COMP4501A Project Proposal

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Disclaimer: Some CRC cards may be split over page breaks.

Overview

The game shall be titled *affliction*. In the game, the player will control six organs and a host of microorganisms within the human body with the objective of defending against a threatening virus. At the start of a game, two infections will exist somewhere in the body unknown to the player. This infection will begin the production of enemy units which will surge toward the player to destroy organs and spread more infections. Enemy units will consist of pathogens, which are infectious killing virus units which only serve to destroy allied units and organs, and spores, which are virus units with the intention of spreading and creating more infections throughout the body. Infections continuously produce new virus units.

The player will have control over a heart, lungs, brain, stomach, and kidneys, each of which has its own special function and upgrades. All organs need to be constantly supplied with oxygen, otherwise they begin to continuously take damage over time. Organ upgrades need to be paid for with protein, a nutrient which will be discussed shortly. The heart will be responsible for the production of blood cells, taking erythropoietin (‘Eryth’ in game) as payment. The two types of blood cells which can be produced by the heart are red blood cells and white blood cells. Red blood cells will be able to collect nutrients and deliver them to organs (if applicable) while white blood cells will be able to attack viruses and infections. The lungs will be responsible for producing oxygen to be retrieved by red blood cells. The brain will be capable of researching new upgrades for organs, paid for with protein. The stomach will be the location to mine protein. And finally, the kidneys will be the location to mine erythropoietin.

The objective of the game is to destroy every last infection and every last virus within the body. But if the player has all organs destroyed, then it’s game over. In reality the crucial organs to continue the game are the heart and lungs. All the rest are just supplemental.

Technical Requirements

The following list includes the requirements from all deliverables and the way in which *Affliction* fulfills them.

- The game uses an overhead isometric view camera angled at the terrain at 50 degrees.
- The game has illumination from a directional light and game objects cast dynamic shadows.
- The game is made up of 3d models for all units and a terrain made with unity’s terrain editor.
    - All visual assets are textured.

- Collision detection is implemented between all game objects using unity's rigid body component for units which are made up of sphere or cylinder colliders and a terrain collider for the terrain.
- When the game starts up, all of the player's organs exist as well as two red blood cells to get the work started. For the enemies, two infections are created by default.
- Units can interact with each other via mouse input. Clicking (or dragging over) any units selects them. Shift clicking as well as dragging the mouse allow for multi unit selection. With allied units selected, right clicking issues orders to units. Right clicking the terrain orders the selected unit(s) to move to that location. For white blood cells right clicking enemy units orders it to attack. For red blood cell, right clicking any resource miner organ and then right clicking another organ orders a work command. For more information see the AI requirement.
- The camera is moved with the WASD or arrow keys and can pan across the level.
- Physics are implemented through rigid body physics where microorganisms are moved physically (through the NavMesh agent), and collisions are responded to physically by reacting to the unit collided depending on the two units mass (organs do not move, their mass is too large)
- Animation: all microorganisms have animation while they are alive in the level. The red blood cell and pathogen have unique animations that reflect their geometry.
- Character animation is implemented through the skeletal animation on the tentacles of the pathogen
- Particle Systems are implemented in three distinct ways. When an allied microorganism spawns a beam of life bursts forth and rises up. When allied units move through the level a bubble trail is left behind. Finally when an enemy unit takes damage blood slashes off.
- Pathfinding is implemented through the NavMesh and NavMesh Agents. All Units are NavMeshAgents and attempt to avoid each other unless explicitly interacting with other agents (like a red blood cell interacting with an organ, or a white blood cell attacking an enemy). The terrain is a NavMesh with prebaked pathways that the agents navigate through.
- Semi-automatic actions are present in all microorganisms through the command class. The player (Or A.I.) issue commands to the microorganism and the microorganisms perform actions to satisfy the commands. The red blood cell will automatically transfer resources between two organs. The white blood cell and the pathogen will automatically attack an enemy unit close to itself, additionally the two microorganism will stop what they were doing and automatically respond to it being attacked.
- Enemy A.I is implemented independently on the infections, spores and pathogens. There is no overarching A.I. instead each unit thinks and acts independently. These AIs are implemented through various rule based state machines.
    - The Infection starts off by maturing, before gathering strength and attempting to spread. It will then send out pathogen(s) to attack before gathering more strength. The amount of spores and pathogens the infection releases depends on the level and the amount of strength it has stored. The infection senses its environment and responds to threats by initiating a defense mode. This defense mode will constantly spawn pathogens to defend itself until it runs out of strength.
    - The Spores sole responsibility is to spread the infections. They start of in a dormant state where they blindly wander around the level. After waking up they will sense their environment by wandering around. They may decide to create a new infection

by “colonizing”, or they may decide to give their cells to a current infection if they are close to one. Upon colonizing a new infection or colonizing a current infection they die.
    - The Pathogens sole goal is destruction. They wander the level until they get notice an enemy (player controlled) unit and will attack it until either its target is dead or the pathogen itself is dead. Once it has destroyed its target it immediately looks for another.
- The game mechanics involve keeping your organs and body alive while purging all infections. The player orders cells around to maintain oxygen supply to organs, upgrade organs to provide more resources, or stronger units and orders white blood cells around to hunt for infections and enemy cells.

Bonus Features

The following are major features found in *Affliction* that were not required but are present

- The Graphical User Interface in the game provides live information updates and keeps track of selected units. It also provides a quick menu, accessible by holding the space bar, for navigating quickly between organs by pressing the organ’s corresponding number. Additionally it provides button for action like recruiting and leveling organs up.
- The Brain provides the ability to upgrade buildings which allows organs to level up and therefore provides a non-linear progression throughout the game.

Architecture

The following CRC cards describe the responsibilities in the relevant game classes (does not include built in Unity classes).

GameController	
Responsibilities	Collaborators
- Interaction between player and game - Updates GUI and Camera	Camera Units UI

Unit	
Responsibilities	Collaborators
-Health -On attacked event - Selected Status - Level - Damage Particle Effect (If present)	MouseEventHandler RigidBody GameController NavMeshAgent ParticleSystem

Microorganism	
Responsibilities	Collaborators
-Tracks Command Queue - Attempts to perform actions based on the Commands - Trail Particle Effect (if present) - Spawn Particle Effect (if present)	Unit ParticleSystem Command

Blood Cell	
Responsibilities	Collaborators
- Movement to locations	-Microorganism

Red Blood Cell	
Responsibilities	Collaborators
-Harvests nutrients from organs -Carries nutrients - Work Command	-Blood Cell -Organ -Nutrient -Command

White Blood Cell	
Responsibilities	Collaborators

- Issues Attack Command - Looks for enemies near itself	-Blood Cell - Infection - Command

Organ	
Responsibilities	Collaborators
- Stores Resources - Consumes Resources (oxygen and protein) - Can upgrade	-Unit - ResourceStore

Spawner	
Responsibilities	Collaborators
- Spawns units from list of available units - consumes Resouce eryth to spawn based on objects cost	- Organ - ResourceStore

Miner	
Responsibilities	Collaborators
- Produces Resources	- ResourceStore - Organ

Brain	
Responsibilities	Collaborators
- Researches upgrades that are made available to organs to level up - Consumes protein	- Organ - ResourceStore

Infection

Infection	
Responsibilities	Collaborators
- does not consume oxygen - enemy ‘organ’	-Organ - InfectionBehaviour

InfectionBehaivour	
Responsibilities	Collaborators
- Provides intelligent behaviour to the infection - responsibilities include issueing spawn commands, leveling up infections and responding to threats against the infection	- Infection - Physics

Command	
Responsibilities	Collaborators
-Track list of action objects microogranisms need to complete complex tasks - triggers for specific actions like move and collision	- Organ - ResourceStore - Spawner - Unit

Pathogen	
Responsibilities	Collaborators
- Enemy White Blood Cell	- White Blood Cell - PathogenBehaviour

Spore	
Responsibilities	Collaborators

- Enemy Worker - Creates colonize commands on action on other objects	- Red Blood Cell - Infection - Commands - SporeBehaviour

PathogenBehaviour	
Responsibilities	Collaborators
- Issues move order to pathogen	- Pathogen - NavMesh

SporeBehaviour	
Responsibilities	Collaborators
- Provides intelligent behavior for Spore - Issues move orders and decide whether or not to colonize a nearby infection, or colonize a new infection somewhere in the level (where there is room)(	- Spore - Infection - Physics - NavMesh

ResourceStore	
Responsibilities	Collaborators
- Contains a number of a specific resource, interface to add stores, subtract stores, and move resources around	- Miners - Organs - Spawners - Red Blood Cells