Unreal Engine Plugin for 3D Video Game Blind Accessibility

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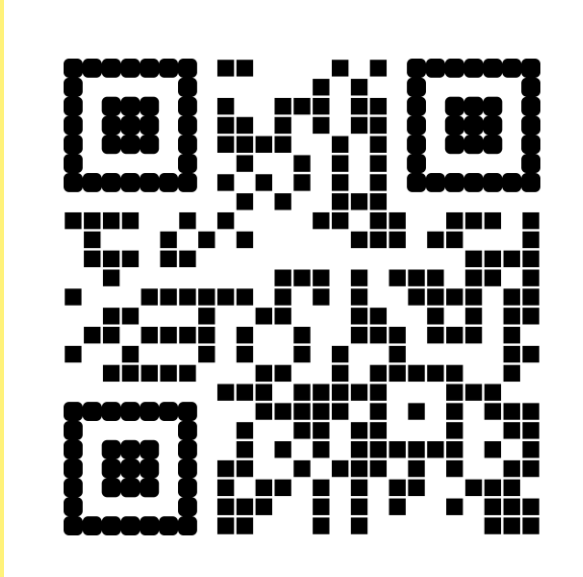
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ABSTRACT:
NavStick is an audio-based technology that allows visually impaired gamers to "look around" in their gaming environments. It repurposes the right joystick to allow visually impaired players to identify objects in their visual line-of-sight with spatialized audio. **Our objective was to implement a consumer-ready version of NavStick as a plugin to market to large-scale game developers.** We chose plugin implementation to **maximize the impact NavStick can have** on the VIP community, in attempts to create **more accessibility for gaming** as a whole.
Our goal of the summer was to develop an MVP (minimum viable product) of NavStick and contact an external developer for assistance on more features. The results were a prototype of the NavStick System and several UI mockups of NavStick for the external developer.

RESEARCH CHALLENGES:
- How should NavStick's core algorithm for querying direction and location of objects be implemented?
- NavStick is a 2-dimensional system that uses 2D line-of-sight to "view" objects in the gaming environment, so how should NavStick be modified to account for games with 3-dimensional components?
- How much the game companies who purchase the plugin should be able to control/modify?
- Since Unreal Engine is new to the lab, should an external developer be hired in order ensure the system's marketability?
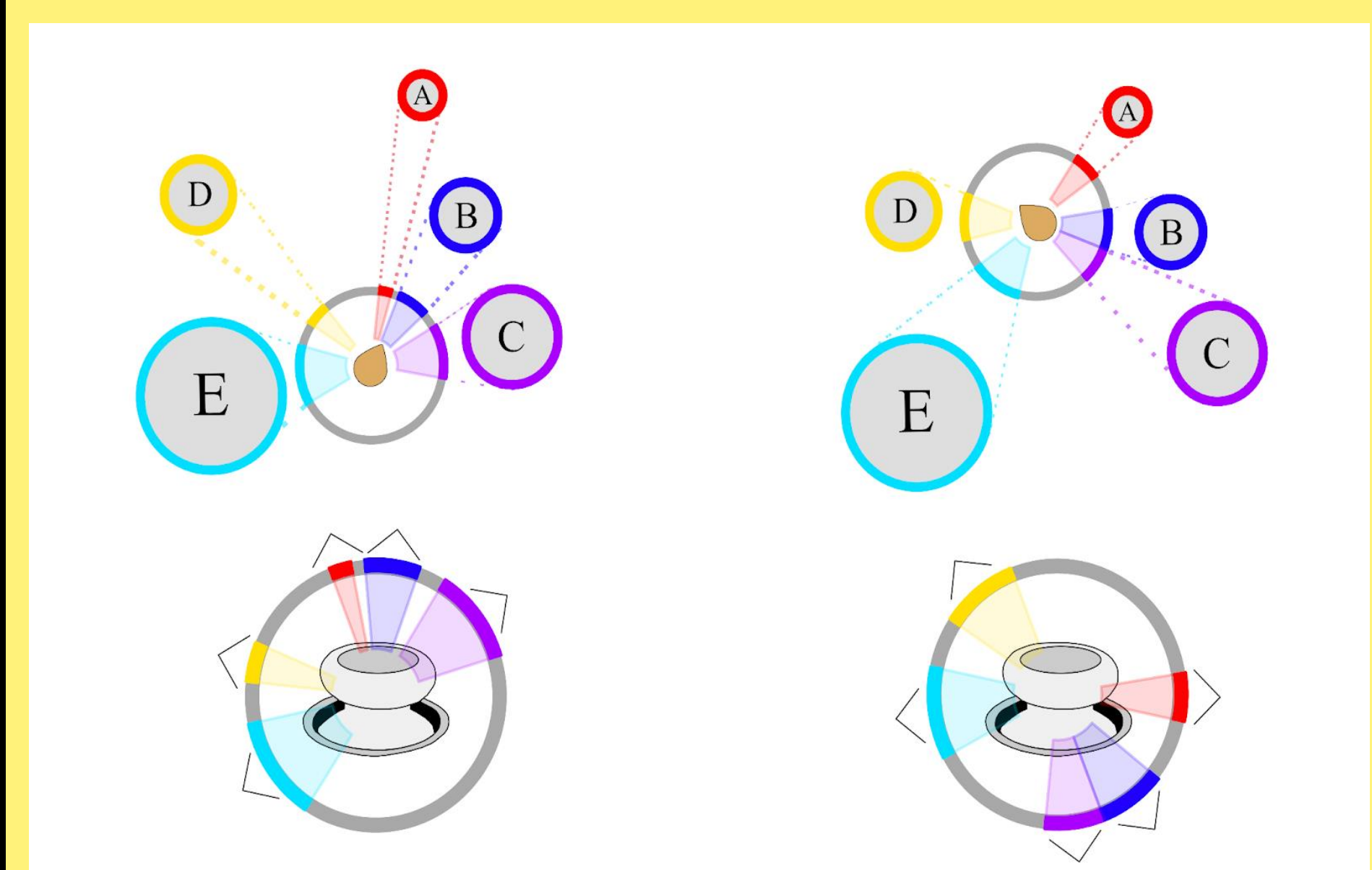

The first prototype shows **NavPie** (upper left corner) implemented in a test environment.
In this version, the **player location** function (coordinates) is also visible.
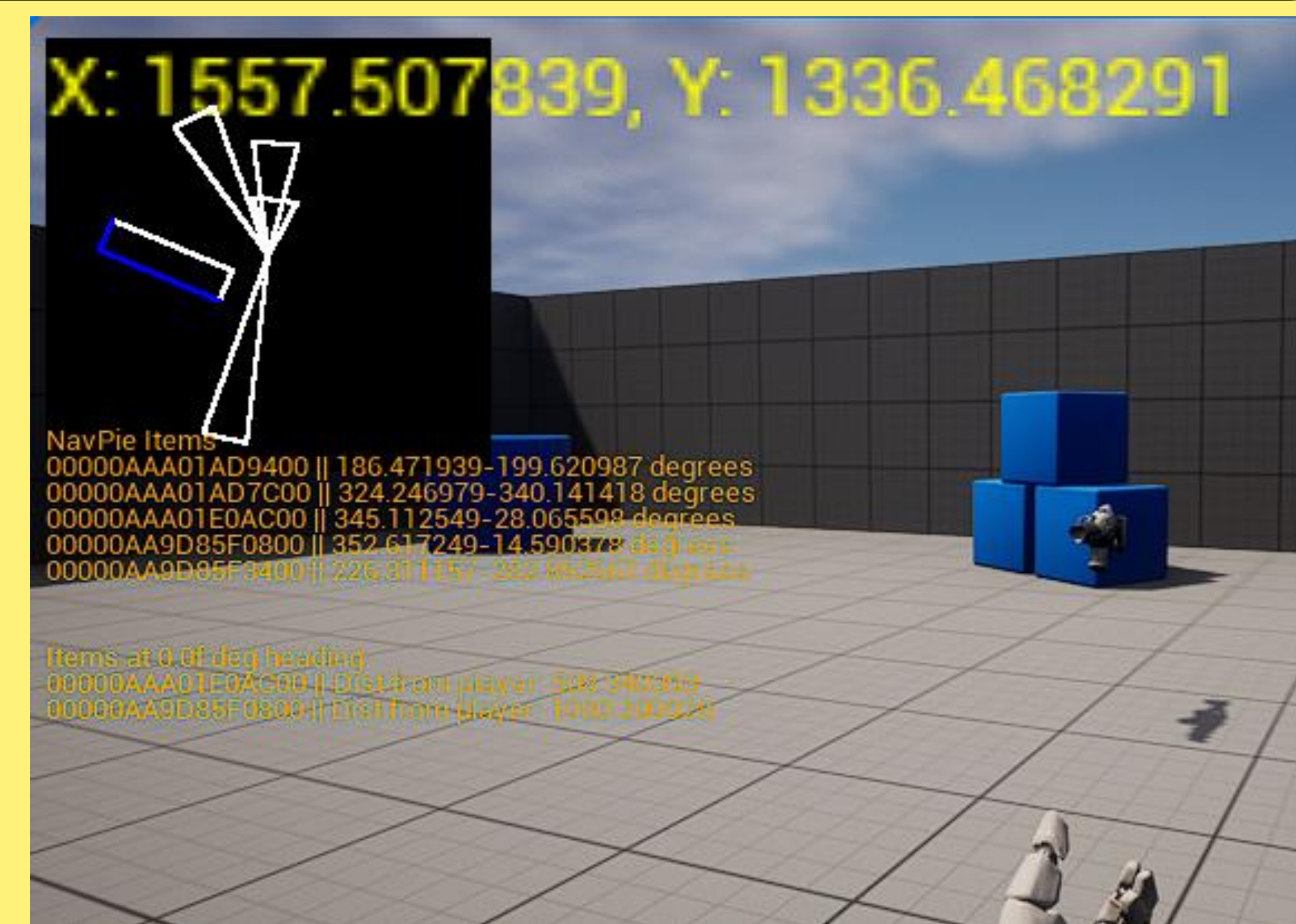
First Prototype

NavPie

In NavPie, each **actor** in the player's line-of-sight covers an area which forms an **angle** with respect to the **player's position**. The angle is stored in the NavStick system along with its corresponding **actor name**.

This wireframe is a mock-up of the editor functionality for **creating zones**.
The blue **actors** have been attached to the red **zone** and can only be seen when the player **enters** the red zone.
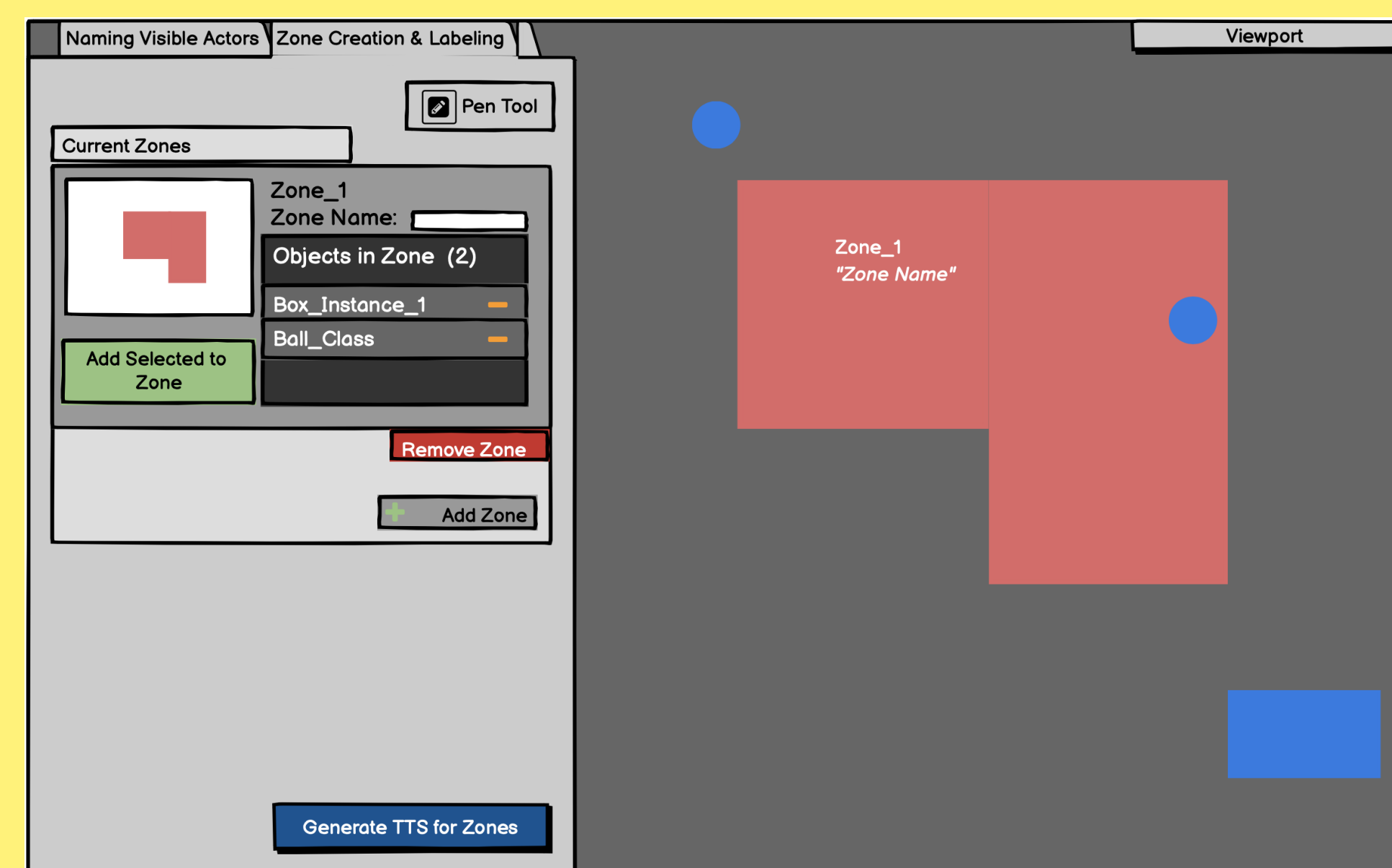
UI Wireframe for Zones

METHODS/SOLUTIONS:
- Decided on NavPie—a geometric way of calculating and storing the relative locations of objects-- for the core algorithm
- Implemented zones, which allow the editor to delegate certain objects to be seen in certain areas. This allows for organized structured like buildings with floors or rooms.
- Decided to offer the source code along with software and editor functionality so game developing companies can have modification control
- Decided to hire an external developer to assist with Unreal Engine development

RESULTS:
- Developed a working prototype of the NavStick system in Unreal Engine 5
- Developed UI wireframes and mockups for the external developer
- Contacted and onboarded an external developer