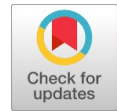


Virtual Tour With Voice Assistant using Extended Reality



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 many industries like Education, Hospitality, Gaming, Army, Tourism, etc. It is the medium of creating our own world, our own customized reality. In this paper, we discussed the extended reality concepts to make the virtual tour of the college campus with real voice assistant service that based on IoT concept. It is the key to experiencing, feeling and touching the college premises, using VR Technology. With this project any of guests want to visit the college premises, He/She can do virtually with our assistant service. In hectic schedules, colleges are facing difficulties during visiting the college to the parents because all faculty members have their other work to do. With this problem, the virtual tour is a solution. So we make the virtual tour with unique voice assistant facility on the concept of IoT technology which will provide the information regarding the place where the visitor will enter for visit by the help of 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 actually exist. Virtual Reality means when we try to mimic the real world object or environment.[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 immersion in the 3d visual world. VR is beyond the flat monitors. Virtual reality helps people to feel the world where they were not visiting due to any difficulties or any disability.

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*Correspondence Author(s)

Indra Kishor*, Department of Computer Engineering, Poomima Institute of Engineering and Technology, Jaipur (Rajasthan), India. E-mail: ijs2k8@gmail.com, ORCID ID: <https://orcid.org/0009-0007-8617-1335>

Kishore Kumar, Department of Computer Engineering, Poomima Institute of Engineering and Technology, Jaipur (Rajasthan), India. Email: kk9055331214@gmail.com, ORCID ID: <https://orcid.org/0009-0002-2733-795X>

Aarya Sharma, Department of Computer Engineering, Poomima Institute of Engineering and Technology, Jaipur (Rajasthan), India. Email: aaryasharma932394@gmail.com, ORCID ID: <https://orcid.org/0009-0008-7369-9111>

Harsh Bansal, Department of Computer Engineering, Poomima Institute of Engineering and Technology, Jaipur (Rajasthan), India. Email: harshbansal328001@gmail.com, ORCID ID: <https://orcid.org/0009-0004-4505-8465>

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B. Introduction of VR Headset

For experiencing virtual reality, VR headset must be used i.e connected with 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 like accelerometers and gyroscopes that detect the user's head pose in order 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 requirement for using the HTC vive are:

Table- I: System Requirement

Components	Requirements
Operating system	Windows 10 or more
Processor	I5 or more
Ram	8gb 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 had used many tools are

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 figuring out how your hand will appear when using those controllers.



F. Ultimate XR plugin

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

G. Inbuilt Objects

In this we have used 3d object which are inbuilt in unity editor like cube, sphere, cylinder, capsule, plane etc. This could be used for making the 3d objects like table, chair, walls, fans etc. Audio will be used for adding the audio in the project. Light were used to provide the lights at the dark place. Others are like particles, UI, camera etc.

II. LITERATURE SURVEY

- A. In this research paper, the authors have provided a thorough summary of the ways in which virtual reality technology benefits every industry, as well as how virtual tours contribute to college recruitment and give 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 Unity3D, which offers a virtual picture of the college's physical landscape. By implementing an efficient path showing implementation, it enables visitors to visit certain departments and labs from a distance and displays a virtual view of the path to the goal.[10][11]
- B. In this research paper, the authors discussed the college's infrastructure, which is built on Unity3D and targets the computer department explicitly. With the aid of the effective path-finding A* algorithm, it enables visitors to visit a specific department or lab from a distance while also providing a virtual representation of the route to take. The schedule will make it possible to locate the students' classrooms.[2][6]
- C. This study created a virtual reality app for android devices with a gyroscope sensor. It can be said that all the requirements listed for developing the interactive virtual reality museum mobile application were satisfied. The evaluation results following various testing show that the study's goals have been met.[3]
- D. In this paper, a web platform was created and installed that enables cultural organisations to catalogue and register all of their numerous artworks, sculptures, and display locations, regardless of the use in it as a technique. they then used this digital data to engage with a mobile application to present the artwork and sculptures to users in an interactive manner. Based on the experience gained in the deployment of this platform in a gallery, they claim that the online and mobile platform is practicable to apply in other cultural domains such as museums, archaeological sites, and interpretive centres. Our technology may improve tourist tours of cultural places by including 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

since he became familiar with all of the floors, classrooms, teachers' lounges, offices, and other components that make up the University's facilities. Designing elements and objects in 3D may appear to be a challenging task, but it is actually quite simple. In this case, technology tools were essential because they enable us to create 3D models from 2D plans with the right arrangement of their components.[5][9]

- F. Virtual reality and augmented reality are expected to revolutionize how 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 major barrier, remarkable progress in creative optics and photonics is still being done. Ultra-thin optical components like 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 worked on the virtual tour of college premises which is embedded with unique voice assistant services on 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 as per recorded audio for particular area like a classroom, laboratory, or any faculty cabin of the VR Project. For example, if a person will enter a specific lab, then our assistant service that is based on IoT concept will detect the person entry for the lab and during the visit the voice assistant will play an audio that will carry all the information about the labs name, number of systems, seating capacity, each system configuration along with the installed software, throughout the laboratory carpet area.

IV. METHODOLOGY

In our proposed work we have done an in-depth analysis of Unity 3D and their components some of the major steps to develop such a project are shown in the figure.



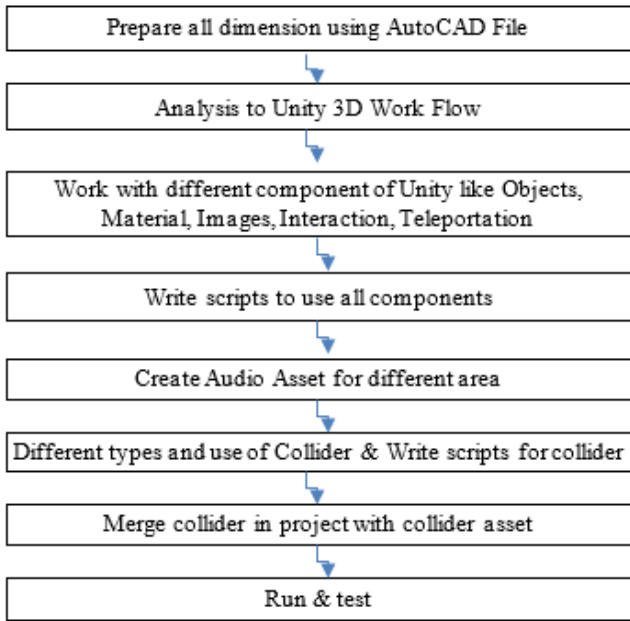


Fig. 1. Major Steps to develop project

A. 3d Objects

Solids with three dimensions, such as length, breadth, and height, are referred to as 3D objects. In our project 3d objects like 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. for customize objects with the help of scaling, translation, rotation etc. In objects, we can add the images easily. For remove the blurriness, we had to set the texture.

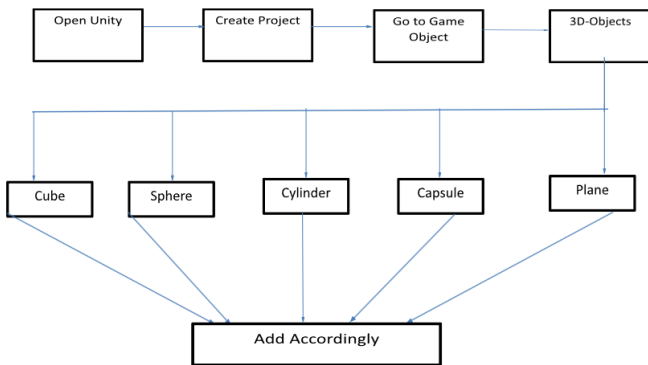


Fig. 2. Steps to add 3d objects

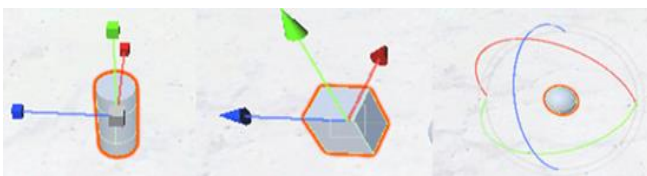


Fig. 3. Scaling, Translation & Rotation _of_ 3d_objects

B. Teleportation

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

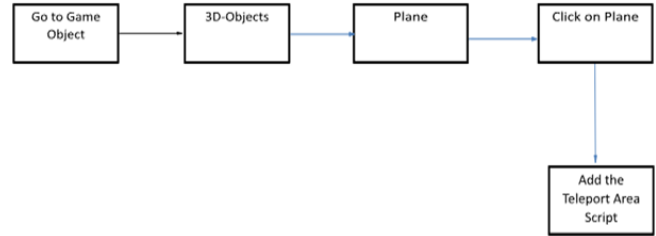


Fig. 4. Steps to add Teleportation

Teleportation Area Script:

```

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

        private MeshRenderer areaMesh;
        private int tintColorId = 0;
        private Color visibleTintColor = Color.clear;
        private Color highlightedTintColor = Color.clear;
        private Color lockedTintColor = Color.clear;
        private bool 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 bool ShouldActivate( Vector3 playerPosition )
        {
            return true;
        }
    }
}
  
```

```
public override bool ShouldMovePlayer()
{
    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 make the objects with the help of cube, cylinder, sphere etc. And we had created the new game object then we had drag and drop the combination of 3d objects which help for make any object like chair, table, Dice etc. For moving the object, we have to create the object and import the scripts from stream vr i.e. interactable and throwables.

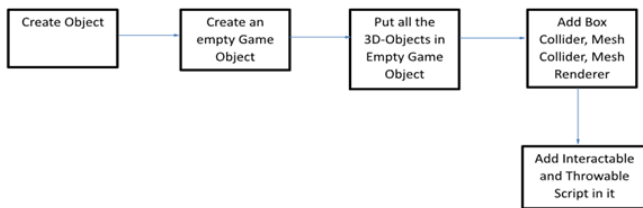


Fig. 5. Figure of method to interact with object

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.

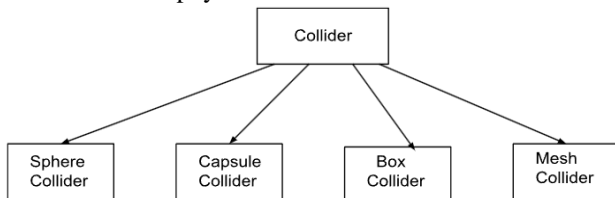


Fig. 6. Types of Collider

For our Voice assistant we use Box Collider & Mesh Collider that provide the detail about the location when any person enters. For adding the voices in the project, we need to create a 3D object like a cube when the player collides with the cube or stay on the cube the voice will play after collision and it will stop after leaving the area. the main steps involved to use collider are:

1. Create a cube.

2. Upload audio in the asset folder.
3. Add the audio source and upload the voice recording in it.
4. Add rigid body, box collider and mesh renderer.
5. Add the trigger script.

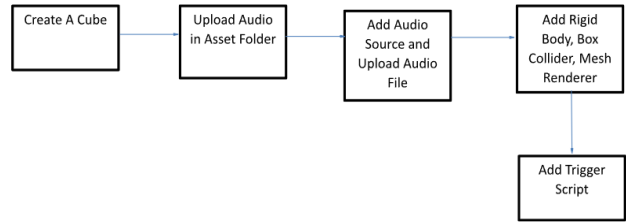


Fig. 7. Steps to use collider and script for trigger

Scripts:-

```
Audio :-
using UnityEngine;
using System.Collections.Generic;
public class RegisterAudioSources: MonoBehaviour {
    private List<AudioSource> soundList = new List<AudioSource>();
    void OnTriggerEnter(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();}}
        void OnTriggerExit(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



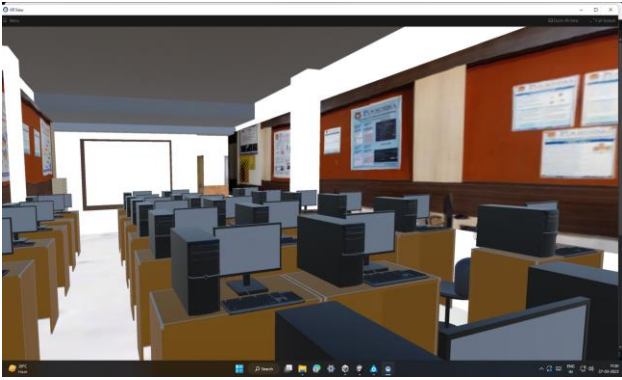


Fig. 9. Computer Lab

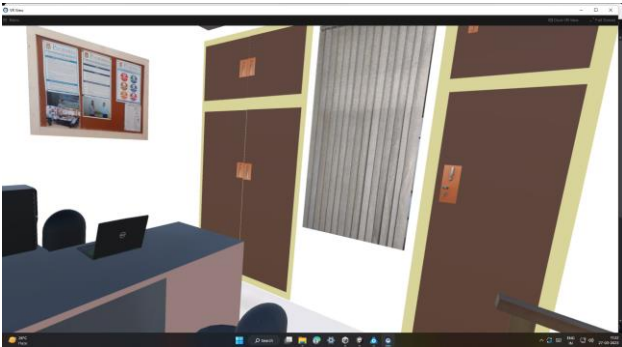


Fig. 10. Faculty Cabins

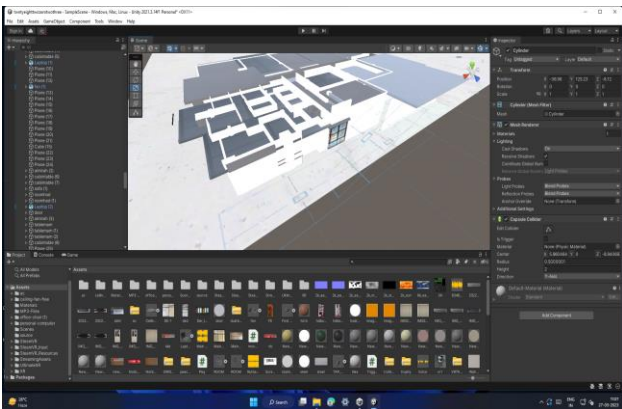


Fig. 11. Outer View

VI. CONCLUSION AND FUTURE SCOPE

A. Conclusion

Finally, with the help of unity and its components we develop a virtual tour for college with special voice assistant service i.e. very helpful for any kind of person or team those want to visit college premises without any physical activity. The project is also beneficial for the inspection team members like AICTE, NAAC and other governing bodies, they can view the entire college from one place.

B. Future Scope

In future, we will make the avatar of our faculty members. We will add them in our labs, classrooms and faculty rooms. When any person will go to any of classroom, lab or faculty room, then the Avatar will interact and answer the question which will be asked by the person who tours college virtually. And we will make the avatar to learn according to our need.

DECLARATION

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

REFERENCES

1. Dr.Senthil Kumar.M, 2Vigneshwaran K, 3 Veeraragavan S, 4 Vasanth T, VIRTUAL TOUR FOR COLLEGE VISITORS.
2. Handore, A., Suryawanshi, Y., Shaikh, A., Ahire, U. and Patil, C., Virtual Reality Based Virtual Tour of College Using Unity 3D.
3. Cabibil, Nizle& Jr, Antonio &Obero, Kezia& Arroyo, Jan Carlo &Delima, AllemarJhone. (2020). MuseoDabawenyo: An Interactive Virtual Reality Museum Application using Unity. International Journal of Advanced Trends in Computer Science and Engineering. 9. 3556-3562. 10.30534/ijatcse/2020/161932020. [CrossRef]
4. K.Medrano, R. Tejada and B. González, "Development of a computer platform for the enrichment of cultural environments using VR and AR," 2021 IEEE Latin American Conference on Computational Intelligence (LA-CCI), Temuco, Chile, 2021, pp. 1-6, doi: 10.1109/LA-CCI48322.2021.9769849. [CrossRef]
5. L. F. Aguas, R. Coral, F. D. Morales and R. M. Toasa, "3D Modeling for virtual tour of a Higher Education Institution," 2022 17th Iberian Conference on Information Systems and Technologies (CISTI), Madrid, Spain, 2022, pp. 1-5, doi: 10.23919/CISTI54924.2022.9820366. [CrossRef]
6. Zhan T, Yin K, Xiong J, He Z, Wu ST. Augmented Reality and Virtual Reality Displays: Perspectives and Challenges. iScience. 2020 Aug 21;23(8):101397. doi: 10.1016/j.isci.2020.101397. Epub 2020 Jul 22. PMID: 32759057; PMCID: PMC7404571. [CrossRef]
7. Xiong, J., Hsiang, E.L., He, Z., Zhan, T. and Wu, S.T., 2021. Augmented reality and virtual reality displays: emerging technologies and future perspectives. *Light: Science & Applications*, 10(1), p.216. [CrossRef]
8. N. Elmqaddem, "Augmented Reality and Virtual Reality in Education. Myth or Reality?," *Int. J. Emerg. Technol. Learn.*, vol. 14, no. 03, pp. 234–242, Feb. 2019. [CrossRef]
9. Rojas-Sánchez, M.A., Palos-Sánchez, P.R., & Folgado-Fernández, J.A. (2022). Systematic literature review and bibliometric analysis on virtual reality and education. *Education and Information Technologies*, 28, 155 - 192. [CrossRef]
10. Hussain, Afzal & Shakeel, Haad & Hussain, Faizan & Uddin, Nasir & Ghouri, Turab. (2020). Unity Game Development Engine: A Technical Survey. University of Sindh Journal of Information and Communication Technology. 4.
11. Cosmina, Cosmina. (2018). A Glance into Virtual Reality Development Using Unity. *Informatica Economica*. 22. 14-22. 10.12948/issn14531305/22.3.2018.02. [CrossRef]
12. "Design and Analysis of Raspberry Pi Based Voice Communication System" Volume 4, Issue 6, June-2022, pp: 816-824 in International journal of Advances in Engineering and Management (IAEM) ISSN: 2395-5252.

AUTHORS PROFILE



Mr. Indra Kishor working as an Assistant Professor in Poornima Institute of Engineering & Technology Computer Engineering Department has total 13+ years' experience in Teaching and Industry. Mr. Indra has completed dual master's degree M.Tech.(CSE), MBA(IT), B.Tech & Diploma in CSE. Has great researcher in every new commerce Technology like AR/VR, IoT,

ML, AI & etc. also published more than 18 research paper in different conference, national and International Journals. While has an education you tube channel in which many technical video uploaded. Mr. Indra also received lot of prize for different activity like he received first position in district Chess championship award also appreciated as jury member of NASA Space app. challenge and received best faculty award from 80 worldwide Institute.



Mr. Kishore Kumar is a student pursuing a B.Tech degree in Computer Engineering from the Department of Computer Science at Poornima Institute of Engg & Tech 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 HTC Vive Pro2 Kit Headset. He has developed strong skills in programming languages such as Python and C#, game development platform Unity 3D, and the use of virtual and augmented reality technology with the HTC Vive Pro2 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 with MySQL displays her versatility in different areas of computer engineering.



Harsh Bansal is a dedicated B.Tech student in Computer Engineering at Poornima Institute of Engg & Tech in Jaipur. He has a broad range of expertise in various fields such as Machine Learning, Deep Learning, Natural Language Processing, Python, Virtual Reality, Augmented Reality, C# programming Language, Unity 3D, and HTC Vive Pro2 Kit Headset. He has honed his programming skills in languages like 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.

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