



UNIVERSITY OF
ARKANSAS

College of Engineering

CSCE 50103 Advanced Special Topics in Computer Science: Introduction to Augmented Reality. Spring 2025

Danse Macabre - "Dance of Death"

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Introduction

Danse Macabre is an augmented reality game developed using Unity for the Oculus Quest 3. It is a magic-themed shooter game where the player is a wizard fighting off an onslaught of monsters. The player stands still and casts spells to damage the monsters by performing specific hand gestures.

Some key augmented reality features of our application are:

- Spatially-aware monster spawning and navigation
- Occlusion of virtual monsters behind real objects
- Hand tracking and gesture recognition

Methods

Development occurred primarily on Unity 2022 (LTS) with GitHub to synchronize changes. Below is a table of packages we utilized and the features they enabled.

Package	Features
Meta's XR SDK	Camera tracking, passthrough, augmentation, occlusion
Meta's Mixed Reality Utility Kit	Spatial-aware spawning and navigation
Unity's XR Hands	Hand tracking and gesture recognition

Other features like the actual collision detection, damage calculations, score- and time-keeping, and more were developed using Unity's built-in GameObjects and custom C# scripts.

Our code can be found here:

<https://github.com/himmannshu/ar-final-project>

Experimental Setup

Targeted playtesting composed the majority of our experiments. This involved running the application in different physical environments and observing its behavior in response to a variety of user actions. No standardized procedure was developed as to preserve the flexibility required for fast iteration.

Initial experiments primarily focused on bugfixing, ensuring that essential features functioned as envisioned. Once the features were deemed functional, further experiments focused on various aspects such as game design, appearance, and user experience.

Results

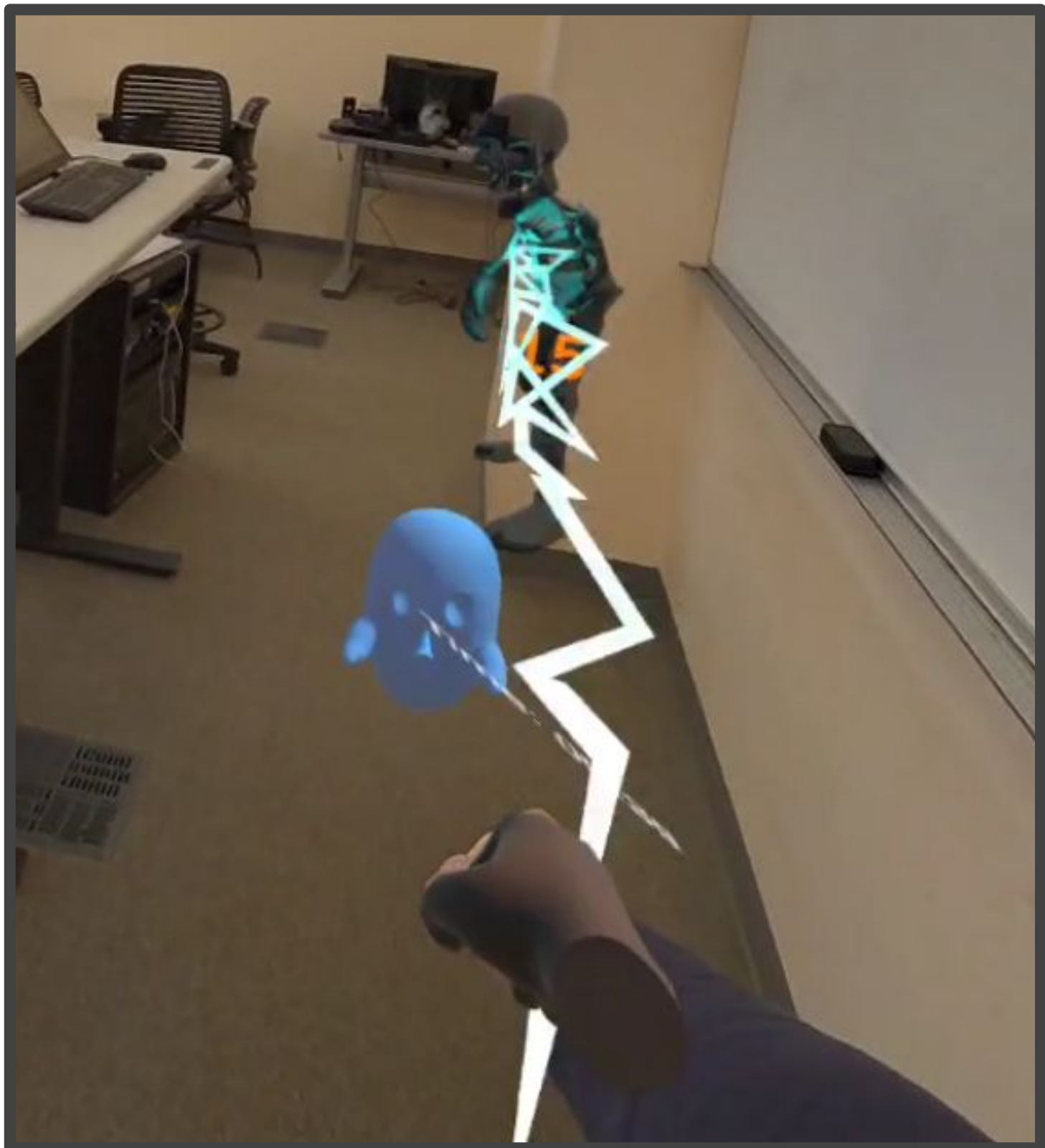
The game was successfully tested on Meta Quest 3 with accurate gesture detection, functional spell casting, and responsive enemy behavior. Spawning, occlusion handling, collision detection, and HUD elements worked reliably. Overall, testers found the gameplay intuitive and engaging.

Conclusions

This project successfully developed an Augmented Reality (AR) game centered around immersive enemy engagement. The game dynamically spawns adversaries in the player's real-world environment, creating a compelling and spatially aware experience. A key innovative feature is the implementation of gesture recognition for the core shooting mechanic, allowing players to interact with the game in a natural and intuitive manner. This work demonstrates the potential of combining AR with gesture-based controls to create engaging and interactive gaming experiences.



(Left) Skeleton occluded by physical desk; damage indicators
(Right) Lightning spell aligned with fist; lighting effects



Game Instructions

--- Objective ---

Defeat as many enemies as you can in 60 seconds!

Monsters will spawn in batches and approach you (you have weak legs from studying magic, so you can't run away). If they come too close, you will take damage! You begin with 100 HP. If your health hits 0, you lose. If you survive for 60 seconds, you win! Shoot spells at the monsters by shaping and aiming your hands.
Tip: Take advantage of enemy weaknesses.

--- Spells ---

Fireball // (60 DMG)

To shoot a fireball, **open your palm and push outwards**. You will need to close your palm before shooting again.
Tip: Use your shoulder to push to stabilize your aim!

Railgun // (75 DMG)

To shoot a slug, **point your index finger** and close your other fingers. You will need to bend your index finger before shooting again.
Tip: Try shooting a fireball with this to cause an explosion!

Lightning // (2 DMG / 0.25 s)

To shoot lightning, **close your fist** and point it out.
Tip: Slowly rotate your wrists to improve tracking accuracy!

--- Monsters ---

Skeleton // (120 HP, 0.15 m/s, 1.00 DMG / s)

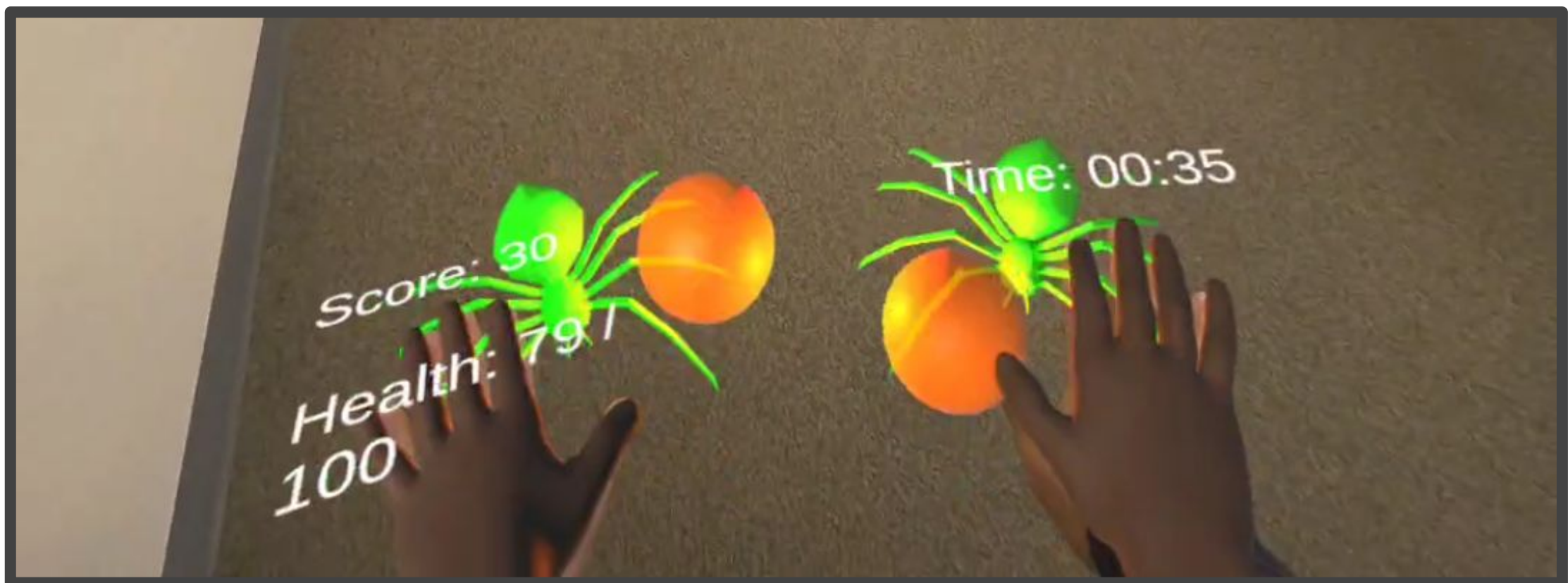
The skeleton receives **1.5x DMG** from slugs (**railguns**)!

Ghost // (90 HP, 0.20 m/s, 0.75 DMG / s)

The ghost receives **1.7x** and **1.2x DMG** from **lightning** and **fire**!

Spider // (60 HP, 0.30 m/s, 0.50 DMG / s)

The spider receives **1.6x** and **1.3x DMG** from **fire** and **lightning**! Beware, spiders will split into two (at most once) upon death.



(Left) Split spiders and two fireballs; score, health, and timer aligned with hands