

# Development of 3D Model and Display on Web Using Open-Source Technology

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## ABSTRACT

### Article Info

Volume 9, Issue 6

Page Number : 346-352

### Publication Issue

November-December-2022

### Article History

Accepted : 20 Nov 2022

Published : 05 Dec 2022

It is basically done on the concept for bringing the 2D area view to 3D area view. The problem arises in the 2D view area is that there is only perspective angle of sight which may occurs problem after some time if we use it as a blueprint. 3D-model overcome this problem. As 3D model has various perspective angle of sight. If in the blueprint there is any such model which is not suitable at that location, we can easily remove it from there and place it on the new location where it is needed.

For this we use Blender for 3D modelling and later on displayed on the web using Cesium and Three.js.

Study Area -We are creating 3D Model for Babasaheb Bhim Rao Ambedkar University, Central University, Lucknow.

Keywords : 3D modelling, 2D view, Open-Source Technology

## I. INTRODUCTION

3D modelling basically refers to the process of developing the mathematical representation of any surface of an object in three dimensions using specialized software like Blender, MAYA, CAD, ZBrush etc.

The process of displaying the 3D model as a two-dimensional images is called 3D rendering. 3D modelling is used in various fields like films, games, animation, interior designing and architecture.

Sometimes 3D modelling is also used in the medical industry for the interactive representation of anatomy. Apart from these, 3D modelling is

used in mechanical and industrial design, where products are 3D modelled and the 3D models are first shown to the client, after which subject to approvals, the actual 3D objects are made.

Parametric Modelling is a technique of 3D modelling which relies heavily on the object parameters (width, height, breadth, length).

Polygonal / Direct Modelling is a concept - driven rather than measurement - driven. It's akin to making something out of clay where the object depends more on artistic vision than set dimensions. It is typically used today in animation and video game industries to create / design 3D objects such as CGI (Computer Generated Imagery) movie characters and video game characters.

In this project we use the Parametric Modelling technique to module the university building . We use the software named Blender for the 3D modelling as it is open-source software .

## II. Tools

**A. Blender-** It is used for designing 3D Model. We use the Blender software for designing the model of the university. It is an open-source software used for creating a 3D object animation, video editing , visual effects, art, virtual reality and video games, text editing .

**B. Cesium-** Cesium is programming language based on the JavaScript library . It is a cross-platform for displaying the 3D object and map . Cesium is an open-source program which is used for the commercial purpose and non - commercial purpose free of charges. Cesium is based on the Apache 20 license . Cesium uses WEBGL for hardware accelerated graphics, which does not require any plug-in support but the browser should support the WEBGL. Cesium is front end programming language . Cesium is equipped with the server side of node.js and can be deployed through node js.

### WHAT CAN CESIUM DO ?

- Support map in the format of 2D, 3D.
- Supports dynamic presentation with timeline .
- Used for displaying 3D Object , dynamic visualisation provides good touch support and support most of the browser and mobile .
- Supports the visual display of imported images or models or video and so many other data

When we upload a model, we have to mentioned the coordinate (longitude, latitude ) where have to place the model. Beside the object Cesium display the 2D map.

**C. Three.js** - Three.js is an open-source JavaScript library that is used to display the graphics, 3D and 2D objects on the web browser.

It uses WebGL API behind the scene. Three.js allow you to use your GPU (Graphics Processing Unit) to render the Graphics and 3D objects on a canvas in the web browser. Since we are using JavaScript so we can also interact with other HTML elements.

### WHY WE USE THE THREE . JS

- Since Three.js is an open-source programming language
- It does not require any external plugin to run the Three . js code
- Three.js works on the JavaScript and HTML.
- It is use for displaying the 3D object provide animation to the imported object on the web browser .

For implementation of Three.js on web we require to create a scene add a light and a camera . These three are the primary things which we have to keep in mind before moving ahead to the Three.js programming.

When we upload a model, we have to mentioned the X, Y, Z coordinate where have to place the model . Adjust the location of the light and the type of light like the light is ambient light or dull light and the perspective of the camera .

Then at last we have to provide an animation function. In this function we provide an animation property this property is not as important means we can skip but inside this we have to call the render function which is important.

## III. Methodology

Flow Chart of Development of 3D Model Display on Web:



### A. Data Collection-

For making this I collect the following data such as coordinates and images of the selected building from the site of university or some are click from different angle .

**Ambedkar Bhawan:** The coordinate of location of this building is X : 26.764736 and Y : 80.928613.



**BBAU Auditorium :** The coordinate of location of this building is X : 26.764725 and Y : 80.930078



**BBAU Library :** The coordinate of location of this building is X : 26.769773 and Y : 80.925631



**BBAU Health Centre :** The coordinate of location of this building is X : 26.771462 and Y : 80.922334







**BBAU Bank ( Canara Bank )** : The coordinate of location of this building is X : 26.763805 and Y : 80.927002



**RCA Building** : The coordinate of location of this building is X : 26.768046 and Y : 80.922653.



**EVS Building (or say a data centre building)** : The coordinate of location of this building is X : 26.767885 and Y : 80.919419



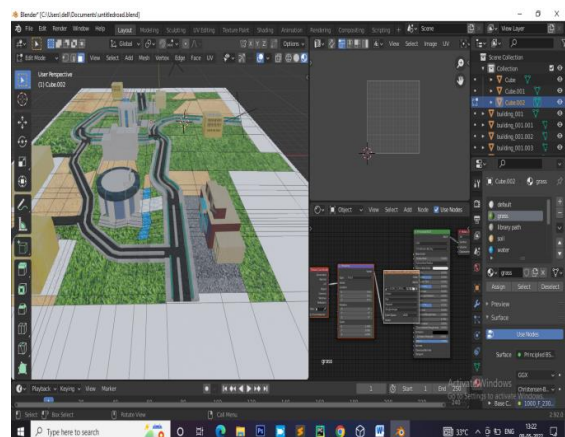
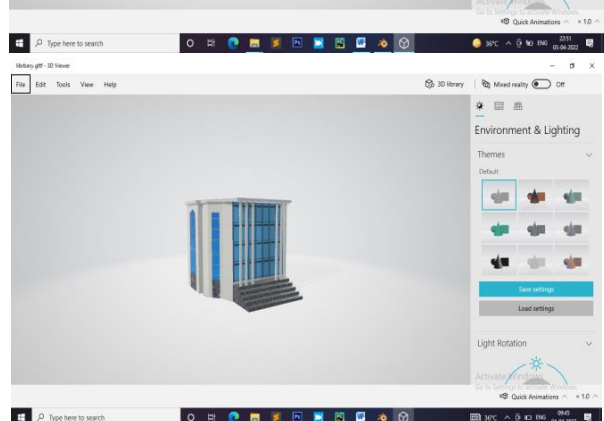
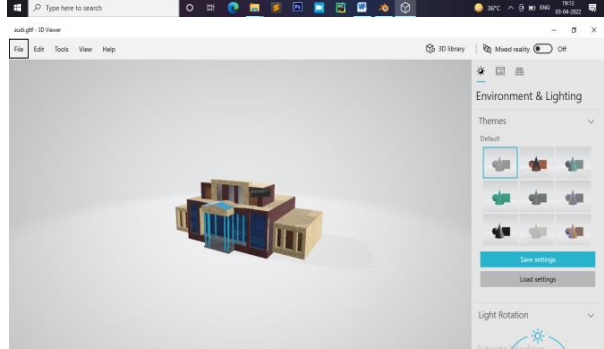
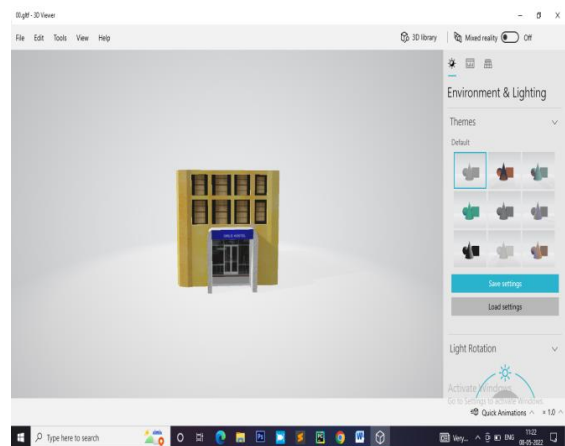
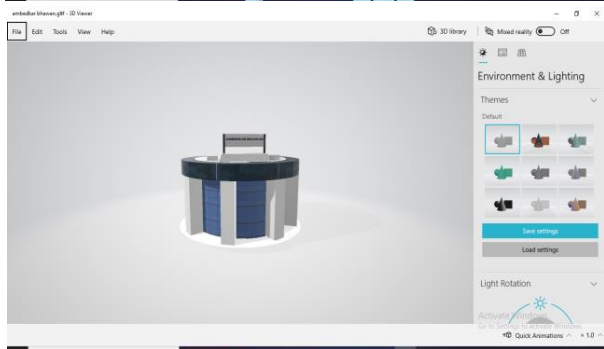
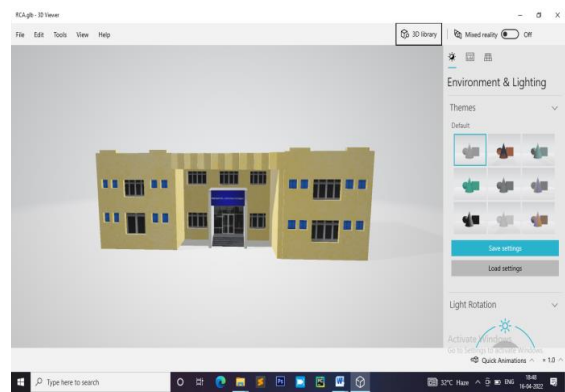
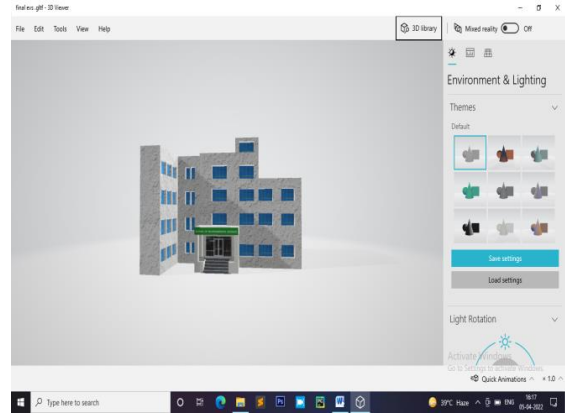
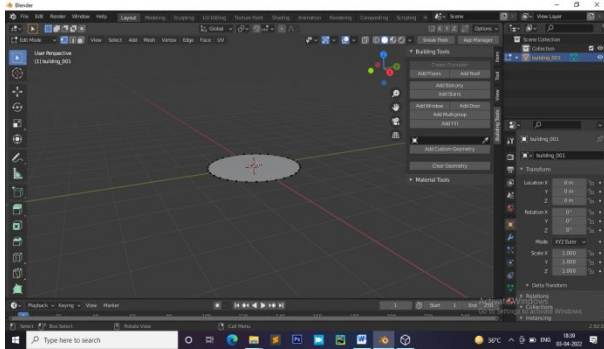
**Boys Hostel**: The coordinate of location for the boy's hostel building is X : 26.770839 and Y : 80.919419

**Girls Hostel**: The coordinate of location for the girl's hostel building is X : 26.770359 and Y : 80.929063

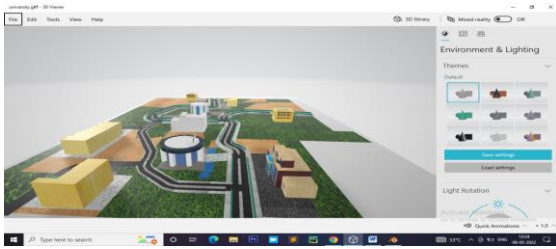
### B. 3D - Model Creation:

Now the steps regarding the building models of the university i.e. BBAU( Babasaheb Bhimrao Ambedkar University ) in blender .

**Output-** Following images are the models of each building of university like auditorium, hostels, library and also a combine model of whole university.

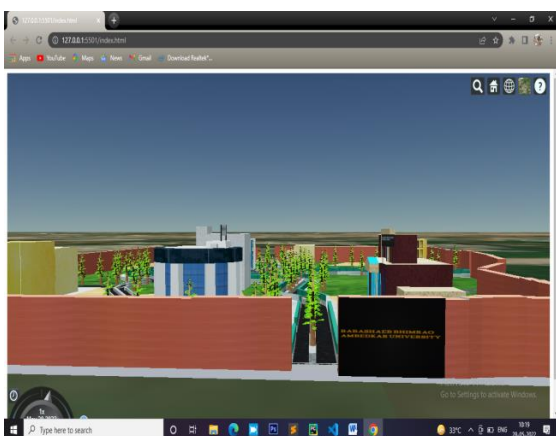
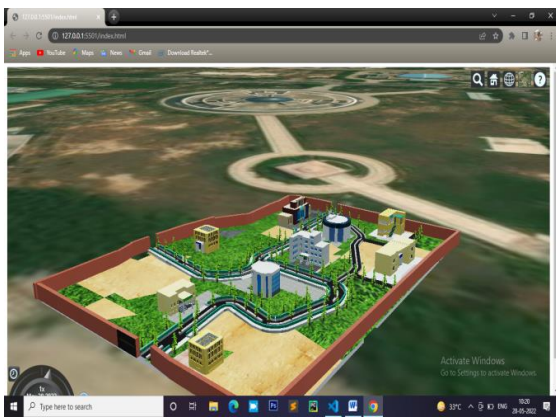
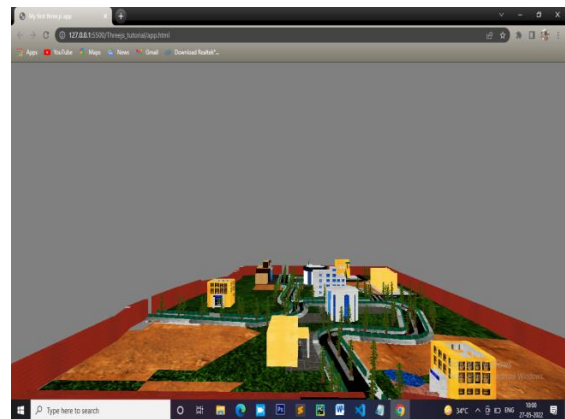
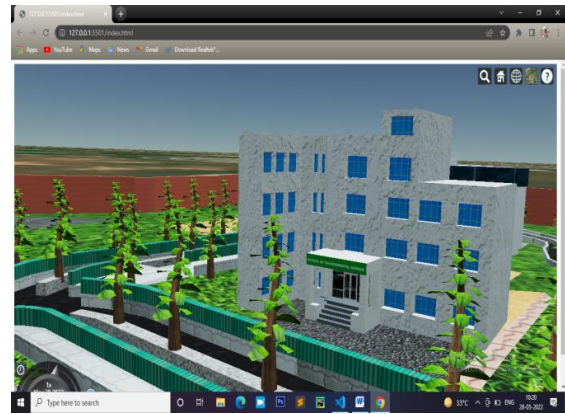






C. **3D - Model Rendering on Web:** model developed using blender now render on web, for this we are using Cesium.js and Three.js.

**Output-** Following pictures shows the model of buildings of university. Images can take with each angle. We can easily rotate our model and also zoom in and zoom out . This model is also view on browser.



#### IV. CONCLUSION

Using open source technology, we can easily develop 3D model of any object and it can also publish on web. People can interact and easily understand by using 3D model.

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**Cite this article as :**

Sushil Chandra, Udai Raj, Rajeev Sonkar, Pragati Srivastava, Ayushi, "Development of 3D Model and Display on Web Using Open-Source Technology", *International Journal of Scientific Research in Science and Technology (IJSRST)*, Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 6, pp. 346-352, November-December 2022. Available at doi : <https://doi.org/10.32628/IJSRST202114> Journal URL : <https://ijsrst.com/IJSRST202114>