SIMULATING SITES

predicting human behavior in proposed designs

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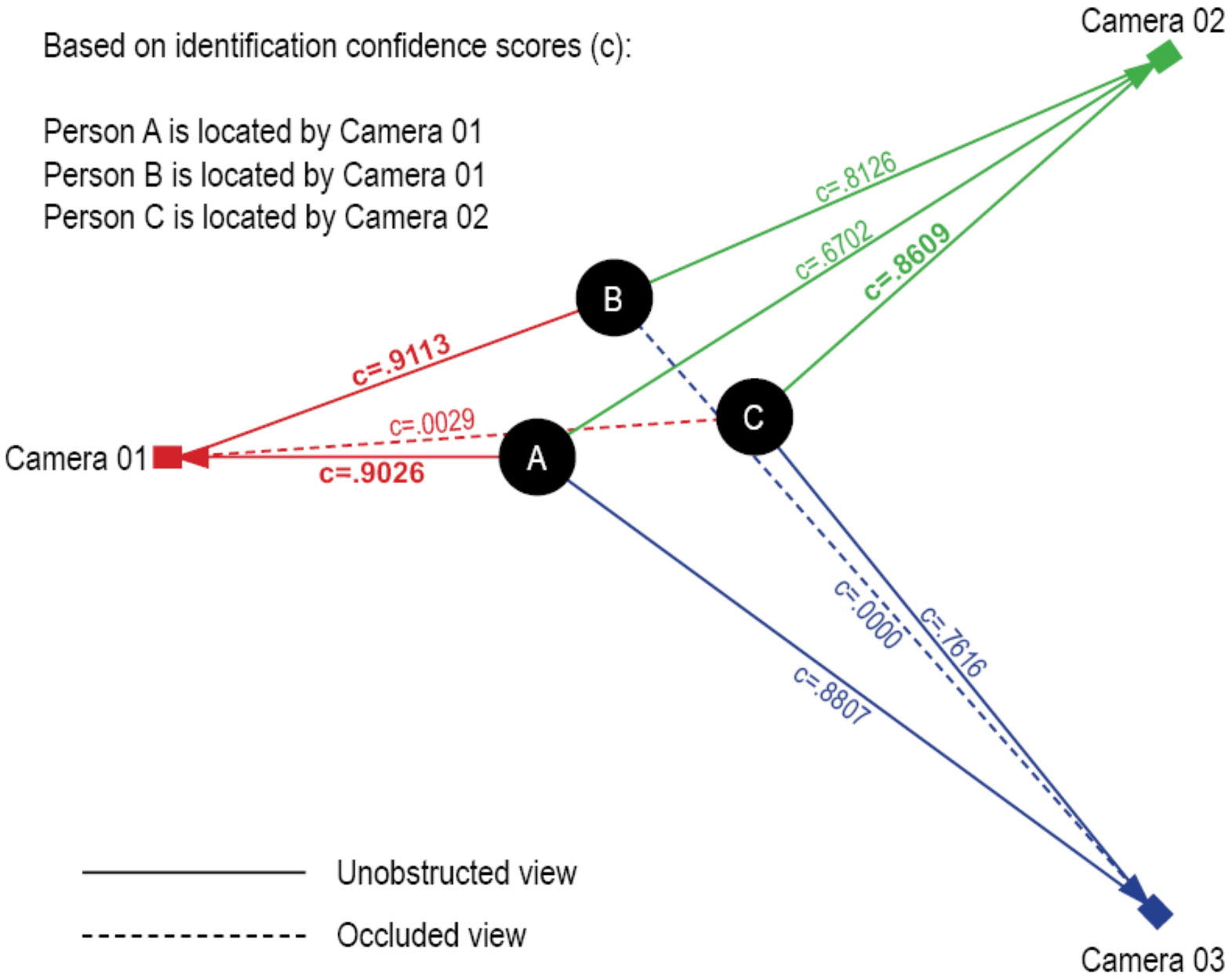
Project Overview

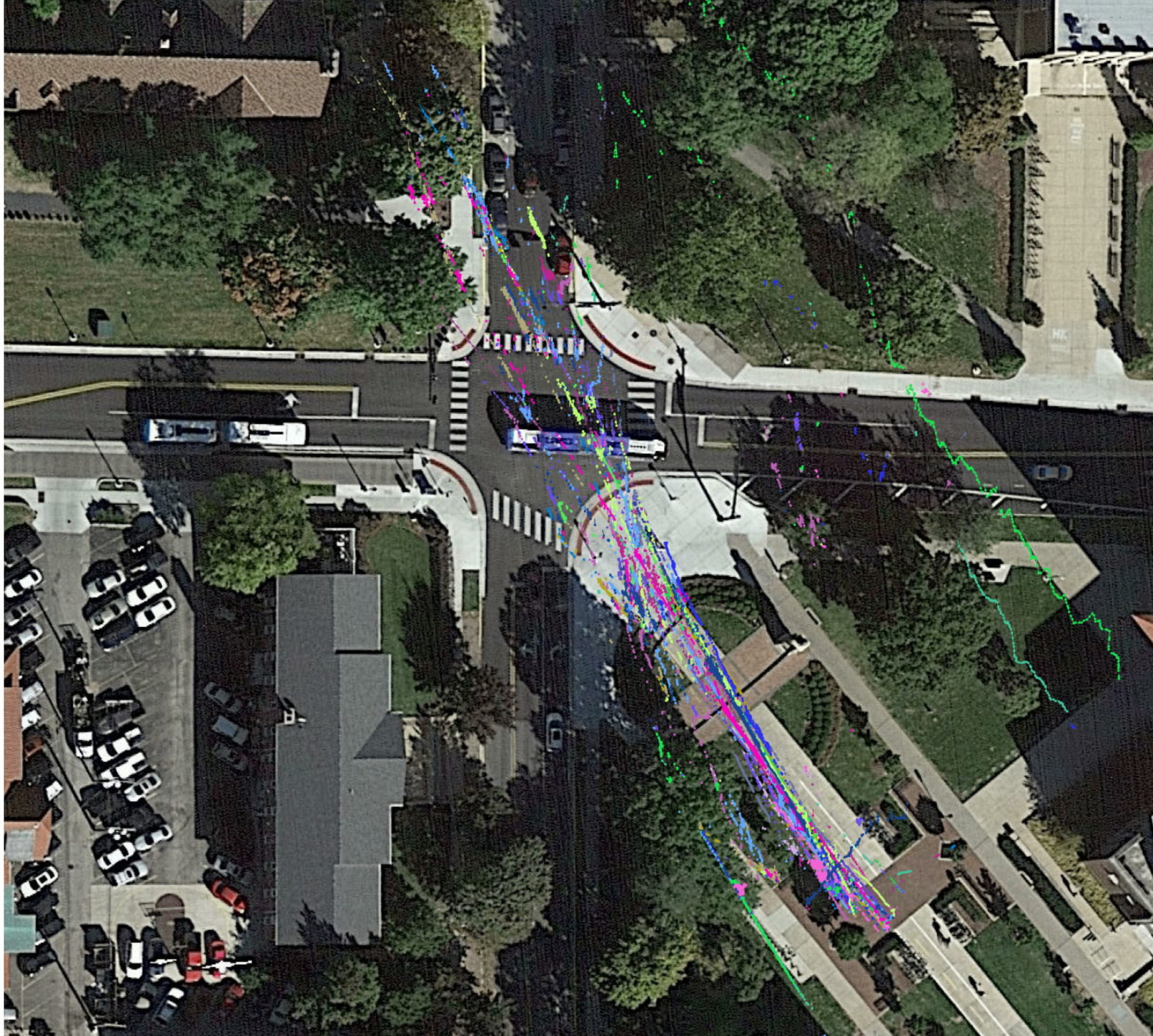
Previous Artificial Intelligence (AI) and Machine Learning (ML) camera vision research used multiple networked cameras to record human and object locations and movement in the built environment without bias or gaps in recording.



Project Overview

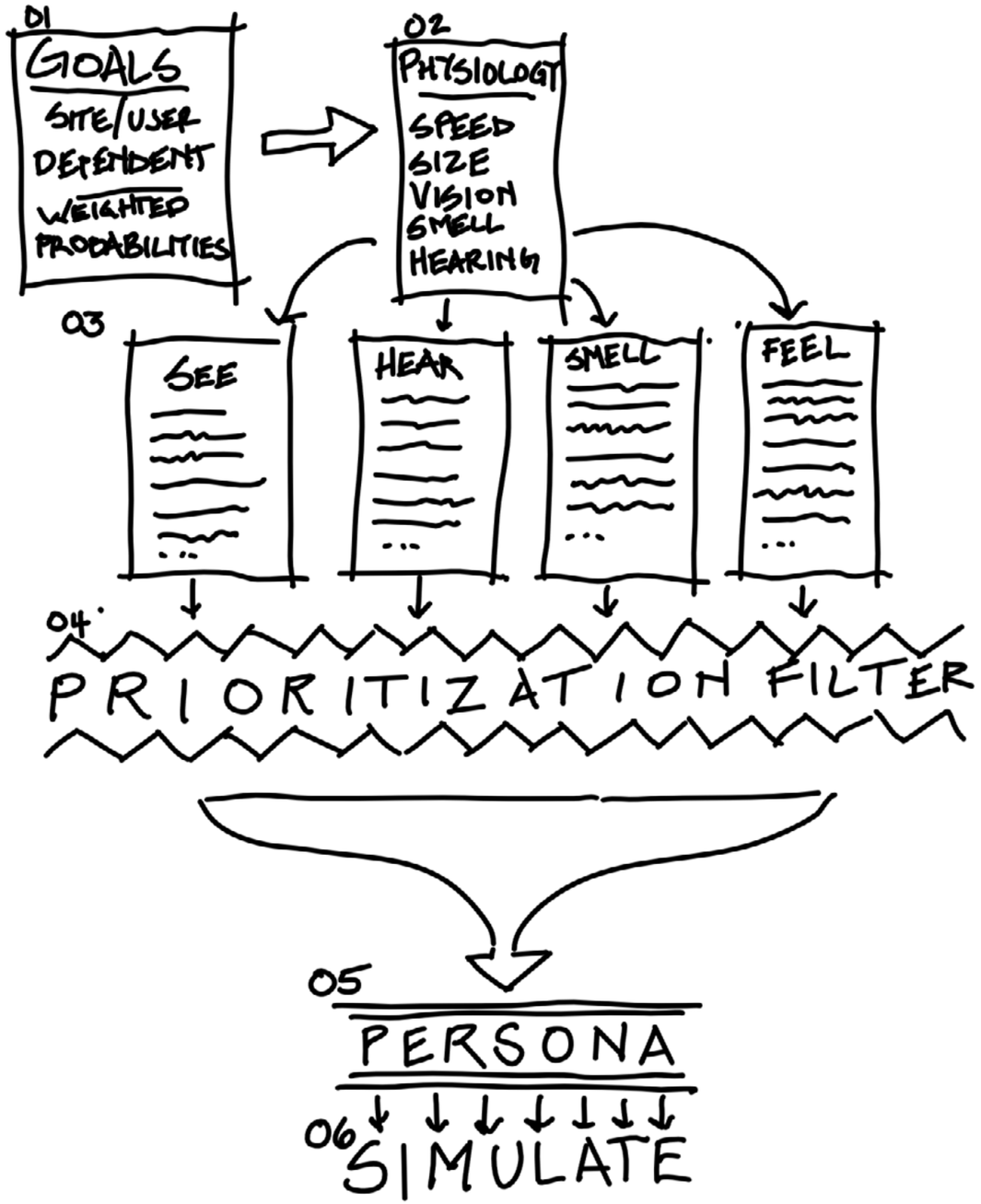
Mapping where people move, linger, gather, and rest has allowed for the development of a database of human behaviors within a specific cultural and programmatic context - in this case, a college town and campus.

But how can this knowledge help designers propose new spaces, programs, and experiences?



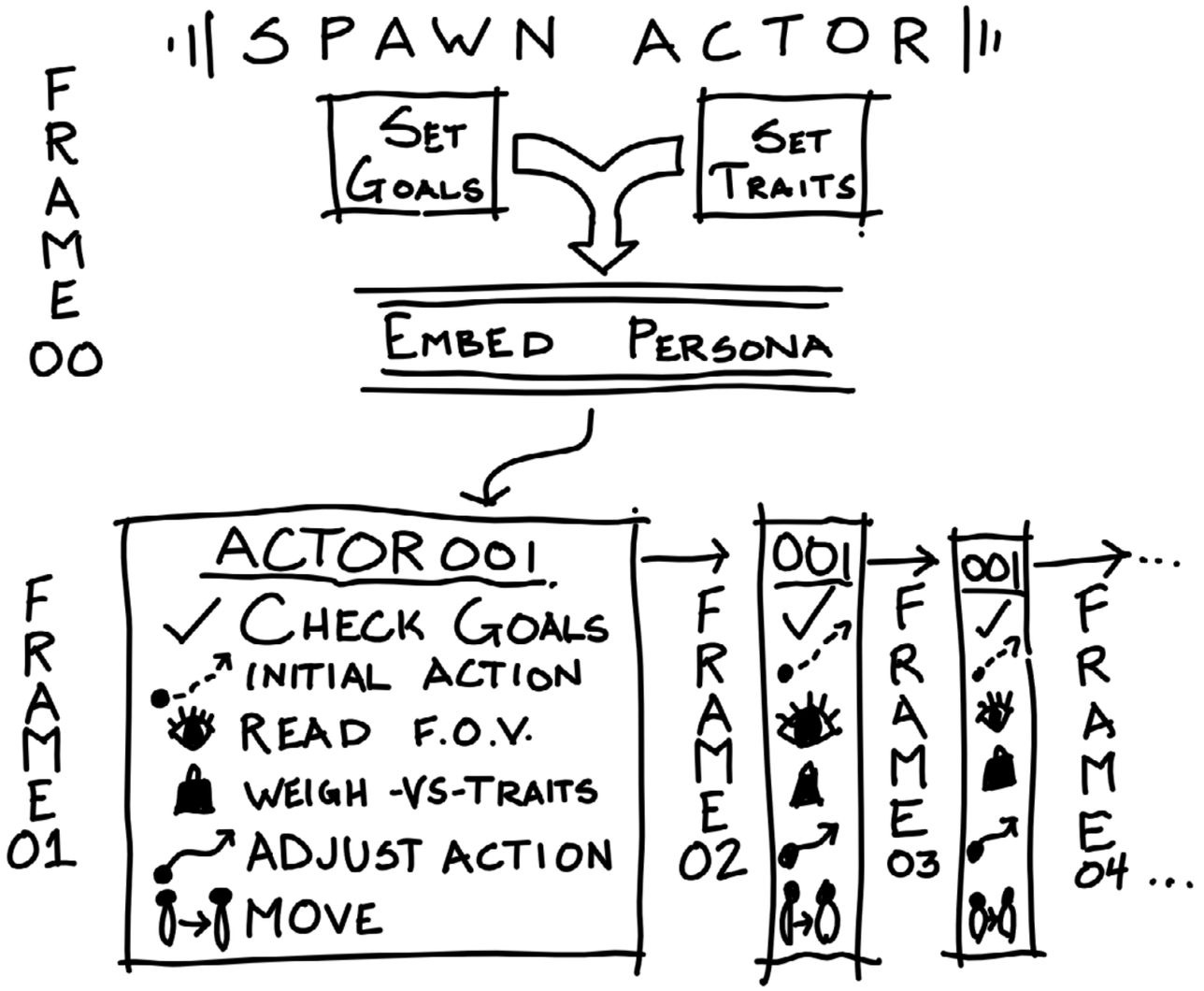
NPC + Environmental Systems

This research effort uses video game development software (Unreal Engine) to generate simulated humans (NPCs), each with their own physiology, perception, behavioral tolerances, and goals.



NPC + Environmental Systems

NPCs spawn at locations determined by designers intent (thresholds and gateways). They will then perceive the simulated world through their unique perception traits and determine how to move (or not) towards their randomly assigned goal.



NPC + Environmental Systems

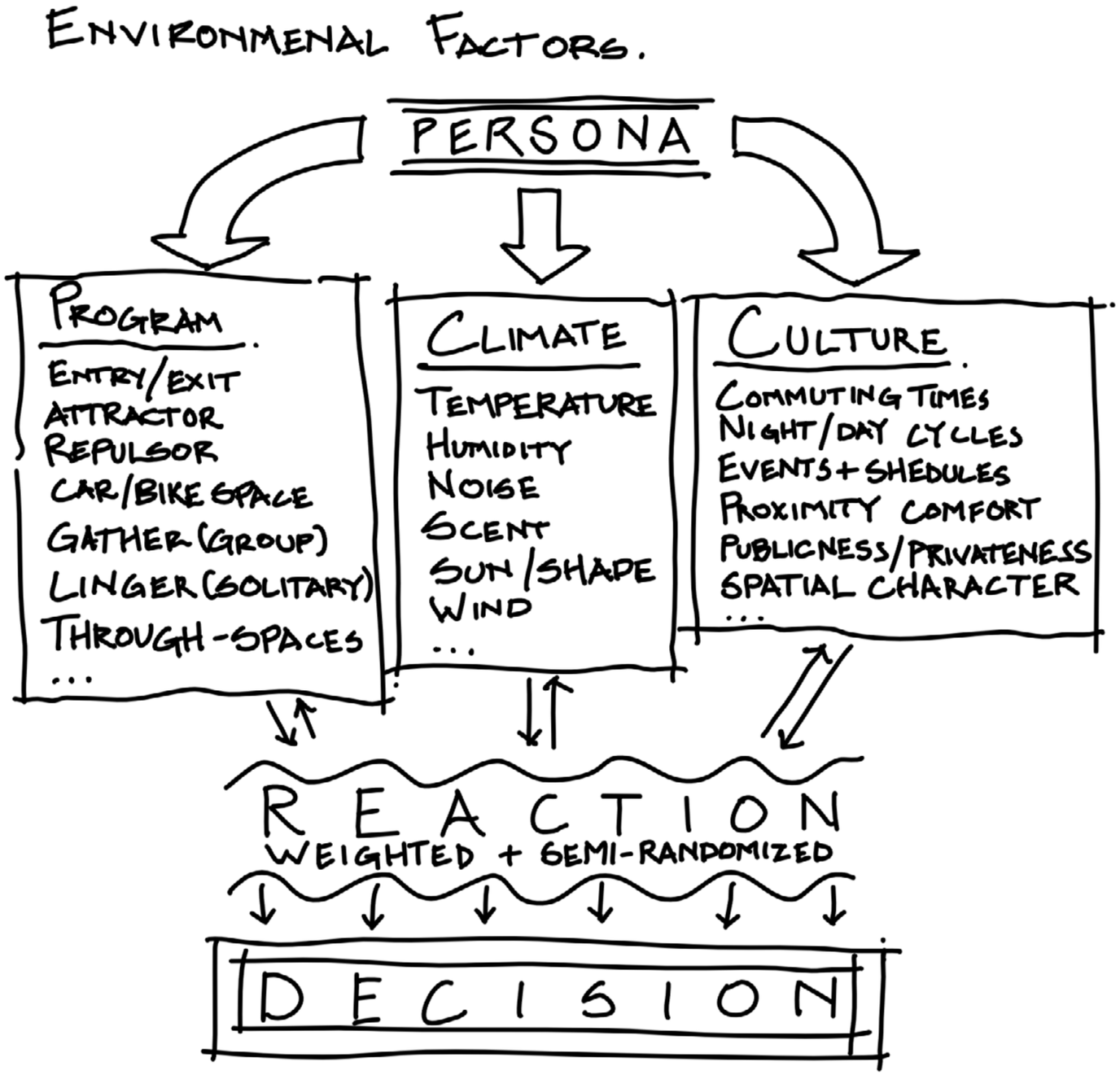
The environment itself must also be developed to include:

spatial programming - movement spaces, gathering spaces, etc.

interactive objects - seats, trash cans, etc.

climactic variables - wind, sun, etc.

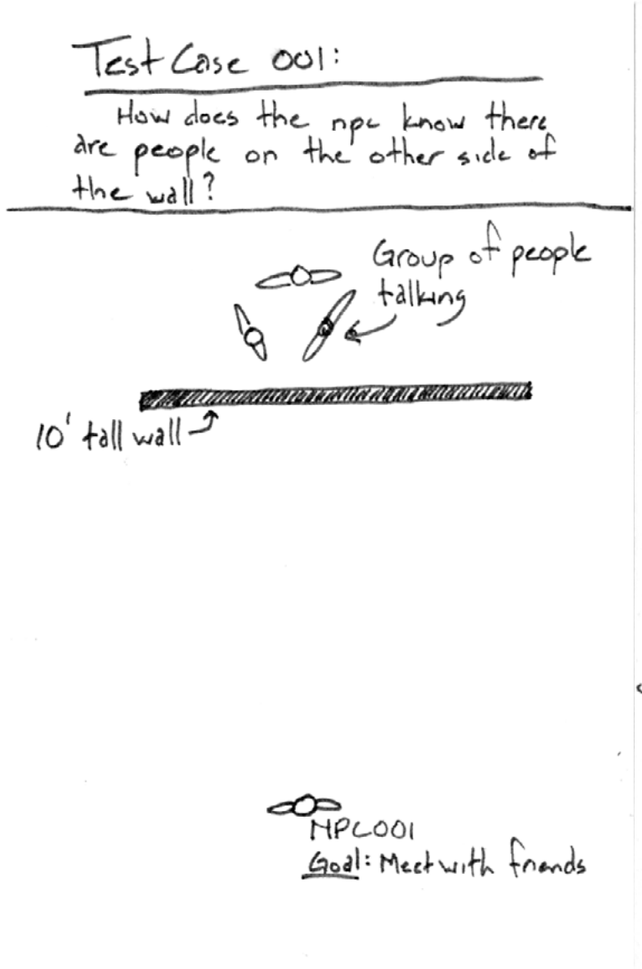
cultural variables - norms addressing gathering, behavioral appropriateness, etc.

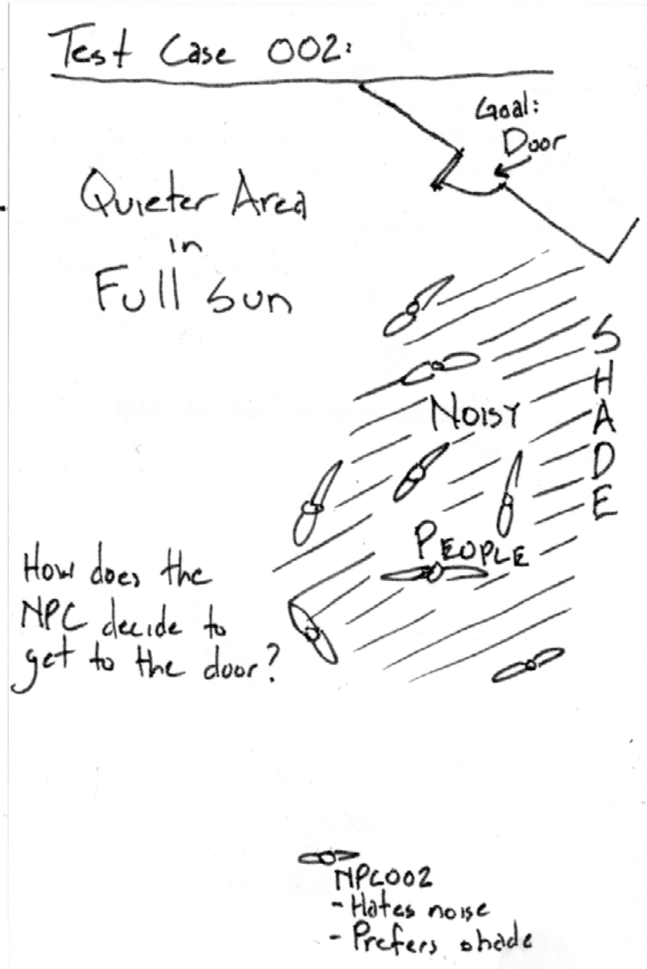


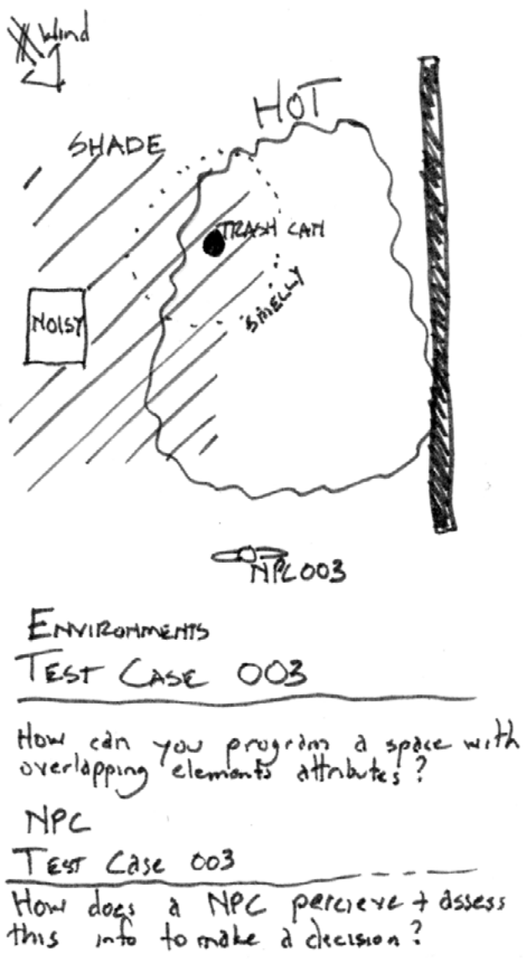
Test Cases

The team worked through increasingly complex scenarios for NPCs to experience.

We are currently developing for Test Case 003.

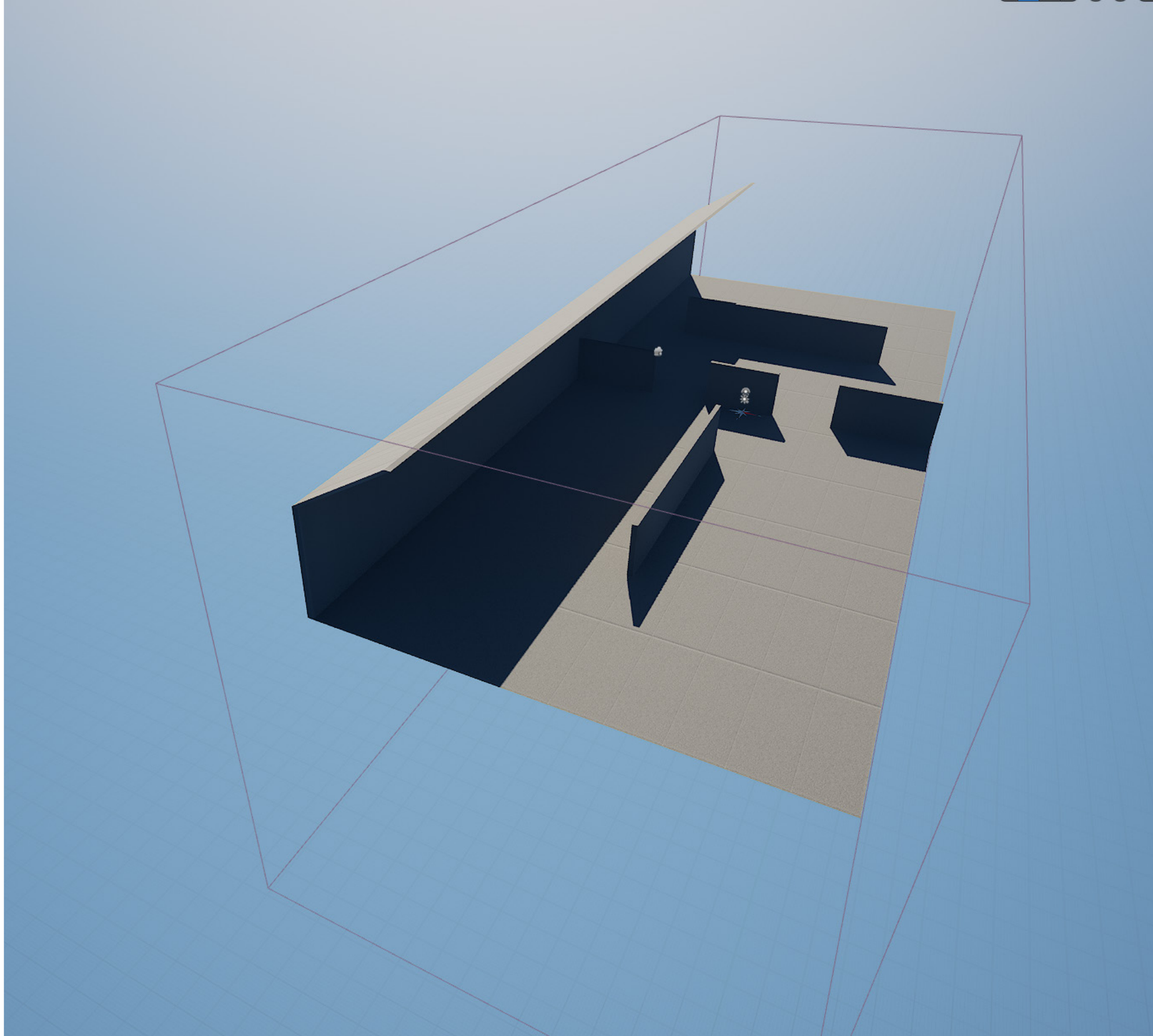






The Test Environment

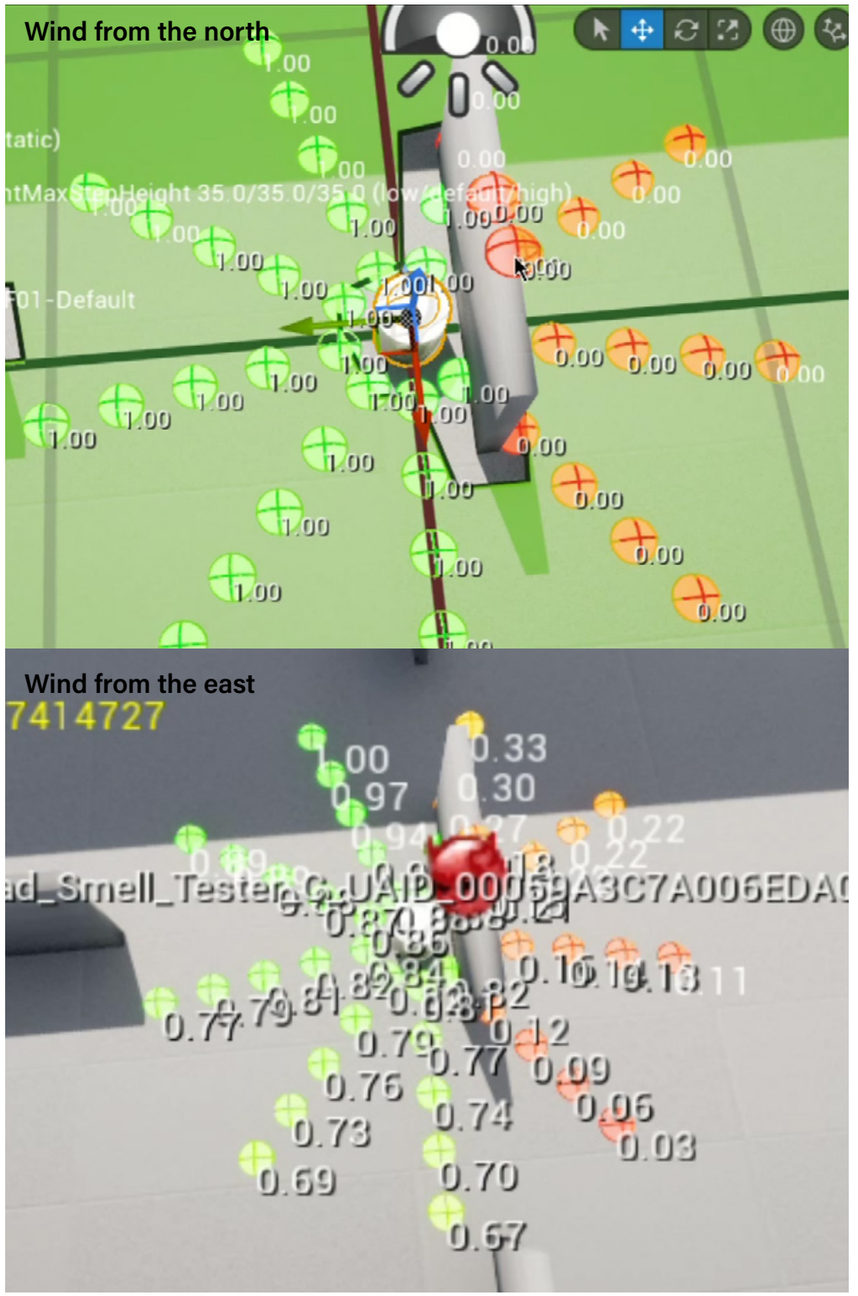
A simple maze with the goal area blocked from vision. One path is in the sun while another is in the shade. NPCs spawn in the area closest to us and attempt to proceed to the far side of the site.



Environmental Simulation

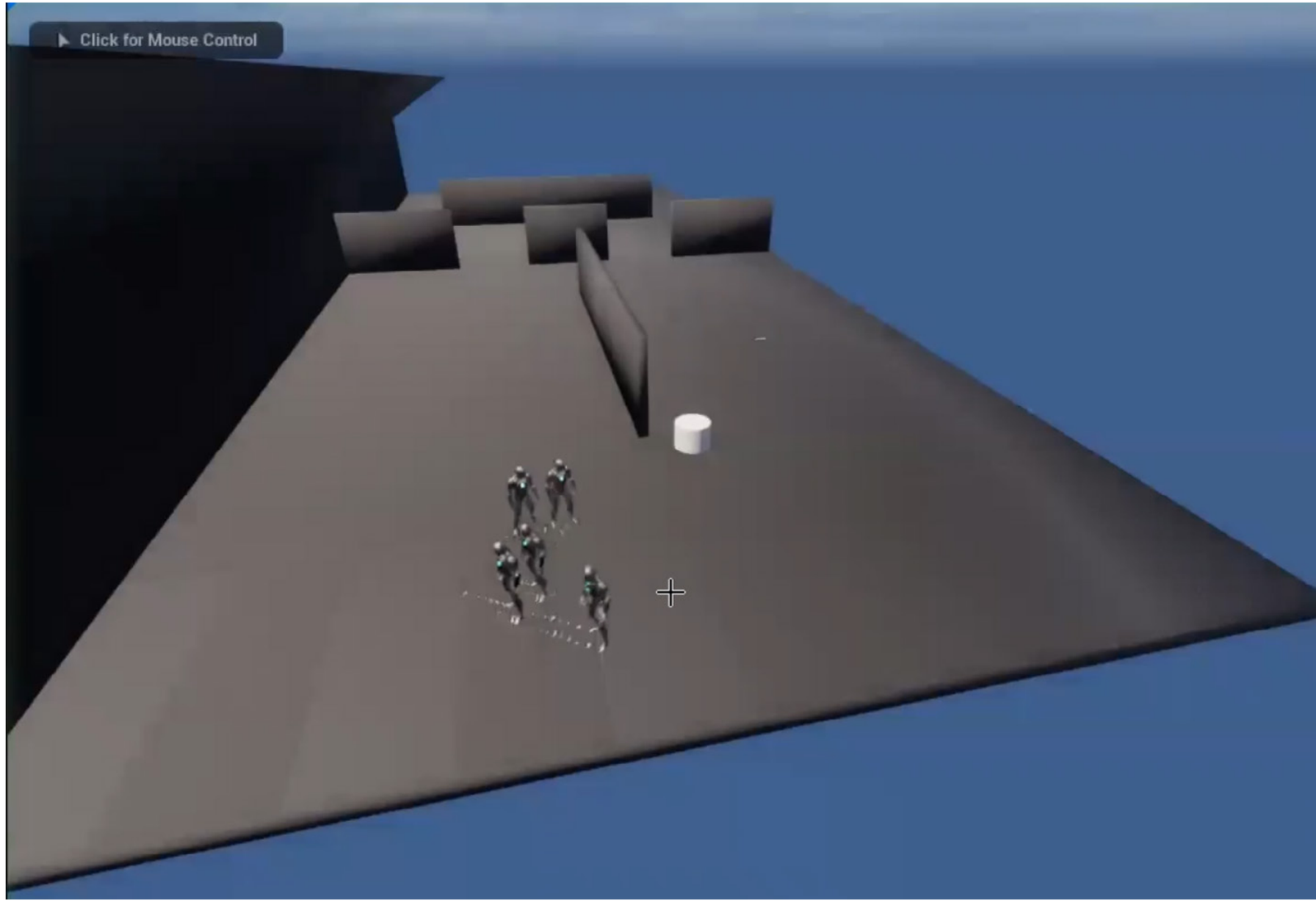
Modeling particulates and air quality (like this smelly trash can) requires wind direction and intensity along with physics simulations for geometry.

This system can then be expanded to sound, solar reflectance, permeable barriers (vegetation and fences), and tactile responses (rain, humidity, etc.)



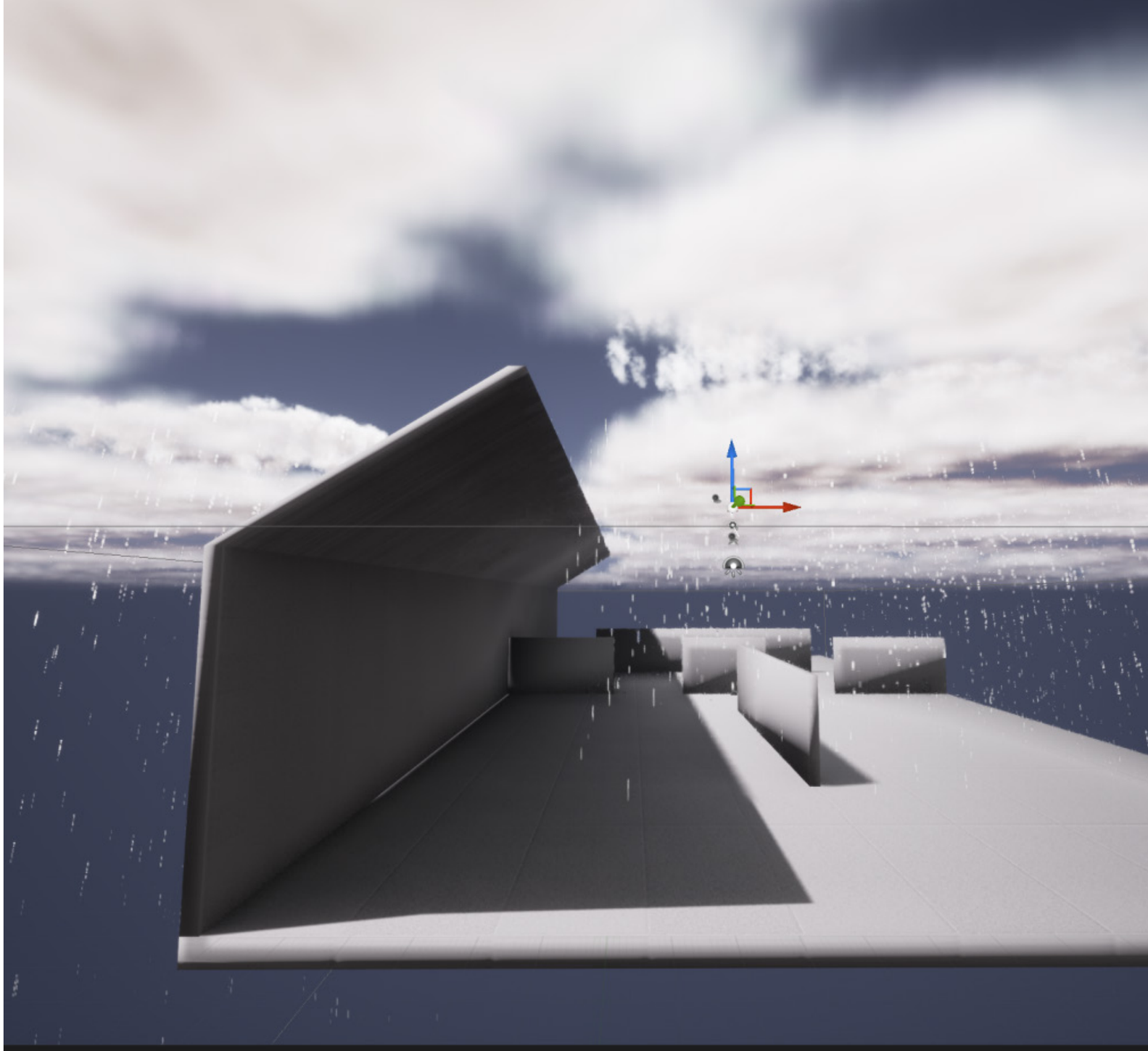
NPC Simulation

NPCs unique personalities (Personas) result in varying intensity of responses to perceived conditions.



Weather effects

Current efforts are incorporating NOAA-provided weather per day to simulate sun, wind, cloud cover, rain, humidity, etc. alongside associated NPC perception and reaction systems.



Thank you

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