NORTHEASTER UNIVERSITY - SILICON VALLEY

CS 5150 - GAME AI

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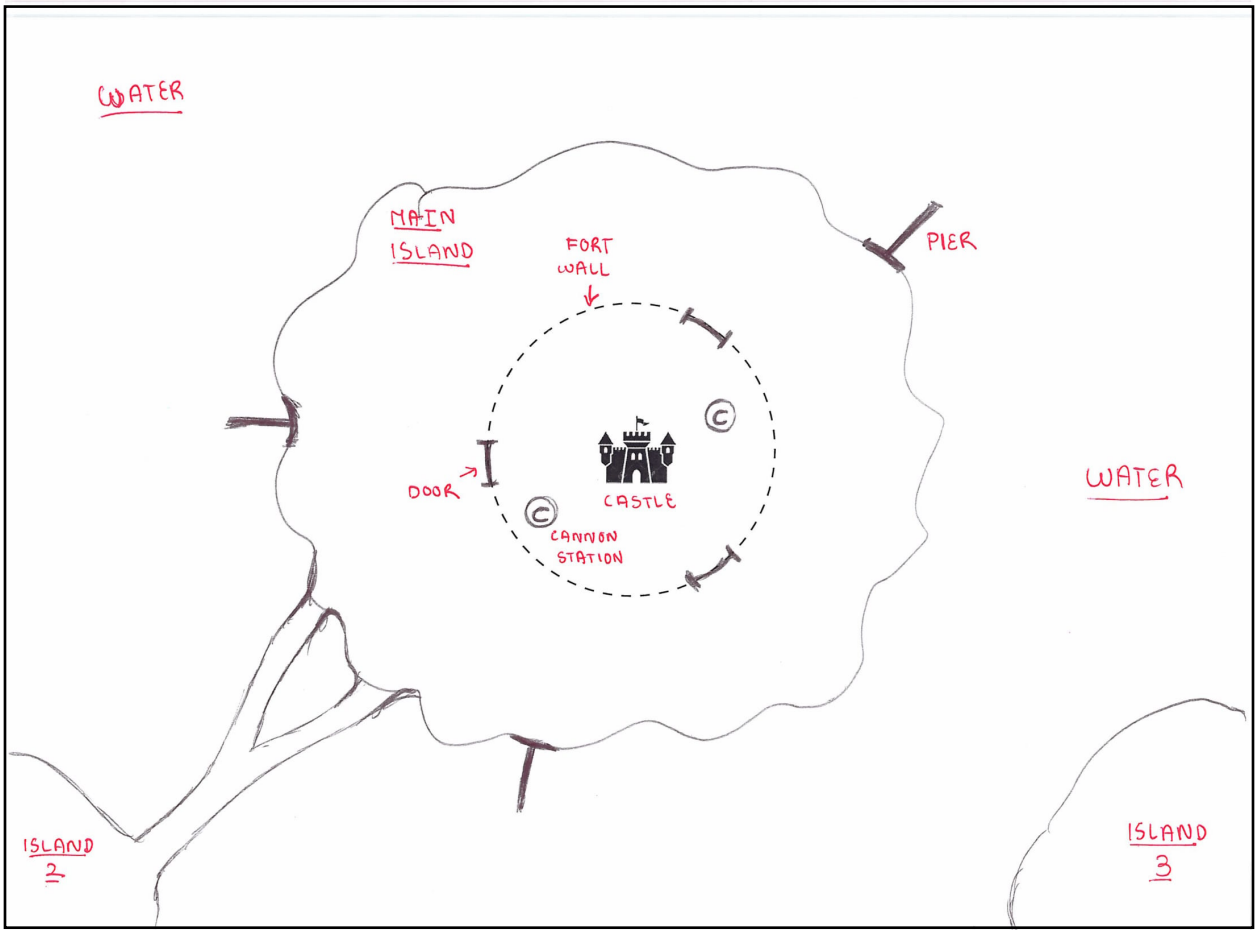
PROJECT PROPOSAL

SUMMARY

The Game is supposed to be a strategic game with a human player and an AI competing against each other. The goal of the AI is to capture the castle and the goal of the human player is to prevent that from happening. The game shall progress in levels. The player has to destroy all the AI characters on the screen to proceed to the next level. The difficulty increases at each level. The human player and the AI has multiple resources at their disposal to achieve their goal.

Note: Things mentioned in the subsequent sections are based on an initial idea of the game and might change once I start developing the game.

ENVIRONMENT



- The image shown above is a rough sketch of what the game window shall look like
- The Castle is at the centre. The castle is surrounded by the fort wall shown with the dotted circle
- The only way to enter the fort wall is through the 3 doors along those walls.
- All this is located on the main island which is surrounded by water. There are two other islands which are enemy territories (The roles of these islands are not finalized yet)
- The AI army will approach the the main island via water using a ship or via land through a bridge from island 2

OBJECTIVE

Prevent the AI army from conquering the castle. (5 enemy soldiers/knights reaching the main castle implies castle is conquered)

CHARACTERS

1. Soldier:
   - Shown as a circle (boids)
   - The Human Player and the AI will both have soldiers
   - A soldier attacks an enemy soldier and both die.
   - 10 soldiers can bring down a door
   - 5 soldiers cab bring down a player built wall (not the fort wall)
   - The Human player can direct a group of soldiers/knights towards a specified point and the soldiers engage with the enemy if they are within the combat radius

2. Knight :
   - Represented with concentric circles
   - A knight is twice as powerful as a soldier
   - A knight destroys 2 soldiers before it dies
   - The Human player can direct a group of soldiers/knights towards a specified point and the soldiers engage with the enemy if they are within the combat radius

WEAPONS/ LOGISTICS

1. Ships :
   - Ships are used to transport the soldiers via water. Each ship can carry multiple soldiers
   - The ships can land only at the Piers where the soldiers will get off and head towards the castle
   - Ships can be destroyed

2. Cannons :
   - There are cannon stations on the main island
   - The human player can shoot cannon balls from these cannon stations in any direction within the shooting radius
   - Destroys all the soldiers within a certain radius of where the cannon ball lands

3. Walls :
   - The Human player can build a certain number of walls to create an obstacle for the AI.
   - Depending on the location of the wall, the AI can either go around the wall or sacrifice 5 soldiers and bring down the wall

4. Land Mines:

- The players can deploy land mines around the main island
- If an enemy character comes in contact with the mines, all the characters inside the blast radius are killed

5. Aquatic Mines :
   - These mines are like land mines but can be placed in water which allows it to destroy ships

RULES/ FLOW OF THE GAME

- The Player starts with an army of a given size and a limited number of weapons
- The enemy will start attacking in waves with each subsequent wave having more enemy soldiers than the previous ones
- A new wave starts when all the characters from the previous waves are destroyed or have fled
- In each wave, the AI army will try to overcome the obstacles and reach the castle.
- The player on the other hand will try to destroy all the AI characters before they reach the castle
- The player loses and the game ends if at least 5 soldiers/knights reach the castle.
- The player wins and the game ends if the AI Army was unable to capture the castle after 5 waves

BASIC ALGORITHMS

ALGORITHM	DESCRIPTION
Steering Behaviors	The game will use all kinds of steering algorithm like seek, chase, flee, collision avoidance etc for character movements
Flocking and Swarming	Both the Player and the AI army will use the swarming behavior because the soldiers will move in groups and hence will require the swarming behavior

AI ALGORITHMS

ALGORITHM	DESCRIPTION
Dijkstra's Algorithm	Used for finding the shortest path to the castle
A*	Used for finding an optimal path to the castle
Decision Making	Uses one or more of the decision making algorithms like Decision Tress of FSMs to make a decision like engage with the army or to flee or to bring down a wall etc

IMPLEMENTATION APPROACH

- The first thing to implement would be the game world.I would be using PyGame for building this game
- The initial game world would look similar to the rough sketch under the environment section
- The next thing to build would be the characters i.e the player and the AI army. I would have to give the army path finding, steering and swarming behaviors and they should be capable of reaching the target if there are no obstacles
- The next step is to allow the player to use weapons to destroy the AI army
- I would then give the AI Army decision making capabilities which would allow it to reach the castle even if there are obstacles on the way.
- The next step would be to use decision making algorithms to form strategies like:
  - Flee if the AI army is losing
  - Combine or breaking a group to help another group for higher chances of winning etc.
- The next step would be bring all these things together and that should give us a very basic prototype of the game and we can then fine tune it and build upon it to add other features and behaviors as and when required