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From Filth it Rises presentation

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From Filth It Rises

Project by Griffin Hartz
Advised by Wesley Deneke
Overview

- Video game made in Unity Engine over Spring Quarter
- Genre: Survival Horror
- AI for enemy developed using Unity’s Machine Learning Agents package
- I had no background in ML prior to project
My Background

- Computer Science Major
- Done research with Dr. Deneke developing a virtual world since fall 2021
  - Currently developing it as a therapy platform
  - Have worked on Virtual Reality, Networking, User Abilities & Tools, Database, Tutorials, Environments
  - Worked on it last summer via the Elwha award scholarship from WWU
- President of WWU Game Design Club since fall 2022
  - Officer since fall 2021
- Took Dr. Deneke’s Game Programming class fall 2021
  - Made a dark fantasy stealth game called ‘Tainted Whisper’
- Fan of:
  - Tabletop & video games
  - Metal music
  - Sci-fi/fantasy/horror books & movies
Game Concept / Motivation

- What is a survival horror game?
  - Player is generally in a confined space they must escape.
  - Limited power/control.
    - Often need to subvert foes rather than fight.
- What makes survival horror interesting?
  - Player needs a different approach than action or FPS games.
    - Alternatives to direct confrontation.
  - Exploration of fear in an immersive context.
- What makes these games challenging?
  - Scarce resources.
  - Use of environment.
  - Puzzle elements.
Game Concept cont.

- Player is sent to investigate a sewer beneath Cologne, Germany.
- A previous employee had been sent down earlier.
  - Did not return, is not answering radio.
- Player goes down and finds a collapsed wall.
- Leads to a buried undercity.
  - Accessible through a gate which closes behind them.
  - Radio does not work in the city.
- Coworker is quickly found, slaughtered.
- There is a mutant monster prowling the undercity.
  - Hunts the player.
- Player has to find a way out of the city, or a way to contact help.
Early design and development

- Level design sketching based on expected player movement
- Interactions, some inspired by other works
  - Readable items for info about setting, hints
  - Throwable objects
    - Distractions
    - Breaking obstacles
  - Obstacles such as jammed gates
- Mutant is to pursue ‘traces’ the player drops
- WASD movement and cursor based looking
- Design document
What is a Neural Network?

- Layers of nodes/neurons.
- Input layer, x amount of hidden layers, output layer.
- Input layer receives some form of data, usually numbers.
- Neurons receive input from previous layer.
  - Perform a mathematical operation.
  - Apply activation function.
    - Activation function stimulates non-linearity, allowing complexity.
- Output layer returns predictions from hidden layers.
Neural Network Cont.

- Subject the NN to a training scenario which will produce the input data
- During training, NN adjusts internal parameters (weights & biases)
  - This is based on input data & desired output
- Unity’s MLAgents:
  - Uses a reward-punishment system
- Why use ML as opposed to static AI?
  - Flexibility
Integrating Machine Learning

- Training runs via ‘episodes’ that are a given amount of ‘steps.’
- CollectObservations & OnActionReceived
  - Input and output, respectively
- Output Visible in animator
  - Using this to drive animation, movement
Training Demo
Asset collection

- I had several unity assets from previous projects available to me (some were free)
- These include:
  - Castle & mine visual 3D assets and materials
  - Water shaders
  - Footstep, fantasy & horror sounds
  - Unity’s first-person demo project
- Got mutant model & animations from Mixamo.com
Development Process

- Learn MLAgents
  - Environment setup
  - Basic training scenario
  - Avatar rigging & animation
- Level design
  - Whiteboxing
- Adding player
  - Basic actions
- Interactables
- Curating visuals
Challenges

- Git (version control) with Unity
- Anaconda environment setup
- Learning MLAgents was time consuming
- Animation with ML was difficult
- Extending default interactions
- Managing all elements without team
Current State & Next Steps

- Game still needs a handful of functionality:
  - Improved UI & Controls options
  - Additional interactable items
  - Sound not implemented
- AI needs additional training & tweaking
  - Still does an annoying amount of random wandering
  - Will eventually do heuristic training with a live player
- Pickup items & some other objects use placeholder assets
- Readable text throughout the ruins
Questions?