CNERG F24: Smart Campus Research

Principal Investigator: Adam Holland

Supervisor: Sean Yo

Nov. 08, 2024

Smart Campus Research Team

Principal Investigator: Adam Holland

Supervisor: Sean Yo

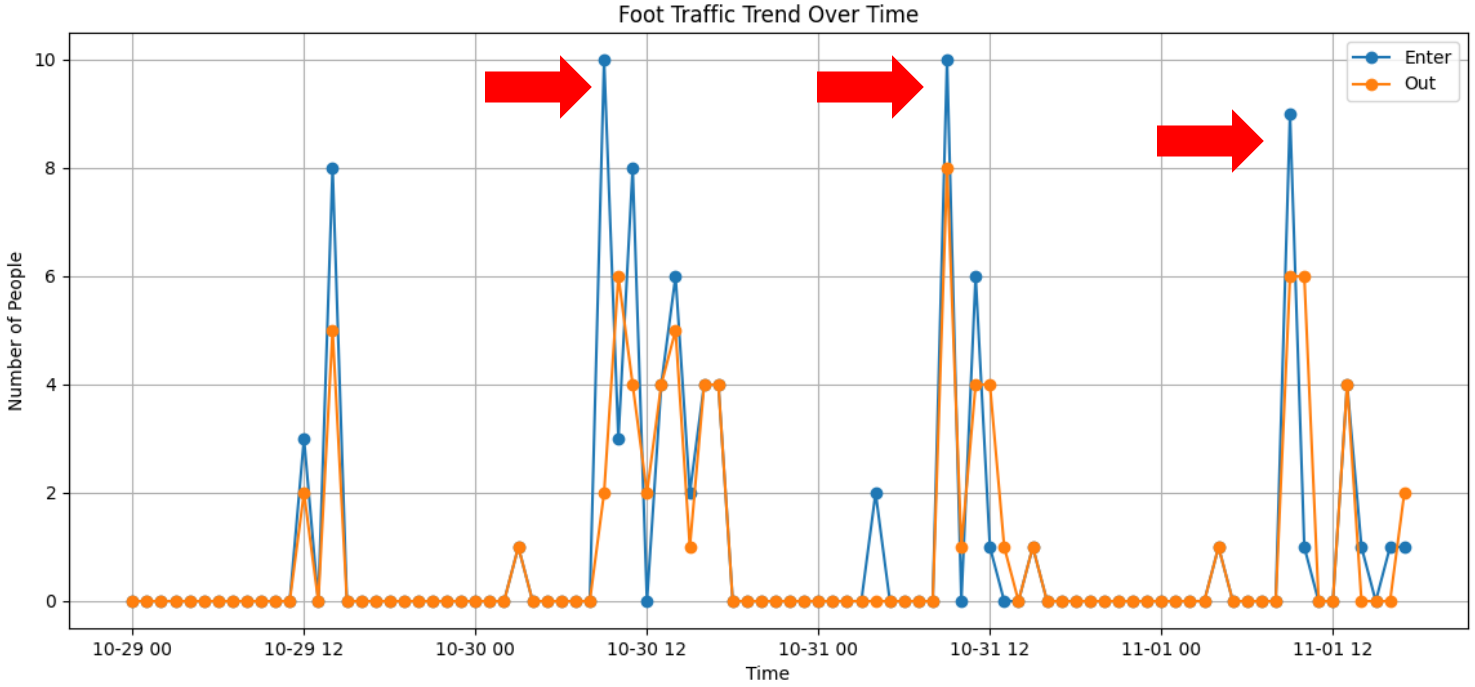
- Alice Nguyen
- Ashish Gyawali
- Eunie Jo
- Justin Dookhran

Sprint Goal

- Sensors Setup and Data Management
  - Install HX-HE3 sensors in the 3G26-4 meeting room.
  - Collect, ingest, and validate sensor data in InfluxDB.
- 3D Dashboard Development
  - Enhanced the dashboard interface and features.
  - Improved stable and reliable display on the Tilt Five.
- Digital Twin
  - Build 3G26-4 and 3G26 Prefab.
  - 3D Simulation: NPCs moving around to represent the number of visitors.
- User Interface and Voice Command Integration (Tilt Five)
  - Explore UI and voice command features for the Tilt Five platform.

Outcomes

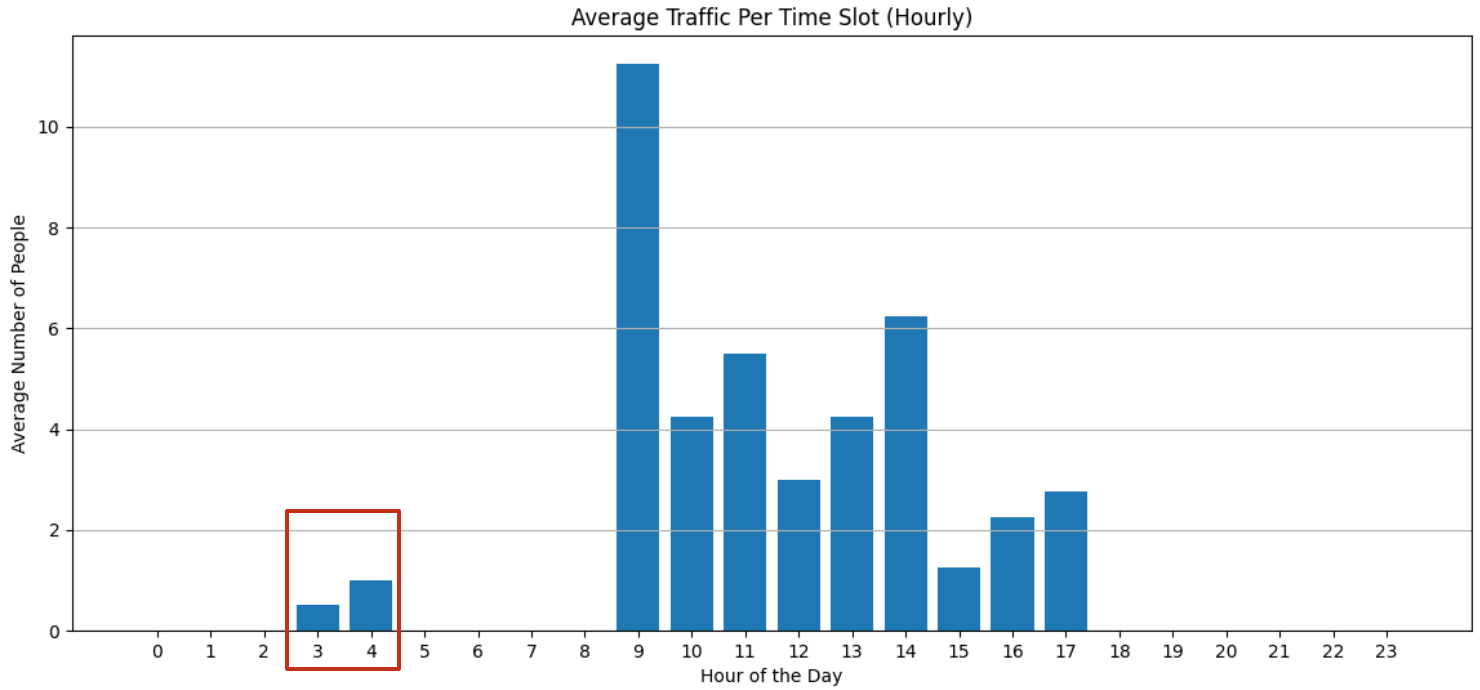
- Sensors Setup and Data Management
  - Foot Traffic Trend Over Time: High traffic observed in the meeting room between 9 and 10 AM.



[Foot Traffic Trend Over Time]

Outcomes

- Sensors Setup and Data Management
  - Average Traffic Per Time (Hourly): High traffic from 9 to 10 AM, with some visitors around 3 to 4 AM.



[Average Traffic Per time(Hourly)]

Outcomes

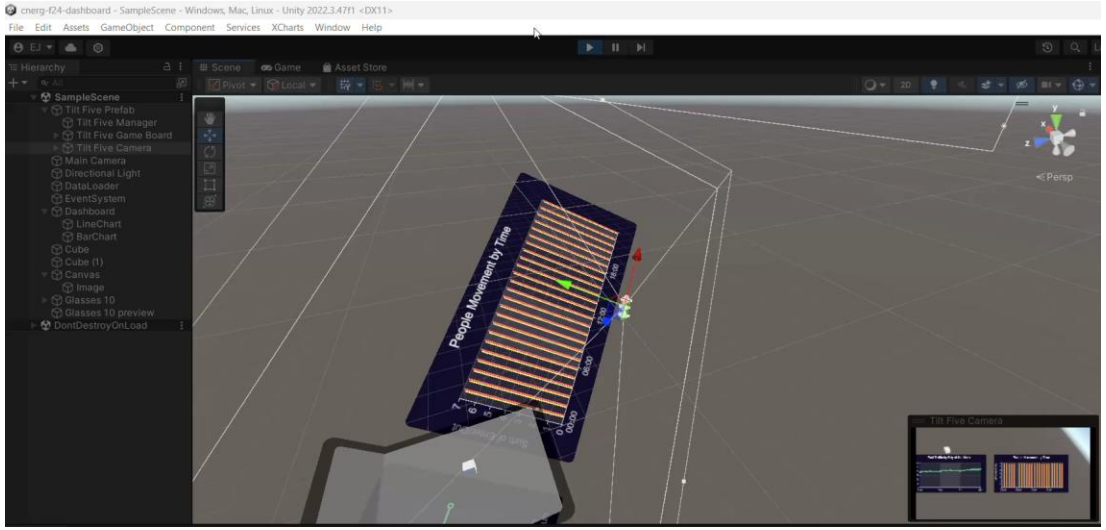
- Sensors Setup and Data Management
  - Sensor Discrepancy

: Analysis of sensor data revealed a mismatch between the in and out counts.

Time	Out	Enter	Cumulative Out	Cumulative Enter
2024-11-01 17:00:00	2	1	2	1
2024-11-01 14:00:00	0	1	2	3
2024-11-01 13:00:00	4	4	6	7
2024-11-01 12:00:00	0	0	6	7
2024-11-01 11:00:00	0	0	6	7
...	...	...	...	...
2024-10-29 04:00:00	0	0	78	91
2024-10-29 03:00:00	0	0	78	91
2024-10-29 02:00:00	0	0	78	91
2024-10-29 01:00:00	0	0	78	91
2024-10-29 00:00:00	0	0	78	91

Outcomes

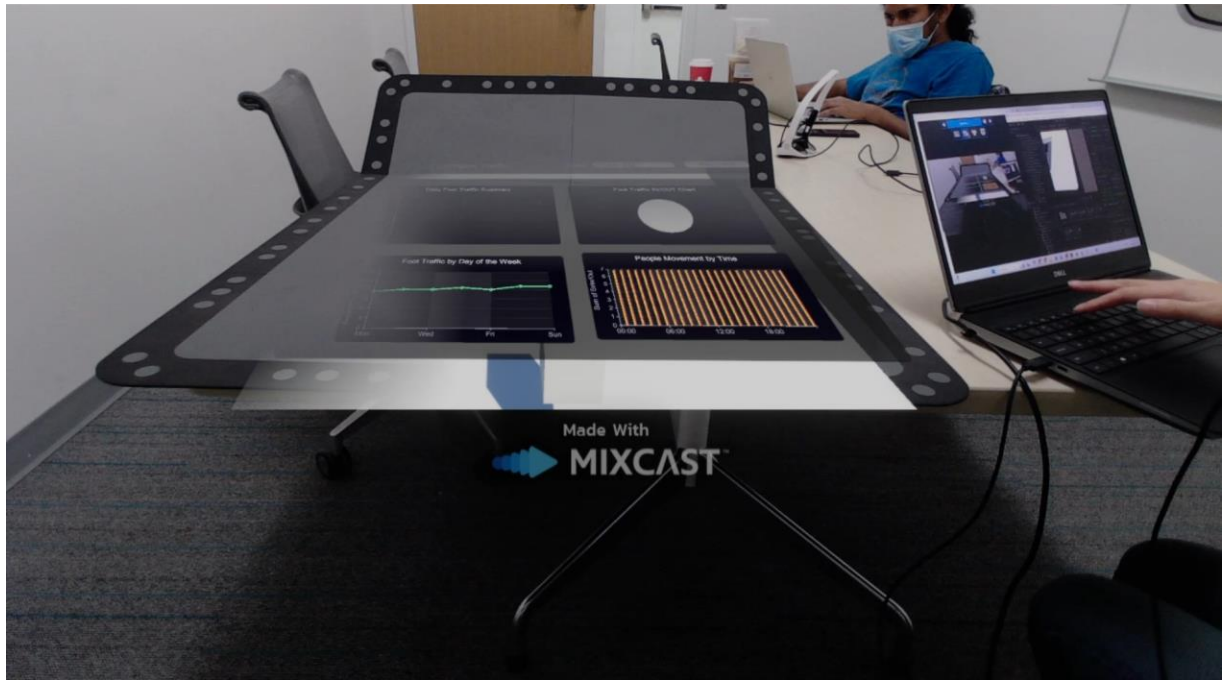
- Challenges in 3D Dashboard Development
  - Issue: The dashboard is visible in the Unity Editor with the TiltFive camera but not on the actual TiltFive device.
  - Cause: The dashboard size and distance between the dashboard and the TiltFive board.
  - Solution: Adjust the dashboard size to fit the TiltFive board and make sure the dashboard stays within the board's area.



[3D Dashboard Demo]

Outcomes

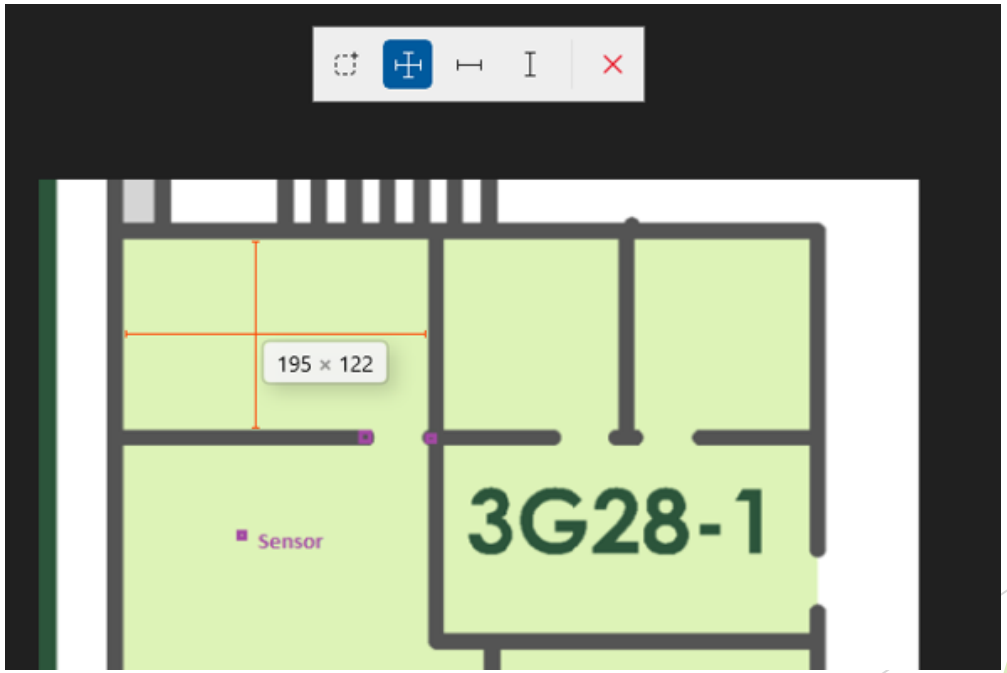
- 3D Dashboard Development
  - Enhanced the dashboard interface and features
  - Improved stable and reliable display on the Tilt Five



[3D Dashboard Demo]

Outcomes

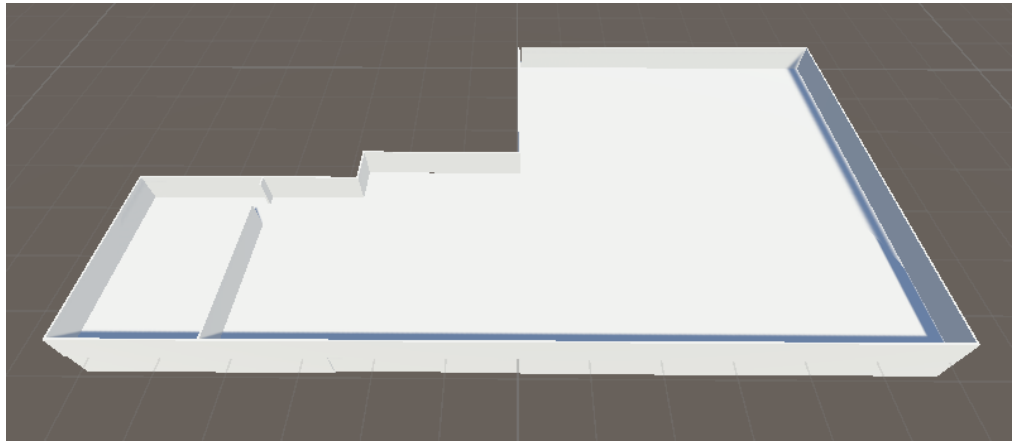
- Digital Twin of 3G26-4 and 3G26
  - Tools and assets used:
    - Waterloo campus floor plan
    - PowerToys app (Screen Ruler)
    - Unity



[3G26-4 Foor Plan]

Outcomes

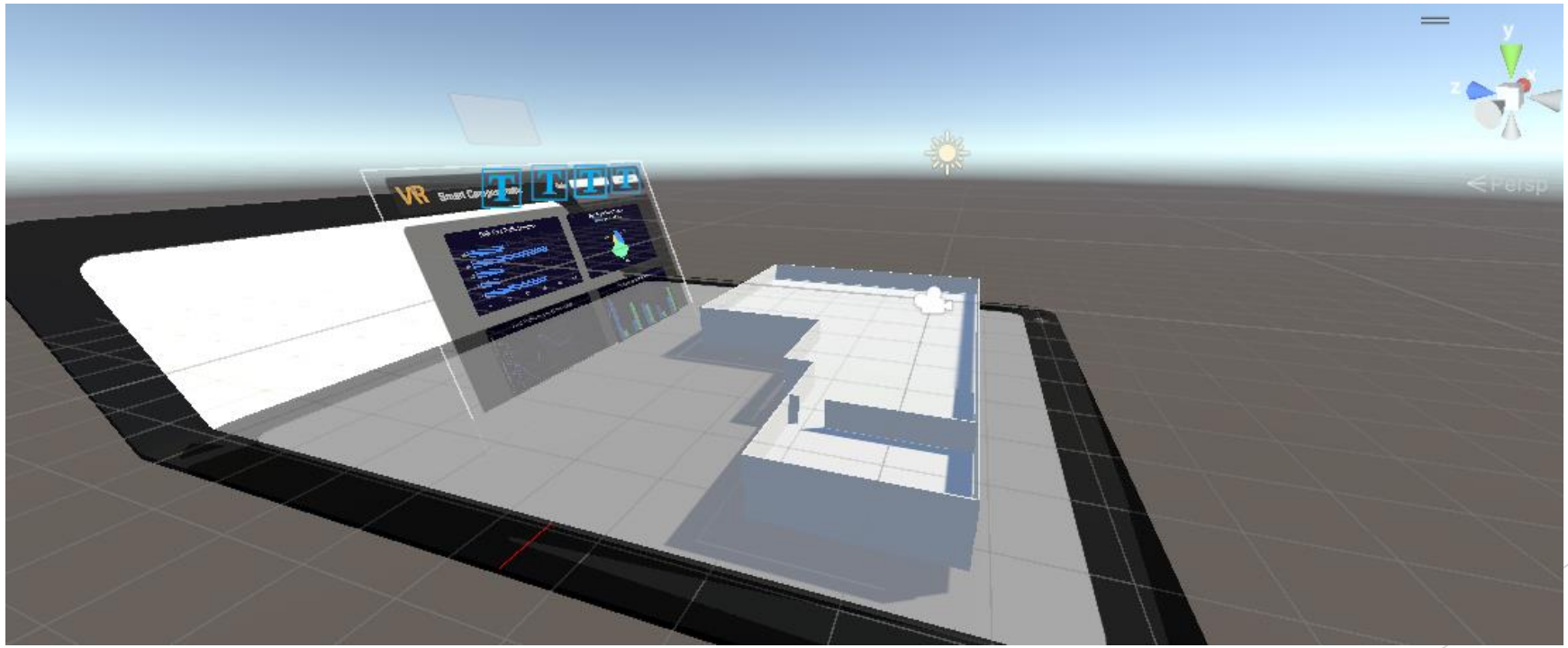
- Digital Twin of 3G26-4 and 3G26
  - Tools and assets used:
    - Waterloo campus floor plan
    - PowerToys app (Screen Ruler)
    - Unity



[3G26 Unity Prefab]

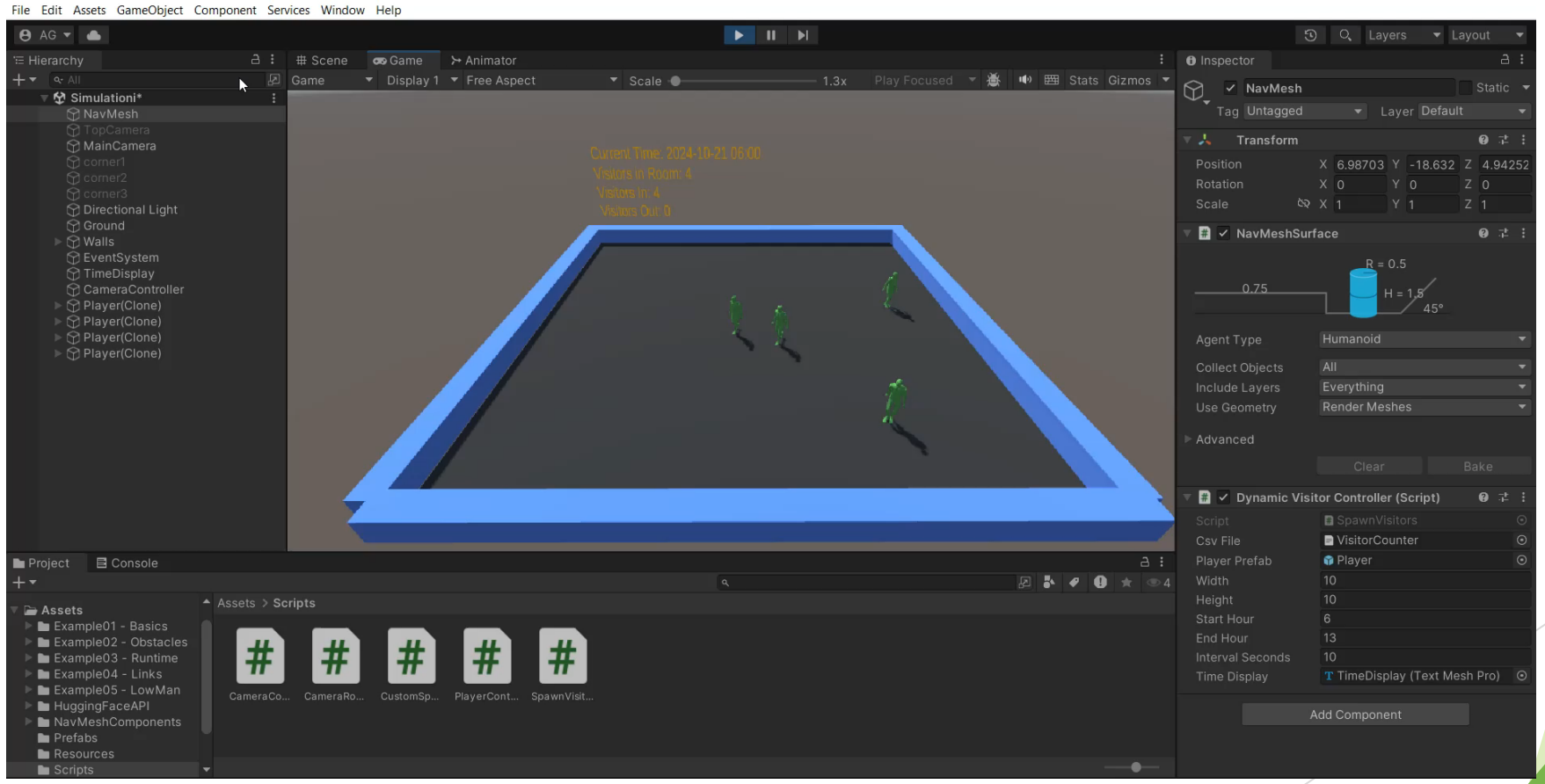
Outcomes

- Digital Twin with 3D Dashboard



Outcomes

- 3D Simulation
  - NPCs moving around representing number of visitors inside a room.



[Prototype of 3D simulation Demo]

Outcomes

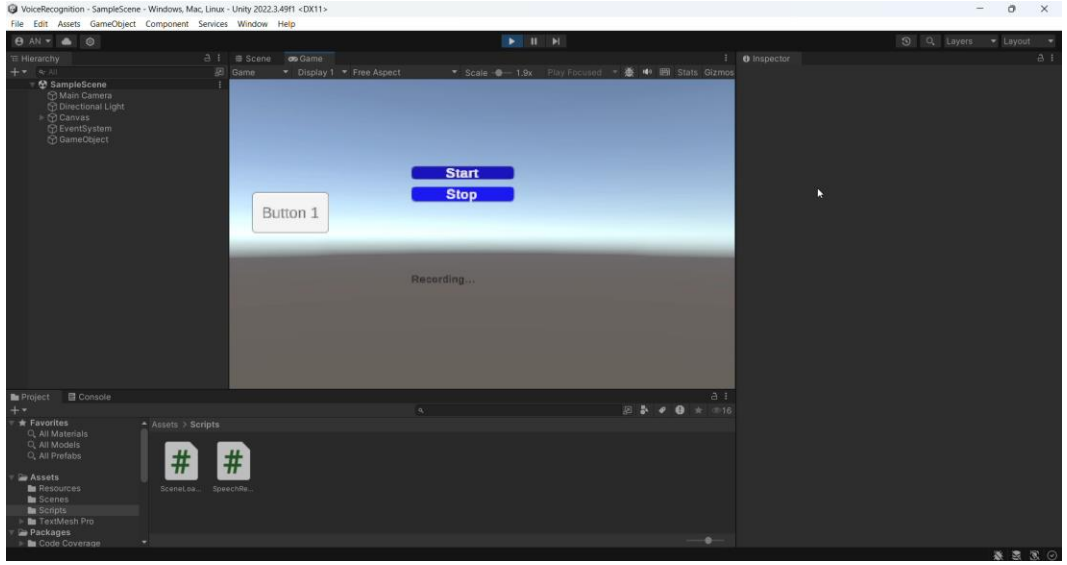
- User Interface and Voice Command Integration (Tilt Five)
  - Speech to text technology considered:
    - OpenAI
    - Hugging Face
    - Vivox
    - Unity Engine Windows Speech
  - Developed a prototype for the voice recognition interface.
    - Using Hugging Face

Outcomes

Flow of the System

*__*Prerequisites*__: *Hugging Face Unity API installed*

- A "Start" button triggers the microphone to start recording.
- Audio is captures and converts into a byte array.
- Audio sent to Hugging Face API for transcription.
- The transcribed text is analyzed for specific key words: " Open Button 1",…
- If a key word is detected, the new scene opens.



[Voice Recognition' Prototype Demo]

Next Steps

- Sensors
  - Sensor Discrepancy Handling.
  - Install more sensors (Candidate locations: 2C10, 2C12, ASCIT Office.)
- Put all the parts together
  - Dashboard
    - Navigate different views for the different charts in dashboard.
  - 3D Simulation
    - Integrate NPC heuristics to make simulation more immersive.
  - Interface and Voice Command Integration (Tilt Five)
    - Use voice commands to interact with application.

People to recognize and thank:
(mentioned in no specific order)

- Jonathan
- Dayne & Dev Ops
- Carolina
- Topher
- Anzhelika
- Arsh
- Alistair
- Hayden
- Elliot

Questions?