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Virtual Tour With Voice Assistant using Extended Reality

Indra Kishor, Kishore Kumar, Aarya Sharma, Harsh Bansal

Abstract*: *We are all aware that virtual reality is a new emerging technology in the modern era. Virtual reality has enormous potential across various industries, including education, Hospitality, Gaming, the Military, Tourism, and more. It is the medium through which we create our world, our customised reality. In this paper, we discuss extended reality concepts to create a virtual tour of the college campus with an honest voice assistant service based on the IoT concept. It is the key to experiencing, feeling and touching the college premises, using VR Technology. With this project, any guest who wants to visit the college premises can do so virtually with our assistant service. In hectic schedules, colleges are facing difficulties when faculty members see their parents, as they often have other work to attend to. With this problem, the virtual tour is a solution. We create a virtual tour with a unique voice assistant facility, based on IoT technology, which provides information about the place the visitor will visit using a VR Headset.

Keywords*: *Virtual Reality, Extended Reality, Teleportation, 3d Objects, Collider, Material, Audio source.

I. INTRODUCTION

A. Introduction of Virtual Reality

VR refers to the idea of experiencing things through computers that don't exist. Virtual Reality refers to the process of mimicking real-world objects or environments.[1] The user will have a different experience because everything will be virtualized, which assists in the development of new technologies like user interface and virtual reality. VR provides an immersive experience in a 3D visual world. VR is beyond the flat monitors. Virtual reality helps people feel a sense of presence in a world they would not otherwise be able to visit due to difficulties or disabilities.

B. Introduction of VR Headset

For experiencing virtual reality, a VR headset must be used, i.e., connected to a base station. A head-mounted device called a virtual reality headset immerses the user in a virtual environment. Virtual reality headsets are frequently employed with VR video games, but they are also utilized in other contexts, such as simulators and trainers. The majority of VR headsets come equipped with stereo sound, a stereoscopic display, and sensors such as accelerometers and gyroscopes that detect the user's head pose to align the virtual camera's orientation with the user's actual eye positions. In this, we have used the Headset named HTC VIVE PRO 2 KIT. It comes with two base stations, two controllers and a headset. The system requirements for using the HTC Vive are:

Table I: System Requirements

Components	Requirements
Operating system	Windows 10 or more
Processor	5 or more
Ram	8 GB or more
USB Port	1 * 3.0 or more
GPU	NVIDIA GeForce GTX 1060 / AMD Radeon RX 480 equivalent or better
Video Output	DisplayPort 1.2 or newer

C. Introduction to Unity

Many platforms can be used with the game engine Unity. In 2005, Unity Technologies launched the game Unity. The creation of 2D and 3D games as well as interactive content is Unity's primary focus. In terms of target platforms, Unity presently supports 27 different ones. Android, PC, and iOS systems are the most used platforms.

D. Introduction to Unity Tools

In this work, we have used many tools.

E. Stream VR Plugin

Developers can aim for a single API that SteamVR allows connections from all of the main VR headsets. The modern SteamVR Unity Plugin for developers handles three crucial tasks: loading 3D models for VR controllers, processing input from those controllers, and determining how your hand will appear when using those controllers.

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F. Ultimate XR plugin

A powerful toolkit and framework for Unity, called Ultimate XR, offers features such as cross-device compatibility, cutting-edge grab and manipulation mechanics, a library of gender- and race-neutral hands, fully customizable avatar representation, advanced UI components, locomotion mechanics, and more.

G. Inbuilt Objects

In this, we have used 3D objects built into the Unity editor, such as the cube, sphere, cylinder, capsule, and plane. This could be used to create 3D objects, such as tables, chairs, walls, and fans. Audio will be used to add sound to the project. Light was used to provide illumination in the dark place. Others are like particles, such as UI and the camera.

II. LITERATURE SURVEY

A. In this research paper, the authors provide a thorough summary of how virtual reality technology benefits every industry, as well as how virtual tours contribute to college recruitment, offering users an easy way to access the campus's infrastructure and facilities. The proposed system offers a virtual tour of the institution, with the computer department serving as its focal point[1]. It is built on Unity 3D, which offers a virtual representation of the college's physical landscape. By implementing an efficient path showing implementation, it enables visitors to access specific departments and labs remotely and displays a virtual view of the path to the goal.[10][11]

B. In this research paper, the authors discuss the college's infrastructure, which is built on Unity3D and specifically targets the computer department. With the aid of the effective path-finding A* algorithm, visitors can access a specific department or lab from a distance while also receiving a virtual representation of the route to take. The schedule will enable the location of the students' classrooms.[2][6]

C. This study developed a virtual reality app for Android devices equipped with a gyroscope sensor. It can be said that all the requirements listed for creating the interactive virtual reality museum mobile application were satisfied. The evaluation results from various tests demonstrate that the study's objectives have been achieved.[3]

D. In this paper, a web platform was created and installed that enables cultural organisations to catalogue and register all their numerous artworks, sculptures, and display locations, regardless of the technique used. They then used this digital data to engage with a mobile application, presenting the artwork and sculptures to users in an interactive manner. Based on the experience gained from deploying this platform in a gallery, they claim that the online and mobile platform is practical to apply in other cultural domains, such as museums, archaeological sites, and interpretive centres. Our technology can enhance tourist experiences of cultural sites by incorporating VR and AR interactivity.[4][8]

E. In this paper, using the resources while he was pursuing his academic studies, the developer produced the initial 2D blueprints for the UISRAEL. He was able to convert these into 2D designs for the project during this period, as he became familiar with all the floors, classrooms, teachers' lounges, offices, and other components that make up the University's facilities. Designing elements and objects in 3D may seem like a challenging task, but it is pretty straightforward. In this case, technology tools were essential because they enable us to create 3D models from 2D plans with the proper arrangement of their components.[5][9]

F. Virtual reality and augmented reality are expected to revolutionise the way individuals interact with the digital world. Expectations go hand in hand with engineering challenges to cram a high-performance display system into a small module for everyday wear. Despite etendue conservation being a significant barrier, remarkable progress in creative optics and photonics is still being done. Ultra-thin optical components, such as PPHOEs and LCHOEs, offer alternatives to conventional optics. Their unique multiplexing properties and polarisation dependence further expand the possibilities for innovative wavefront modulations.[7][12]

III. PROPOSED WORK

In this paper, we have developed a virtual tour of college premises that is embedded with unique voice assistant services, utilising the concept of IoT technology. Wherein if a person who wears VR Headset will enter a specific area like a classroom, laboratory, or any faculty cabin of the VR Project, the voice service will detect the person's entry and start a voice assistant in the entire area with pre-recorded audio, while the assistant service will stop play audio if person leaves the area. This assistant service will work for all regions, according to the recorded audio for a specific location, such as a classroom, laboratory, or faculty cabin, the VR Project. For example, if a person enters a particular lab, our assistant service, based on the IoT concept, will detect their entry to the lab. During the visit, the voice assistant will play an audio that conveys all the information about the lab's name, number of systems, seating capacity, each system's configuration, and the installed software throughout the laboratory's carpeted area.

IV. METHODOLOGY

In our proposed work, we have conducted an in-depth analysis of Unity 3D and its components. Some of the key steps in developing such a project are illustrated in the figure.

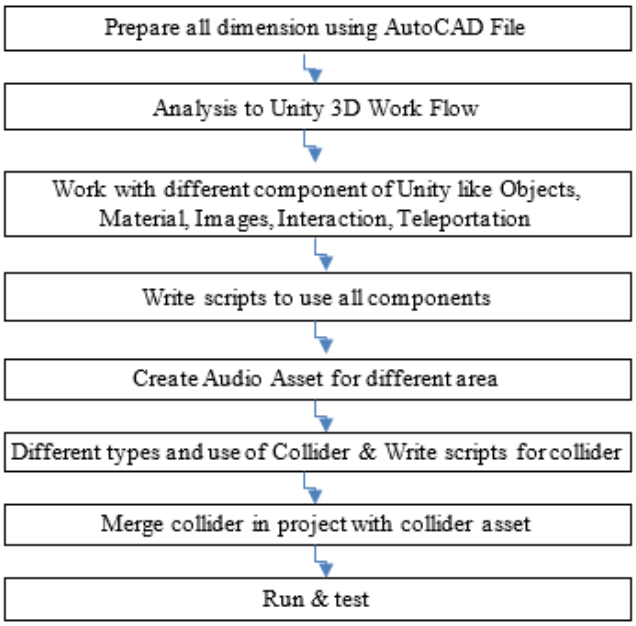

Fig. 1. Major Steps to develop a project

A. 3d Objects

Solids with three dimensions, such as length, breadth, and height, are referred to as 3D objects. In our project, we utilise 3D objects, including cubes, spheres, cylinders, planes, and capsules. For making the objects like walls, doors, and Windows, we used more than one object according to the requirement. To customise objects with the help of scaling, translation, rotation, etc. In objects, we can easily add images. To remove the blurriness, we had to set the texture.

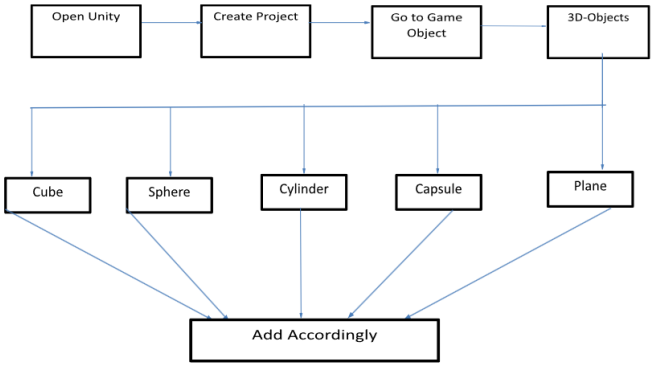

Fig. 2. Steps to add 3d objects

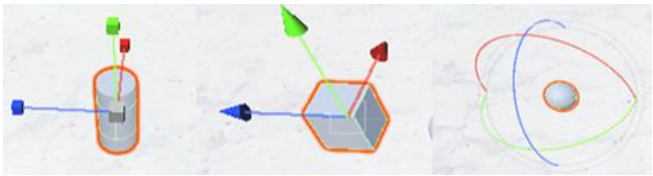

Fig. 3. Scaling, Translation & Rotation _objects

B. Teleportation

Teleportation enables the player to move from one location to another. There are two types of teleportation. One is a teleportation point, and the other is a teleportation area. In point teleportation, we can add teleportation directly with the help of a C# script. In the Teleport area, we need to create the plane object and add the Teleport area C# script.

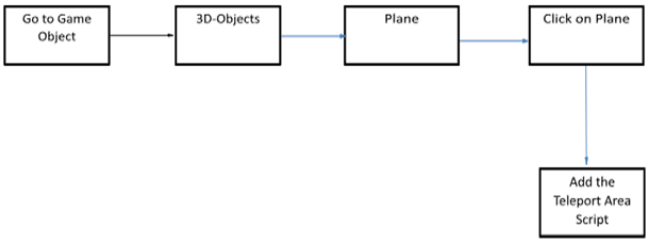

Fig. 4. Steps to add Teleportation

Teleportation Area Script:

```
using UnityEngine;
#if UNITY_EDITOR
using UnityEditor;
#endif
namespaceValve.VR.InteractionSystem
{
public class TeleportArea: TeleportMarkerBase
   {
public Bounds meshBounds { get; private set; }

private MeshRenderer areaMesh;
privateinttintColorId = 0;
private Color visibleTintColor = Color.clear;
private Color highlightedTintColor = Color.clear;
private Color lockedTintColor = Color.clear;
privatebool highlighted = false;

public void Awake()
      {
areaMesh = GetComponent<MeshRenderer>();

#if UNITY_URP
tintColorId = Shader.PropertyToID( "_BaseColor" );
#else
tintColorId = Shader.PropertyToID("_TintColor");
#endif

CalculateBounds();
      }

public void Start()
      {
visibleTintColor                                    =
Teleport.instance.areaVisibleMaterial.GetColor( tintColorId
);
highlightedTintColor                                =
Teleport.instance.areaHighlightedMaterial.GetColor(
tintColorId );
lockedTintColor                                     =
Teleport.instance.areaLockedMaterial.GetColor(
tintColorId );
      }
public override boolShouldActivate( Vector3 playerPosition
)
      {
return true;
      }
```

```
public override boolShouldMovePlayer()
        {
return true;
        }
public override void Highlight( bool highlight )
        {
if ( !locked )
            {
highlighted = highlight;

if ( highlight )
                {
areaMesh.material                                    =
Teleport.instance.areaHighlightedMaterial;
                }
else
                {
areaMesh.material = Teleport.instance.areaVisibleMaterial;
                }}}
```

C. Interaction with objects

For picking and movement of objects, we had to interact with the scripts. In this, we had to create objects using cubes, cylinders, spheres, and other shapes. We then made the new game object and dragged and dropped a combination of 3D objects, which helped us develop objects such as chairs, tables, and dice. To move the object, we need to create it and import the scripts from Stream VR, specifically those for interactable and throwable objects.

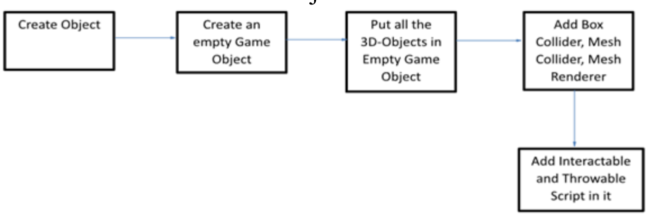

Fig. 5. Figure of the method to interact with the object

D. Voice Assistant

A. Collider: A collider in Unity is a component that is used to detect collisions between Game Objects in the game world. A collider is a simple shape (such as a box, sphere, capsule, or mesh) that is attached to a Game Object and is used to define its physical boundaries.

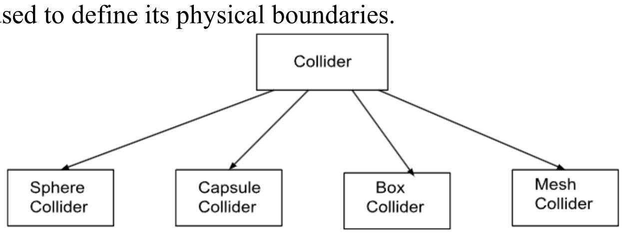

Fig. 6. Types of Collider

For our Voice assistant, we use Box Collider and Mesh Collider, which provide details about the location when any person enters. To add voices to the project, we need to create a 3D object, such as a cube. When the player collides with the cube or remains on it, the voice will play after the collision and stop when the player leaves the area. The main steps involved in using the collider are:

1. Create a cube.
2. Upload the audio file to the asset folder.
3. Add the audio source and upload the voice recording to it.
4. Add rigid body, box collider and mesh renderer.
5. Add the trigger script.

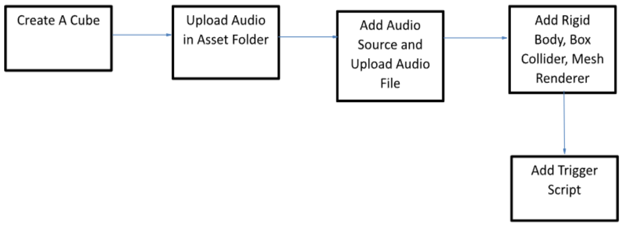

Fig. 7. Steps to use the collider and script for the trigger

Scripts:-

Audio:-

```
using UnityEngine;
using System.Collections.Generic;
public class RegisterAudioSources: MonoBehaviour {
private       List<AudioSource>soundList       =       new
List<AudioSource>();
voidOnTriggerEnter(Collider other){
if (other.tag == "SoundSource"){ // sound object entering the
trigger?
soundList.Add(other.audio); // add it to the list
}
else
if (other.tag == "Player"){ // player entering trigger?
foreach(AudioSource sound in soundList){ // play all sounds
in the list
sound.Play();}}}
voidOnTriggerExit(Collider other){
if (other.tag == "SoundSource"){ // sound object leaving the
trigger?
soundList.Remove(other.audio); // yes: remove it from the
list
}
else
if (other.tag == "Player"){ // player leaving the trigger?
foreach(AudioSource sound in soundList){
sound.Stop(); /./ yes: stop all sounds in the list
```

V. RESULT AND DISCUSSION

Fig. 8. Classroom

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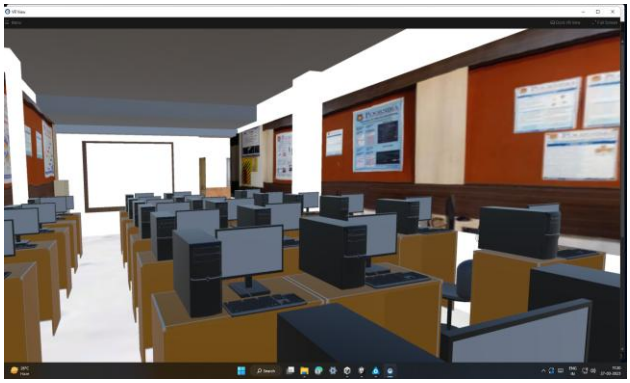

Fig. 9. Computer Lab

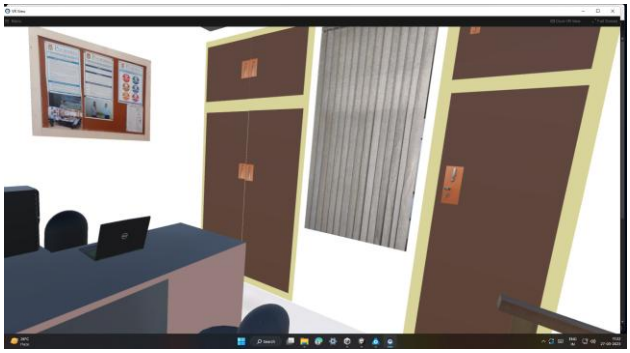

Fig. 10. Faculty Cabins

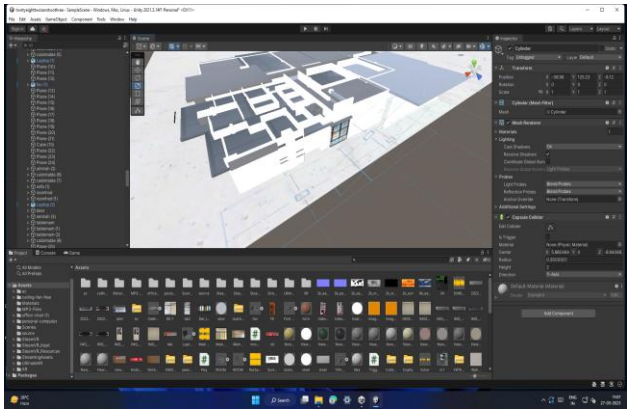

Fig. 11. Outer View

VI. CONCLUSION AND FUTURE SCOPE

A. Conclusion

Finally, with the help of Unity and its components, we develop a virtual tour for a college with an exceptional voice assistant service, which is very helpful for any person or team that wants to visit the college premises without any physical activity. The project is also beneficial for inspection team members, such as those from AICTE, NAAC, and other governing bodies, as they can view the entire college from a single location.

B. Future Scope

In the future, we will create avatars of our faculty members. We will add them in our labs, classrooms and faculty rooms. When a person visits any classroom, lab, or faculty room, the Avatar will interact and answer questions asked by the person touring the college virtually. We will tailor the avatar's learning to meet our needs.

DECLARATION

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Ethical Approval and Consent to Participate	No, the article does not require ethical approval or consent to participate, as it presents evidence that is not subject to interpretation.
Availability of Data and Material/ Data Access Statement	Not relevant.
Authors Contributions	All authors have equal participation in this article

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Mr. Indra Kishor, working as an Assistant Professor in the Computer Engineering Department at Poornima Institute of Engineering & Technology, has over 13 years of experience in Teaching and Industry. Mr. Indra has completed a dual master's degree, M.Tech.(CSE), MBA(IT), B.Tech & Diploma in CSE. Has great researchers in every new commerce technology, such as AR/VR, IoT, ML, AI, etc. Also, has published more than 18 research papers in different conferences, national, and International Journals. While has an education YouTube channel in which many technical videos are uploaded. Mr. Indra also received numerous prizes for various activities. He received the first position in the district Chess Championship award and was also appreciated as a jury member of the NASA Space App Challenge. Additionally, he received the Best Faculty Award from 80 worldwide Institutes.

Mr. Kishore Kumar is a student pursuing a B.Tech degree in Computer Engineering from the Department of Computer Science at Poornima Institute of Engineering and Technology in Jaipur. He has authored a review paper in DRSR Journals, showcasing his knowledge and understanding of the subject. His areas of expertise include Machine Learning, Deep Learning, Natural Language Processing, Python, Virtual Reality, Augmented Reality, C# programming Language, Unity 3D, and the HTC Vive Pro 2 Kit Headset. He has developed strong skills in programming languages such as Python and C#, as well as game development platform Unity 3D, and the use of virtual and augmented reality technology with the HTC Vive Pro 2 Kit Headset.

Aarya Sharma is a dedicated B.Tech student in Computer Engineering at Poornima Institute of Engg & Tech in Jaipur with expertise in various fields, including Machine Learning, Deep Learning, Natural Language Processing, Python, MySQL, UI/UX Design, Virtual Reality, Augmented Reality, C# programming Language, Unity 3D, and HTC Vive Pro2 Kit Headset. He has honed her programming skills in languages such as Python and C#, and has extensive experience working with Unity 3D, a popular game development platform. She has practical experience with virtual and augmented reality technology, working with the HTC Vive Pro2 Kit Headset, which showcases her competence in working with emerging technologies. Moreover, Aarya's knowledge in UI/UX design and database management, particularly with MySQL, demonstrates her versatility in various areas of computer engineering.

Harsh Bansal is a dedicated B.Tech student in Computer Engineering at Poornima Institute of Engineering & Technology in Jaipur. He has a broad range of expertise in various fields, including Machine Learning, Deep Learning, Natural Language Processing, Python, Virtual Reality, Augmented Reality, C# programming Language, Unity 3D, and the HTC Vive Pro 2 Kit Headset. He has honed his programming skills in languages such as Python and C#, and has extensive experience working with Unity 3D, a popular game development platform. He has practical experience with virtual and augmented reality technology, working with the HTC Vive Pro2 Kit Headset, which demonstrates his competence in working with emerging technologies.