VIRTUAL REALITY IN ONLINE LEARNING

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Abstract— **The goal of this project is to develop a virtual reality based model for the purpose of immersive and interactive learning environment for students. The initiative focuses on using VR technology to give students a better learning experience. The project starts with the production of a VR environment using tools like Unity or Blender, which enable the creation of 3D models and environments that are as realistic as possible. Then, different VR hardware tools can be used to interact with the environment, enabling students to experience a simulated environment as if they were physically present. Examples of these tools include Oculus Rift and HTC Vive. To improve the learning experience for students, the project also entails creating numerous interactive features like quizzes or simulations. In general, using VR technology in online learning has the ability to completely change how students interact with and learn from educational contents.**

Keywords- Virtual Reality, Immersive Experience, 3D Modeling, Simulation, Head-Mounted Display, Motion Tracking, Spatial Audio, Haptic Feedback, Presence, Interactive, Gamification, User Experience, Unity, Unreal Engine, WebVR, Augmented Reality, Mixed Reality.

I. INTRODUCTION

Virtual learning has become essential for educational institutions all over the world in the wake of the global pandemic. The lack of contact, engagement, and immersion that are essential elements of traditional classroom learning are among the difficulties that come with online learning. Emerging technology known as virtual reality (VR) can get around these problems by simulating a real-world classroom through immersive, interactive learning experiences. Virtual reality (VR) has attracted a lot of interest recently as a potential tool for improving online learning experiences. In order to increase the efficiency of online education, this study will examine the potential of virtual reality (VR), as well as its advantages and disadvantages.

The creation and deployment of VR experiences on the web have become simpler because to the integration of VR with web technologies like Django. Beautiful VR settings and components may be made with Blender, a potent open-source 3D creative tool. Django and Blender work together to create accessible, fully immersive web-based virtual reality experiences. Virtual reality (VR) has the potential to transform online learning by giving students immersive, interactive experiences that can improve their comprehension and memory of difficult concepts.

II. TECHNOLOGIES INCLUDED

i) Blender:

The 3D modelling, animation, and visual effects software Blender is open-source and free, and it may be used for a variety of tasks. Users can modify the layout, tools, and workflows in Blender's sophisticated and adaptable interface to fit their needs. FBX is one of the several file types that Blender supports and can be used to import and export 3D models into other software programs. For the purpose of generating interactive 3D experiences, such as games and simulations, Blender has a built-in game engine. There is a sizable and vibrant community of Blender users and developers that work together to improve the program, provide add-ons and plugins, and offer assistance and resources to users. Python programming can be used to enhance Blender, enabling users to customize the program, automate tedious activities, and add new tools and features.
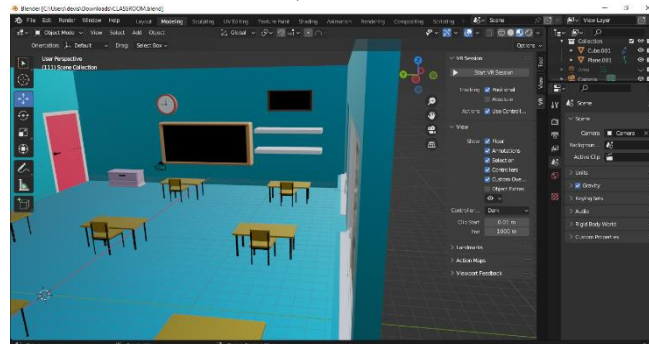
ii) SteamVR:

The Valve Corporation created the Steam VR platform, which is mostly used with the HTC Vive headset and other VR accessories. With full motion tracking, room-scale capabilities, and a number of interactive tools and features, it offers a high-quality virtual reality experience. An SDK, sample code, and documentation are just a few of the developer resources and tools that Steam VR provides. It is a flexible option for programmers of different experience levels and backgrounds because it supports a wide range of programming languages and frameworks, such as C++, Unity, and Unreal Engine.

iii) RiftCat:

RiftCat is a piece of software that enables users to play PC virtual reality games on portable VR systems like Google Cardboard. The VR game is streamed from the PC to the mobile device through Wi-Fi or a USB connection using a technology called VRidge. Numerous VR games and

applications, such as those for SteamVR, Oculus Rift, and OpenVR, are supported by RiftCat. Additionally, the software provides options for voice controls, motion-to-joystick mapping, and customizable control schemes. RiftCat works with a variety of mobile devices, including iOS and Android models, and it can also be used with SteamVR-compatible VR headsets. RiftCat offers virtual desktop streaming, which enables users to use their desktop PC from a mobile device in a VR setting in addition to gaming.

III. LITERATURE REVIEW

A. AlAgha and M. Alhabeeb in their paper titled "The Impact of Virtual Reality Technology on the Online Learning Experience: A Comparative Study" discusses about how with VR, online learning experiences can be enhanced, as it allows learners to be more immersed in the learning environment. The writers examine the possible advantages and difficulties of introducing VR into online courses as well as the current status of research on the topic. They also offer suggestions for developing and putting into practice VR-enhanced online learning activities. According to the study, using VR to learn a language dramatically enhanced students' motivation, engagement, and overall learning outcomes. By offering a virtual classroom experience that can be accessed from anywhere at any time, virtual reality in online learning can improve accessibility and flexibility of education in addition to having a favorable impact on learning outcomes. Students who have restricted access to physical classrooms owing to geographic or physical restrictions may find this to be especially helpful.

In a study published in 2021, R. Liu, Y. Zhang, Y. Xie, and Y. Xie et al. called "Application of Virtual Reality in Online Teaching and Learning during the COVID-19 Pandemic" investigated the use of VR simulations to instruct difficult subjects improved the lifestyle of students. The findings demonstrated that, in comparison to conventional teaching techniques, the utilization of VR simulations considerably enhanced student learning outcomes. He also proposed that due to its capacity to give learners a realistic and engaging experience in a virtual world, which can increase learning outcomes and retention rates, the use of VR in online learning is becoming more and more popular.

A thorough assessment of the literature was done by Dascalu et al. in 2021 to determine how well virtual reality may improve medical education. The authors discovered that virtual reality has a number of advantages over conventional teaching methods, citing 35 studies that used it in medical education. These advantages include the capacity to deliver an interactive and realistic learning experience, boost motivation and engagement, improve spatial and temporal knowledge, and enhance performance in real-world settings. A literature research was carried out by Jang and Kim (2021) to investigate the application of virtual reality (VR) in education. The authors focused on the effects of VR on student learning outcomes, attitudes, and engagement by reviewing 61 studies that were published between 2016 and 2020. According to the review, VR has the ability to boost student motivation and engagement, improve learning results, and alter students' attitudes towards learning. In addition, the authors pointed out that VR can offer a special educational opportunity that is challenging to duplicate in conventional classroom settings.

The application of immersive virtual reality (VR) platforms in STEM education was studied by Garca-Pealvo et al. in 2020. The authors looked at how VR technology might improve students' educational experiences, particularly in challenging subjects like STEM. They gave a thorough analysis of the pertinent literature and discussed how VR may be used to create immersive learning environments. The authors emphasised a number of advantages of VR, such as its capacity to raise student engagement, encourage teamwork, and offer realistic simulations. They also talked about how VR might be used to address issues with access to specialised facilities and equipment, which is a problem in STEM education.

IV. PROPOSED METHODOLOGY

The methodology to implement Virtual reality for teaching includes combination of various technologies.

Use Blender to design the VR environment: Blender may be used to build a virtual world with all the required 3D models, textures, and animations. The environment ought to be created to satisfy the demands of the VR application. The 3D classroom model you design in this phase will be used as the virtual setting for your VR experience. The walls, floor, ceiling, and other components of the classroom can be built using Blender's modelling tools. You can even import 3D models of furniture such as desks, seats, and a projector screen. To make the model look realistic, you must add textures and materials once it has been produced. To create a realistic lighting environment, you can also add lights to the model. The classroom model must be exported in a format that can be imported into your VR program, such as a .fbx or .obj file, before you can use it.

You would need to build a texture or material that could be placed to the board surface in the classroom model in order to display videos on it. Then, using this information, you can

display videos in a manner akin to that of a real-world board. This can be accomplished by adding the video file as a texture, which the VR environment can play back in real-time. Blender nodes can be used to connect the video file to the material.

The model must first be exported from Blender as an FBX file in order to be used in a Django project. By choosing "File" > "Export" and selecting FBX as the file format, you can accomplish this. The FBX file can be imported into the Django project after it has been exported. We can use Three.js, a JavaScript package that makes working with 3D graphics in a web browser simple, to load the FBX model into a web page. To load FBX files directly into a Three.js scene, we may also use the FBXLoader.js Three.js plugin. We may include the required JavaScript files in our HTML template so that Three.js and FBXLoader.js can be used in our Django project. The 3D scene will then be rendered inside of a container element that we can define in the template. The FBX model can be added to the scene using the FBXLoader by creating a Three.js scene, camera, and renderer in the JavaScript code. Using the Three.js renderer, we can finally render the scene and display it in the container element. Using Three.js and an HTML5 video player, we can position the video on the classroom model's board once it has been loaded into the web page.

Add video files to the Django project: You can either add video files to the project's static directory or use a cloud-based storage solution like AWS S3 to store them. The video files can be put in a folder called "videos" that you create in the static directory of your Django project. The videos can then be served by creating a URL pattern in your Django project.

You can use Three.js, a JavaScript toolkit for producing and displaying 3D images in a web browser, to show the videos on the board of the classroom model. Using Three.js, you can produce a video texture and apply it to the board's surface. We can enter into the virtual mode of the project by clicking the Enter into VR MODE button.

Enter into VR MODE

In order to establish a VR environment for the classroom model, integrating SteamVR and Riftcat is a crucial step. For the VR environment for the classroom model, the SteamVR plugin for Unity can be utilised. A game engine called Unity offers a variety of tools for creating games and other interactive applications, such as VR environments. Developers may quickly create a VR environment with the Unity SteamVR plugin by importing the classroom model and including VR elements like teleportation, interactivity, and locomotion. On the other side, Riftcat is a piece of software that enables VR multimedia streaming from a computer to a smartphone. Riftcat streams the VR experience to the smartphone via a Wi-Fi and USB connection combo.
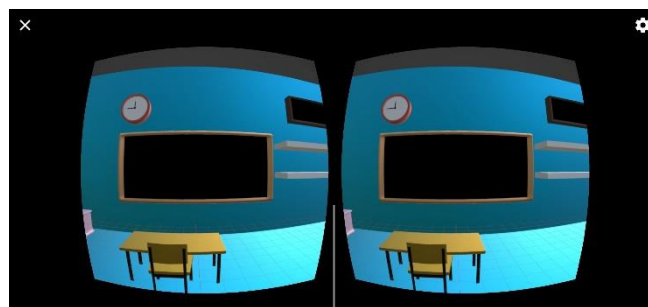
V. CONCLUSION

In conclusion, the use of virtual reality into online education offers enormous potential to improve students' learning outcomes. Django, Blender, SteamVR, and Riftcat are a few examples of the technologies that can be used to build a virtual classroom that can mimic a real-world learning environment. The classroom model's ability to project films on the board gives the learning process a new dimension and makes it more dynamic and engaging. Virtual reality's capacity to succeed in online learning will depend on how well it can navigate logistical and technical difficulties, but the advantages are obvious. The potential for virtual reality in teaching will only increase as technology develops.

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