

Navigating virtual agents through real environments in Augmented Reality

Implementation of a context-sensitive augmented reality application

Using Microsofts Mixed Reality Toolkit (MRTK) for Unity on the HoloLens 2 to create a simulation game with physical context awareness.

INTRO

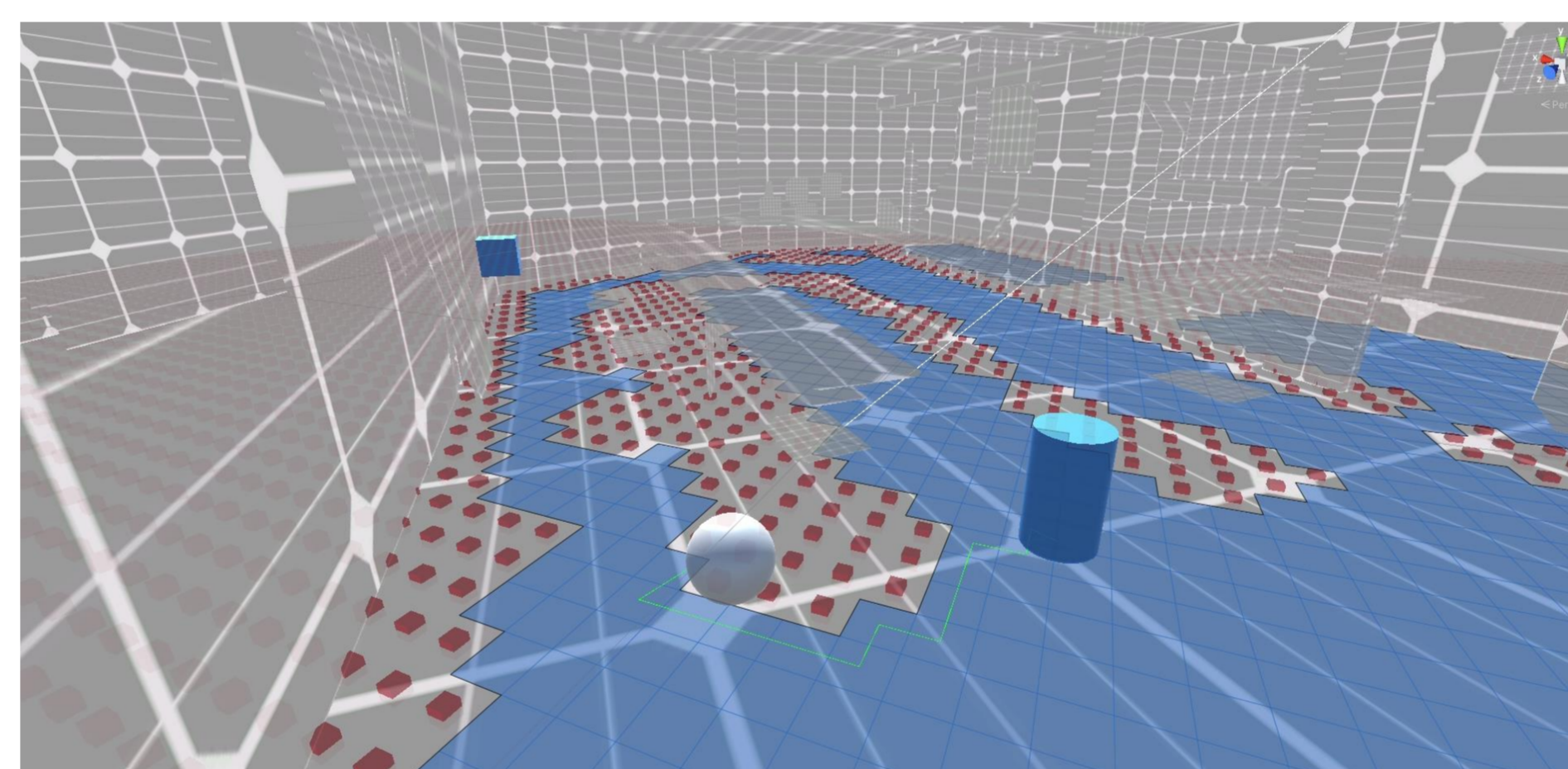
- The MRTK can be used to provide HoloLens 2 apps with physical context sensitivity. For example, it can be used to create navigation apps, point-of-interest apps, or even video games with reference to the real physical world.

METHODS

- **Walkable** and **unwalkable** planes for generating the navigation mesh are inferred from MRTK's Scene Understanding surfaces.
- The pathfinding algorithm A* is used to calculate waypoints on the navigation mesh.
- The agents are moved through the virtual environment along those waypoints.
- Hand tracking is used to place the simulation objects into valid positions at runtime in the virtual environment.

RESULTS

- A virtual agent navigating a real physical environment.



DISCUSSION

- The agents can only navigate on 2D planes for now. Since a layered grid graph is used for navigation, the height of obstacles is still considered. A possible further development could be using 3D navigation meshes to simulate flying agents.
- The navmesh generation process is triggered manually by the user. Automatic generation is problematic because of performance issues. Dividing the navigation mesh into smaller regions and only updating affected regions could solve this.

Watch a quick demo!



- The HoloLens 2 can scan real-world surfaces (Spatial mapping). On top of Spatial mapping, the MRTK provides the Scene Understanding service. It is used to identify surface types, such as Walls, Floors, etc.
- The navigation mesh is generated by observing surfaces, assigning surfaces to their corresponding navigation layer masks (Walkable; Obstacle) and then creating the navmesh according to these masks.
- Agents will patrol between the base (cylinder) and outposts (cubes).
- **Challenges:** Developing Deviceless → Rapid prototyping using emulators and simulation tools for HoloLens 2

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