



CampusNav3D

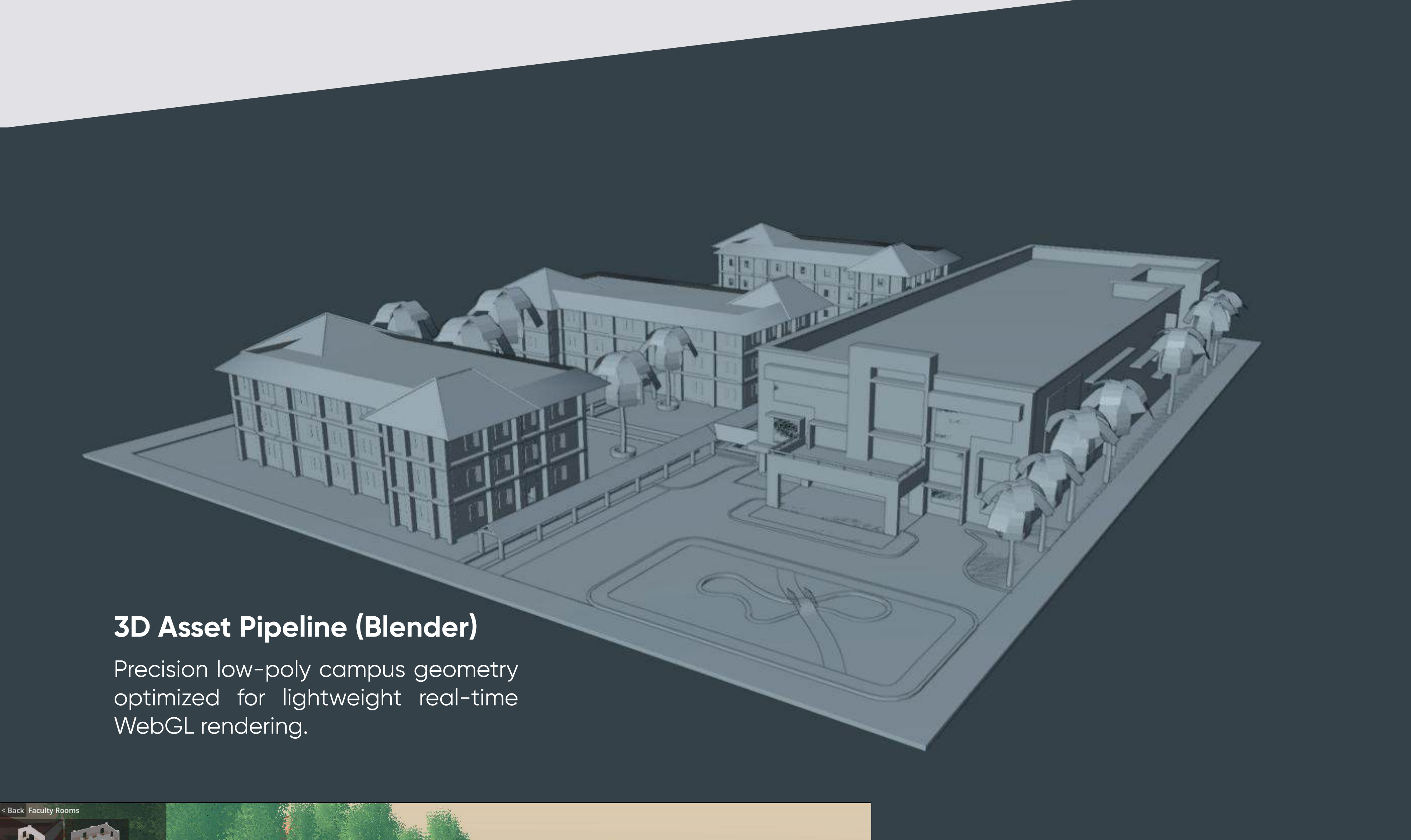
Interactive 3D Campus Wayfinding & Mobile Sync

Project Overview

An interactive WebGL-based **3D campus wayfinding application** designed for touchscreen kiosks and mobile devices. The system replaces static 2D maps with a dynamic, multi-level 3D spatial view that highlights optimal paths through complex campus structures and bridges kiosk interaction with **personal smartphones** via real-time **QR session handoff**.

Key Technical Features

- **Dynamic 3D Pathfinding & Route Mesh:** Utilizes Godot's NavigationServer3D and custom ImmediateMesh rendering to calculate real-time spatial routes, rendering elevated ribbon paths across open grounds, corridors, and multi-flight staircases.
- **Dollhouse Floor Slicing:** Automatically slices away roofs and upper levels depending on the user's selected target floor, providing a clear top-down view of interior room layouts.
- **Camera Occlusion & Building Transparency Control:** Features an automated wall-hiding algorithm and a manual "Building Transparency" slider, allowing users to adjust wall opacities to view paths behind structural obstacles.
- **Cross-Device Mobile Session Handoff:** Integrated Firebase Realtime Database REST APIs to sync state between kiosk and mobile. The kiosk generates a session-encoded QR code that opens the web app on any smartphone, automatically syncing the target destination and 3D route.
- **Zero-Install WebGL Deployment:** Built and optimized for WebGL 2.0/HTML5 cloud hosting platforms, allowing high-performance 3D rendering in standard mobile and desktop web browsers without extra app installation.



3D Asset Pipeline (Blender)

Precision low-poly campus geometry optimized for lightweight real-time WebGL rendering.

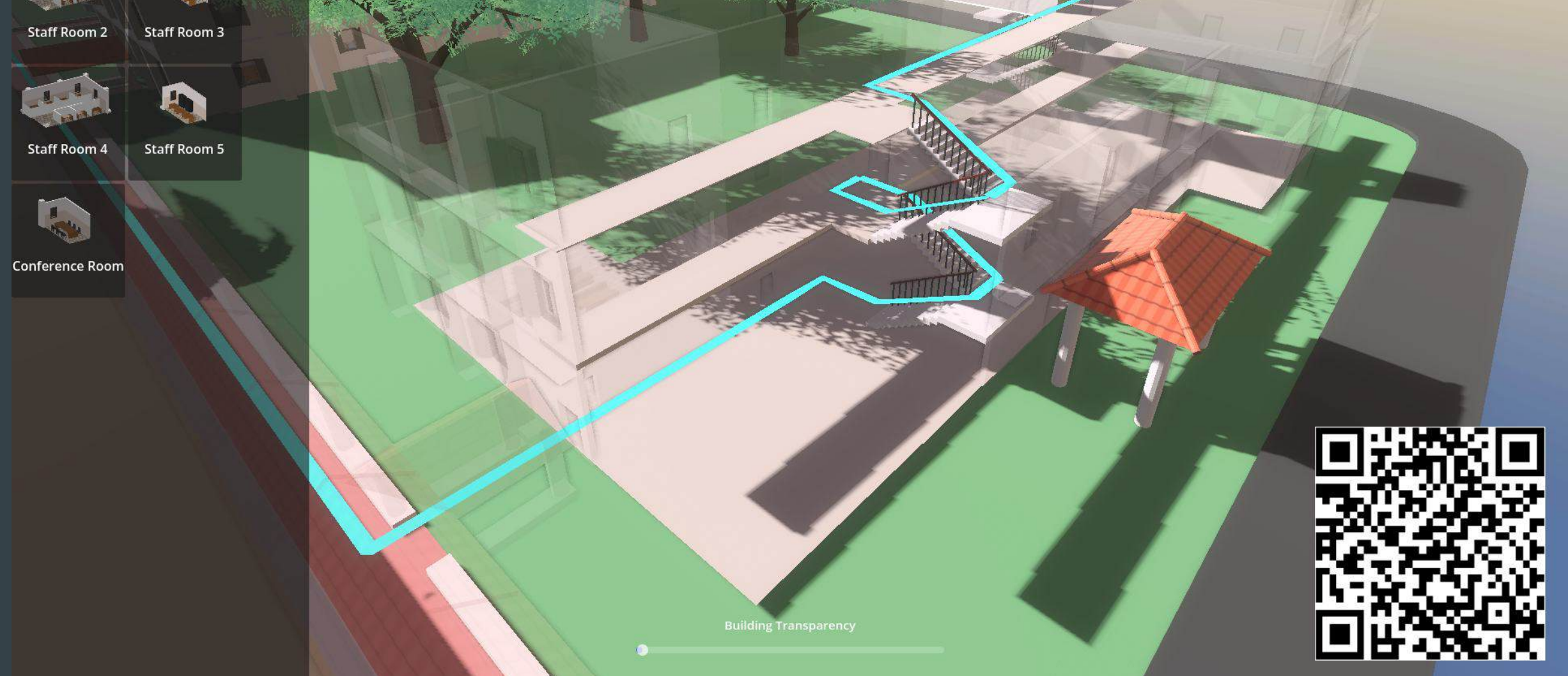


Smart Camera Occlusion

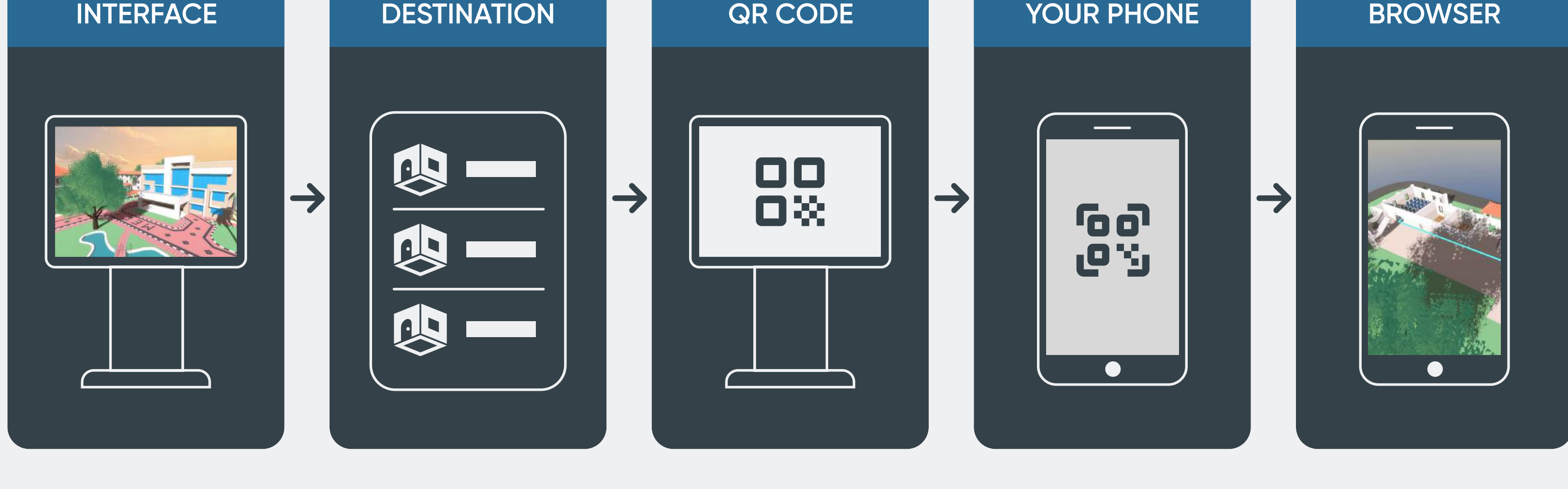
Dynamic raycasting automatically slices away obstructing walls and upper floors, keeping the active navigation path visible at all times.

Building Transparency Control

Adjustable opacity slider fades surrounding structures into transparent wireframes to isolate the target room and path context.



USER FLOW



TECHNOLOGY STACK



Blender: creates all the clean, low-poly 3D models of the campus, buildings, and landscape to keep the app lightweight.



Godot Engine: The main application engine that powers the interactive 3D navigation, processes all inputs, and handles the path calculations.



Firebase Realtime DB: The cloud database that instantly and securely syncs your selected destination from the kiosk to your smartphone browser.



Cloud Hosting Platform: Hosts the final web application on the internet, so you can open the map directly on your phone without installing an app.

Current Status & Roadmap

- **Completed:** Full core engine architecture, multi-floor 3D pathfinding algorithms, UI navigation hierarchy, cross-device QR handoff, and complete 3D modeling/integration of the primary Computer Science & Engineering (CSE) Block.
- **Next Steps:** Currently awaiting formal architectural floor plans to model the remaining campus buildings, outdoor amenities, and administrative blocks into the unified 3D map environment.

DESIGNED & DEVELOPED FOR

Marian Engineering College

