CS105.L22.KHCL

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Computer Graphics : Theejs Website

Three.js uses the JavaScript programming language to create GPU-accelerated 3D animations that can be included in a website without the use of browser plugins. Ricardo Cabello initially published the project on GitHub in April 2010. On GitHub, there are over 1300 contributors, with many of them contributing from their own websites.

I. Introduction:

Our team will create a web application to simulate 3D geometries and execute operations on them in the following project.

1. Tools :

- Javascript : coding language
- Node : excuting Javascript
- Npm : managing Javascript library
- Docker : deploying website

2. Library:

- React: building user interfaces
- Threejs : 3d building
- Dat.gui : building user interfaces

3. Enviroment:

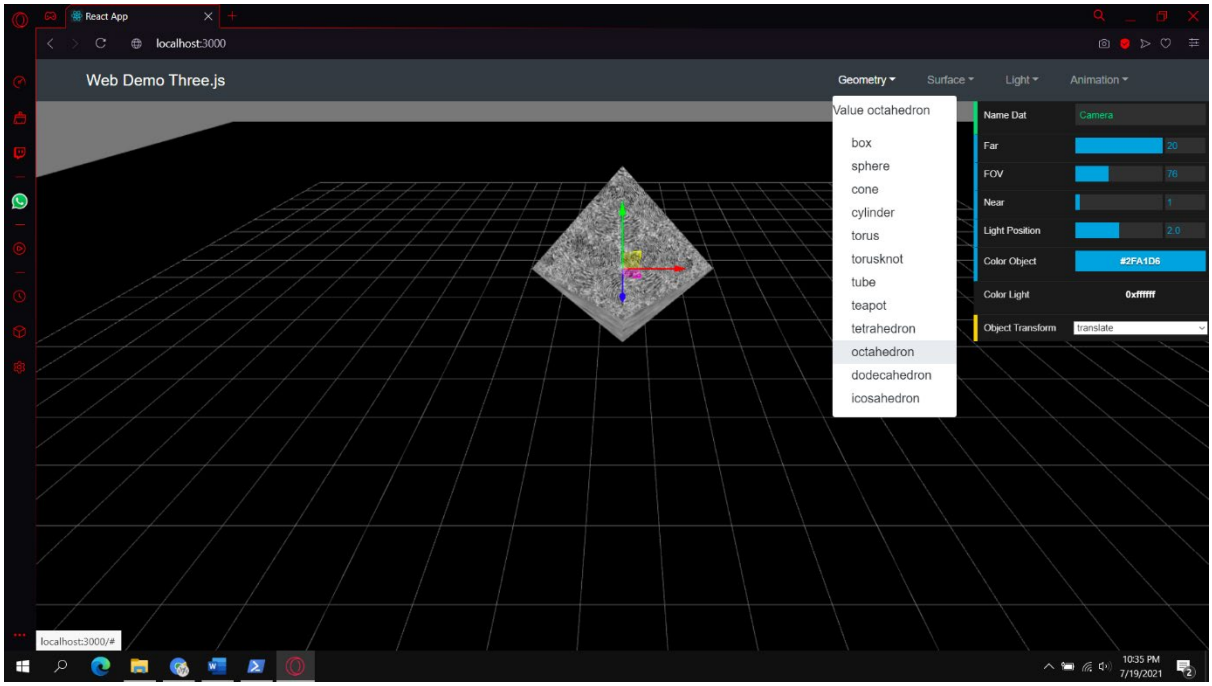
- Node: 15.11.0.
- Npm: 7.6.0.
- React: 17.0.2.
- Threejs: 8.3.2.
- Dat.gui: 0.7.7.

II. Feature :

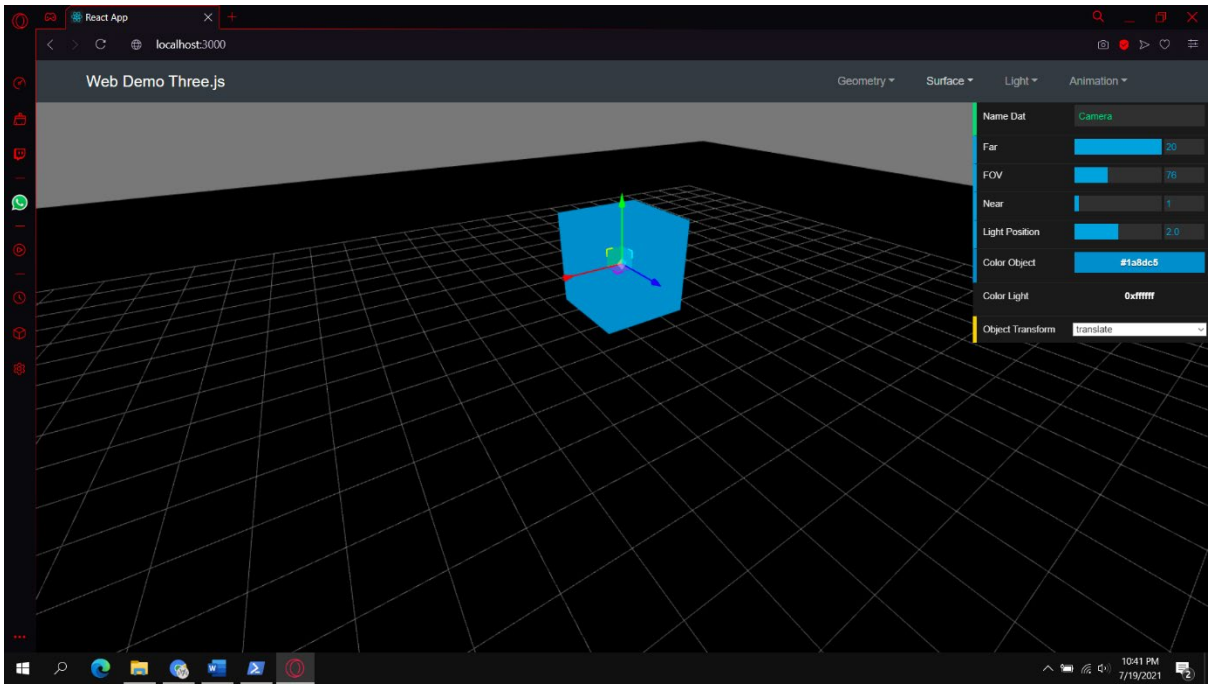
Our team has created certain functionalities in the following project, such as drawing selection, material selection, texture selection, animation selection, and so on. The functions of the website will be introduced in the subsections that follow.

1. Geometry

Users may pick from seven different types of drawings on our website, including boxes, spheres, cones, cylinders, torus, knots, tubes, teapot, tetrahedron, etc.



Octahedron Geometry



Box Geometry

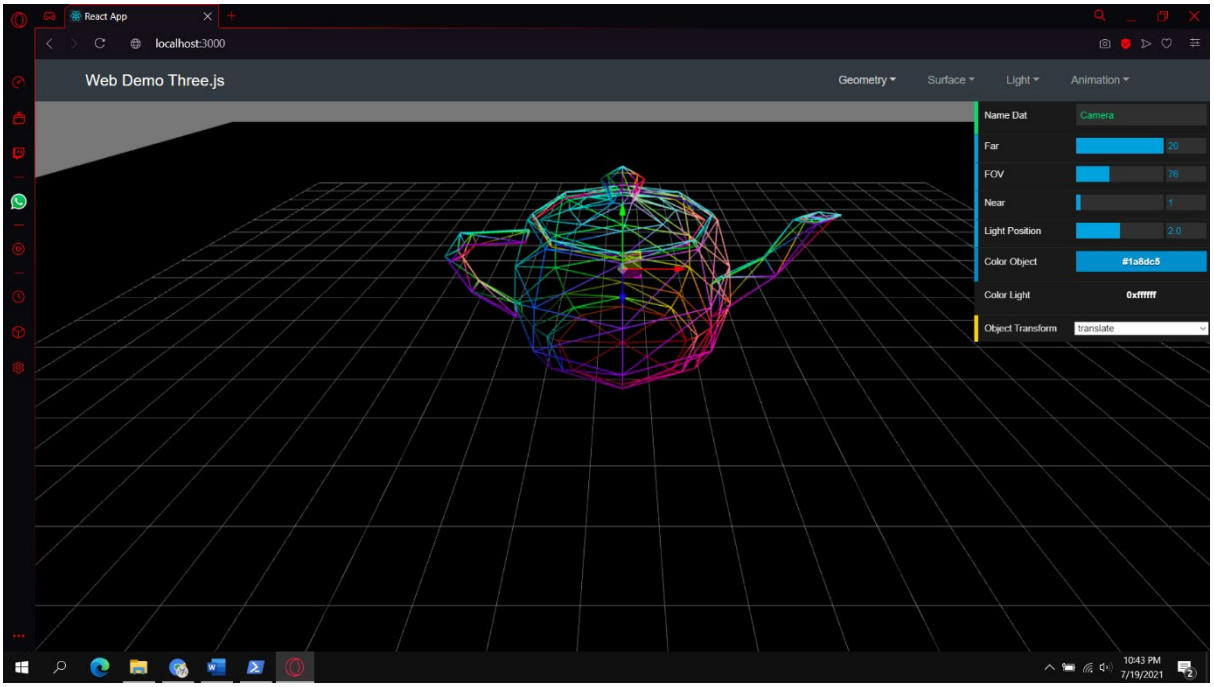
2. Surface

Our team also included a capability to the website that allows users to pick the geometric surface. In terms of the geometry's surface, our team has installed the following:

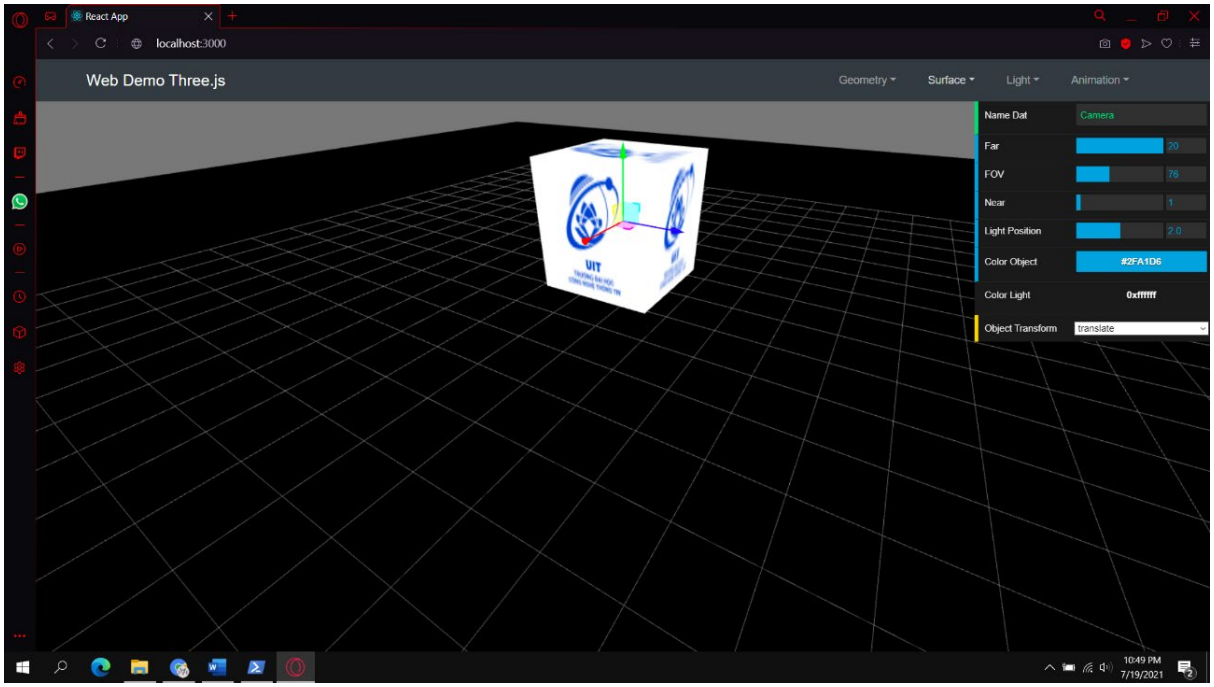
- Point
- Line

- Phong
- Lambert
- Standard
- And 6 textures

The user may also simply alter the color of the geometry using the color object (provided the texture type is default).



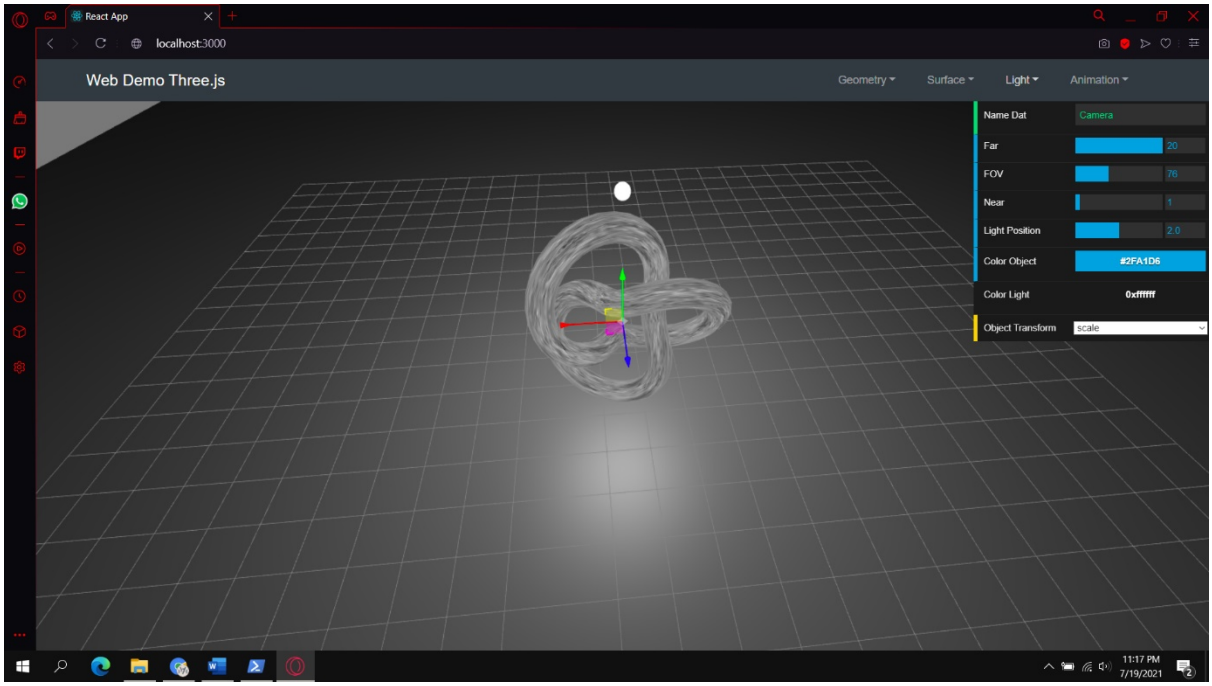
Line Suface



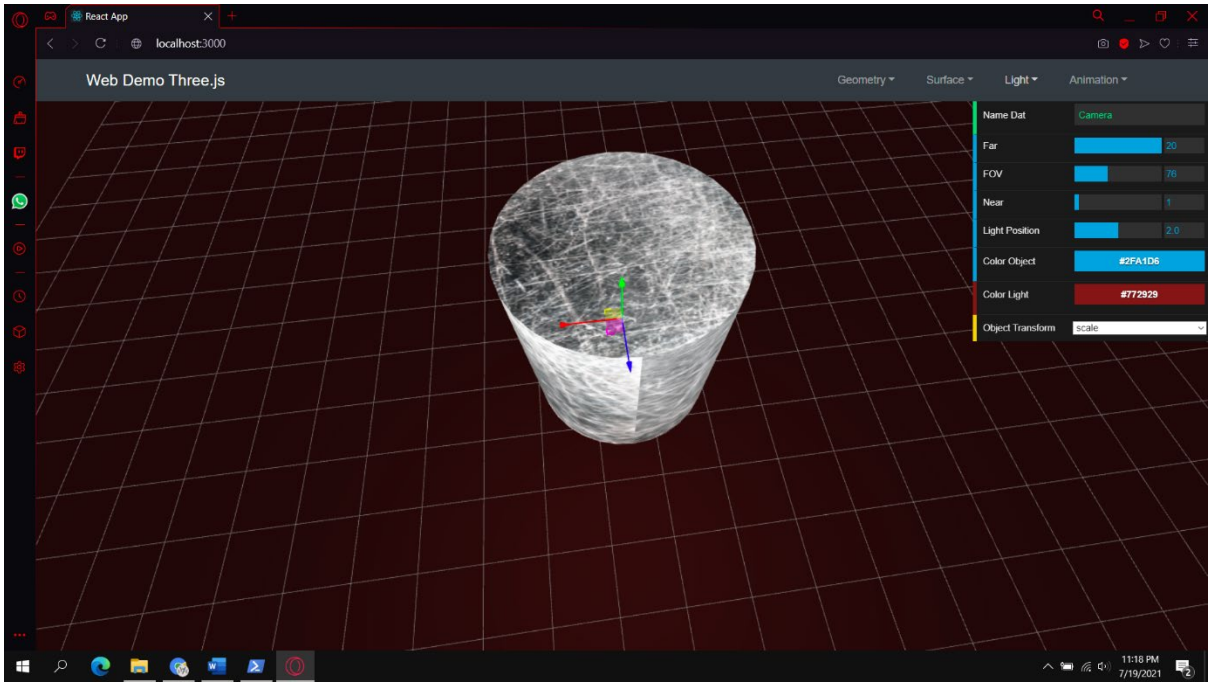
UIT Texture

3. Light

Our team made one light source in the lighting source. The light source may be adjusted for color, and light position. Users may also select the type of lightning, such as point, spot, directional, and ambient point. Our team uses the items as light sources in the shading portion, the object being presented produces a shadow, and the plane below takes on the shadow made by the two preceding objects.



Point Lightning



Red Directional Lightning

4. Animation

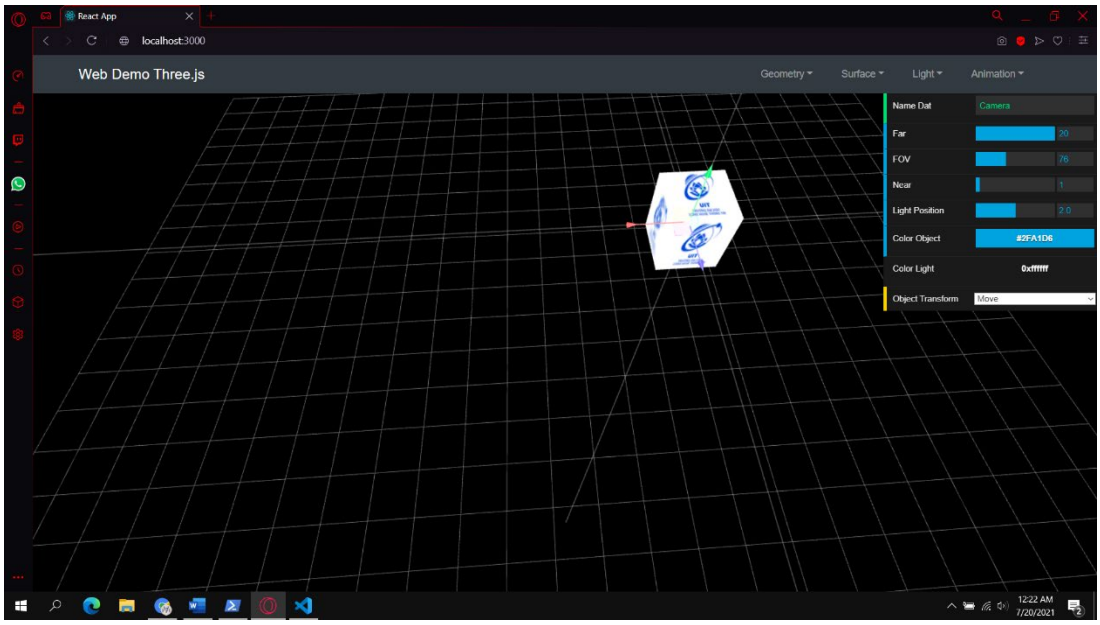
Our team provide four animation options. The first three animation will makes the geometry to spin around the axis. The last one allows the moving geometry to bounce between 100 and 30 on the y-axis then return to 100. Furthermore, the geometry will spin in any direction throughout the movement.

5. Camera

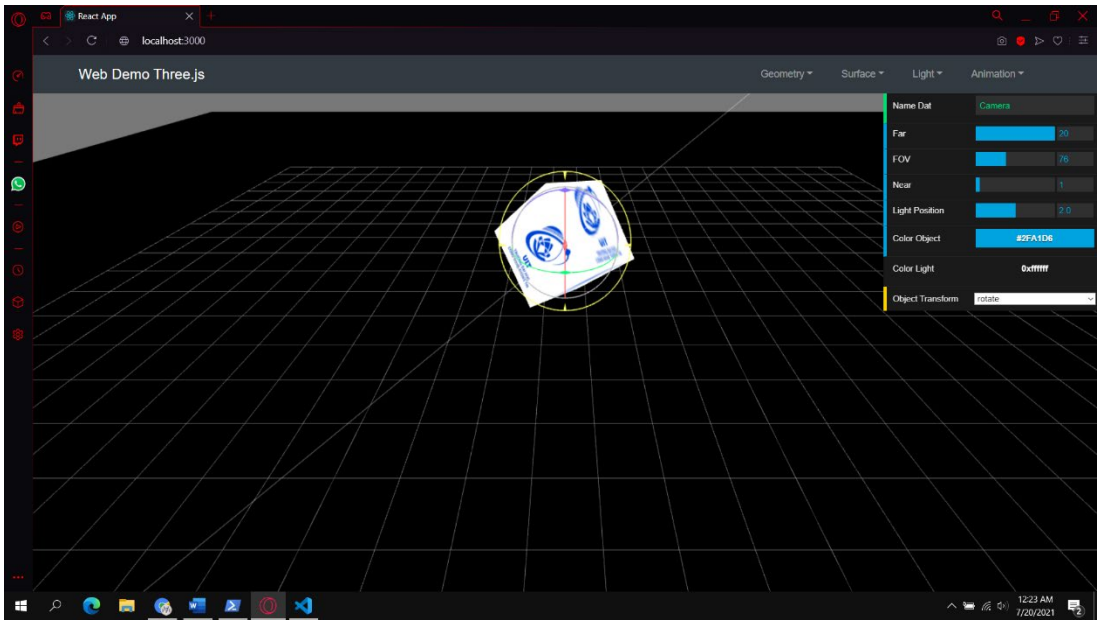
The team utilized the orbit control library to put up this portion so that users could easily change the camera.

6. Transformation

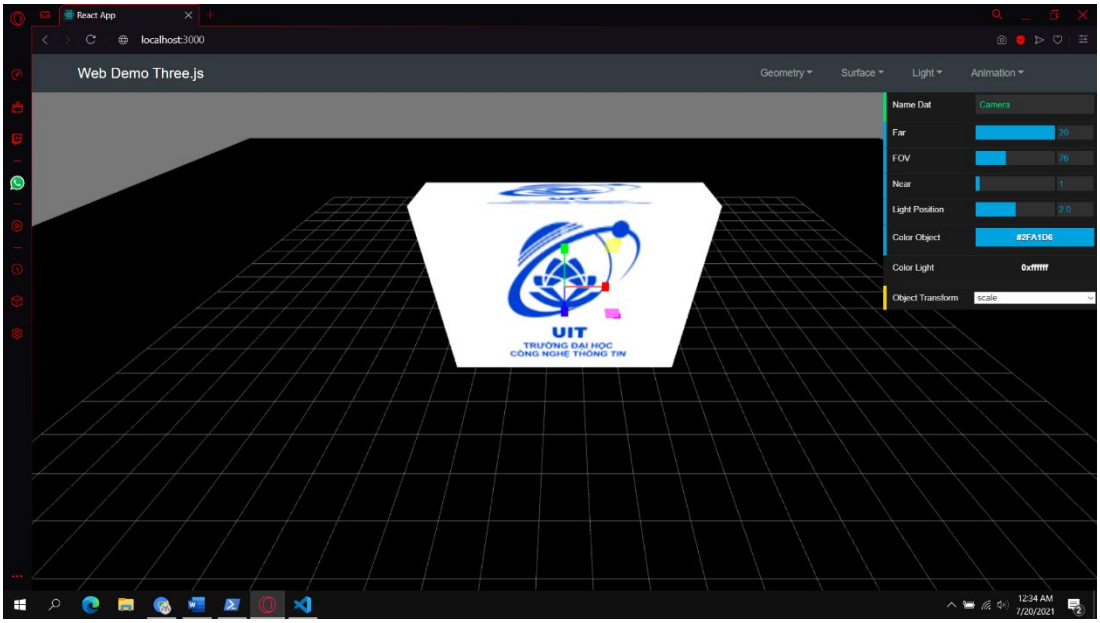
- Move : users can easily move geometry to anywhere.



- Rotate : rotating geometry around the axis



- Scale : making the geometry bigger or smaller



III. Installation Instructions

1. Option 1: Docker

Requirments : Docker, download at https://www.docker.com/

Open PowerShell in Three_3d folder

- Build website to docker

```
docker build -t threejs_demo:v1 .
```

- Run image

```
docker run -it --rm -v ${PWD}:/app -v /app/node_modules -p 8001:3000 -e CHOKIDAR_USEPOLLING=true threejs_demo:v1
```

Open http://localhost:8001/ with web browser

2. Option 2: NodeJS

Requirments : NodeJS, download at https://nodejs.org/en/

Open PowerShell in Three_3d folder

- Install lib

```
npm i
```

- Run sever

```
npm start
```

IV. Demo

Github : https://github.com/tonhathuy/project-do-hoa-may-tinh/
Demo link : https://bom.to/demothreejs

V. Limitation and improvement

1. Limitation

Users may only choose fixed image in the textures area, and the website will not be able to accept all of them.

2. Improvement

- Add more geometries
- Create more animations.
- Improve perfomance
- Add FPS counter
- Adjust animation speed

VI. Conclusion

Three.js is a fantastic tool for making WebGL content. Our team doesn't need to know too much to set up a scenario and render some bespoke geometries,. Our team has mastered several fundamental principles, and users may now begin adjusting light intensity, fog color, and geometries size. Our team is also accustomed to constructing more complex geometries.

VII. Reference

https://threejs.org/