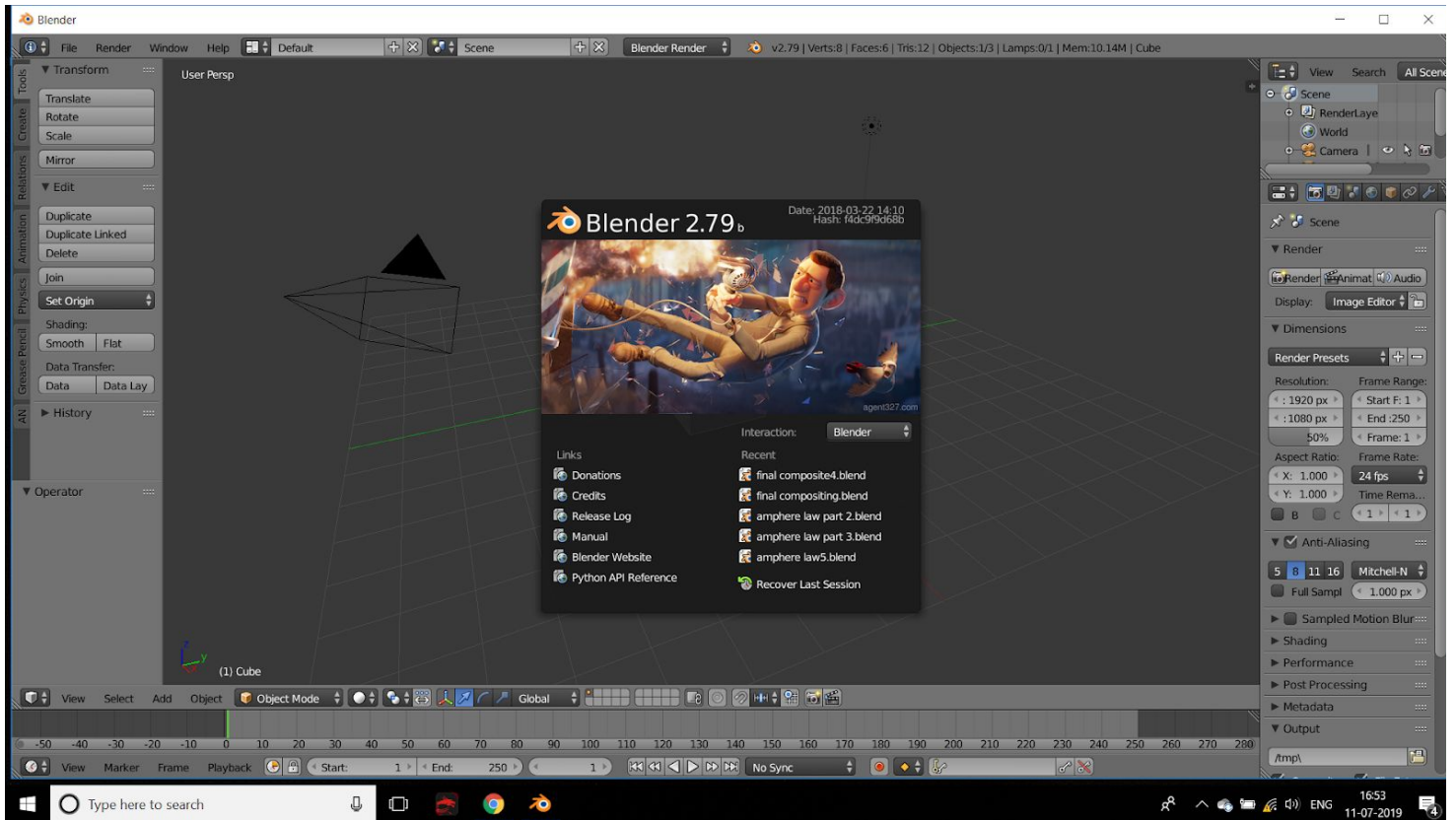
Currently standard virtual reality systems use either virtual reality headsets or multi-projected environments to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to look around the artificial world, move around in it, and interact with virtual features or items. The effect is commonly created by VR headsets consisting of a head-mounted display with a small screen in front of the eyes, but can also be created through specially designed rooms with multiple large screens. Virtual reality typically incorporates auditory feedback and video feedback, but may also allow other types of sensory and force feedback through haptic technology.

Applications of virtual reality can vary from using it in military operation to complex brain surgery or as discussed above in education and at last the most common entertainment.

1.3 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.

For this project i was using 2.79b and it had two rendering option in which you can work , one is blender render and other is cycle render and i have used Cycle render for this project.



2 Work Flow

2.1 Studying About Topic

First step to making a video is to read and study about the topics on which you will be making tutorial so that you don't pass any wrong or incorrect information to the viewer.

I used wikipedia and youtube , and then there were some physics lesson website(some of them were “hyperphysics.phy-astr.gsu.edu”, “study.com”, “khan academy”, “iit.edu”) to collect the information about the

topic and get an idea of what you want to show viewers to help them understand the concepts.

2.2 Scripting

Script writing, sometimes called Screenwriting, involves creating an outline of all of the events taking place in an animation. This means detailing all of the audio such as dialogue, sound effects and music score. It also details all of the visual events or features appearing or taking place throughout such as fades, transitions from one scene to another, characters appearing, descriptions of the landscape etc.

Scripting the most important part of making an animation it is the base of your animation .If the base is strong then building animation will be easy and you will not get lost in ideas or make a huge mess.

The screenshot shows a Google Docs document titled "Script for Gauss law animation" in red text. The document contains a table with two columns: "Narration" and "Visual Cue". The table has six rows of content. The interface includes a browser window at the top, a Google Docs menu bar, and a Windows taskbar at the bottom.

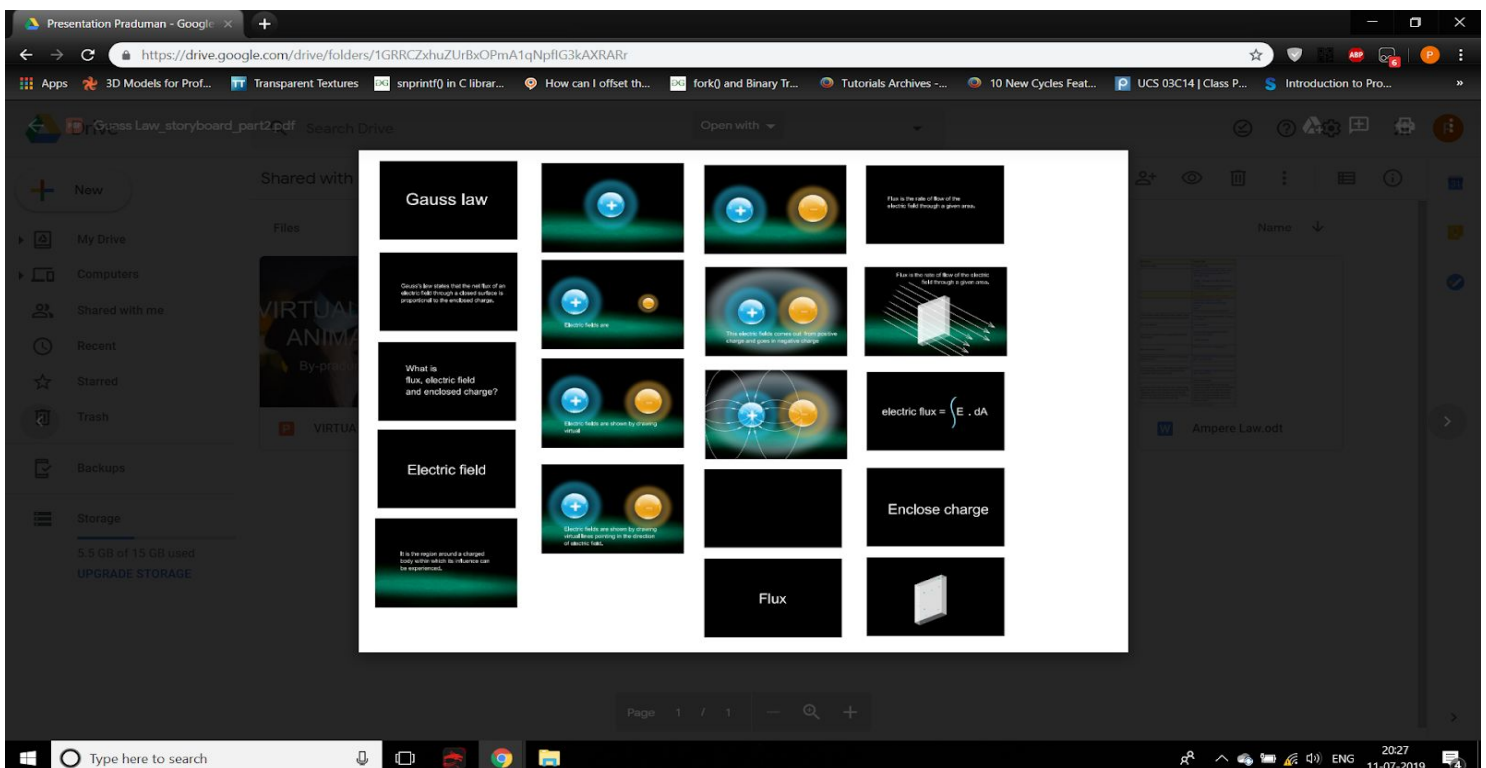
Narration	Visual Cue
Gauss law	"Gauss law"- <i>Text appears</i>
	<i>Text disappears</i>
Gauss's law states that the net flux of an electric field through a closed surface is proportional to the enclosed charge	"Gauss's law states that the net flux of an electric field through a closed surface is proportional to the enclosed charge."- <i>Text appears(typing effect)</i>
	<i>Text is disappears and "flux","electric field","enclose charge" moved to the front of the screen.</i>
What is flux , electric field and enclosed charge?	"What is " <i>Typing effect - text appears and complete the sentence, combining with previously appeared text.</i>
Electric field	Electric field <i>Come up and rest disappear</i>
It is the region around a charged body	It is the region around a charged body

2.3 Story board

A storyboard is a graphic organizer in the form of illustrations or images displayed in sequence for the purpose of pre-visualizing a motion picture, animation, motion graphic or interactive media sequence. The storyboarding process, in the form it is known today, was developed at Walt Disney Productions during the early 1930s.

It has key movements and events all laid out visually, as well as the camera angles and camera movements to guide you through your animation making process so that you don't mess up. It tells animators on what has been established in your pre-production work. When multiple people are working on a story.

Storyboards themselves don't have dialogue bubbles, so they're not like a comic book version of the film. They leave the dialogue and any details off and just focus on what the visual will be.



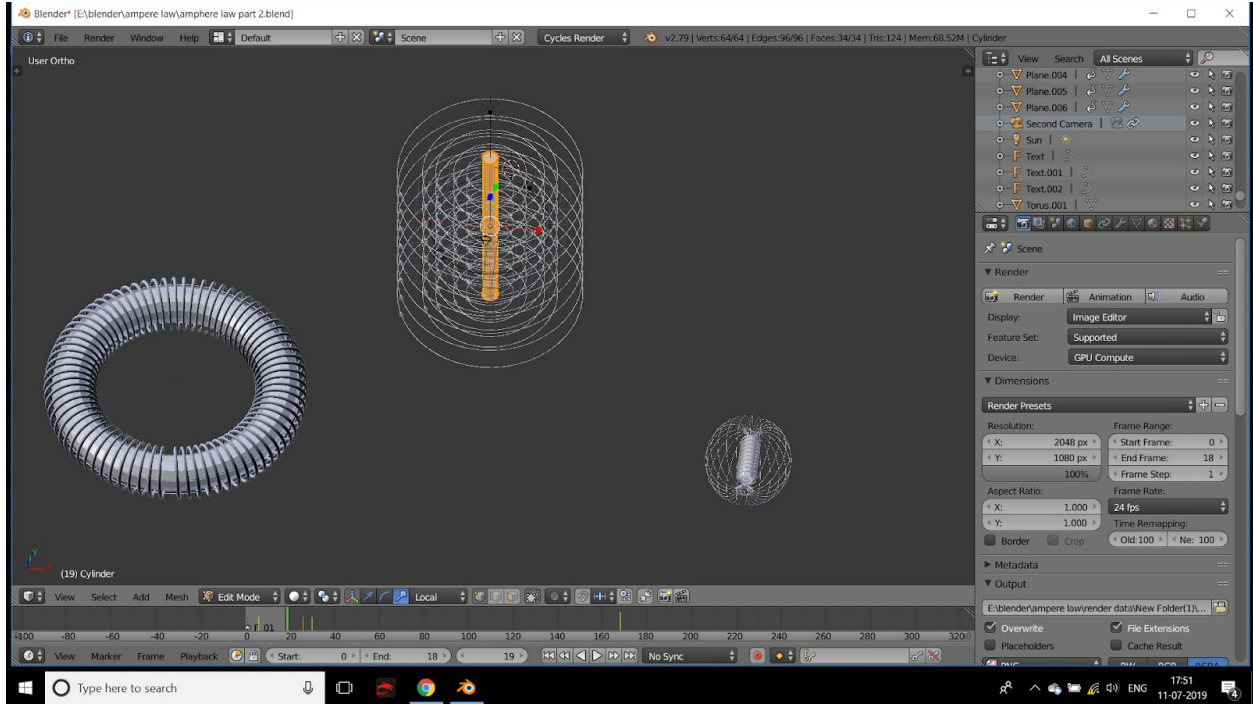
2.4 Animation

Animation are a set of pictures which are played in continuous motion to create an illusion of continuous motion.

2.4.1 Modeling

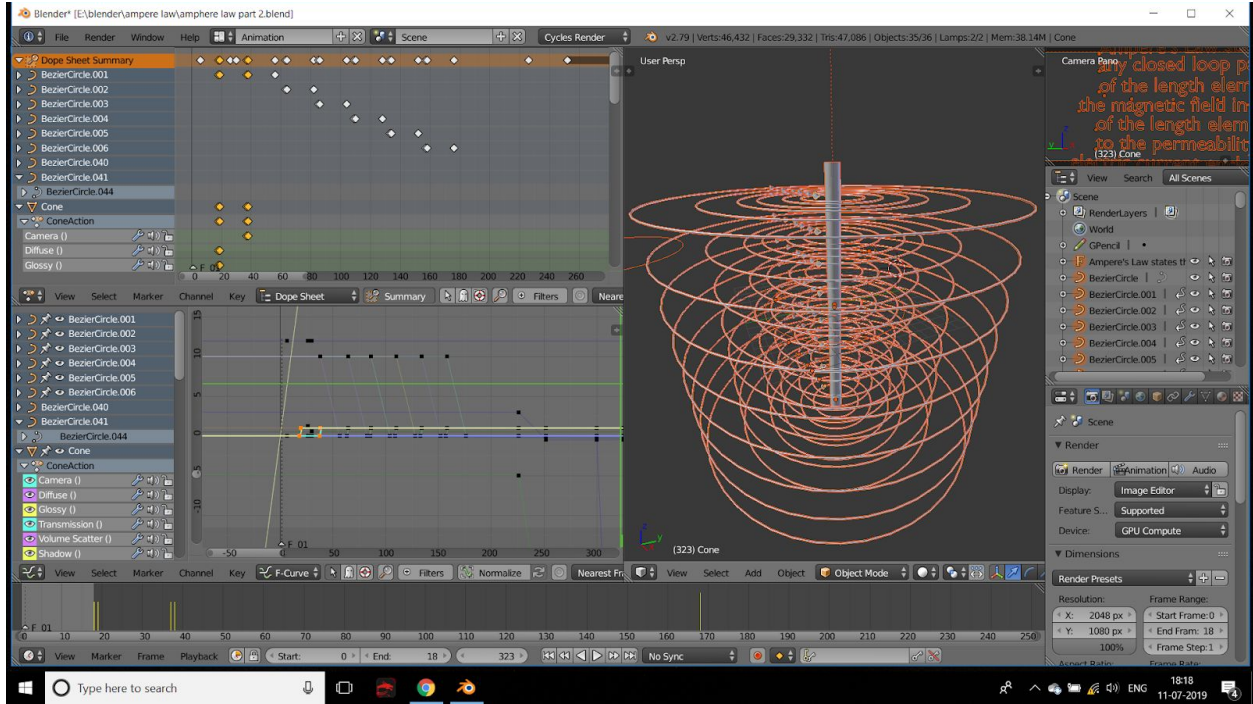
Modeling is a technique in computer graphics for producing a 3D digital representation of any object or surface. An artist uses special software to manipulate points in virtual space(called vertices) to form a mesh: a collection of vertices that form an object. These 3D objects can be generated automatically or created manually by deforming the mesh, or otherwise manipulating vertices.

These points are mapped into a 3D grid and joined together as polygonal shapes, usually triangles or quads. Each point or vertex has its own position on the grid and by combining these points into shapes, the surface of an object is created



2.4.2 Animating

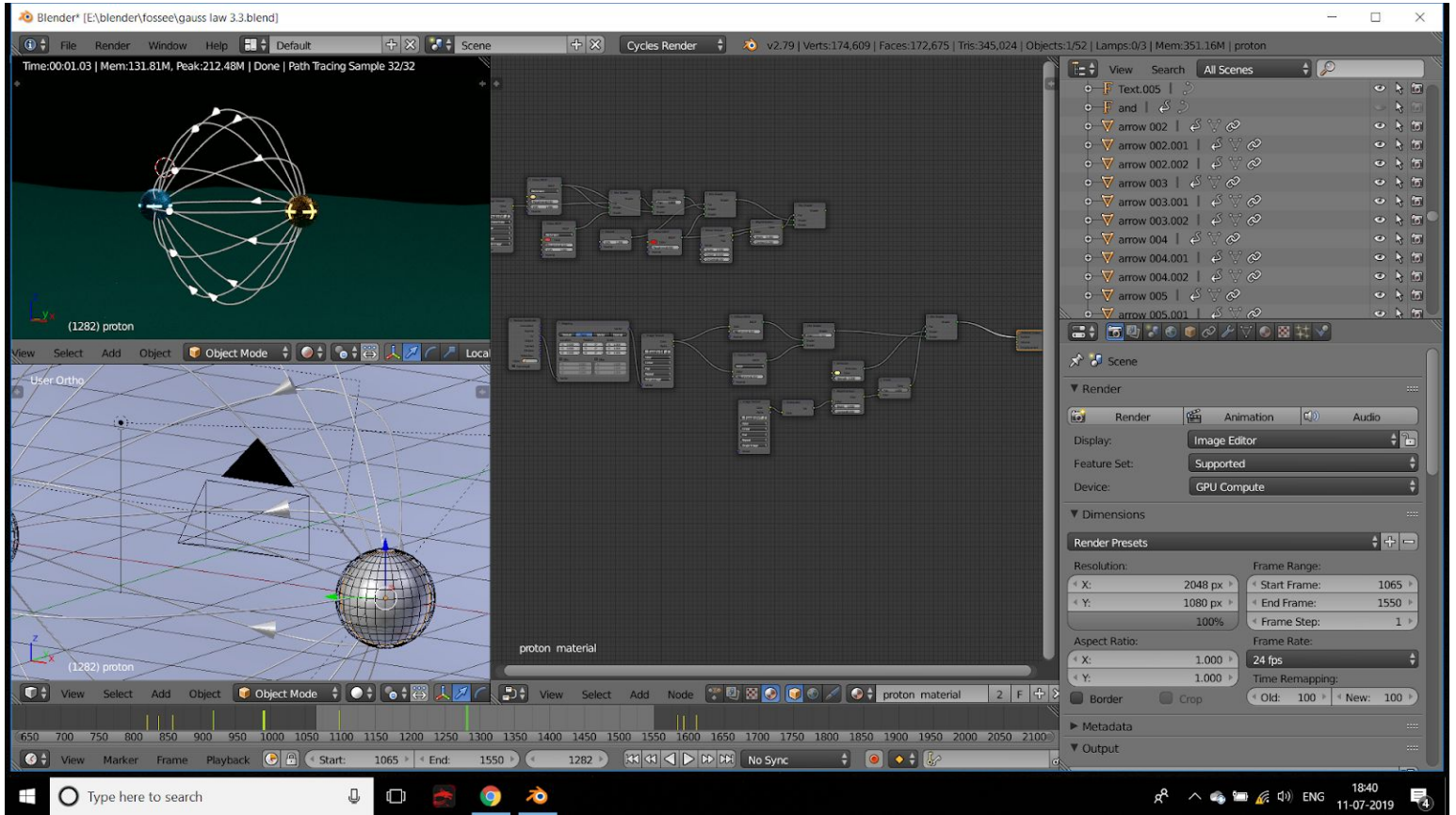
Animation include moving the objects and armature(bones) to different frame and adding keyframe to make it animate from one place to enter. To make it move then using graphs and nodes to adjust the speed and distance of the animation .



2.4.3 Adding Material

The Material is the skin that covers the model there's a set of properties associated with each material changing these properties produces a different material.

Materialing helps to give color to to model and different reflection and diffuse properties to it .

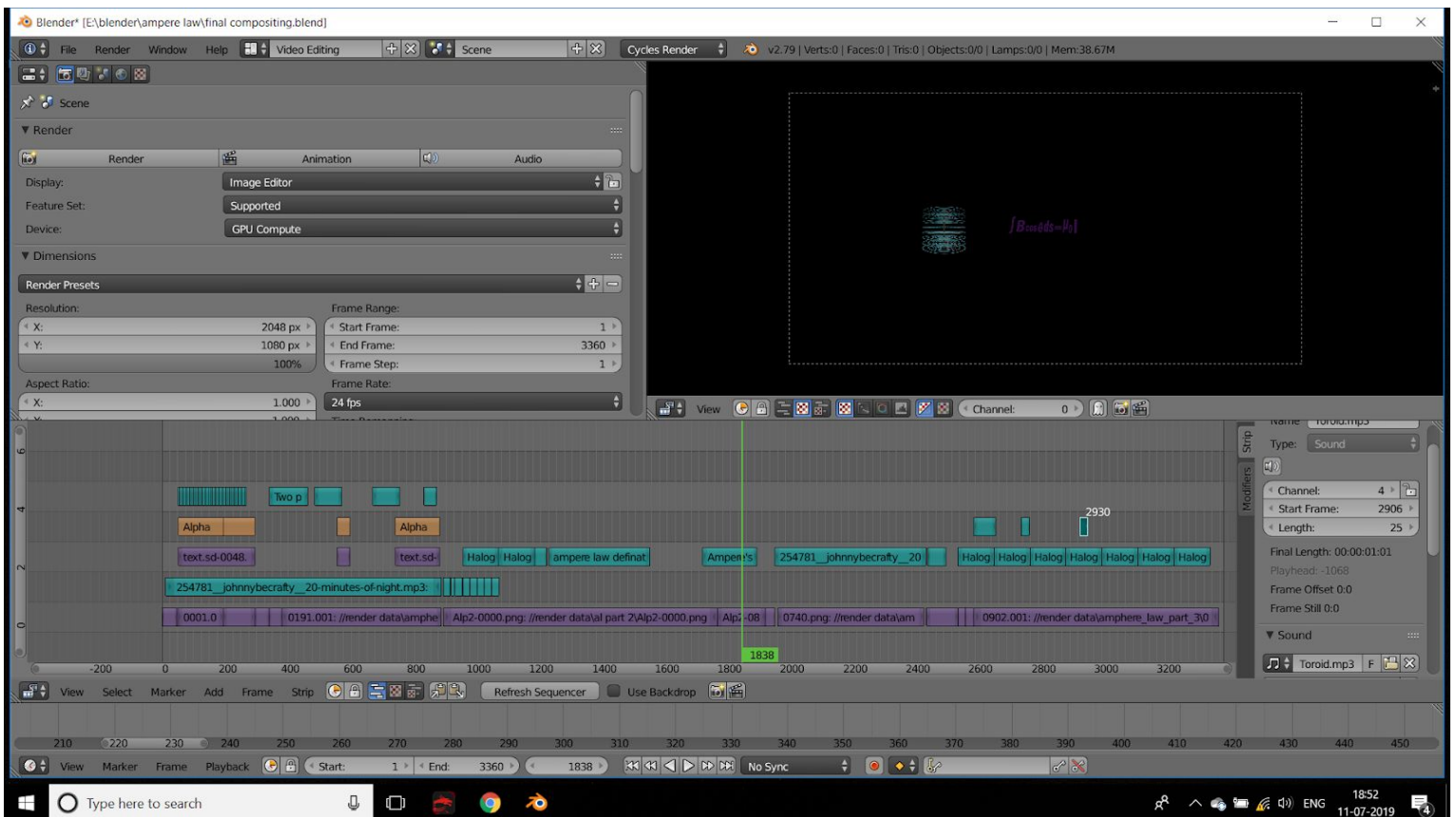


2.4.4 Testing

Testing is the final part of confirming that the animation you have made is going the same way as you planned . Because sometimes you might get error with frame speed or material . Before finally sowing it to other that the video made is creating that VR effect which you want the viewer to experience.

2.4.5 Adding Sound.

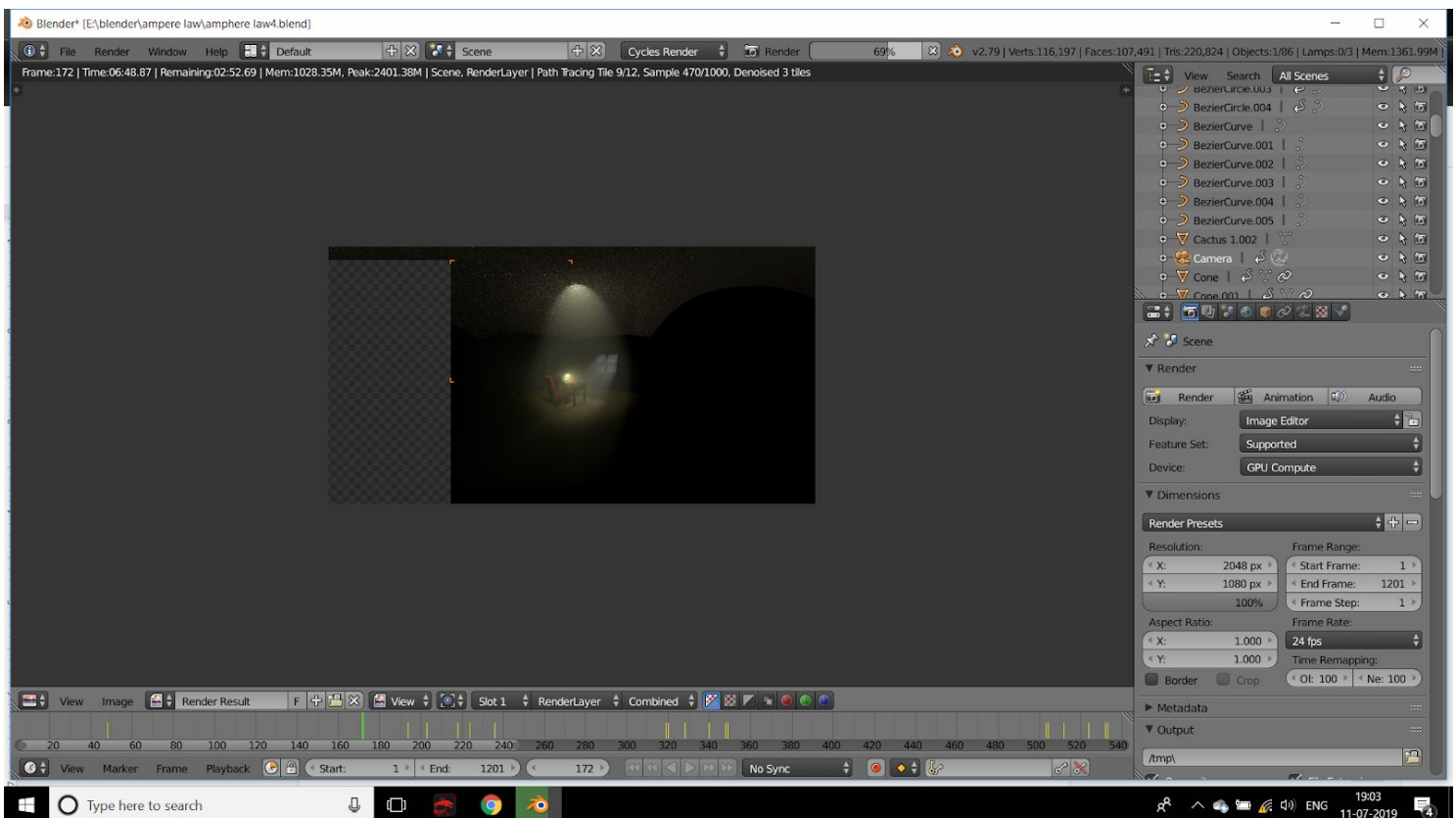
This is the final editing which you do where you synchronise your dialogue and sound effects with the animation. Then the viewer will get the complete visual and audio effect which will create that feeling of watching something magical. Feeling happy, scared, quorius and surprise they can be created.



2.5 Rendering

Rendering is the process involved in the generation of a two - dimensional or three-dimensional image from a model by means of application programs. Rendering is mostly used in architectural designs, video games, and animated movies, simulators, TV special effects and design visualization.

This is the part which take the most time to complete as now you will be rendering all the frames as images and then make the video by playing the images at a certain speed, normally called as fps. Sometime it takes day and week to render a 1min video.



3 Video Title

3.1 Gauss Law

The video is of around 3min which explain about gauss law , electric field , enclose charge and flux throw various animation of 3d model where viewers can see how the electric field lines form between two charged particle or what is meant by flux and how it passes throw a plane. To better understand about all these concepts. And at last we presents the equation of gauss law to conclude the explanation.

3.2 Ampere Law

The video is around 2.5 min which explain about the ampere's experiment of parallel wire "why they attract or repeal?". And later it will be shown some application of ampere's law which include "magnetic field around a long straight wire" , "magnetic field around solenoid" , "magnetic field around a toroid" .

4 Issue faced and their Solution

The major issue was of rendering time of VR videos were taking a lot more than a normal video to render as it had to render the whole scene not only the front part of camera.

For ex:- a 1 min video has 1440 frame and 1 frame takes 15 min(for 2k) which is 6 days.

Which is quite a long time to wait so for this we used "Sheep it render farm" for rendering which render the frames by distributing it to all the users which are connected and it mostly has 400 active user so the video go render very quickly in 1 day 15hrs .

But sheep it has also some problems, the first one was that it uses a point base mechanism to render an animation "who has more points get to render first" and you earn points on sheep it by helping others to render. So for that we had putted the lab pc to earn points for us which we can use later on. Those pc render other people animation while no one is using them so we got a lot of help from it.

The other problem with sheep it was that different users do your rendering and it's quite possible that all those people will be having different gpus of different brand and as different brands uses different light calculating algorithm so some time in final result some frames got change. So for that we have to render those frames on our machine separately but its still faster than rendering all frames ,as now you have to render only some of them.

The other problem with sheep it was that it does not support an addon called animation node which we use for text animation. So for that we have to animate the text part separately and then add both of the render results in final composition.

The other problem was of quality as VR is different then a normal 3d video which play at 2k resolution for the highest quality but the minimum resolution for a VR video is 4k . And Increasing the resolution from 2k to 4k increases its time by 4 to 5 times so, 6 days become 24-30 days. Which we never wanted so for now we had only render the videos in 2k only.

The last problem was with VR headset as we didnt get a google cardboard which comes with a magnetic button which can play, pause, re-center, go back and start. And it also comes with its own player which is compatible with most of the devices. As the VR set which we use to test these was ok but it had some issues. And at the end we deal with all of them by trying different player which might get compatible with the device.

5 Reference

- Wikipedia
- Youtube
- *Hyperphysics* - "hyperphysics.phy-astr.gsu.edu",
- *Study* - "study.com"
- *Khan Academy* - "[khan academy](http://khan.academy)"
- *Turbosquid* - "www.turbosquid.com"