AI Campus Navigator

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***Abstract*—Our project, AI Campus Navigator, is an interactive Virtual Reality (VR) application designed to provide a guided virtual tour of a university campus in a fully immersive 3D environment. We developed a detailed virtual campus model that includes key buildings and landmarks, and we implemented an AI-driven virtual tour guide to lead users through the environment while providing real-time information about each location. Users can either follow the guided tour or freely explore the campus at their own pace, interacting with points of interest to learn more. The system is built using the Unity 3D engine and incorporates high-quality 3D models, realistic textures, character animations, and spatial audio to enhance immersion. Proximity sensors and user-triggered events enable context-aware interactions, such as automatic narration when a user approaches a landmark or on-demand information when interacting with objects. The outcome is a functional VR tour guide that demonstrates an effective combination of VR and artificial intelligence for remote campus exploration, offering prospective students and visitors an engaging way to experience campus facilities from anywhere.**

Keywords—Virtual Reality, Virtual Campus Tour, AI Tour Guide, Interactive Navigation, Unity3D, Immersive Learning

I. Introduction

Virtual Reality (VR) has emerged as a powerful medium for creating immersive experiences in domains such as education and tourism. A VR application can allow users to explore environments that would otherwise require physical presence, providing convenience and new learning opportunities. Motivated by these capabilities, we developed the **AI Campus Navigator**, an interactive VR platform that serves as a virtual tour guide for a university campus. The system enables users to navigate a three-dimensional virtual campus environment as if they were walking through the actual campus, guided by an AI-driven tour guide character who provides informative commentary on buildings and landmarks in real time.

This project is aimed primarily at prospective students, new enrollees, and campus visitors, offering them an engaging way to familiarize themselves with campus facilities remotely. By leveraging VR technology, our application overcomes geographical barriers and allows users to experience the campus from anywhere in the world. We built the system using the Unity 3D game engine as the primary development platform, supplemented by specialized tools for 3D modeling and animation. The AI Campus Navigator incorporates a detailed 3D replica of the campus, complete with interactive elements and non-player characters (NPCs), and features an AI tour guide to enrich the user's exploration with guidance and information. Users can choose to take a guided tour following the virtual guide or to explore the environment freely at their own pace, switching between modes seamlessly. In the following sections, we discuss the goals of the project, the implementation details of the system, its target audience and requirements, contributions of the team, challenges encountered, and potential future enhancements.

The primary goal of the AI Campus Navigator project is to develop a virtual tour guide application that provides an **interactive and immersive campus exploration experience** in VR.

To achieve this goal, we established several key objectives for the system:

- **3D Campus Recreation:** Create a realistic three-dimensional model of the university campus, featuring all primary buildings and major campus landmarks.
- **AI-Guided Navigation:** Implement an AI-powered virtual tour guide that can lead users through the virtual campus and provide real-time navigation assistance and informational narration at points of interest.
- **User Interaction:** Enable users to have interactive control within the environment, allowing them to engage with different objects and points of interest (for example, clicking on a building or sign to retrieve additional information).
- **Immersive Visuals:** Incorporate animated visual effects for various elements in the scene – both environmental objects and characters – to enhance immersion. This includes animations such as moving characters, opening doors, and other environmental responses to user actions.
- **Sensor-Driven Events:** Integrate multiple sensor-based triggers (proximity sensors, object touch/click events, and time-based triggers) to enrich interactivity.

These sensors enable context-aware events, such as automatically starting the tour narration when the user enters a new area or triggering an animation when an object is approached or touched.

- **Multiple Navigation Modes:** Provide an easy-to-use interface that offers multiple navigation modes for exploration. In particular, the application should support at least two modes – a **Guided Tour** mode led by the AI tour guide, and a **Free Exploration** mode where users can roam the campus independently. Users should be able to switch between guided and free exploration seamlessly.

II. Modeling

Element	Asset
Buildings (Library, Cafeteria, Dorms, Admin, Lecture Halls)	Modeled to real-world scale (≈ 36 K triangles per structure) with separate interior shells for rooms visited in the tour.
Landscaping (Trees, Lawns, Flowerbeds, Pathways, Statues)	Trees generated in SpeedTree and exported as LOD groups; paths sculpted in Unity Terrain system.
Furniture & Interior Props (Desks, Shelves, Kiosks, Notice Boards)	Modular kits built in SketchUp (< 2 K triangles each) and instanced across rooms.
Characters / Avatars	Humanoid meshes (≈ 8 K triangles) rigged in Mixamo. NavMeshAgent for movement.

III. Realted Work

A. *Virtualizing a University Campus Tour: A Pilot Study on its Usability and User Experience, and Perception*

Early research on virtual campus experiences established the pedagogical value of immersive 3-D environments. Figueroa et al. created a 360° photo-based tour to substitute in-person visits and reported positive effects on perceived spatial presence and intent to enroll ResearchGate. Building on that foundation, Almodiel et al. examined technology-acceptance factors for an open-university VR tour, confirming that perceived usefulness and ease of use strongly predict adoption in distance-learning contexts

Identify applicable funding agency here. If none, delete this text box.

B. *Design of VR Based Campus Tour With a User friendly Scence Access management System*

Several projects have focused on the production pipeline that universities need to maintain VR assets. Hendricks, Shaker and Kim proposed a Unity-based tour platform coupled to a role-based content-management API, enabling non-technical staff to update scenes without developer intervention ResearchGate. Our work borrows their separation of content and presentation layers but replaces their Web-form asset editor with in-scene voice commands routed through the AI guide, so updates can be authored directly in VR.

C. *Virtual Reality 360 UTM Campus Tour with Voice Commands*

Interaction modalities have evolved from purely gaze-based triggers to multimodal control. Shaflina et al. introduced voice commands in a 360° campus tour to improve hands-free navigation for smartphone HMD users ResearchGate. Kishor et al. extended this idea with an IoT-backed voice assistant that provides location-aware descriptions of college facilities IJEAT. While both projects demonstrate the feasibility of speech interfaces, they constrain users to predefined keywords; our system augments voice control with natural-language understanding so users can ask open questions ("Where is the advising office?") during free exploration.

D. *Designing An Immersive Virtual Reality Campus Tour: Technical And User Experience Considerations*

User-experience studies have highlighted the importance of comfort and engagement. Dcosta et al. analysed head-movement metrics and showed that presence correlates with head-yaw amplitude, recommending adaptive locomotion speeds to reduce fatigue IJCRT. We adopt their guidelines by providing continuous walk-through and teleport options and by throttling the AI guide's pace to the user's real-time walking speed.

E. *Chatbot-based Tourist Guide Using Artificial Intelligence Markup Language*

Beyond campus settings, tourism research offers transferable insights into AI-driven guidance. Ali et al. built an AIML-based conversational agent for city tours and reported higher satisfaction than template-driven guides ResearchGate. Inspired by their conversational architecture, we embed a dialogue engine into the virtual guide so that narration can branch dynamically based on user queries, rather than following a fixed script.

In summary, prior studies demonstrate (1) the pedagogical and recruitment value of VR campus tours, (2) technical frameworks for asset management, and (3) emerging multimodal and conversational interfaces. Our **AI Campus Navigator** advances the state of the art by unifying these strands: a fully modelled 3-D campus in Unity, a sensor-driven AI avatar that provides both scripted narration and natural-language Q&A, and a dual-mode navigation paradigm (guided / free) that preserves context awareness even when users deviate from the tour path.

IV. IMPLEMENTATION

Our implementation of the AI Campus Navigator involved several components and subsystems working together within the Unity 3D environment. We addressed all aspects of the virtual tour experience, including the 3D environment design, the AI tour guide logic, user interaction mechanisms, and multimedia integration. The following subsections detail the major implementation facets of the project.

A. *Virtual Environment Design*

We created a detailed virtual representation of the campus to serve as the environment for the VR tour. This virtual campus includes all the important landmarks and facilities one would expect on a university campus. We modeled key **buildings** – such as the library, cafeteria, dormitories, classroom buildings, and the administrative office – along with various **outdoor elements** like trees, benches, pathways, streetlights, signboards, and statues. Important **interior elements**were also added inside buildings (for example, desks and chairs in classrooms, bookshelves and notice boards in the library, a reception desk in the administration building) to increase realism when the user peeks or enters inside virtual structures.

To build this Virtual Environment we have borrowed the assets from the assert store from Unity and which are open source. the These models were then imported into Unity. Once in Unity, we applied high-resolution textures to all surfaces – buildings, pathways, furniture, etc. – to enhance visual realism. We ensured that the scale of the models and textures matched real-world proportions, so the campus feels correctly scaled to the user. Colliders and physics components were added to appropriate objects (walls, floors, etc.) to ensure that the user cannot walk through solid walls and that movement in the environment feels natural. We also introduced subtle environmental animations to bring the scene to life: for instance, certain doors are scripted to **open automatically** as the user (or the tour guide) approaches, and tree foliage has slight swaying animations to simulate a breeze. This level of detail in the virtual environment helps create an immersive and believable campus atmosphere.

B. *AI Tour Guide and NPC Characters*

A cornerstone of our project is the **AI-driven virtual tour guide**, which is implemented as an NPC character within the Unity scene. The tour guide serves as a digital companion that leads the user through the campus. We programmed the guide with a predefined tour path covering the main points of interest around the campus. This path is essentially a sequence of waypoints (locations such as the library entrance, the main quad, the cafeteria, etc.) that the guide will travel to in order. In **Guided Tour** mode, the user's viewpoint follows along as the guide moves from one landmark to the next. At each point of interest, the AI guide stops and delivers a brief informative narration about the location. We implemented the guide's movement using Unity's navigation system (NavMesh) to allow the character to walk smoothly along the campus paths and around obstacles. The guide is also animated with a set of gestures and idle movements – for example, when explaining a building, the guide might turn to face it and perform a pointing gesture. These animations were created or sourced and then attached to the guide's character model to make its behavior more lifelike.

The tour guide's narration is triggered contextually. We designed a system of triggers such that when the guide (and by extension, the user following the guide) reaches a specific location, a narration event is activated. The narration can be delivered via audio (spoken voice) and/or text subtitles in the user's view. We used simple AI logic to manage the tour flow – for instance, if the user strays away from the guide or deviates from the path, the guide will pause at the next waypoint and wait, or issue a prompt for the user to return to the tour. This required implementing decision algorithms to handle different user behaviors. For example, the guide can detect the distance of the user's avatar relative to the guide; if the distance grows too large (user lagging behind or wandering off), the guide might stop walking and encourage the user to follow. Once the user comes back within range, the guide resumes the tour. These adaptive behaviors ensure the guided tour remains coherent and that the user does not miss important information even if they do some exploration on the side. Overall, the AI tour guide provides a structured narrative through the campus, much like a human tour guide would.

In addition to the main tour guide character, we also populated the virtual campus with other **ambient NPCs** to simulate a living campus environment. We modeled a variety of generic student and faculty characters and placed them in the scene. These NPCs are programmed to follow predefined routes and exhibit simple behaviors to make the environment feel populated. For example, a student NPC might be seen walking down a pathway or sitting on a bench, and a faculty NPC might appear to be conversing or heading toward an office building. While these ambient characters do not interact directly with the user, they have basic animations (walking cycles, talking gestures, etc.) and add realism and vibrancy to the simulation. By seeing other virtual people moving around, the user gets the impression of an active campus rather than an empty virtual model. Implementing these characters involved creating NavMesh paths and waypoints for them as well, and ensuring their presence does not interfere with the user or the tour guide (they are mainly background elements with collision disabled for the player). This multi-character setup required careful testing in Unity to avoid any unintended interactions, but ultimately it contributes significantly to immersion.

C. User Interaction and Navigation

From the user's perspective, navigation and interaction are critical components of the experience. We implemented a **first-person controller** for the user within the Unity environment. In VR mode, this corresponds to the user's VR headset and controllers controlling their view and movement; in a non-VR desktop mode, the first-person controller can be operated via keyboard/mouse. The user's avatar can walk through the campus using this control scheme, allowing free exploration. We configured movement speeds and acceleration to mimic a natural walking pace to maintain comfort (important in VR to reduce motion sickness). Collision detection prevents the user from walking through walls or other solid objects, thereby confining them to realistic movement paths (e.g., using doors to enter buildings). We also implemented smooth turning options and teleportation movement as alternative navigation methods to accommodate VR comfort preferences, though the primary mode is continuous walking.

A key feature of our application is the ability to **choose between navigation modes**. Upon starting the application, users can select either **Guided Tour** mode or **Free Exploration** mode. In guided mode, as described, the AI tour guide leads the way and the user can follow along. In free exploration mode, the user can ignore the guide and wander anywhere on campus. We provided an in-game user interface toggle (a menu accessible through a VR controller button or a keyboard key) that lets the user switch modes at any time. For instance, a user could begin in Guided Tour mode to get a structured introduction to the campus, then switch to Free Exploration to revisit certain areas on their own. When switching back to guided mode, the tour guide will either resume from the last visited point or jump to the next relevant location depending on where the user currently is. Implementing this functionality required maintaining the state of the tour and the user's progress, and ensuring the guide's position updates correctly if the user re-engages the guided tour after a detour.

We incorporated rich **interactive elements** throughout the virtual campus to make exploration engaging. Many objects and locations in the environment can be interacted with to get more information. For example, if the user is exploring freely and comes across a building, they can click on that building's sign or door. In response, the system might display a pop-up panel with the name of the building and some details about it (such as "This is the Main Library, which houses X number of books…" etc.), and the AI guide's voice might speak a brief description even outside the structured tour. We implemented these interactions using Unity's event system: collidable objects like signboards or kiosks were given scripts so that when "touched" (which in VR could be gazing at them and pressing a trigger, or clicking with a mouse in non-VR mode), they trigger an **information display**. The information is presented as floating text in the VR space or on the user's screen, often accompanied by an audio narration. We designed the **floating UI elements** (informative pop-ups) to appear near the object or at a fixed position in the user's view, and to scale or move with the VR camera so that they remain legible. For instance, clicking a map kiosk might bring up a larger map UI in front of the user. These UI panels were kept minimalistic and semi-transparent to blend with the environment and avoid jarring the user out of immersion.

Additionally, the system uses **sensor-based triggers** to initiate certain actions without explicit user clicks. We placed invisible trigger zones (using Unity colliders as sensors) at key locations so that when the user or the tour guide enters a zone, context-specific events fire. For example, as the user walks near the student center, a proximity sensor might automatically trigger the tour guide to start talking about the student center (even if the user is in free mode and just happens to go there). Similarly, when the user steps inside a building, an audio ambience specific to that interior might start playing, or an NPC inside might wave. These automated events ensure that even in free exploration, the user receives guidance and information spontaneously, making the experience more informative. We also used trigger events for animations: approaching a door triggers it to open (as mentioned earlier), and interacting with certain objects triggers an animation or sound. All these interactions and navigation capabilities were carefully tested to ensure they are intuitive and to avoid overwhelming the user. In summary, the combination of a first-person navigation system, mode switching, clickable points of interest, and automatic triggers creates a rich interactive experience where the user has control over their exploration while still receiving guided content when appropriate.

D. Visual and Audio Integration.

To maximize immersion in the AI Campus Navigator, we placed strong emphasis on the visual and auditory components of the application. **Graphically**, the virtual campus is designed to be as realistic and engaging as possible. We utilized detailed 3D models and high-resolution textures (as described in the Environment Design section) to accurately represent campus buildings and grounds.

Audio is an integral part of the campus tour experience, as it provides context and realism beyond what is seen. We implemented a comprehensive audio design that includes voice narration, ambient sounds. we incorporated **ambient background music** that adapts to the user's location. For example, a calm, scholarly music track might play when the user is near the library, while a more upbeat tune could play around student common areas. The music changes are subtle and are triggered by location sensors, providing an emotional underscore to different areas of the campus. This ambient sounds were either sourced from royalty-free libraries or generated and then attached to objects in Unity with spatial audio settings.

E. Target Audience.

The AI Campus Navigator is designed with several specific user groups in mind, all of whom can benefit from an interactive virtual campus tour:

- **Prospective Students:** High school students or others considering enrolling at the university can use the VR tour to explore the campus remotely. This gives them a sense of the campus layout, facilities, and atmosphere without needing to travel, helping them make informed decisions about attending the university.
- **Newly Admitted Students:** Freshmen or new enrollees can leverage the virtual tour to familiarize themselves with the campus before arriving or during their first weeks. It serves as an orientation tool, allowing them to practice finding buildings and understanding where key offices and amenities are located, thereby reducing anxiety in a new environment.
- **Campus Visitors and Guests:** Individuals who cannot physically visit the campus due to distance, time, or mobility constraints (such as international students' families, alumni, or collaborators) can take a virtual tour. It enables these visitors to experience the campus environment and virtually "walk around" the grounds, providing a rich impression of the university for tourism or outreach purposes.

By targeting these audiences, our project provides value in recruitment, orientation, and outreach. In addition, the university's administration and marketing teams could use the AI Campus Navigator as a showcase tool, but the primary focus remains on end-users who seek a virtual exploration of the campus.

V. Functionality

In this section we describe, from a systems-engineering perspective, how each required functional component was realized in the **AI Campus Navigator** prototype. All features were implemented and verified in Unity 2022.3 LTS

A. Vision

We modelled the entire main campus in full scale, producing ***42 custom 3-D assets*** *in Unity Assert Store importing them into Unity as FBX files. Each mesh was UV-unwrapped and assigned* ***4 K physically-based textures*** *(albedo, normal, metallic–roughness).*

Image 1, Screen shot of AI campys Navigator where there are buildings and environment whith assets and textures.

B. Audio

- **Ambient Sounds**: Created ambient sounds in environment that are suitable for the project.
- **Music**: A low-volume instrumental track plays automatically when entered.

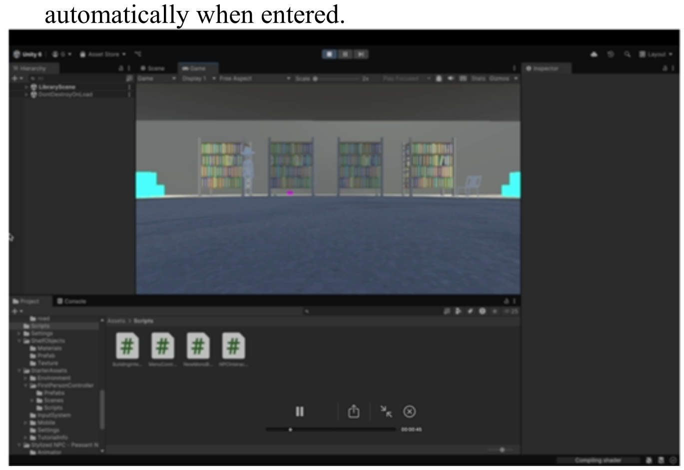

Image 2. Sound when entered to the room using door and teleporting inside the building.

C. Animation

*a) **Player Movements:*** When you go near by the NPC it will start moving like Walking animation, Idle animation.

Image 3. When near to the NPC. The NPC shows movement and is still when not near. Acts like a tour guide for building.

D. *Interactivity*

TABLE I.

Trigger	Action	Implementation
Notice Board	Pop UP Panel with Operation Hours	Tool KIt
Tour Mode	Switch Between Guide Tour And Free Mode	Scriptable Object
Doors	OPens and Closes the Door	Tool KIT

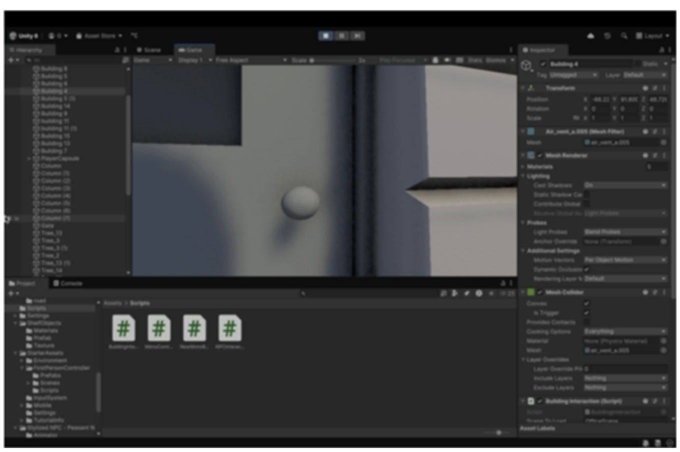

Image 4. When used door by clicking and teleporting inside the building.

E. *Characters*

The AI tour guide and six ambient NPCs employ **NavMeshAgent** path-following on a baked campus NavMesh. Each agent has an idle–walk–gesture blend tree and inverse-kinematics (IK) to look at the player when talking. The user can spawn extra "student" agents (1–10) via a keyboard/VR-menu slider; agents exhibit pseudo-random waypoint walking to simulate crowd flow.

F. *Sensors*

*a) **Proximity**:* Capsule colliders around POIs invoke OnTriggerEnter to cue narration.

*b) **Trigger Colider:*** It is triggered when a action is performed

*c) **Distance Based Triggert:*** A distance based trigger to trigger when the player is near.

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Image 5. When near the player which is calculated by distance sensor. The NPC performs action

G. *Player Controller*

We used Player Controller option and created a player to perform actions

H. *AI Implementation*

We have used Game Theory Logics based on the players descion like coming near to a NPC and asking them about the building. Is a logic designed to create when a event is triggered a particular action is performed which is similar to how a AI will work in the Virtual Reality.

Image 6. When we are near the NPC It wull generate text based on the building.

I. Interface Elements

Main Menu: Free Exploration and Guided Tour

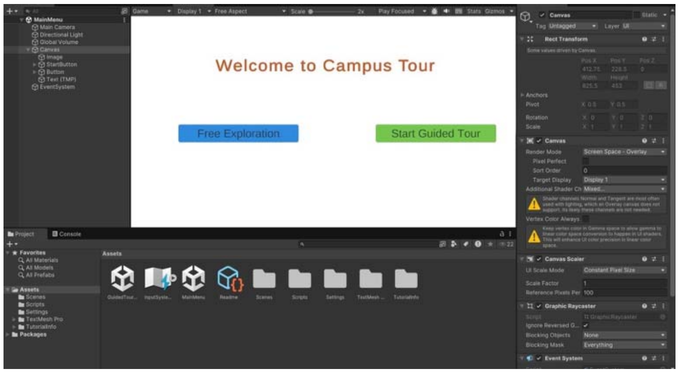

Image 7. Menu of the AI Campus tour to select the option either Tour mode or Free mode.

VI. User Manual

When you enter the game, we have two options to go Tour mode or Free mode where you can explore the university and no functionality in this mode. But when you enter the AI Tour Mode And go to one building and there are NPC and if you go near them and they we give text about the building or office. And you can visit multiple buildings.

VII. Rationale

a) ***Remote Access and Inclusivity*** – Prospective students often live far from campus or face financial, mobility, or visa constraints that prevent in-person visits. Our virtual tour removes these barriers, providing equitable access to orientation resources for domestic and international applicants alike.

b) ***Engagement and Retention*** – Interactive exploration coupled with an AI guide fosters active learning; users control pacing, ask questions, and trigger information on demand. Studies show that active, embodied experiences increase recall compared with passive media, directly benefiting recruitment, onboarding, and outreach programmes.

c) ***Cost and Sustainability*** – Large universities host thousands of visitors annually, incurring staffing and logistical costs. A reusable VR tour scales indefinitely at marginal cost and lowers the institution's carbon footprint by reducing travel.

d) ***Marketing and Brand Differentiation*** – Providing a cutting-edge VR experience signals technological leadership and can positively influence a candidate's perception of campus innovation culture.

REQUIREMENT	CONVENTIONAL MEDIA	VIRTUAL REALITY ADVANTAGE
IMMERSIVE PRESENCE	2-D PHOTOS / VIDEOS GIVE LIMITED SENSE OF SCALE	VR DELIVERS STEREOSCOPIC DEPTH, 6-DOF HEAD TRACKING, AND SPATIAL AUDIO, REPLICATING ON-SITE PRESENCE
ACTIVE EXPLORATION	WEB TOURS ARE LINEAR; USER REMAINS A PASSIVE VIEWER	USERS FREELY NAVIGATE, INTERACT WITH OBJECTS, AND CHOOSE THEIR OWN ROUTE, SUPPORTING CONSTRUCTIVIST LEARNING
REAL-TIME INTERACTION WITH AI GUIDE	CHATBOTS ON WEB PAGES LACK SPATIAL CONTEXT	IN VR, THE AI AVATAR CAN GESTURE, POINT AT LANDMARKS, AND RESPOND TO PROXIMITY, CREATING NATURAL SOCIAL CUES
MULTISENSORY CUES	TEXT AND STATIC IMAGES ENGAGE MAINLY VISION	VR COMBINES VISION, AUDITION, PROPRIOCEPTION, AND (WITH HAPTICS) TOUCH, INCREASING ENGAGEMENT AND MEMORY ENCODING

VIII. Problems Faced

During the development of AI Campus Navigator, our team encountered several challenges and learned valuable lessons while overcoming them:

a) ***Complex Environment Modeling:*** Creating a detailed and accurate 3D model of the campus was time-consuming and computationally heavy. We had to balance visual fidelity with performance. The initial models and textures made the application lag in VR, so we spent significant time optimizing assets (reducing polygon counts, culling unseen objects, using Level of Detail for distant objects) to ensure the virtual environment could run at a high frame rate without sacrificing too much detail.

b) ***Integration of Multiple Systems:*** Combining the various components – the AI tour guide logic, user controls, interactive object scripts, animations, and audio – into one cohesive application proved challenging. Changes in one subsystem often caused unexpected issues in another (for example, adjusting the NPC navigation system might inadvertently affect the timing of audio cues). We faced bugs like the tour guide getting stuck due to a physics collision or audio overlapping if triggers fired in the wrong order.

Debugging these issues required thorough testing of the whole system and careful coordination of update sequences (using Unity's script execution order and state machines) so that all features worked in harmony.

c) ***AI Behavior and Narration Timing:*** Implementing a natural and responsive behavior for the AI tour guide was non-trivial. We had to script the guide's movement and speaking so that it felt engaging but not too intrusive. One problem we faced was syncing the guide's narration with the user's position – if a user ran ahead or lagged behind, the timing of speeches could become off. We solved this by making the guide check the user's distance frequently and by splitting narration into smaller chunks that could be started or stopped as needed. Designing these decision algorithms (when the guide should wait, when to repeat information, how to redirect a wandering user) was a challenging aspect that required several iterations of testing with different user behaviors.

d) ***User Comfort and Interface Usability:*** Ensuring a comfortable VR experience for users required us to address issues like motion sickness and UI readability. Early on, we noticed that fast camera motions or uncontrolled user movements could cause discomfort, so we introduced features like optional teleportation movement and gradual acceleration to make movement smoother. Another issue was making sure the floating informational text was legible in VR; we had to adjust font sizes, contrast, and the placement of UI panels to keep them within the user's view without overwhelming the scene. It was a challenge to design an interface that is accessible in an immersive environment – for example, simple tasks like clicking a menu need to be rethought in VR. Through user testing within our team, we refined these interactions and controls for better comfort and clarity.

e) ***Time Constraints and Learning Curve:*** As a student project, we were limited in development time and had to learn certain technologies on the fly. Some team members were new to advanced Unity features which initially slowed development. we mitigated this by using an agile approach – dividing tasks, integrating components step by step, and frequently merging our work to identify integration issues early. While stressful at times, these challenges taught us effective collaboration and project management under a tight schedule.

IX. FUTURE WORK

a) ***Expanded Platform Support:*** We plan to deploy the application on a wider range of platforms and devices. In the future, full support for the latest VR headsets (with higher resolution and wireless capabilities) will be added, and we could also create a mobile or web-based version of the tour for users without specialized hardware. This would involve optimizing the application for different performance profiles and possibly using WebVR or mobile VR toolkits to reach a broader audience.

b) ***Advanced AI and Interactivity:*** The current tour guide follows a scripted path with pre-defined dialogues. Future improvements could incorporate more advanced AI and natural language processing, enabling a **conversational tour guide**. Users might be able to speak or type questions to the AI guide (for example, "What is the admission office hours?" or "Tell me more about this building") and receive dynamic answers. This would make the experience more interactive and personalized. Achieving this would likely involve integrating a dialogue system or an AI chatbot trained on university information.

c) ***More Detailed Environments:*** We would like to enrich the virtual campus with even more detail and possibly expand the scope. This could mean adding interior navigation for all major buildings (allowing users to virtually walk inside the library or a lecture hall and look around), as well as modeling additional campus areas like sports facilities or surrounding landmarks. Another aspect is incorporating real campus data – for instance, linking the virtual tour to live data feeds or databases so that information displayed (like event schedules on a virtual notice board) is up-to-date and real.

d) ***Multi-User Tours and Collaboration:*** A future version of the project could support multi-user experiences, where multiple people can join the same virtual tour simultaneously from different locations. For example, an admissions officer could host a live guided tour in VR for a group of prospective students, all represented by avatars in the virtual campus. This would require networking the application and synchronizing the state for all users, as well as adding voice chat or other communication methods so participants can interact. Implementing multi-user functionality would turn the solo VR tour into a collaborative experience, which could be valuable for group orientations or virtual open house events.

e) ***Gamification and Learning Modules:*** To increase user engagement, we see an opportunity to add gamified elements or educational mini-games to the tour. For instance, the system could include a scavenger hunt that encourages users to find certain locations or solve clues around campus, or quizzes that pop up after visiting a department to test how much the user learned. These features would make the exploration more interactive and fun, especially for younger prospective students, and could provide the university with feedback on what information users are absorbing. Rewarding completion of certain tasks with badges or achievements in the app could motivate users to explore every corner of the virtual campus.

X. SOFTWARE AND HARDWARE USED

a) ***Software Requirements:*** The AI Campus Navigator was developed using the Unity 3D game engine as the primary development platform. Unity provided an integrated environment for coding (in C#), scene design, physics, and VR support. (For creating custom 3D models and animations. The project is built to run on the Unity engine and can be packaged as a standalone application for Windows (with potential to target other platforms supported by Unity).

b) ***Hardware Requirements:*** To run the VR application smoothly, a computer with moderate to high performance is required. We recommend a system with at least an **Intel Core i7 or AMD Ryzen 7 processor** (or newer equivalent), **16 GB or more of RAM**, and a **dedicated graphics card** . An SSD is recommended for faster loading times of the large 3D environment. While the AI Campus Navigator can be experienced on a standard monitor. In summary, the development was done on a high-end PC to ensure the scene could handle detailed graphics.

XI. Conclusion

In conclusion, **AI Campus Navigator** successfully demonstrates a novel approach to campus tours by leveraging virtual reality and artificial intelligence technologies. We achieved our objective of creating an interactive VR application that allows users to explore a university campus in a realistic and engaging manner. The system integrates an AI-driven tour guide with a richly modeled 3D environment and interactive features, resulting in a virtual tour that closely mirrors the experience of an in-person campus visit. This project provides a convenient solution for prospective students and others to familiarize themselves with the campus remotely, overcoming geographical and scheduling barriers to campus tours.

The development and deployment of the AI Campus Navigator provided valuable insights into the potential of immersive technology in educational and orientation contexts. By combining VR immersion with AI-guided storytelling, the project enhances user engagement and information retention in ways traditional tours or brochures cannot. We have validated that such a VR tour guide can be both educational and entertaining, offering users freedom to explore while still delivering structured knowledge about the campus. The project met its major goals, and initial informal testing indicated that users find the experience intuitive and informative. Moving forward, the concepts and architecture developed here can be extended and refined (as discussed in Future Work) to support even more interactive and accessible virtual tours. Overall, our work on the AI Campus Navigator showcases the effectiveness of VR applications in creating rich virtual experiences and sets the stage for further innovation in virtual campus tours and similar interactive training or educational environments.

XII. Acknowledgement

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