Indian Journal of Computer Science and Technology
https://www.doi.org/10.59256/indjcst.20250402017
Volume 4, Issue2 (May-August 2025), PP: 152-156.
www.indjcst.com
ISSN No: 2583-5300

Development of an Immersive Virtual Campus Tour Using Virtual Reality Technology

Rohit Rangari[1], Anay Moharil[2], Aditya Yerpude[3], Kunal Prajapati[4], Nishikesh Bhagat[5]
[1,2,3,4,5] *Information Technology, St. Vincent Pallotti College of Engineering and Technology, Jamtha, Maharashtra, India.*

To Cite this Article: *Rohit Rangari[1], Anay Moharil[2], Aditya Yerpude[3], Kunal Prajapati[4], Nishikesh Bhagat[5], "Development of an Immersive Virtual Campus Tour Using Virtual Reality Technology", Indian Journal of Computer Science and Technology, Volume 04, Issue 02 (May-August 2025), PP: 152-156.*

Abstract: *This paper presents the implementation of an immersive virtual campus tour designed to provide users with an interactive 3D experience of our college environment. Utilizing virtual reality technology, the application allows prospective students, parents, and stakeholders to explore key areas of the campus remotely and realistically. The system is developed using modern game development tools and tested on VR hardware to ensure smooth user interaction and intuitive navigation. This virtual tour aims to enhance accessibility, promote institutional visibility, and offer a scalable solution for digital campus engagement.*

Keywords: *Immersive Learning, Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR).*

I.INTRODUCTION

Campus tours are an important way for prospective students and their families to get a feel for a college—its atmosphere, facilities, and overall environment. But visiting in person is not always possible, especially for those who live far away or face time constraints. That is where virtual reality (VR) can make a real difference, offering a more flexible and engaging way to explore a campus from anywhere. This project is about creating a virtual campus tour that lets users move around and explore the college in a fully 3D environment. We have developed it using Unity 2022.3 and tested it with a VR headset to make sure it feels natural and easy to use. The tour includes key parts of the campus like academics blocks, workshop, cafeteria, and outdoor multifacility areas—giving users the freedom to look around and interact at their own pace. The idea behind this project came from the need to modernize how colleges present themselves to the outside world. Whether it is for students who cannot travel, alumni wanting to revisit, or event attendees looking to familiarize themselves with the space, this virtual tour offers a convenient and visually rich solution. It can also be a valuable tool for admissions teams and college marketing efforts, providing a tech-driven way to reach more people in a memorable way. By using VR, this project opens new ways for the college to connect with future students and visitors. It is a step toward making campus visits more accessible, interactive, and in tune with the digital age.

II.MATERIAL AND METHODS

Study Design: This project is an exploratory, application-based development study focused on the design and implementation of a virtual reality (VR)-enabled campus tour. It is a technology-driven project aimed at creating an immersive and interactive digital representation of the college infrastructure.

Study Location: The entire project was centered around our own college campus. We used real-life locations like academic blocks, labs, auditoriums, and open areas as the reference for building the virtual spaces. These were carefully selected to give viewers a comprehensive and engaging virtual walkthrough.

Study Duration: 4 January 2025 to 29th April 2025.

Tools and Technology: The application was developed using Unity version 2022.3, a widely-used game development engine with robust support for 3D rendering and VR integration. The project used built-in VR support tools for scene building, navigation systems, lighting, and interaction design. For VR testing and deployment, a Meta Quest headset was utilized, allowing real-time immersive interaction with the virtual environment. The project also leveraged standard 3D modelling tools (e.g., Blender, SketchUp) for asset creation and optimization.

Content Development Process: The virtual tour includes multiple interactable zones within the campus, each recreated in a 3D environment based on actual floor plans and reference images. The development followed these key stages:

1. **Data Collection and Planning**
   - Collection of campus blueprints, photographs, and reference videos.

- Identification of key landmarks and navigation paths within the campus.
- Planning of user journey and virtual touchpoints within the tour.

2. 3D Modelling and Environment Setup

- Custom modelling of buildings and landscapes using Blender and/or Unity.
- Texture mapping and lighting were applied to enhance realism.
- Navigation zones will be used for mapping, using Unity's NavMesh for seamless movement.

3. VR Integration and Testing

- Implementation of VR interaction scripts for user teleportation, gaze interaction, and scene transitions.
- Testing was carried out using Meta Quest devices in both standalone and tethered modes to ensure compatibility and performance.
- User interaction was refined to avoid motion sickness and ensure intuitive controls.

Subjects & selection method: The idea for this project emerged from several discussions with our college management and admissions team. During these conversations, a recurring observation stood out—many parents and prospective students expressed a strong interest in exploring the campus infrastructure before making decisions about admission. The existing methods, such as brochures or introductory videos, often fell short in providing a truly immersive or realistic understanding of the college environment.

This feedback sparked the motivation to create something more experiential and interactive. Rather than following a traditional survey or data-driven approach, we focused on identifying a real and recurring need: a better way to showcase the college's spaces and facilities. The result was a collaborative concept that brings together immersive technology from the emerging Industry 5.0 framework with the informative value of a campus promotional video.

By translating this concept into a VR experience, we aimed to provide an engaging and accessible alternative to physical campus visits—one that could support admissions outreach, marketing efforts, and general campus awareness in a more impactful way.

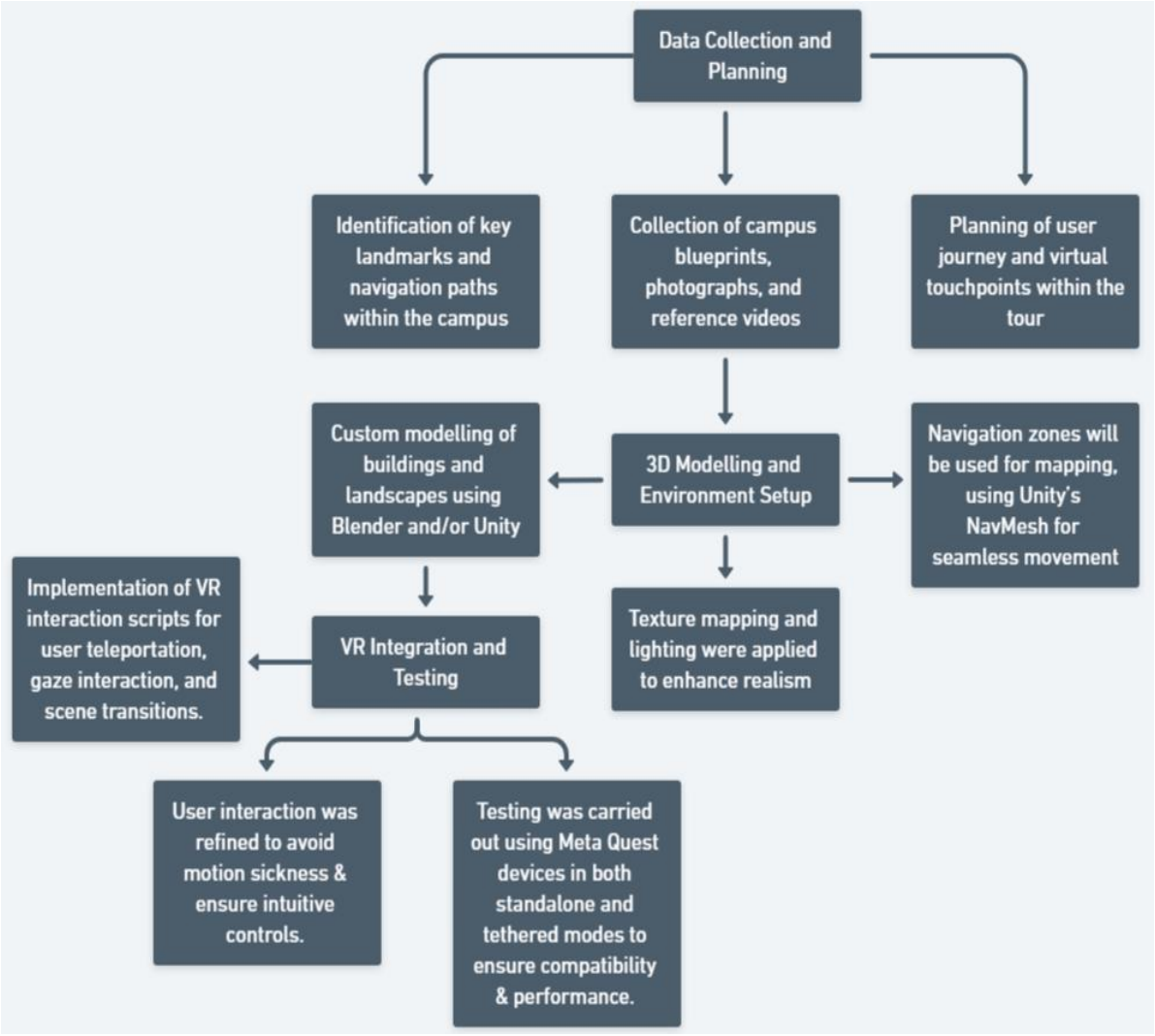

Figure no 1: Development Workflow of the VR College Tour Project

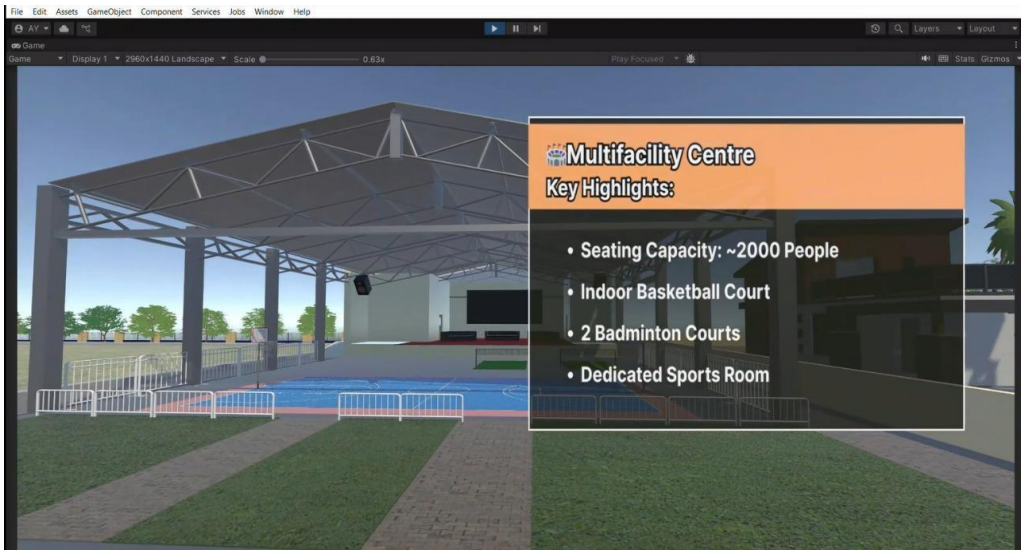

Figure no 2: Implementation Snapshots (1)

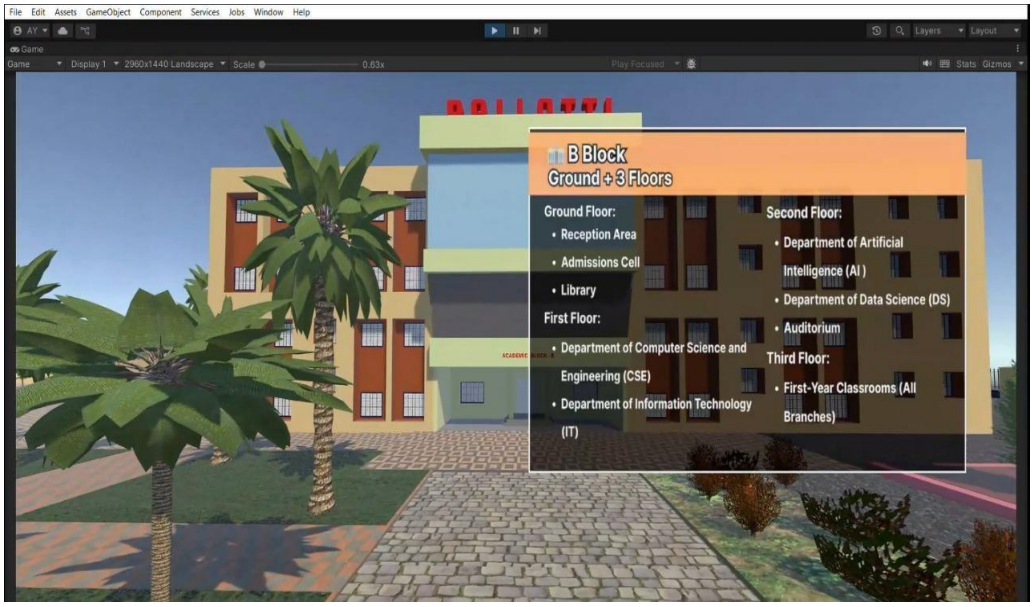

Figure no 3: Implementation Snapshots (2)

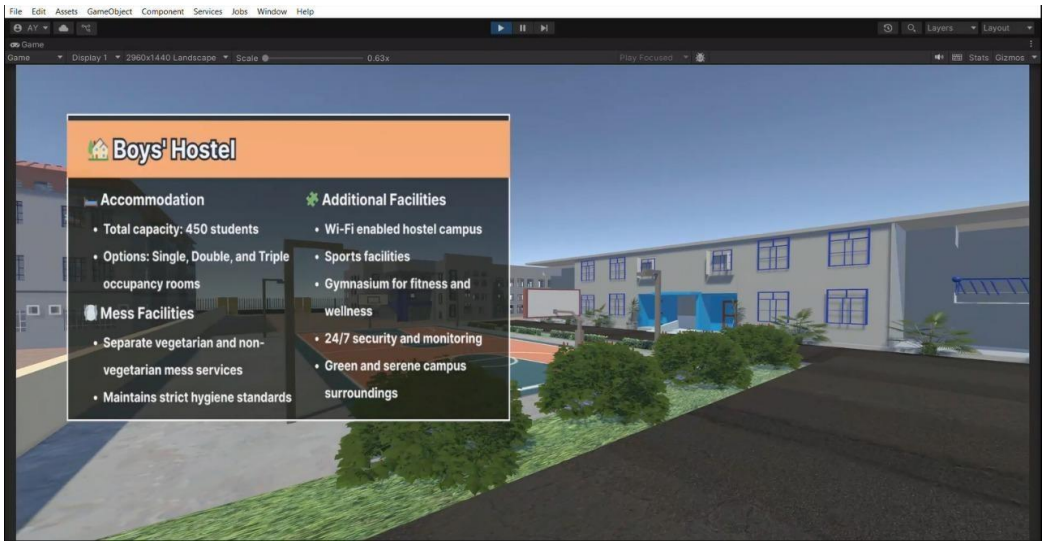

Figure no 4: Implementation Snapshots (3)

CameraMovement.cs

D: > Projects > MetaQuestVRCollegeTour > Assets > Scripts > CameraMovement.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class CameraMovement : MonoBehaviour
{
    public float moveSpeed = 5f;
    public float mouseSensitivity = 2f;

    private float pitch = 0f;
    private float yaw = 0f;

    void Start()
    {
        // Lock and hide cursor
        Cursor.lockState = CursorLockMode.Locked;
        Cursor.visible = false;

        // Initialize rotation
        yaw = transform.eulerAngles.y;
        pitch = transform.eulerAngles.x;
    }

    void Update()
    {
        // Mouse look
        float mouseX = Input.GetAxis("Mouse X") * mouseSensitivity;
        float mouseY = Input.GetAxis("Mouse Y") * mouseSensitivity;

        yaw += mouseX;
        pitch -= mouseY;
        pitch = Mathf.Clamp(pitch, -89f, 89f);

        transform.rotation = Quaternion.Euler(pitch, yaw, 0f);

        // WASD movement
        float moveZ = Input.GetAxis("Vertical");   // W/S
        float moveX = Input.GetAxis("Horizontal"); // A/D

        Vector3 move = (transform.forward * moveZ + transform.right * moveX) * moveSpeed * Time.deltaTime;
        transform.position += move;
    }
}
```

Figure no 5: Implementation Snapshots (4)

TriggerUIPanel.cs

D: > Projects > MetaQuestVRCollegeTour > Assets > Scripts > TriggerUIPanel.cs

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class TriggerUIPanel : MonoBehaviour
{
    public GameObject panelToShow;        // Assign the UI Panel
    public AudioClip showPanelSound;      // Assign the audio clip
    public string cameraTag = "MainCamera";

    private AudioSource audioSource;

    void Start()
    {
        // Create an AudioSource on this GameObject (trigger zone)
        audioSource = gameObject.AddComponent<AudioSource>();
        audioSource.playOnAwake = false;
    }

    void OnTriggerEnter(Collider other)
    {
        if (other.CompareTag(cameraTag) && panelToShow != null)
        {
            panelToShow.SetActive(true);

            if (showPanelSound != null)
            {
                audioSource.clip = showPanelSound;
                audioSource.Play();
            }
        }
    }

    void OnTriggerExit(Collider other)
    {
        if (other.CompareTag(cameraTag) && panelToShow != null)
        {
            panelToShow.SetActive(false);
        }
    }
}
```

Figure no 4: Implementation Snapshots (3)

III.RESULT

After a focused development cycle of approximately four months, the initial prototype of the virtual campus tour was successfully completed. The prototype included detailed 3D models of key college areas such as the main building, auditorium, multi facility center, workshop, library, and central open spaces. Each structure was designed to reflect the actual architecture and spatial layout of the campus, aiming to provide a realistic and immersive navigation experience. The virtual environment was tested using a standalone VR headset, allowing for full 6DoF (six degrees of freedom) interaction. Users could move freely within the campus, teleport to key points of interest, and interact with designated hotspots that provided contextual information (e.g., details about lab facilities or academic programs). These interactive features were added to mimic the experience of a guided physical tour. Informal usability testing among a small group of faculty and students provided initial impressions on comfort, clarity, and navigation. Feedback indicated that users found the experience intuitive, engaging, and far more informative than a static video or image gallery. The VR experience was also reported to enhance spatial understanding of the campus, particularly among those unfamiliar with the layout.

In terms of performance and technical benchmarks, the final build maintained a stable frame rate of 72 FPS on Meta Quest devices, with optimized assets ensuring smooth rendering without compromising visual quality. The application build size remained under 500 MB, making it easily distributable. This phase of development validated the potential of using immersive technology to transform traditional campus tours into interactive and user-driven experiences. The results support the feasibility and relevance of integrating VR into institutional outreach, especially in a post-pandemic context where virtual accessibility has become increasingly important.

Table no 1: Key Components and Implementation Summary of the VR Campus Tour.

Component	Description
Development Duration	~4 months (Initial prototyping, 3D modelling, and VR integration)
Platform Used	Unity 2022.3
VR Device Tested On	Meta Quest Series
Key Areas Modelled	Main Building, Workshop, Cafeteria, Hostel Facility, Multifacility Center, Open Spaces
Interaction Features	Teleportation, Info Hotspots, Free Navigation
Optimization Achieved	72 FPS stable performance on Meta Quest, <500 MB build size
Testing Method	Informal internal feedback from faculty and students
Reported Feedback	Engaging, realistic, easy to navigate, more effective than traditional videos

IV.DISCUSSION

The development of a Virtual Reality (VR) campus tour was initiated in response to practical insights gathered through discussions with college management and admissions personnel. A recurring observation was the need for an engaging and informative way to showcase the college's infrastructure to prospective students and their families—many of whom cannot physically visit the campus. Traditional video tours, while helpful, often lack interactivity and immersion. This motivated us to create a more dynamic alternative using immersive technologies aligned with Industry 5.0 principles.

Our approach integrates an explorable 3D campus model with interactive elements, offering a self-guided tour experience. The use of Unity and Meta Quest for development and deployment ensured cross-platform compatibility and efficient performance. Teleportation-based navigation, contextual information hotspots, and optimized assets contributed to both user engagement and performance stability.

One of the notable takeaways from our testing phase was the user feedback on interactivity. While conventional video tours present a linear narrative, our VR model allows users to explore spaces at their own pace. This aspect was particularly appreciated during internal trials, where faculty and students highlighted the increased sense of presence and orientation. In terms of production pipeline, the project required approximately four months for the creation of 3D assets, basic VR setup, and experience polish. A modular development approach was adopted to allow future expansion—such as the addition of voice-over guides, multilingual support, or even a live virtual interaction feature with admission counselors.

While the experience successfully meets the core objective of providing a virtual glimpse of the campus, further improvements are planned. These include integration of real-time data for events or admissions, dynamic weather and lighting conditions to mimic different times of the day, and a mobile/WebXR version for broader accessibility.

Overall, the project demonstrates how immersive technologies can enhance institutional outreach and engagement. It serves not only as a prototype for our own institution but also as a scalable model that other colleges could adopt or customize.

V.CONCLUSION

This project was a step toward blending technology with education to create a more engaging and informative experience for college visitors. By using Virtual Reality, we were able to give prospective students and parents an immersive look at the campus facilities, helping them make more confident decisions. The journey from asset creation to a fully functional VR experience taught us a lot about collaboration, design, and technical implementation. While this is just the beginning, we believe this kind of interactive solution has the potential to redefine how institutions present themselves in the digital age.

References

1. *Radianti J, Majchrzak TA, Fromm J, Wohlgenannt I. A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. Computers & Education. 2020;147:103778.*
2. *Jensen L, Konradsen F. A review of the use of virtual reality head-mounted displays in education and training. Education and Information Technologies.2018;23(4):1515–1529.*
3. *Akçayır M, Akçayır G. Advantages and challenges associated with augmented reality for education: A systematic review of the literature. Educational Research Review. 2017;20:1–11.*
4. *Kavanagh S, Luxton-Reilly A, Wuensche B, Plimmer B. Creating a Virtual Reality First Year Engineering Experience. Proc. of the 29th Australian Conference on Computer-Human Interaction. 2017;128–132.*
5. *Alhalabi W. Virtual reality systems enhance students' achievements in engineering education. Behaviour & Information Technology. 2016;35(11):919– 925.*
6. *Freina L, Ott M. A literature review on immersive virtual reality in education: State of the art and perspectives. eLearning and Software for Education.2015;1:133–141.*
7. *Jerald J. The VR Book: Human-Centered Design for Virtual Reality. ACM and Morgan & Claypool. 2015.*
8. *Slater M, Sanchez-Vives MV. Transcending the self in immersive virtual reality. Computer. 2014;47(7):24–30.*
9. *Bailenson JN. Infinite Reality: Avatars, Eternal Life, New Worlds, and the Dawn of the Virtual Revolution. HarperOne. 2012.*
10. *Mikropoulos TA, Natsis A. Educational virtual environments: A ten-year review of empirical research (1999–2009). Computers & Education.2011;56(3):769–780.*
11. *Pantelidis VS. Reasons to use virtual reality in education and training courses and a model to determine when to use virtual reality. Themes in Science and Technology Education. 2009;2(1-2):59–70.*
12. *Milgram P, Kishino F. A taxonomy of mixed reality visual displays. IEICE Transactions on Information and Systems. 1994;E77-D(12):1321–1329.*