Artificial Intelligence

Main Assignment

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1 Design & Implementation Rationale

Beginning the AI implementation, first, the class TempRadius, and tempRadius.fcl was created to use Fuzzy Logic (FL) to guide the Player to the Maze Exit. The input variables are playerLocation and mazeExit. Their terms work with a brute force set of inference rules to get the Defuzzify's output of the player's temperature radius with the exit. In MazeExitLocator, TempRadius is used to get the output to notify the player how close they are to the exit.

An Encog Neural Network (NN) was constructed in the new class NNCharacterTask to control the Ghost Characters. This NN is built with three layers (detailed below). It takes in a dataset of stats and an expected outcome for actions. Then gets trained with the dataset by using Resilient Back Propagation and an error rate of 0.09. In CharacterManager, the NN's classification of the output switches the ghosts between actions depending on their changing stats. These actions are Panic, Hide, Run, and Attack which, are accessed in CharacterTask. Panic turns them pink, Hide turns them invisible, Run turns them orange, and Attack puts them into a hostile mode. At the start of the game, the player has five lives. If the player is in range when the ghosts are in this mode, the player loses a life.

FL is then used to analyze the NN's decided actions in intelligence.fcl and CharacterLogic. In CharacterTask, if the actions are declared as intelligent by the Defuzzifier, the ghosts tell the player a more precise area of where the maze exit is than tempRadius. The ghosts have the power to do this from a Recursive Depth-First Search that locates the Goal Node (mazeExit in GameWindow).

With the AI implemented, the player has two options: escape the maze or suffer defeat by the ghosts.

Neural Network Topology

- Input Layer - No Activation Function, Bias = True, Neurons = 4
- Hidden Layer - Sigmoidal Activation Function, Bias = True, Neurons = 2
- Output Layer - Sigmoidal Activation Function, Bias = False, Neurons = 4