INDIRA GANDHI DELHI TECHNICAL UNIVERSITY FOR WOMEN

(IGDTUW) KASHMERE GATE, DELHI-110006

SUMMER INTERNSHIP
"METAVERSE - VIRTUAL REALITY WITH UNITY"

UNDER THE GUIDANCE OF

VIRTUAL LIBRARY

REPORT FILE

- COURSE – B.TECH
- BRANCH – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (AI&ML)
- SEMESTER – THIRD
- DEPARTMENT – INFORMATION TECHNOLOGY

SUBMITTED BY~

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2. KANCHAN (02601192022)

ACKNOWLEDGEMENT

It gives us immense pleasure to express our deep sense of gratitude to all those who have helped and guided us throughout the Summer Internship of "Metaverse - Virtual Reality With Unity". We would like to take this opportunity to acknowledge everyone who has helped us in every stage of this project. We are deeply indebted To STEAMedu team and Dr. Alongbar Wary Professor for sharing their vast reservoir of knowledge and experience during the entire duration of the internship. We were in the organization and it was a great learning experience and, as a curtain raiser to an exciting and rewarding career path. Their guidance and suggestions help us in completion of this project on the topic " VIRTUAL LIBRARY ". We came to know about so many things like HTML , A-FRAME , BLENDER and experiences in Virtual Reality and Metaverse . We had our differences but we worked together and finalized this project within the limited time frame.

DECLARATION

We, Hemlata and Kanchan hereby, declare that the material/content presented in the report is free from plagiarism and is properly cited and written in our own words. In case plagiarism is detected at any stage, We shall be solely responsible for it.

We, Hemlata(02301192022)and Kanchan(02601192022), solemnly declare that the project report is based on our own work carried out during our Summer Internship **"Metaverse - Virtual Reality With Unity"** under the guidance of STEAMedu team and Dr. Alongbar Wary Professor, IGDTUW.

We have followed the guidelines provided by the university in writing this report.

HEMLATA (02301192022)

KANCHAN (02601192022)

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ABSTRACT

This internship report explores the development and implementation of a virtual library within the metaverse using virtual reality (VR) technology and the Unity game engine. The project aimed to create an immersive and interactive environment where users can access and interact with books, resources, and educational content within a 3D virtual space. The report outlines the design, development process, challenges faced, and outcomes achieved during the internship period.

INTRODUCTION

The advent of virtual reality (VR) and the metaverse has opened up new frontiers in the way we interact with information and knowledge. As technology continues to evolve, traditional concepts such as libraries are being reimagined in immersive and interactive ways. This internship report delves into the creation of a virtual library within the metaverse using the Unity game engine and VR technology. The project aimed to merge the realms of education, technology, and creativity by providing users with a unique and engaging platform to access and interact with books, resources and educational content within a 3D virtual space.

WHY VIRTUAL LIBRARY ? (BACKGROUND AND MOTIVATION)

Traditional libraries have long served as repositories of knowledge, providing access to a wealth of information through physical books and resources. However, with the rise of digital content and the increasing demand for interactive learning experiences, there is a need to adapt these timeless institutions to the digital age. The metaverse, a collective virtual shared space, offers a promising avenue for creating immersive and social environments that can revolutionize the way we consume and share knowledge.

The motivation behind this project lies in the desire to bridge the gap between traditional libraries and cutting-edge technology. By leveraging VR and Unity, we sought to create a virtual library that not only preserves the essence of physical libraries but

also enhances the learning experience through innovative features, interactive elements, and multi-user collaboration.

OBJECTIVES

The primary objectives of this internship project were as follows:

1. **Design and Develop a Virtual Library Environment**: Create a 3D virtual environment using the Unity game engine that replicates the ambiance of a physical library while incorporating VR interactivity.

2. **Enable Access to Books and Resources**: Implement a system for users to access and interact with a collection of digital books and resources within the virtual library.

3. **Enhance User Engagement and Immersion**: Utilize VR technology to provide users with an immersive experience that goes beyond traditional methods of accessing digital content.

SCOPE

- The scope of this internship project encompassed the design, development, and testing of a prototype virtual library within the metaverse. The project focused on creating a functional proof-of-concept that demonstrated the feasibility of the concept. While the intention was to create a comprehensive virtual library experience, certain aspects, such as the size

of the book collection and the complexity of interactions, were limited due to time constraints.

- The virtual library was designed to be accessible through VR headsets, allowing users to explore the 3D environment, interact with books, and engage in social interactions with other users. The project also involved the creation of 3D models for the library interior, bookshelves, reading nooks, and avatars.

- It's important to note that the virtual library's content was limited to a curated collection of digital books and resources, and it did not include real-time access to external online databases or catalogs.

- In the subsequent sections of this report, we will delve into the detailed methodology, challenges faced, outcomes achieved, and future possibilities for expanding and enhancing the virtual library in the metaverse using Unity and VR technology.

LITERATURE REVIEW

1. Virtual Reality and its Applications:

Virtual Reality (VR) is a technology that immerses users in a computer-generated environment, simulating a physical presence in a three-dimensional space. VR has found applications in various fields, including entertainment, education, healthcare, training, and more. In the context of education and learning, VR offers the potential to create engaging and interactive environments that enhance comprehension and retention of complex concepts. VR-based learning experiences have been shown to improve student engagement, knowledge retention, and skill acquisition.

2. Metaverse and Virtual Libraries:

The concept of the metaverse refers to a collective virtual shared space, merging physical and virtual reality, where users can interact with each other and digital objects. It has gained significant attention due to its potential for creating immersive social experiences and new forms of interaction. Virtual libraries within the metaverse reimagine the traditional library experience by providing a 3D interactive environment where users can access, read, and collaborate on digital content. These virtual libraries promote social learning, enabling users to interact with each other and share knowledge in innovative ways.

3. Unity Game Engine:

Unity is a widely used cross-platform game engine that enables the creation of interactive 2D, 3D, augmented reality (AR), and VR experiences. Unity provides a range of tools and features for building immersive environments, including physics simulation, scripting, animation, and asset management. It has gained popularity in educational and training settings for its ability to create realistic simulations and interactive learning modules. Unity's integration with VR hardware makes it a suitable choice for developing virtual libraries within the metaverse.

METHODOLOGY

1. Software and Tools Selection:

❖ **Visual Studio Code** : It is a user-friendly code editor that helps developers to Develop tasks. It has features like faster code-build and debug cycle and leaves the complex workflows for featured IDEs.

❖ **Blender** : It was chosen as the primary development platform due to its capabilities for creating interactive 3D environments and 3D objects and VR experiences. It is selected for asset creation, 3D modeling, and VR integration.

❖ **A-Frame** : A-Frame is a web framework for building virtual reality (VR) experiences. A-Frame is based on top of HTML, making it simple to get started. But A-Frame is not just a 3D scene graph or a markup language; the core is a powerful entity-component framework that provides a declarative, extensible, and composable structure to three.js.

A-Frame can be developed from a plain HTML file without having to install anything. Alternatively, create an .html file and include A-Frame in the <head>:

A-Frame supports most VR headsets such as Vive, Rift, Windows Mixed Reality, Daydream, GearVR, Cardboard, Oculus Go, and can even be used for augmented reality. Although A-Frame supports the whole spectrum, A-Frame aims to define fully immersive interactive VR experiences that go beyond basic 360° content, making full use of positional tracking and controllers.
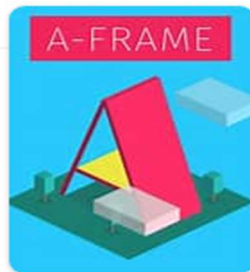
2. Asset Creation (3D Models, Textures, etc.):

A variety of assets were created to populate the virtual library, including 3D models of bookshelves, books, furniture, and architectural elements. High-quality textures and materials were applied to enhance visual realism. Attention was given to detail, ensuring that the virtual space resembled a cozy and inviting library environment.

3.HTML Programming:

HTML (Hypertext Markup Language) is a fundamental programming language used for creating and structuring content on the World Wide Web. It forms the backbone of web development, allowing developers to define the structure and layout of web pages. HTML provides a standardized way to describe the elements and components of a webpage, such as text, images, links, forms, and more.
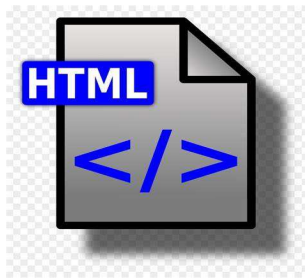
IMPLEMENTATION OF OUR PROJECT

1. OBJECTS CREATED USING BLENDER

- CHAIR
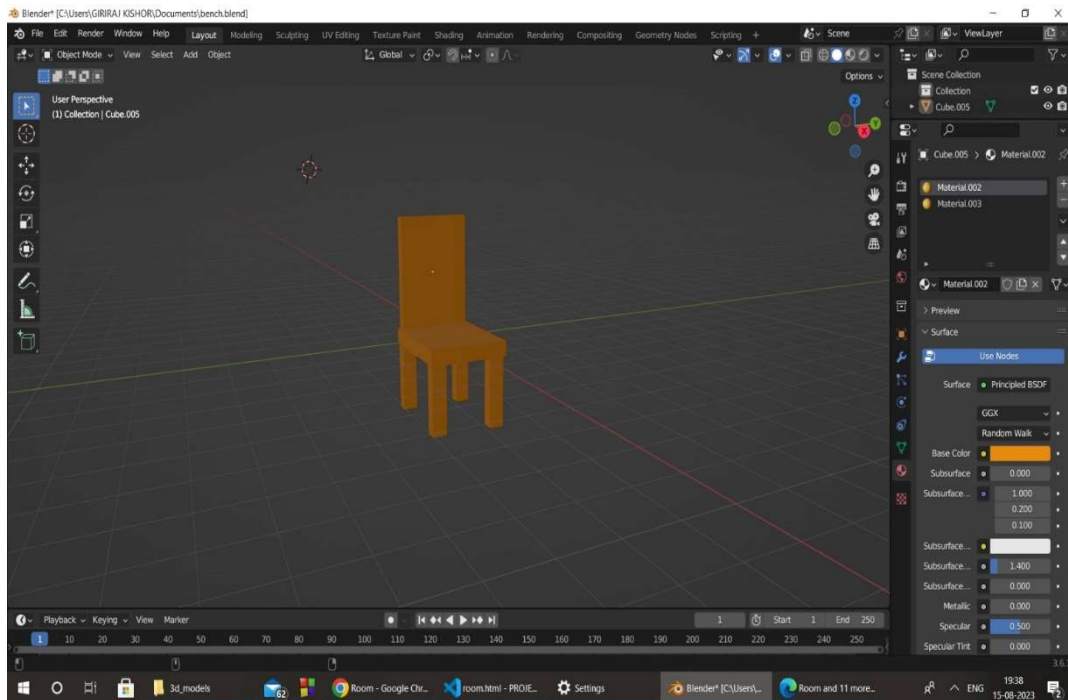
- TABLE
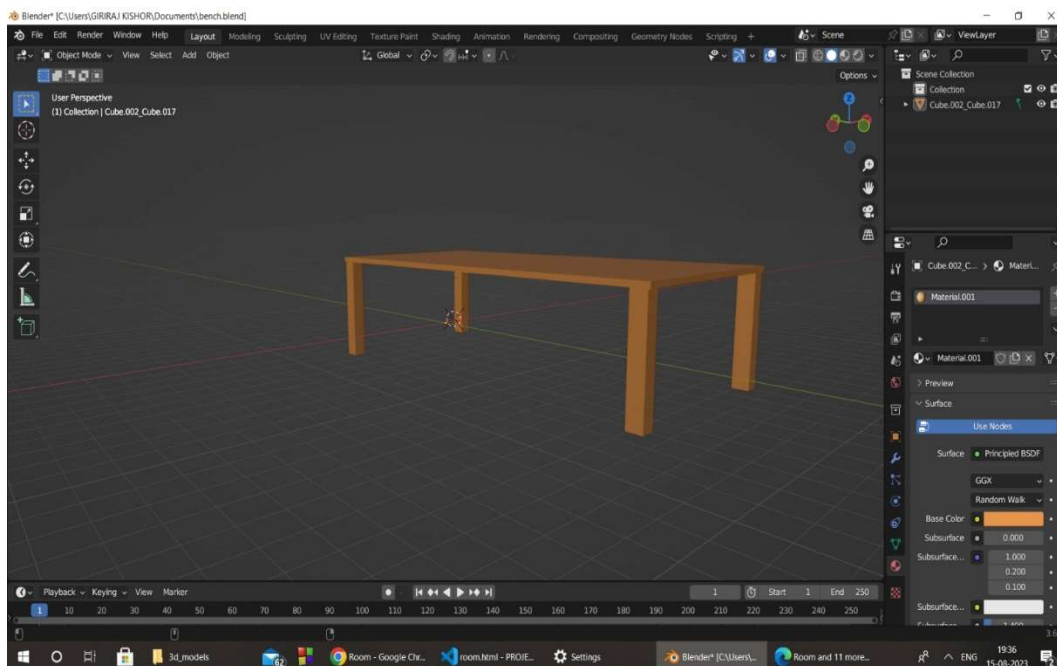
2. HTML CODES OF OUR PROJECT :

First we load basic library which were used in our project and we create basic head functions and we add basics code of html which were require to make any model.
Code :

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Room</title>
  <script src="https://aframe.io/releases/1.4.0/aframe.min.js"></script>
  <title><Image</title>
  <title>My Webpage</title>
  <title>Text Positioning Example</title>
  <style>
  .positioned-text {
   position: relative;
   top: 50px;
   right: 50px;
   padding: 10px;
 }
   </style>
</head>
```

Now, we have first create a small room having following dimensions
Code:

```
<!--Floor-->
    <a-box position="0 0 0.013" scale="40 -0.020 40" color="grey" material=""
geometry=""></a-box>
    <!--Wall1-->
    <a-box position="0.000 10 -19.777" scale="40.000 20.000 0.200"
color="skyblue" material="" geometry=""></a-box>
     <img src="c:\Users\GIRIRAJ KISHOR\Desktop\hemlata docs\photo.jpg"
alt="pic">
       <!-- Shelf 1 -->
```

```
    <a-box position="-0.012 7.116 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
    <a-box position="-0.014 5.194 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
    <a-box position="-0.064 3.238 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
    <a-box position="-0.053 2.000 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>

    <!--Wall2-->
    <a-box position="20.018 10" scale="0.200 20.000 40.000" color="lightpink"
material="" geometry=""></a-box>
    <!--Wall3-->
    <a-box position="-20.201 10 3.614" scale="0.200 20.000 32.000"
color="lightpink" material="" geometry=""></a-box>
    <!--Wall4-->
    <a-box position="0.000 10 19.967" scale="40.000 20.000 0.200"
color="skyblue" material="" geometry=""></a-box>
    <!--shelf2-->
    <a-box position="-0.012 6.953 18.673" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
    <a-box position="-0.014 5.194 18.673" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
    <a-box position="-0.064 3.358 18.673" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
```

Then we have create one more room with similar dimensions
Code :

```
<!--Floor2-->
    <a-box position="0.206 -0.074 -40.005" scale="40 -0.020 40" color="grey"
material="" geometry=""></a-box>
    <!--R2Wall1-->
    <a-box position="0.105 10 -59.901" scale="40.000 20.000 0.200"
color="skyblue" material="" geometry=""></a-box>

    <!--R2Wall2-->
    <a-box position="20.233 10 -39.902" scale="0.200 20.000 40.000" color="pink"
material="" geometry=""></a-box>
    <img src="pictures\Find the best global talent_.jpg" alt="Image Description"
width="400" height="300">
    <!--R2Wall3-->
    <a-box position="-20.201 10 -44.258" scale="0.200 20.000 32.000"
color="pink" material="" geometry=""></a-box>
```

Then we create a hall having following dimensions
Code :

```
<!--HALL-->
    <!--Floor3-->
    <a-box position="-59.783 0.265 -19.988" scale="80 -0.020 80" color="grey"
material="" geometry=""></a-box>
    <!--R2Wall1-->
    <a-box position="-60.032 10 -60.156" scale="80.000 20.000 0.200"
color="skyblue" material="" geometry=""></a-box>

<!--R2wall2-->
    <a-box position="-60.032 10 19.637" scale="80.000 20.000 0.200"
color="skyblue" material="" geometry=""></a-box>

    <!--R2Wall3-->
    <a-box position="-99.939 10 -20.849" scale="0.200 20.000 62.000"
color="pink" material="" geometry=""></a-box>
```

Now, we add Title of our project which was virtual library
Code :

```
<!--TOPIC-->
    <h1>VIRTUAL LIBRARY </h1>
    <p style="color: Black;"></p>
    <div class="positioned-text">
      </div>
```

Then we add shelves in rooms 1 and in room 2
Code :

```
<!-- Shelf 1 -->
      <a-box position="-0.012 7.116 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-0.014 5.194 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-0.064 3.238 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-0.053 2.000 -18.724" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
```

```
<!--shelf2-->
      <a-box position="-0.012 6.953 18.673" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-0.014 5.194 18.673" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-0.064 3.358 18.673" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
```

Then we add Tables in our whole Virtual Library
Code :

```
<a-gltf-model position="-86.688 1.951 -6.895" rotation="0 90 0" scale="4.5 1.200
0.500" src="3d_models\table.glb"></a-gltf-model>
    <a-gltf-model position="-61.378 1.798 -7.889" rotation="0 90 0" scale="4.5
1.200 0.500" src="3d_models\table.glb"></a-gltf-model>
    <a-gltf-model position="-38.0 2.136 -49.79" rotation="0 0 0" scale="2  1.200
0.500" src="3d_models\table.glb"></a-gltf-model>
    <a-gltf-model position="-2.282 1.761 -39.737" rotation="0 90 0" scale="3.00
1.200 0.500" src="3d_models\table.glb"></a-gltf-model>
    <a-gltf-model position="-40.393 1.845 2.621" rotation="0 90 0" scale="3.00
1.200 0.500" src="3d_models\table.glb"></a-gltf-model>
    <a-gltf-model position="1.027 1.685 0.281" rotation="0 90 0" scale="3.00 1.200
0.500" src="3d_models\table.glb"></a-gltf-model>
    <a-gltf-model position="1.027 1.685 0.281" rotation="0 90 0" scale="3.00 1.200
0.500" src="3d_models\books (1)\scene.gltf"></a-gltf-model>
```

Then we add shelves in our Virtual library main hall
Code :

```
<!--shelf-->
      <a-box position="-40.217 8.459 -59.171" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-40.283 6.953 -59.171" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>
      <a-box position="-40.217 5.194 -59.171" width="40" height="0.30" depth="2"
color="darkgoldenrod"></a-box>

      <a-box position="-59.814 5.480 -48.104" scale="1 80 1" rotation="0 90 90"
width="10" height="0.30" depth="1" color="darkgoldenrod"></a-box>
    <a-box position="-59.814 5.480 -48.104" scale="1 80 1" rotation="90 90 90"
width="9" height="0.30" depth="1" color="darkgoldenrod"></a-box>
    <a-box position="-59.793 0.782 -48.104" scale="1 80 1" rotation="90 90 90"
width="9" height="0.30" depth="1" color="darkgoldenrod"></a-box>
```

```
      <a-box position="-80.544 5.812 -48.104" scale="1 80 1" rotation="90 90 90"
width="9" height="0.30" depth="1" color="darkgoldenrod"></a-box>
      <a-box position="-80.814 0.809 -48.104" scale="1 80 1" rotation="90 90 90"
width="9" height="0.30" depth="1" color="darkgoldenrod"></a-box>
      <a-box position="-80.849 5.764 -47.847" scale="1 80 1" rotation="0 90 90"
width="10" height="0.30" depth="1" color="darkgoldenrod"></a-box>
```

Now, we set our camera through camera entity through which we can saw our starting and follow with this we get a tour of our whole Virtual library
Code :

```
<!--camera positioning-->
   <a-entity id="rig" position="-97.728 7.331 -33.468" rotation="0 180.000 0">
    <a-camera id="camera" look-controls position="0 1.6 0">
      </a-entity>
    </a-camera>
   </a-entity>
```

We also add some images and posters in our walls of Virtual library
Code :

```
<!--IMAGES-->
    <img src="pictures\Metal Poster Small Changes Can Make.jpg" alt="Image 1"
width="3" height="4">
    <img src="pictures\Premium Vector _ Graphic design quote in hand drawn
style.jpg" alt="Image 2" width="3" height="4">
    <img src="pictures\Steve Jobs by Donnie Ray Crisp.jpg" alt="Image 3" width="3.5"
height="4.5">
    <img src="pictures\Steve Jobs quotes.jpg" alt="Image 4" width="2" height="5">
    <img src="pictures\#Wallpapers🖤😁.jpg" alt="Image 5"
width="4.5" height="3">
```

We also add different different Chairs, which we have made using BLENDER
Code :

```
<!--CHAIRS-->
    <a-gltf-model position="0.628 -1.278 4.082" rotation="0 0 0" scale="1.970 1.500
1.780" src="3d_models\chair.glb"></a-gltf-model>
```

```
<a-gltf-model position="0.371 -1.278 -2.005" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="0.455 -1.278 -7.581" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="0.646 -1.278 -13.456" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-62.737 -0.824 -25.07" rotation="0 0 0" scale="1.970
1.500 7.230" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-42.402 -0.824 -51.640" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-38.923 -0.824 6.065" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-38.503 -0.824 -11.613" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-38.923 -0.824 -12.117" rotation="0 0 0" scale="1.970
1.500 5.330" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-3.730 -1.278 -35.536" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-4.096 -1.278 -40.591" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-3.690 -1.278 -59.186" rotation="0 0 0" scale="1.970
1.500 5.330" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-40.292 -0.824 -42.715" rotation="0 90 0" scale="1.970
1.540 2.270" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-48.257 -0.824 -42.715" rotation="0 90 0" scale="1.971
1.540 2.720" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-88.22 -0.824 -33.984" rotation="0 0 0" scale="1.970
1.50 6.480" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-88.22 -0.824 -9.372" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-88.22 -0.824 -2.797" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-87.88 -0.824 2.462" rotation="0 0 0" scale="1.970
1.500 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-92.40 -0.824 10.472" rotation="0 90 0" scale="1.970
1.540 2.720" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-59.665 -0.964 -27.144" rotation="0 0 0" scale="1.970
1.540 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-59.541 -0.964 -21.496" rotation="0 0 0" scale="1.970
1.540 1.780" src="3d_models\chair.glb"></a-gltf-model>
<a-gltf-model position="-60.840 -0.964 0.021" rotation="0 0 0" scale="1.970
1.540 1.780" src="3d_models\chair.glb"></a-gltf-model>
```
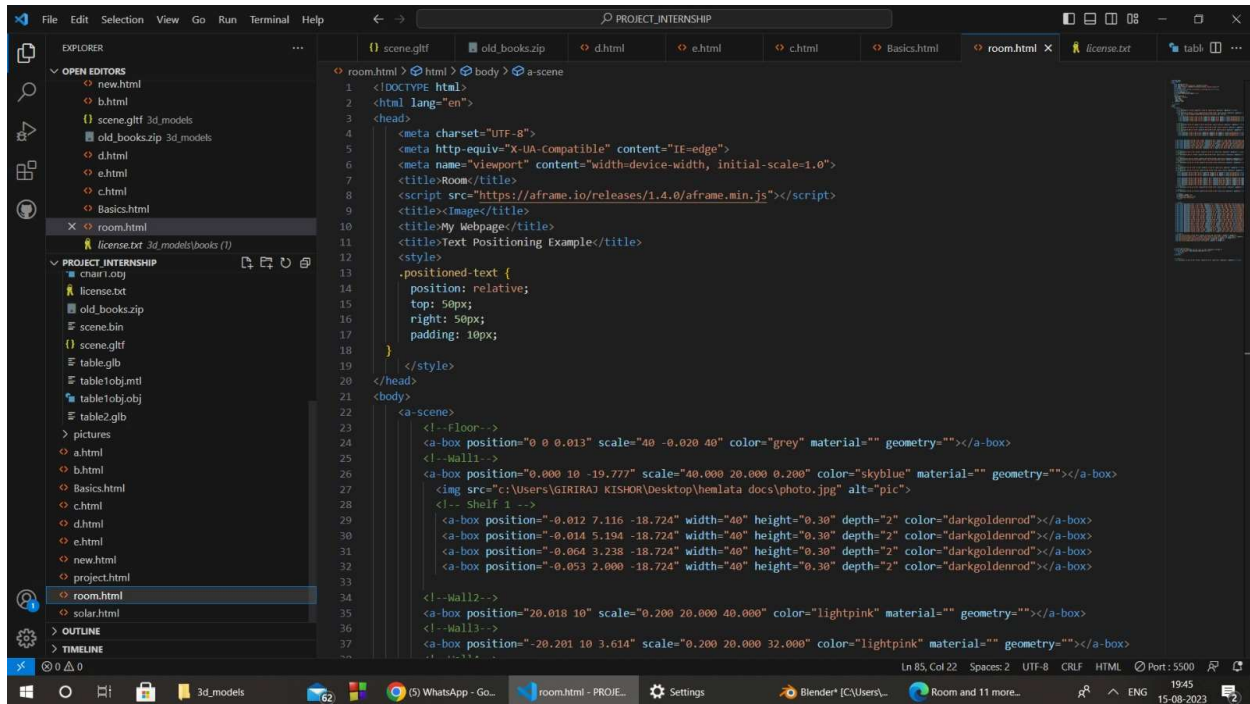
And at last we add Roof of our Virtual library
Code :

```
<!--"Roof"-->
    <a-box position="-39.843 19.995 -20.035" scale="120 0 80" color="grey"
material="" geometry=""></a-box>
```

3. VS CODE VISUALIZATION OF HTML CODES :

a)

b)

```
35    <a-box position="20.018 10  scale="0.200 20.000 40.000" color="lightpink" material=""  geometry=""></a-box>
36    <!--Wall3-->
37    <a-box position="-20.201 10 3.614" scale="0.200 20.000 32.000" color="lightpink" material="" geometry=""></a-box>
38    <!--Wall4-->
39    <a-box position="0.000 10 19.967" scale="40.000 20.000 0.200" color="skyblue" material="" geometry=""></a-box>
40    <!--shelf2-->
41      <a-box position="-0.012 6.953 18.673" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
42      <a-box position="-0.014 5.194 18.673" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
43      <a-box position="-0.064 3.358 18.673" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
44
45
46
47    <a-gltf-model position="-86.688 1.951 -6.895" rotation="0 90 0" scale="4.5 1.200 0.500" src="3d_models\table.glb"></a-gltf
48    <a-gltf-model position="-61.378 1.798 -7.889" rotation="0 90 0" scale="4.5 1.200 0.500" src="3d_models\table.glb"></a-gltf
49    <a-gltf-model position="-38.0 2.136 -49.79" rotation="0 0 0" scale="2 1.200 0.500" src="3d_models\table.glb"></a-gltf-mo
50    <a-gltf-model position="-2.282 1.761 -39.737" rotation="0 90 0" scale="3.00 1.200 0.500" src="3d_models\table.glb"></a-glt
51    <a-gltf-model position="-40.393 1.845 2.621" rotation="0 90 0" scale="3.00 1.200 0.500" src="3d_models\table.glb"></a-glt
52    <a-gltf-model position="1.027 1.685 0.281" rotation="0 90 0" scale="3.00 1.200 0.500" src="3d_models\table.glb"></a-gltf-
53    <a-gltf-model position="1.027 1.685 0.281" rotation="0 90 0" scale="3.00 1.200 0.500" src="3d_models\books (1)\scene.gltf
54
55    <!--Floor2-->
56    <a-box position="0.206 -0.074 -40.005" scale="40 -0.020 40" color="grey" material="" geometry=""></a-box>
57    <!--R2Wall1-->
58    <a-box position="0.105 10 -59.901" scale="40.000 20.000 0.200" color="skyblue" material="" geometry=""></a-box>
59
60    <!--R2Wall2-->
61    <a-box position="20.233 10 -39.902" scale="0.200 20.000 40.000" color="pink" material="" geometry=""></a-box>
62      <img src="pictures\Find the best global talent_.jpg" alt="Image Description" width="400" height="300">
63    <!--R2Wall3-->
64    <a-box position="-20.201 10 -44.258" scale="0.200 20.000 32.000" color="pink" material="" geometry=""></a-box>
65
66    <!--HALL-->
67    <!--Floor3-->
68    <a-box position="-59.783 0.265 -19.988" scale="80 -0.020 80" color="grey" material="" geometry=""></a-box>
69    <!--R2Wall1-->
70    <a-box position="-60.032 10 -60.156" scale="80.000 20.000 0.200" color="skyblue" material="" geometry=""></a-box>
71    <!--shelf-->
72      <a-box position="-40.217 8.459 -59.171" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
```

c)

```
72    <a-box position="-40.217 8.459 -59.171" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
73    <a-box position="-40.283 6.953 -59.171" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
74    <a-box position="-40.217 5.194 -59.171" width="40" height="0.30" depth="2" color="darkgoldenrod"></a-box>
75
76    <a-box position="-59.814 5.480 -48.104" scale="1 80 1" rotation="0 90 90" width="10" height="0.30" depth="1" color="da
77    <a-box position="-59.814 5.480 -48.104" scale="1 80 1" rotation="90 90 90" width="9" height="0.30" depth="1" color="da
78    <a-box position="-59.793 0.782 -48.104" scale="1 80 1" rotation="90 90 90" width="9" height="0.30" depth="1" color="da
79    <a-box position="-80.544 5.812 -48.104" scale="1 80 1" rotation="90 90 90" width="9" height="0.30" depth="1" color="da
80    <a-box position="-80.814 0.809 -48.104" scale="1 80 1" rotation="90 90 90" width="9" height="0.30" depth="1" color="da
81    <a-box position="-80.849 5.764 -47.847" scale="1 80 1" rotation="0 90 90" width="10" height="0.30" depth="1" color="da
82    <!--R2Wall2-->
83    <a-box position="-60.032 10 19.637" scale="80.000 20.000 0.200" color="skyblue" material="" geometry=""></a-box>
84
85    <!--R2Wall3-->
86    <a-box position="-99.939 10 -20.849" scale="0.200 20.000 62.000" color="pink" material="" geometry=""></a-box>
87
88    <!--TOPIC-->
89    <h1>VIRTUAL LIBRARY </h1>
90    <p style="color: Black;"></p>
91    <div class="positioned-text">
92      </div>
93
94
95    <!--CHAIRS-->
96    <a-gltf-model position="0.628 -1.278 4.082" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-gltf
97    <a-gltf-model position="0.371 -1.278 -2.005" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-gl
98    <a-gltf-model position="0.455 -1.278 -7.581" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-glt
99    <a-gltf-model position="0.646 -1.278 -13.456" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-gl
100   <a-gltf-model position="-62.737 -0.824 -25.07" rotation="0 0 0" scale="1.970 1.500 7.230" src="3d_models\chair.glb"></a-g
101   <a-gltf-model position="-42.402 -0.824 -51.640" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-
102   <a-gltf-model position="-38.923 -0.824 6.065" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-gl
103   <a-gltf-model position="-38.503 -0.824 -11.613" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-
104   <a-gltf-model position="-38.923 -0.824 -12.117" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-
105   <a-gltf-model position="-3.730 -1.278 -35.536" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-g
106   <a-gltf-model position="-4.096 -1.278 -40.591" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-g
107   <a-gltf-model position="-3.690 -1.278 -59.186" rotation="0 0 0" scale="1.970 1.500 5.330" src="3d_models\chair.glb"></a-g
108   <a-gltf-model position="-40.292 -0.824 -42.715" rotation="0 90 0" scale="1.970 1.540 2.270" src="3d_models\chair.glb"></a-
109   <a-gltf-model position="-48.257 -0.824 -42.715" rotation="0 90 0" scale="1.971 1.540 2.720" src="3d_models\chair.glb"></a-
```

d)


```
106  <a-gltf-model position="-4.696 -1.278 -40.591" rotation="0 0 0" scale="1.970 1.500 1.780"  src="3d_models\chair.glb"></a-g
107  <a-gltf-model position="-3.690 -1.278 -59.186" rotation="0 0 0" scale="1.970 1.500 5.330" src="3d_models\chair.glb"></a-g
108  <a-gltf-model position="-40.292 -0.824 -42.715" rotation="0 90 0" scale="1.970 1.540 2.270" src="3d_models\chair.glb"></a
109  <a-gltf-model position="-48.257 -0.824 -42.715" rotation="0 90 0" scale="1.971 1.540 2.720" src="3d_models\chair.glb"></a
110  <a-gltf-model position="-88.22 -0.824 -33.984" rotation="0 0 0" scale="1.970 1.50 6.480" src="3d_models\chair.glb"></a-gl
111  <a-gltf-model position="-88.22 -0.824 -9.372" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-gl
112  <a-gltf-model position="-88.22 -0.824 -2.797" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-gl
113  <a-gltf-model position="-87.88 -0.824 2.462" rotation="0 0 0" scale="1.970 1.500 1.780" src="3d_models\chair.glb"></a-glt
114  <a-gltf-model position="-92.40 -0.824 10.472" rotation="0 90 0" scale="1.970 1.540 2.720" src="3d_models\chair.glb"></a-g
115  <a-gltf-model position="-59.665 -0.964 -27.144" rotation="0 0 0" scale="1.970 1.540 1.780" src="3d_models\chair.glb"></a-
116  <a-gltf-model position="-59.541 -0.964 -21.496" rotation="0 0 0" scale="1.970 1.540 1.780" src="3d_models\chair.glb"></a-
117  <a-gltf-model position="-60.840 -0.964 0.021" rotation="0 0 0" scale="1.970 1.540 1.780" src="3d_models\chair.glb"></a-gl
118
119  <!--IMAGES-->
120  <img src="pictures\Metal Poster Small Changes Can Make.jpg" alt="Image 1" width="3" height="4">
121  <img src="pictures\Premium Vector _ Graphic design quote in hand drawn style.jpg" alt="Image 2" width="3" height="4">
122  <img src="pictures\Steve Jobs by Donnie Ray Crisp.jpg" alt="Image 3" width="3.5" height="4.5">
123  <img src="pictures\Steve Jobs quotes.jpg" alt="Image 4" width="2" height="5">
124  <img src="pictures\#Wallpapers❤️😊.jpg" alt="Image 5" width="4.5" height="3">
125
126
127
128
129
130  <!--camera positioning-->
131  <a-entity id="rig" position="-97.728 7.331 -33.468" rotation="0 180.000 0">
132    <a-camera id="camera" look-controls position="0 1.6 0">
133      </a-entity>
134    </a-camera>
135  </a-entity>
136
137
138  <!--"Roof"-->
139  <a-box position="-39.843 19.995 -20.035" scale="120 0 80" color="grey" material="" geometry=""></a-box>
140
141
```
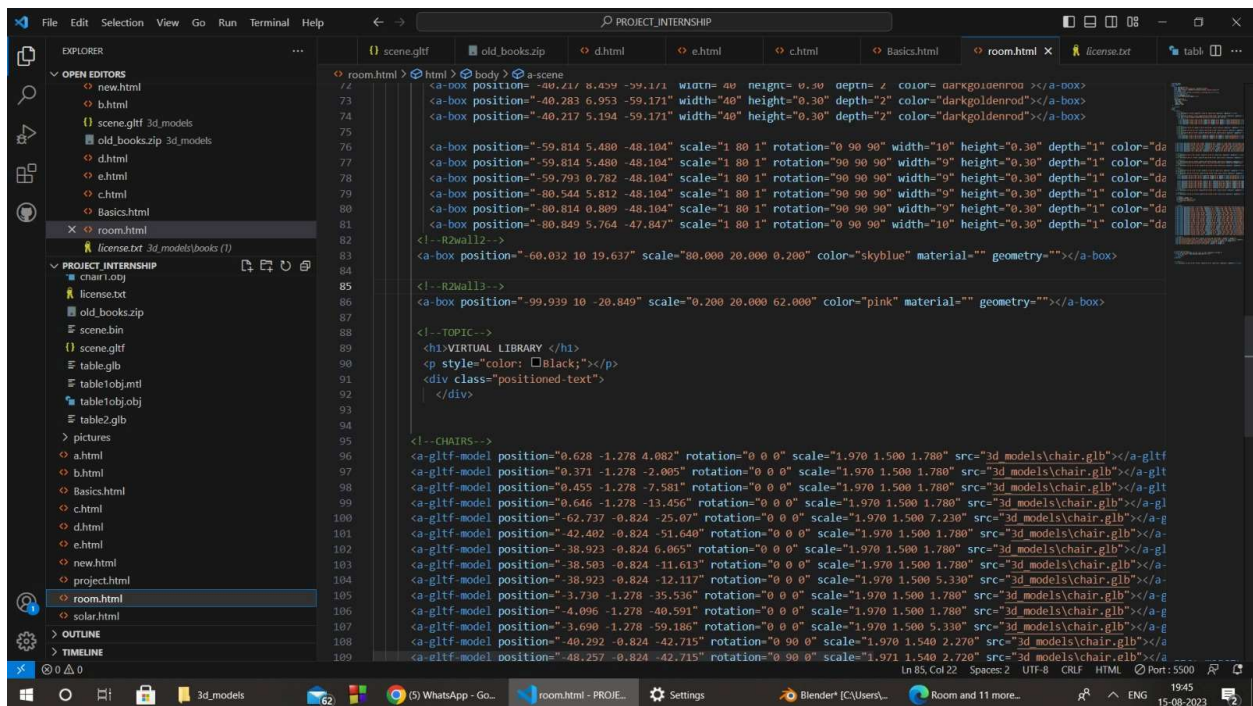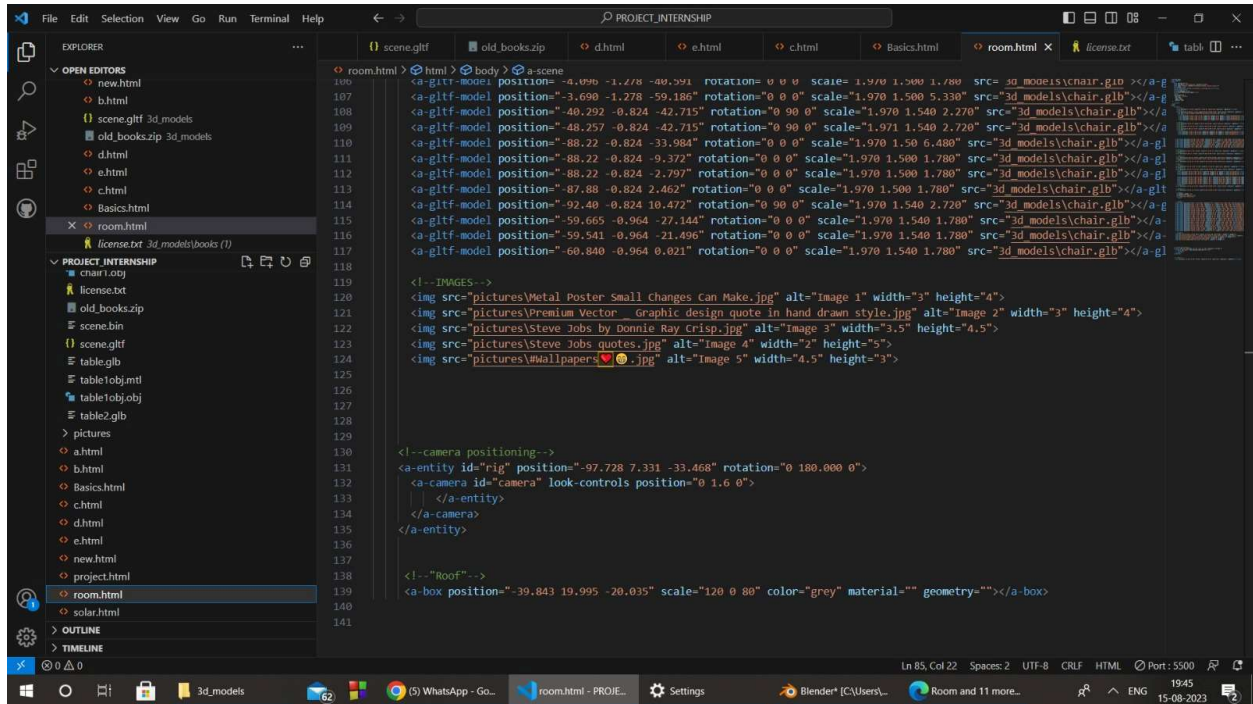
FUTURE ENHANCEMENT

The development of a virtual library within the metaverse using Unity and VR technology has laid a strong foundation for creating an immersive learning and collaborative platform. To further enhance the virtual library's capabilities and user experience, the following future enhancements are recommended:

1. Integration with Online Databases:

Enhancement: Integrate the virtual library with online databases and repositories, allowing users to access a vast array of digital books, articles, research papers, and other educational resources in real-time.

Benefits:

- Wider Content Selection: Users can access an extensive range of materials, ensuring diverse and up-to-date content.
- Real-time Updates: The virtual library will reflect the latest additions to online databases, providing a current and relevant collection.
- Enhanced Research: Researchers and students can benefit from seamless access to scholarly resources and references.

2. Expanding Library Content:

Enhancement: Continuously expand the library's content by curating and adding new books, multimedia content, and interactive learning modules across various disciplines.

Benefits:

- Diverse Subjects: Cater to a broad audience by offering content spanning different subjects, genres, and educational levels.
- Engagement: Frequent content updates encourage users to revisit the virtual library, fostering sustained engagement.
- Special Collections: Curate thematic collections or featured exhibits to showcase specific topics or authors.

3. Incorporating AI-based Search and Recommendation:

Enhancement: Implement AI-powered search and recommendation systems to enhance user discovery and engagement.

Benefits:

- Personalized Recommendations: AI algorithms can analyze user preferences and reading history to provide personalized book recommendations.
- Efficient Search: AI-based search algorithms can improve search accuracy and efficiency, helping users quickly find relevant materials.
- Enhanced User Engagement: AI-driven interactive experiences, such as virtual book discussions or guided tours, can be dynamically tailored to user interests.

CONCLUSION

The development of a virtual library within the metaverse using Unity and virtual reality technology has been a journey marked by innovation, challenges, and transformative possibilities. This internship project has successfully achieved its objectives and has paved the way for reimagining the traditional library experience in a dynamic and immersive digital realm.

1. Summary of Accomplishments:

Throughout this internship, significant accomplishments have been realized:

- Creation of Immersive Environment: A virtual library environment was conceptualized, designed, and developed, providing users with an engaging and interactive space to access and interact with digital books and resources.
- Multi-user Collaboration: The virtual library enables real-time interactions and collaborations among users, fostering social learning and knowledge sharing.
- Intuitive Interactions: Book selection, reading, and interactions have been designed to mimic real-world actions, ensuring a comfortable and immersive experience.

2. Significance of Virtual Libraries in the Metaverse:

Virtual libraries in the metaverse hold immense significance in the digital age:

- Innovative Learning Platform: Virtual libraries provide an innovative platform for education, enabling learners to engage with content in novel and interactive ways.
- Global Accessibility: Virtual libraries transcend geographical boundaries, granting users from around the world access to a vast array of knowledge and resources.
- Social Learning: Multi-user collaboration and interaction foster social learning, enabling users to connect, discuss, and share insights within an immersive environment.
- Future of Knowledge Sharing: As technology advances, virtual libraries are poised to become central hubs for knowledge dissemination and collaborative exploration.

3. Personal and Professional Growth:

This internship project has been a transformative experience on a personal and professional level:

- Technical Skill Development: Proficiency in Unity, VR development, UI/UX design, and network synchronization has been gained.
- Problem-Solving Abilities: Addressing performance challenges, UI design complexities, and network synchronization has honed problem-solving skills.
- Team Collaboration: Working within a team to bring a complex project to fruition has enhanced collaborative and communication skills.
- Innovation and Creativity: The project required innovative thinking and creative approaches to designing an immersive and engaging virtual environment.

REFERENCES

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- Google
- Blender
- Virtual Studio Code
- https://www.w3schools.com/html/html_basic.asp