Computer Graphics - 1

Final Project Report

By
Ankit Nimje
01760450

Contents

Introduction

As per directed, this project aims to create and store a 3D object with as many features as possible. To achieve this, I have created a 3D model of a Snooker Table with as many features given in this report. I tried to implement new features each week as directed. From next page, I have explained each week's progress as done.

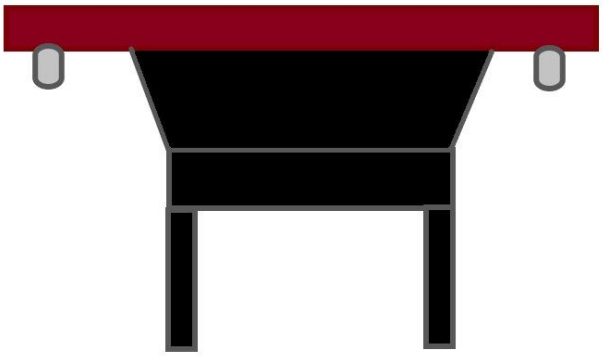
Initially, I used P5.js library to build my object. After working on P5.js, for few weeks, I realized, it has very limited features because of its ongoing development. Since, this technology is not completely developed, it limit my creativity to do more and decided to move on to some other better technology for my project. Thus I chose THREE.js to complete my project which is much more developed and obviously better than P5.js. In final week, I managed to progress and implement as many features as possible.

Week 1

- Planning and drawing of 2d elevations of a model to be drawn.

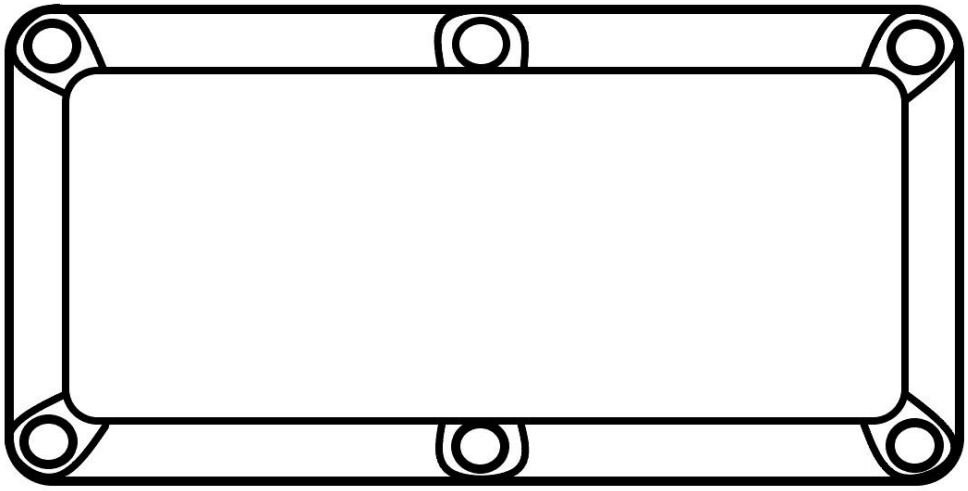
FRONT VIEW

- Used Paint 3D to draw 2d elevation drawings of planned model.It is just a rough representation of how my object should look like.



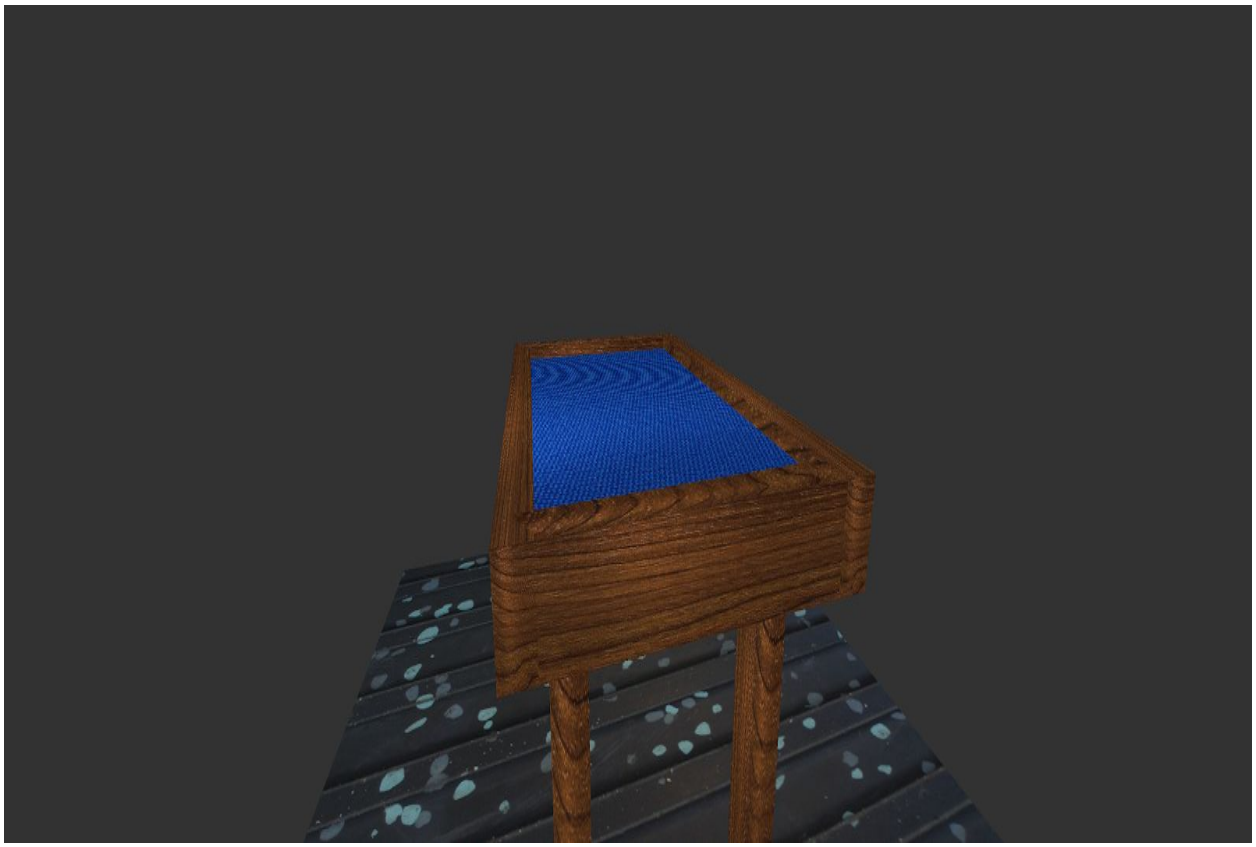
SIDE VIEW

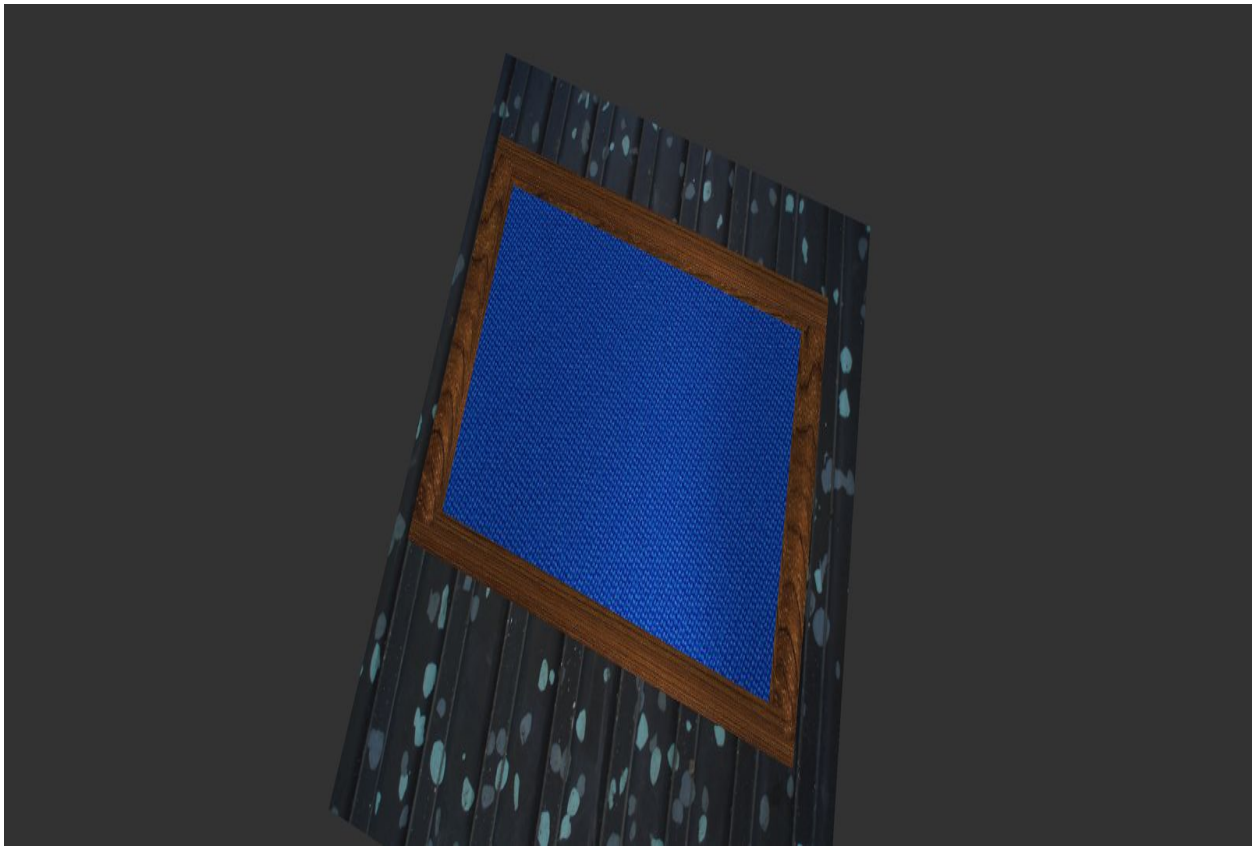
TOP VIEW

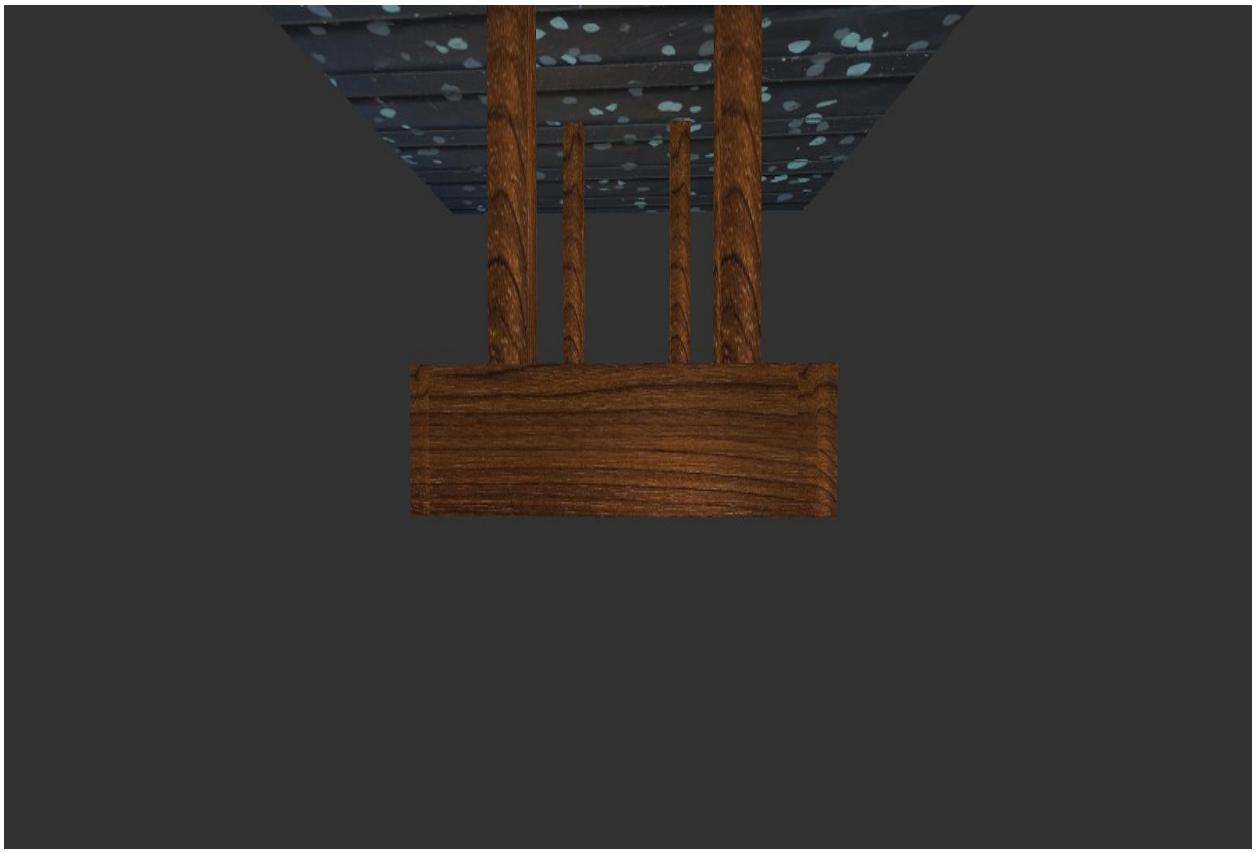


Week 2

- Used p5.js, an open source library for development of 3d drawings using javascript.
- Successfully drawn a Snooker Table Structure in 3D world.
- Implemented Rotate function along X, Y and Z axis.
- I used a variable which increments each time draw() function runs and draw() keeps running all the time window is open. Thus, using this variable object keeps revolving in center space.
- Different textures were used for different surfaces. For example, a floor texture for floor, a blue carpet structure for snooker table top surface. All those images are downloaded from internet.

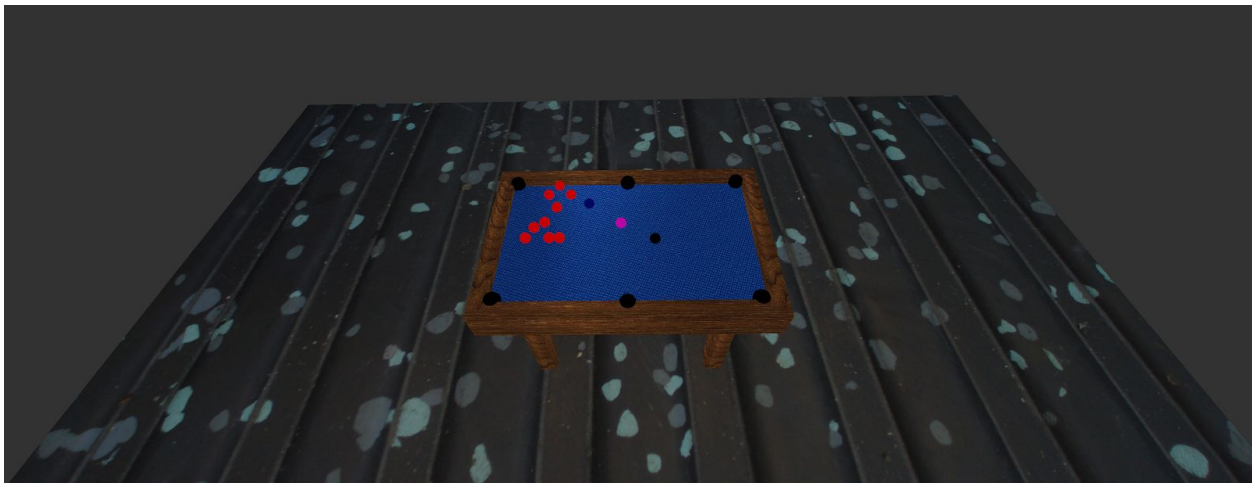


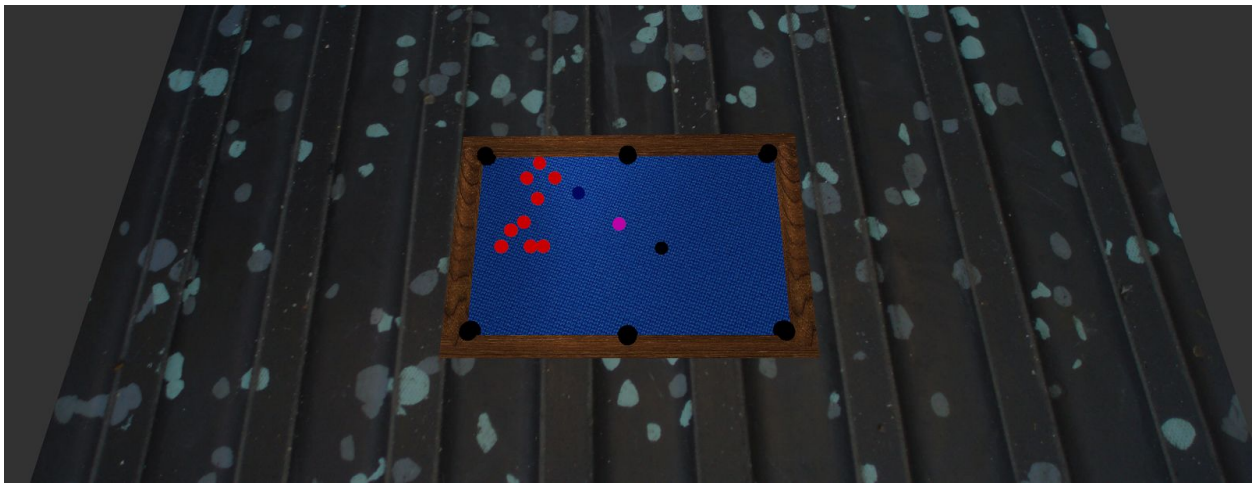


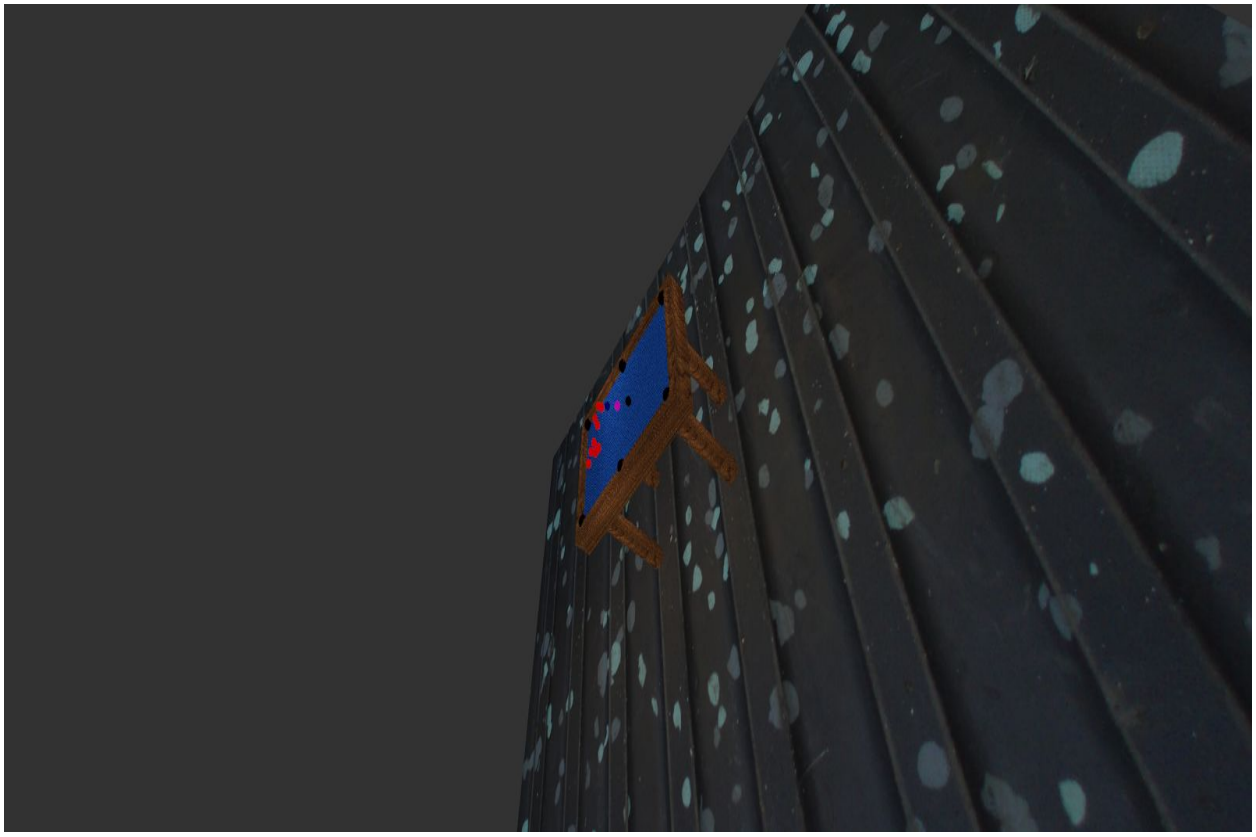


Week 3

- Added some extra features like Snooker Balls and holes to make it look like more real Snooker Table.
- Added camera transformation using mouse movements.
- I mapped Camera transformation function with current values of mouse coordinates which are also predefined as mouseX and mouseY in p5.js and used these to move camera along all directions.







Week 4

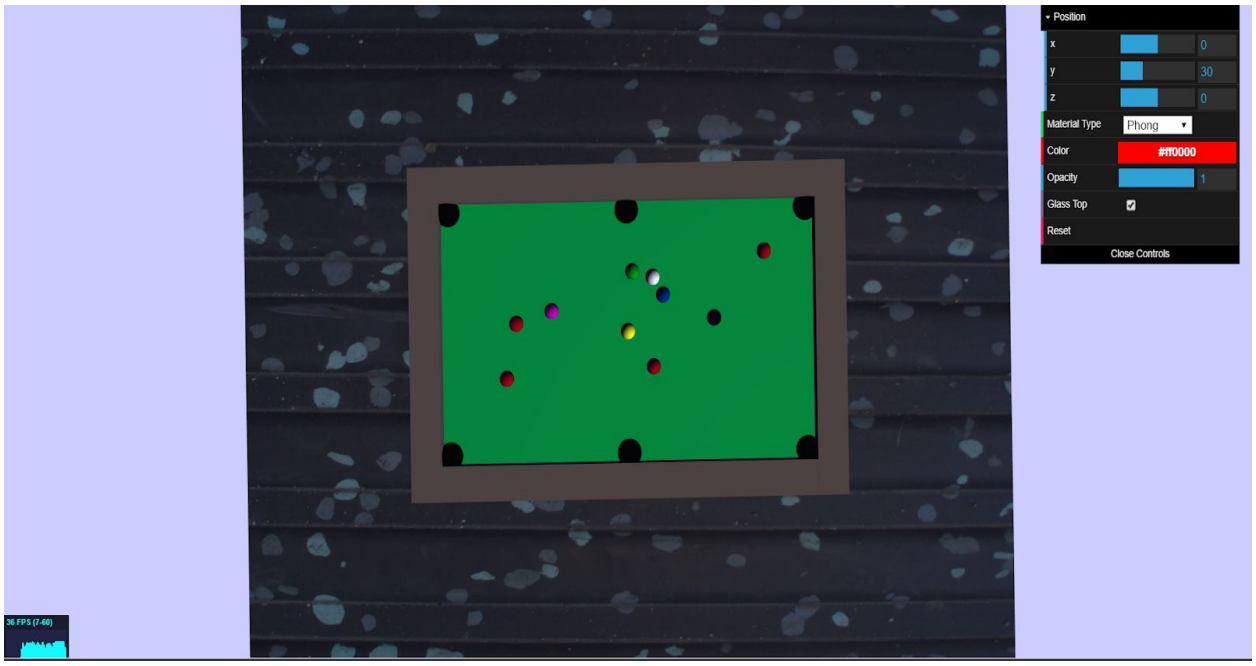
- In week 4, I tried to implement a slider which can be used for functions like rotate, translate, scale, etc. P5.js is still in development mode and many features need to be fixed before next steps. This development phase limit my creativity and I thus decided to used much more developed and advanced 3D library THREE.js.
- In this week, I learnt basics of THREE.js and how to setup environment before starting any progress.
- Like P5.js, THREE.js is a high level graphics library which is built based on WebGL, also an open source freeware library for everyone.

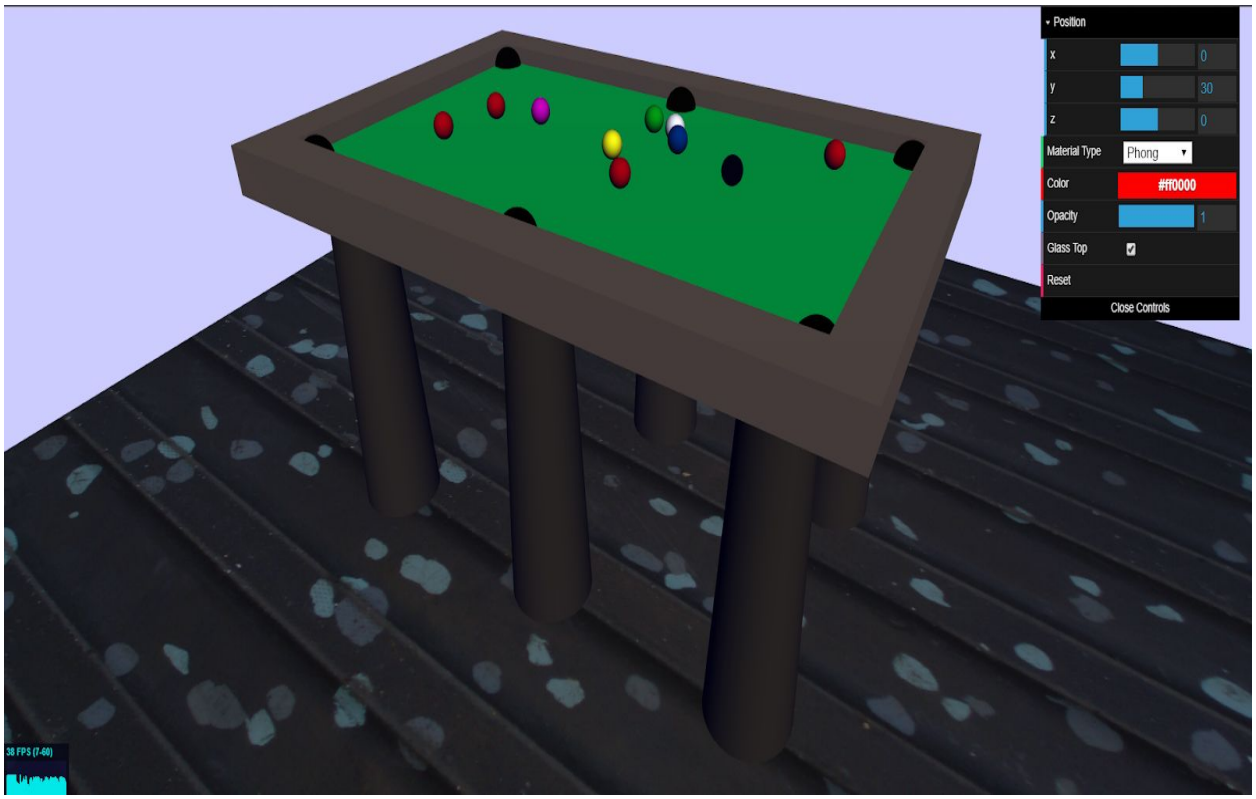
Final Submission

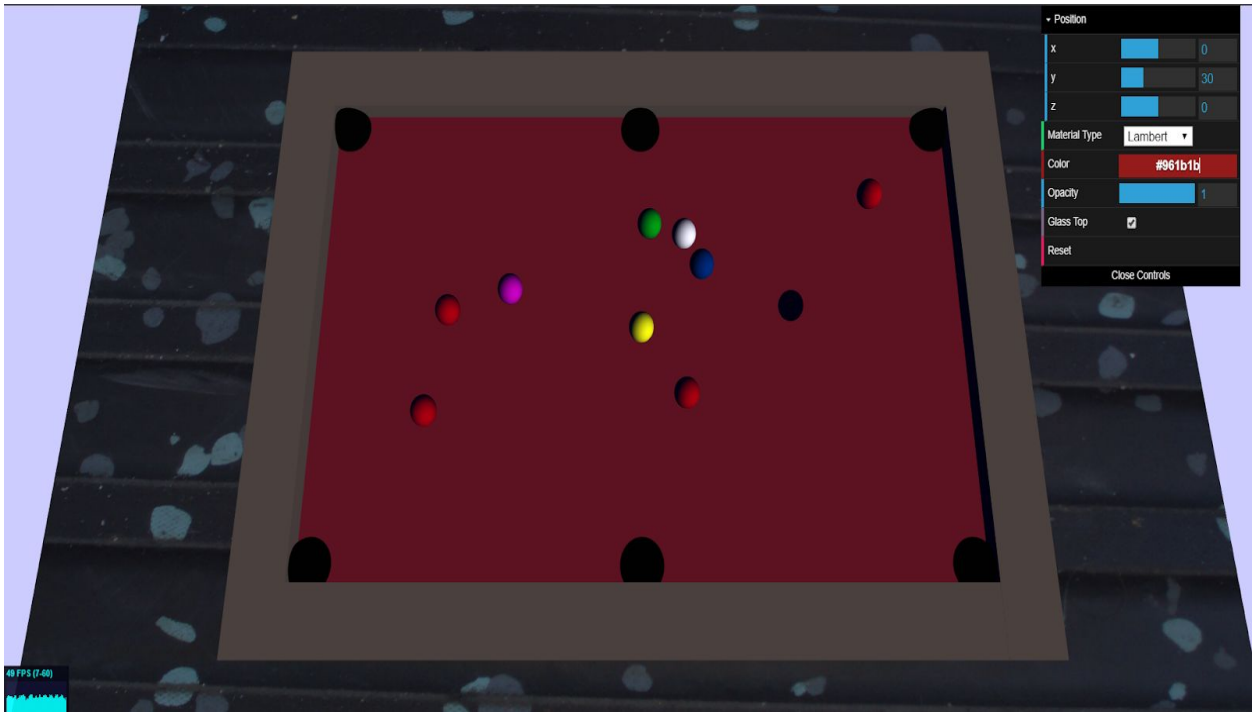
- In final week and final submission, I implemented actual representation of a Snooker Table along with many features as directed using THREE.js.
- Some of the features includes:

1. Translation of Snooker Table along X, Y and Z axis.
2. Rotation of whole object using mouse click and drag.
3. Scaling of object using mouse Scroll.
4. Different camera angle.
5. Different material types for surfaces which includes: Basic Material, Phong Material, Lambert Material and Wireframe Material.
6. Light Source from specific direction.
7. Different Perspective Views
8. Vanishing Point (which is set to 20000 pixels)
9. Option to change color for Table top.
10. Option to change its opacity.
11. Option to change Table top invisible for more interactive glass surface look.
12. Option to reset cube to its original settings.

Screenshots from final implementation:



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z
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Opacity
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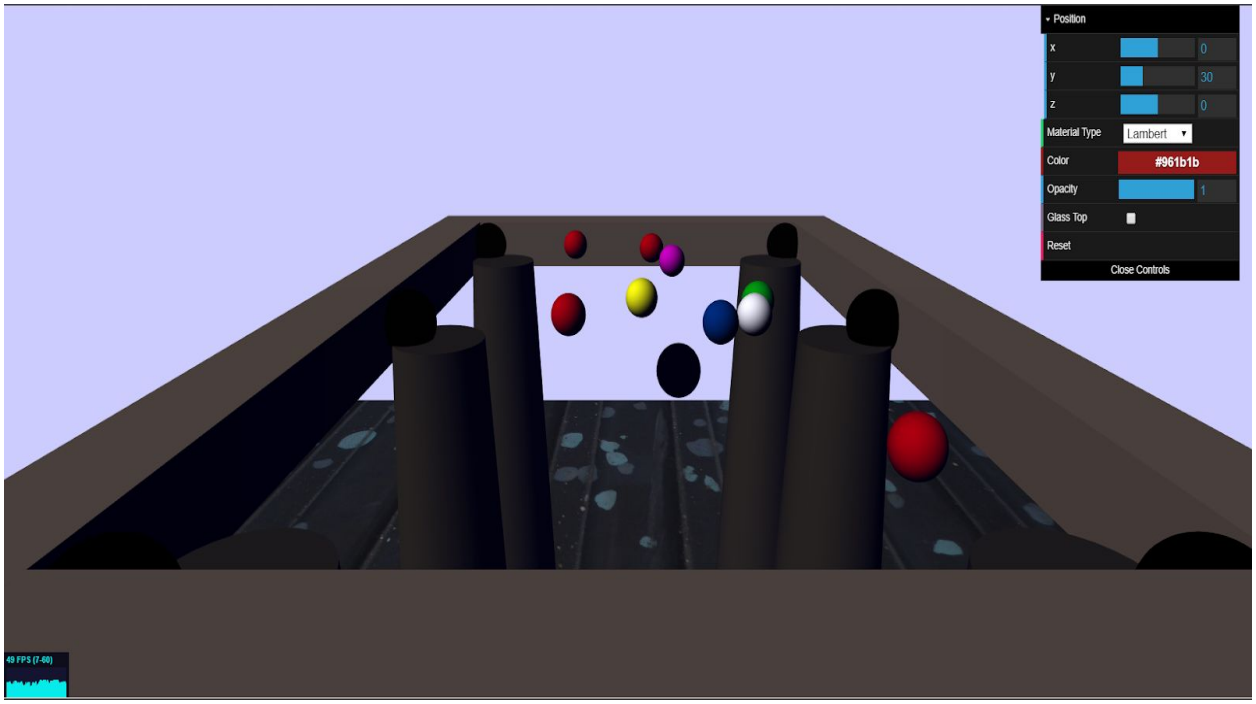
Glass Top
Reset
Close Controls
49 FPS (7-60)


Position
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y
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Material Type
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Color
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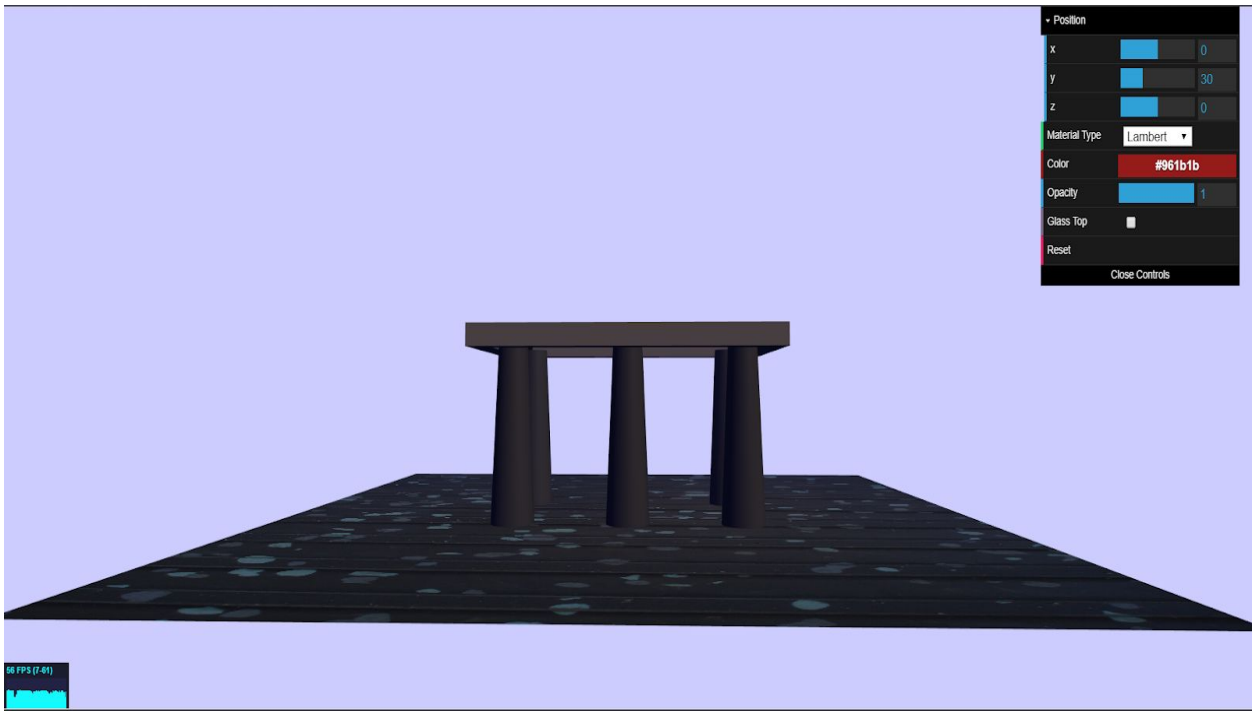
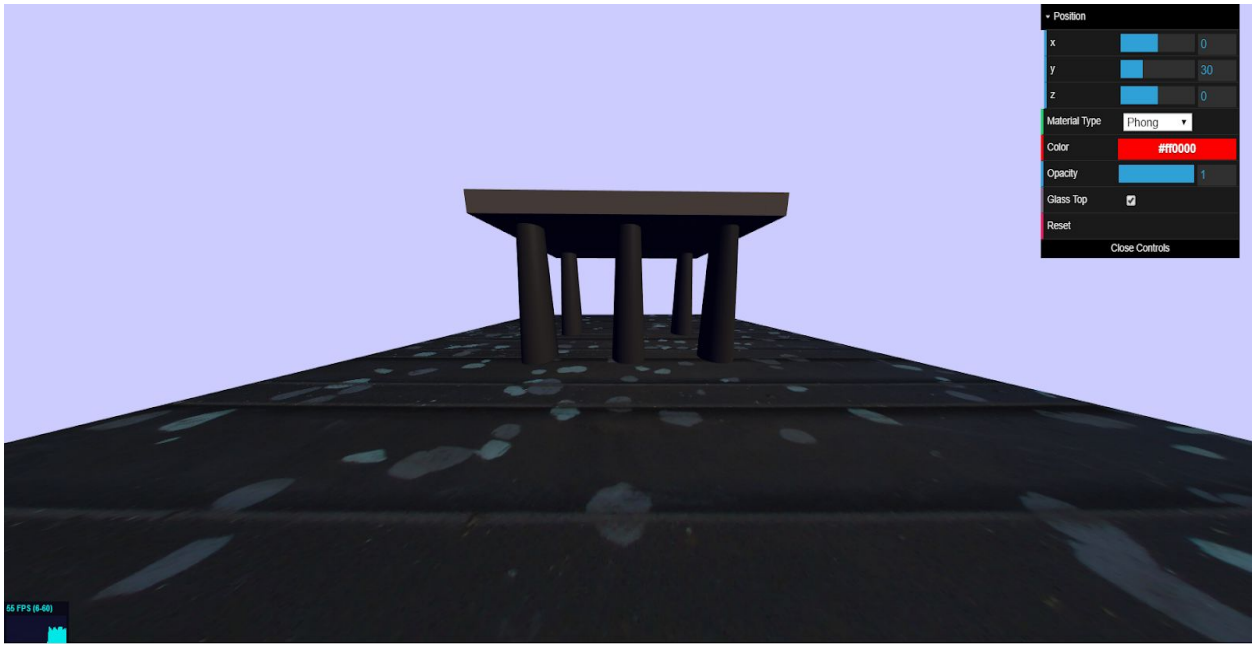
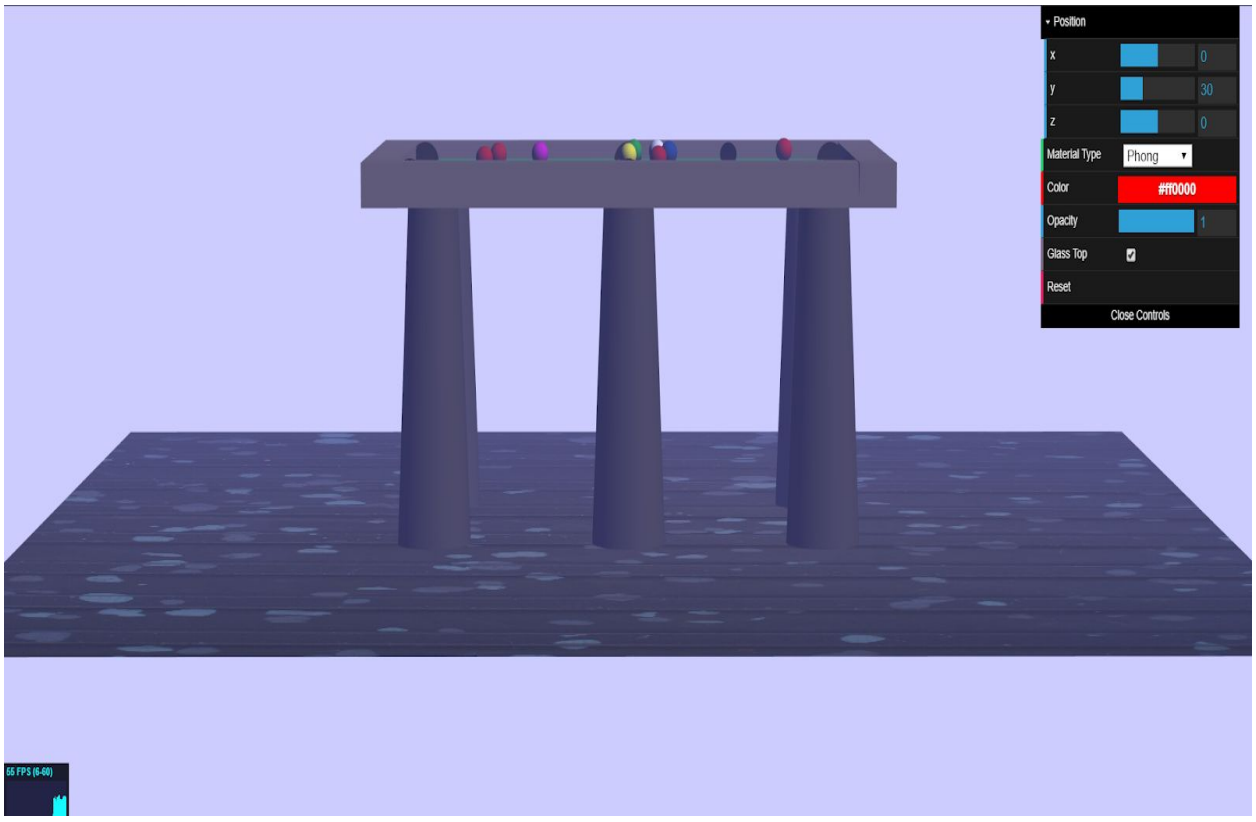
Opacity
1
Glass Top
Reset
Close Controls
49 FPS (7-60)

DIfferent Perspective Cameras:






Position
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0
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z
0
Material Type
Phong
Color
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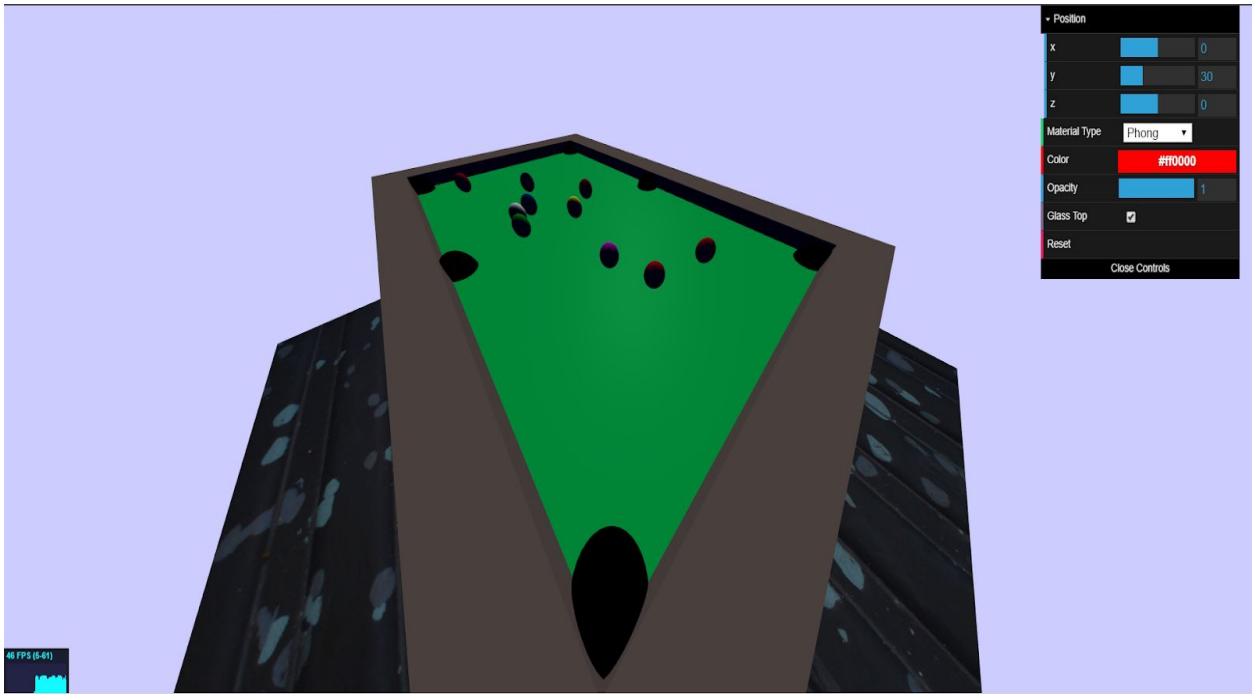
Opacity
1
Glass Top
Reset
Close Controls
55 FPS (6-60)


Position
x
0
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Material Type
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Color
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Opacity
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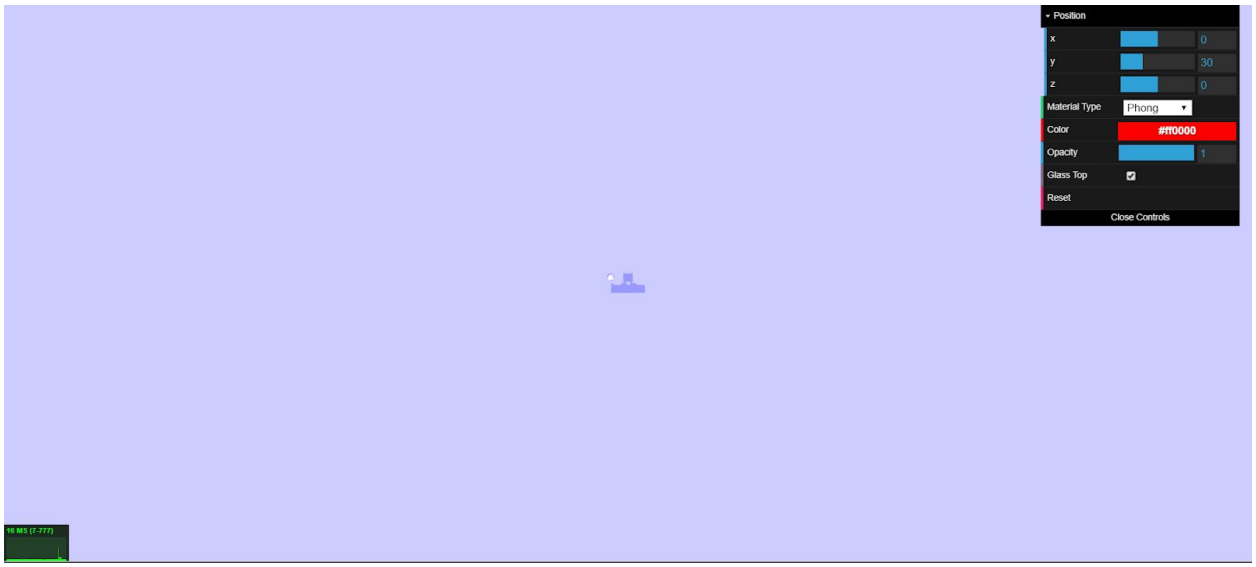
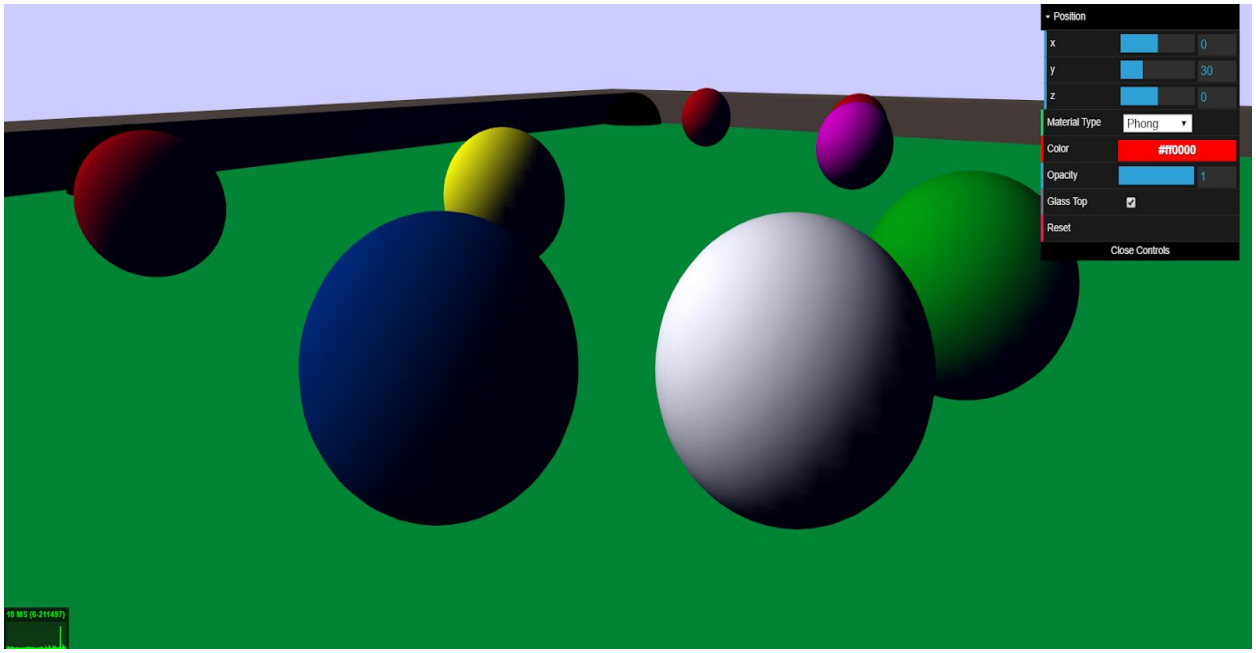
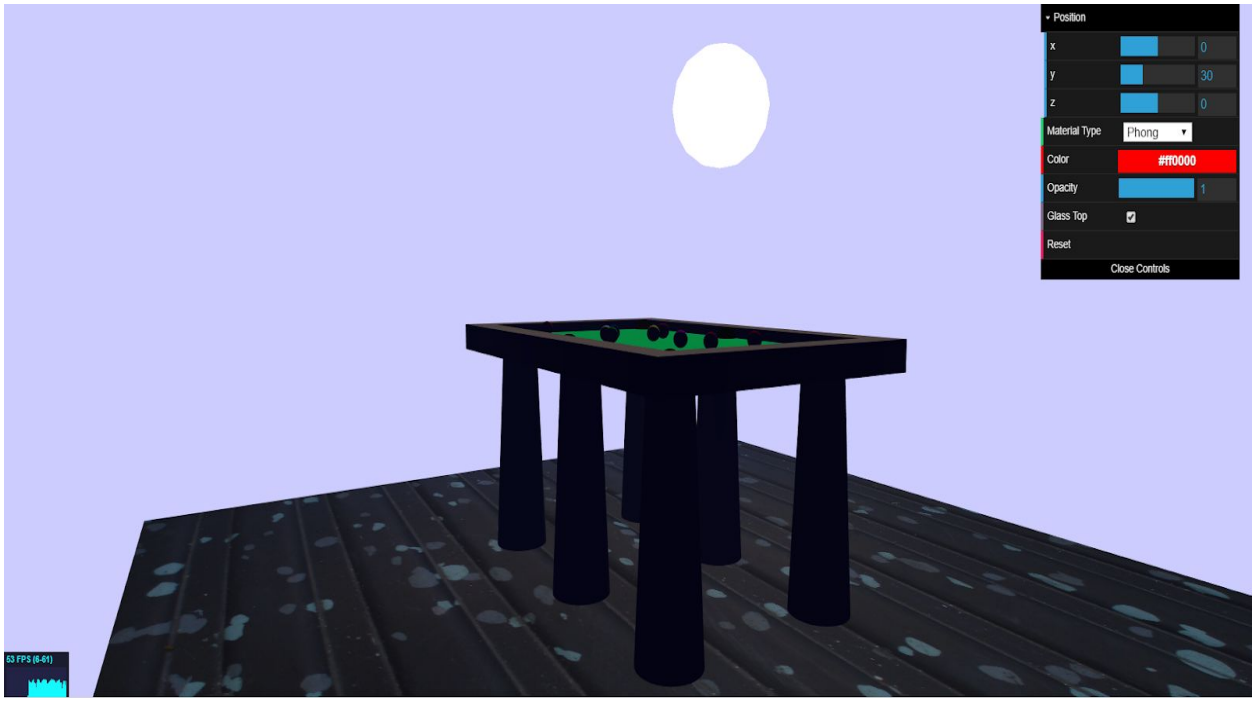
Glass Top
Reset
Close Controls
46 FPS (6-61)

Vanishing Point is set to 20000 pixels



Light Source:





SUMMARY

- Successfully created a 3D model of Snooker Table and applied transformations like Translate, Rotate and Scale.
- Used light source to give an effect of actual real world object.
- Different texture material used for table top which also can be changed by user.
- Table top color can be changed by user.
- Actual images were used as texture in previous attempt of P5.js.
- Perspective views can be changed by changing value of VIEW_ANGLE. By default, it is set to 45.

REFERENCES

1. P5.js library - https://p5js.org/
2. THREE.js library - https://threejs.org/
3. https://stemkoski.github.io/Three.js/#model-animation-control
4. P5.js video Tutorials by Daniel Shipman

"This is entirely my own work, except as disclosed in the documentation."
Signed - Ankit Nimje