AI - Final Project Documentation
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Description of AI Technique:
We have created a reinforcement learning AI that solves a randomly generated maze using the Q learning algorithm. Reinforcement learning starts with an environment to learn in, and creates an agent that is given a reward. The agent is trained to follow the reward in order to obtain the goal.

In our game, the AI traverses the maze at random until it finds the goal, updating the Q-table as it goes to explore its surroundings. The AI will continue the process until it exhausts the amount of allowed iterations. When the AI performs a proper run against the player, it uses the Q-table to look up the most optimal direction it can take and follows it to the end.

Game Description:
The game is a maze game where the player races the AI opponent through a randomly generated maze. On the starting screen of the game, the player can generate their preferred size for the maze, as well as the number of iterations the AI will go through which can increase the AI's difficulty. When the player moves to the next screen, the game will randomly generate a maze. The player is given the option to regenerate the maze from this screen, and can start the game if they are satisfied.

The player (represented with a green capsule) and AI (represented with a transparent red capsule) are randomly generated to spawn at a starting tile, and an ending tile is randomly generated at a different location. The AI will move toward the ending tile with its calculated actions from the Q-table, while the player must race the AI to the ending tile. When the player or AI reaches the end, the game ends, and the player can restart the game with a new round.

The controls are WASD to move the player character, Space to regenerate the maze, G to start the game. The mouse is used on some menus to transition screens.

How AI is Integrated into the game:
The AI is given the same start point as the player and a set amount of iterations to refine its path to the goal. The AI then races the player to the goal when the game starts. The AI uses the starting point and end point of the maze in conjunction with the q-table that it learns through multiple iterations, to determine the best route to reach the end of the maze.

The fewer iterations the AI has, the less optimal its route will be, allowing the player an easier time to beat the AI to the end. The larger the maze, the more pathways it has, which will require more iterations to fully explore and learn about its environment. The most optimal environment for the AI is a small maze with many iterations.