Excavator Simulator VR

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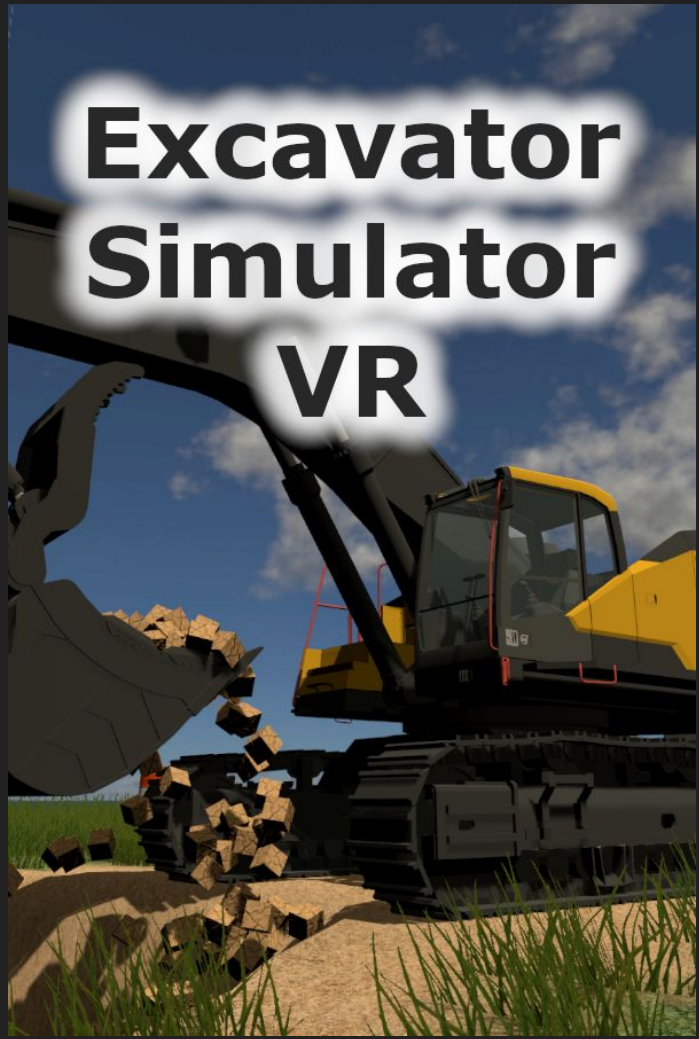
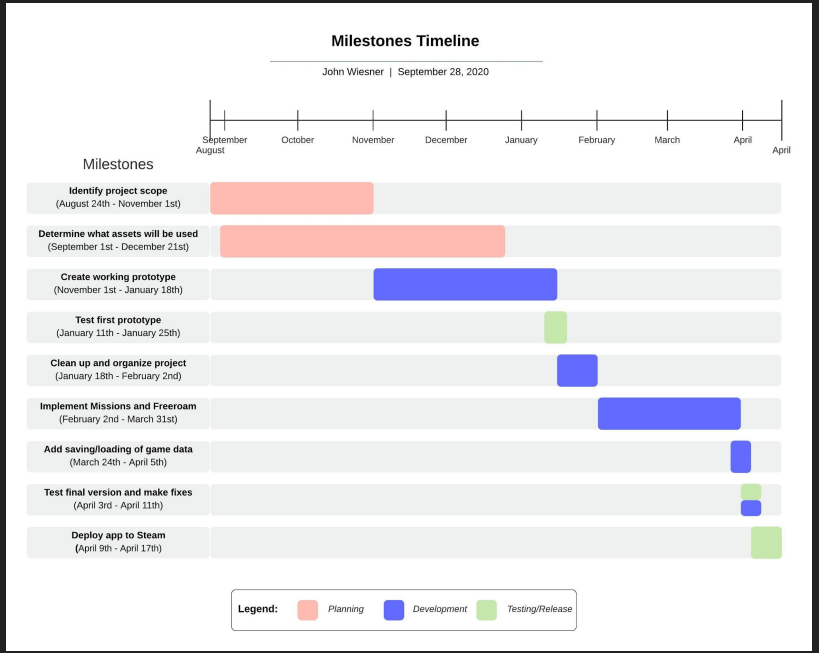


Goals

- 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
- 100 hours of work within 12 weeks
- $200 personal budget



(Original Timeline)

Intellectual Merits

- Discovered that controlling grip-joysticks in VR is not as intuitive as it may seem.
- Optimization is very important for VR projects due to the heavy rendering and high target frames per second. Delaying optimization can easily lead to backtacking and reimplementation.
- While digging user's wanted particles to appear and reabsorb into terrain instead of just fill the bucket. This created a more immersive experience.
- Settings that allow users to adjust their seat height were very important.

(Seat Settings)

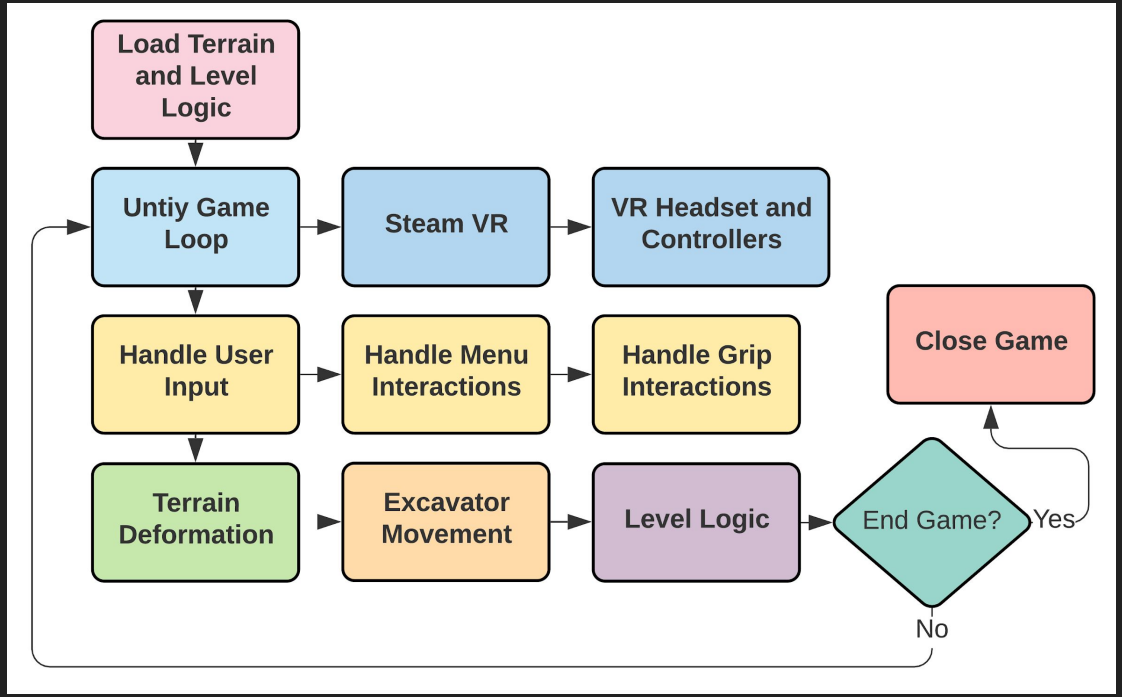
Border Impacts

- 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.

(Main Menu)

Design Specifications

- The application uses the same base logic for each level.
- Each block excluding “Loading” is ran every update.
- This is a high level game loop



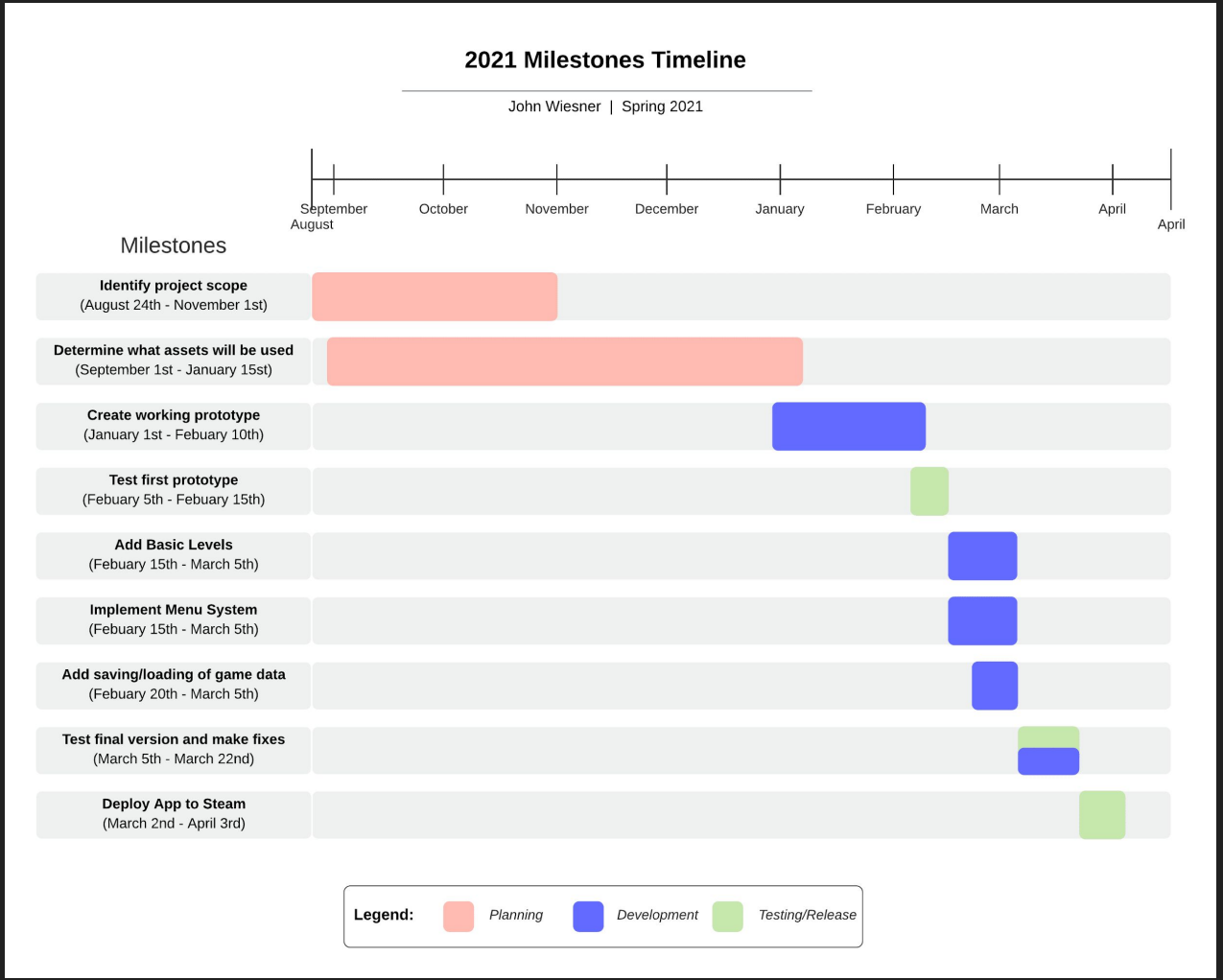
Technologies

- Unity 3D - Game engine
- C# - Primary programming language
- Github - Issues tracking and source control
- Blender - 3D modeling software
- Ultimate Terrains - Voxel engine for real-time terrain modification
- Steam VR - Interface API for Open VR
- Physical Tank Treads - Realistic track movement
- Real-time physics - Environment objects are dynamic and impact excavator's performance

Milestones

Milestones had to be tweaked and cut due to:

- Narrowed scope
- Setbacks
- Shortened deadlines
- Steam publication approvals



Results

- Fully playable and purchasable Steam game.
- Optimized VR game that can run on minimum hardware.
- Three tutorial levels that showcase basic functionalities of an excavator.
- Real-time terrain deformation system that generates and absorbs particles.
- Created virtual joysticks and levers that feel “real” or natural to use within VR.

VR Controls (Left)

Digging (Right)

Challenges and How They Were Overcome

- Planned deadline was moved so the scope of the game was reduced significantly.
- 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 a tank simulation plugin.
- Ran into performance issues thought development so geometry, shaders, and terrain system was optimized.
- Publishing to Steam took longer than expected due to the amount of art assets and processes needed to be learned.
- Different technologies needed to be used so the budget was increased to $300 and the goal is to Sell the game for $4.99 on Steam

VR

The Future

- Refine excavator movement and hydraulic simulation.
- Add ability to pinch objects with hydraulic thumb.
- Add more level and tutorials.
- Keep game up to date on Steam!

(Steam Store Page)

Download today:
https://store.steampowered.com/app/1526380/Excavator_Simulator_VR/