VR Excavator Simulator

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OVERVIEW

VR Excavator Simulator is a **virtual reality** (VR) game that allows users to become familiar with excavator controls, movement, and excavation. This simulator is intended to be **more accessible** than current proprietary simulators that use custom hardware.

GOALS

- Explore the process of **designing, implementing, testing**, and potentially publishing a Steam game.
- Create a simulator/game for VR users.
- Using an excavator that **mimics the real-world**, allow users to interact with the **environment in real-time**.
- Learn how to manage a larger project with a 3 month deadline.
- **Adjust to any setbacks** and avoid pitfalls/blockers.

IMPACT & MISSION

- Provide a **more accessible excavator simulator** to the public by not requiring specialized hardware other than a common VR device.
- Allow users to **gain knowledge** about the use of large excavators.
- **Provide entertainment** to curious minds

ACCOMPLISHMENTS

- **Created virtual joysticks** and levers that feel "real" or natural to use within VR.
- Realistic excavator **movement** and **track deformation**.
- Created a **interactive digging of dirt** mechanic that generates and absorbs particles.
- **Three tutorial levels** that showcase basic functionalities of an excavator.
- **Sandbox level** that allows users to experiment with excavator mechanics.

CHALLENGES

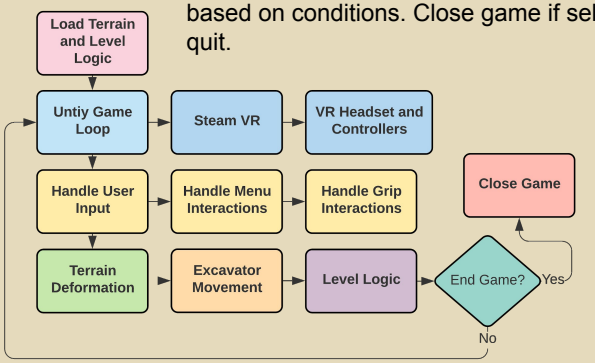
- Planned **deadline was moved up** by an entire month so the idea of publishing a game to steam was removed for this phase due to the amount of testing and time needed before app approval.
- **Allocated project time was reduced** by 60% due to other school work so the scope of work was reduced.
- **Invested time into learning** a newer articulation body system but ended up just using character controllers and a tank simulation plugin.
- **Ran into performance issues** thought development so geometry, shaders, and terrain system was optimized.

TECHNOLOGIES

- Real-time physics
- Voxel Terrain
- Physical Tank Treads

SYSTEM DESIGN

The system, at a high level, reads in world data to **set up a scene**, uses a **game loop** running at 90 cycles per second, reads in **VR data via Steam VR** API, **handle input** events, determine **if terrain should deform**, **move** "player" **excavator** dependent on interactions, and finally **trigger level logic** based on conditions. Close game if selected quit.



SCREENSHOTS OF SIMULATOR

Fully interactable and modeled cab interior with tinted **window menu system**

Dynamic deformable terrain and levels giving users control on how and when they can explore

THE FUTURE

- **Refine excavator** movement and hydraulic simulation.
- Add **ability to pinch objects** with hydraulic thumb.
- Create pond level.
- **Release game on Steam!**