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Homework 6: Decision Making
November 19, 2015

TO RUN THE PROGRAM:

Select the scene "map1" and hit the play button to begin. Once the map loads, left click with the mouse to select the starting location for pacman. Once you have done that, click the START GUI to begin the simulation

Navigating the Scene:

Use the ARROW keys on the keyboard to move the camera about the scene to follow the ghosts or pacman.

Play Again?!:

Hit the Reset GUI Button to clear the map and start again.

Switch Maps:

If you want to switch between the two maps, click the GUI button accordingly.

WHAT'S HAPPENING:

Pacman's Goal is to eat all the pellets in the scene. He has three states for navigating the scene to accomplish his goal. The ghosts goal is to collide with Pacman to end the game. They also have three states to navigate through the map.

OBSTACLE AVOIDANCE:

If Pacman encounters an obstacle on his way to his target pellet he uses A* to find the optimum route to the pellet. He stores the path in an array and follows his path to get to the pellet. Once he gets to the desired pellet he goes back to regular navigation.

PACMAN'S STATES:

State 1 - Best Case - Collect Pellet Groups:

Pacman's best case scenario. The ghosts are not close to him. The Pellets are set up to each belong to a group; the entire map is made up of chunks of these groups of pellets. Pacman finds the nearest pellet group to him and begins to eat all the pellets in this group. This proves to be a smart

algorithm for Pacman so he eliminates large areas of pellets at a time so he doesn't need to return. Once Pacman finishes a group of pellets, he finds the next closest group and begins on that.

State 2 - Middle Case - Switch to a safer Pellet Group:

This state occurs when the ghosts are far enough away to not run directly from them, but close enough to start avoiding them a bit. Pacman sees the closest ghost to him and picks a new pellet group to go after in the opposite direction. This makes pacman start eating pellets in a safer location without completely runnig away from the ghost yet.

State 3 - Worse Case - Run from Ghosts:

This state occurs when the ghosts are so close to Pacman that he forgoes all want for pellets and just tries to get away from the ghosts. He begins running away in the opposite direction of the ghosts chasing him. When he is far enough away he switches back to the middle state.

GHOST STATES:

State 1 - Best Case - Chase Pacman

Pacman is close enough to the ghost that the ghost begins the chase. The Ghost follows Pacman and tries to touch him to end the game. If he gets far enough away, the ghost switches to state 2.

State 2 - Middle Case - Wander toward Pacman

The Ghost is close enough that he has a general idea where Pacman is and begins moving randomly with a tendancy to go toward Pacman. This makes the ghost more likely to wander close enough to Pacman to begin the chase.

State 3- Worst Case - Move Randomly

The Ghost is far away from Pacman and wanders aimlessley around the map trying to find Pacman.

Arbitration Algorithm:

Most arbitration for Pacman and the Ghosts are based on distance to each other. State switches mostly involved distance from Pacman to Ghosts, along with remainder of pellets in the current group, and location in the map. Distance is the most important however. If the ghosts are not close to Pacman, he is in no danger and should act accordingly.

Best PacMan start locations:

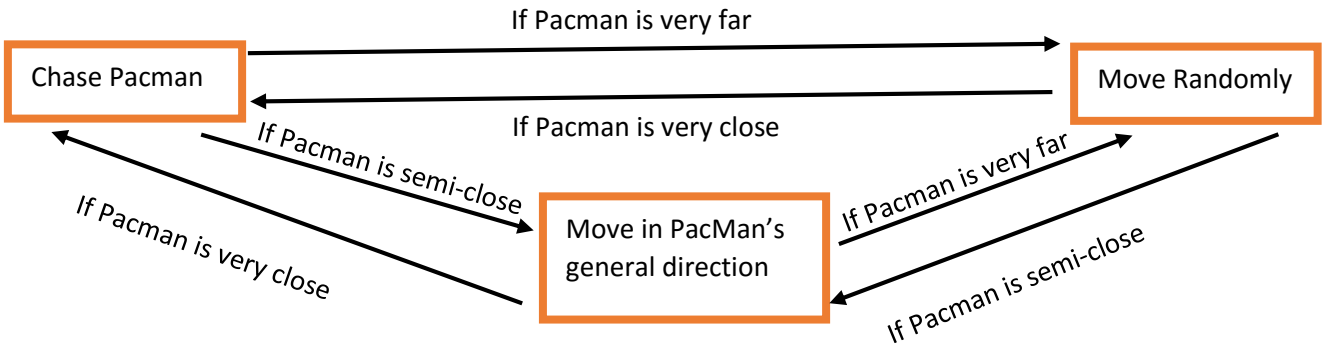
Map 1: Top-Middle Chamber, Top-Right Chamber, Bottom-Right Chamber, Far-Left Chamber

Map 2: Top-Left Chamber, Top-Right Chamber, Bottom-Middle Chamber, Far-Right Chamber

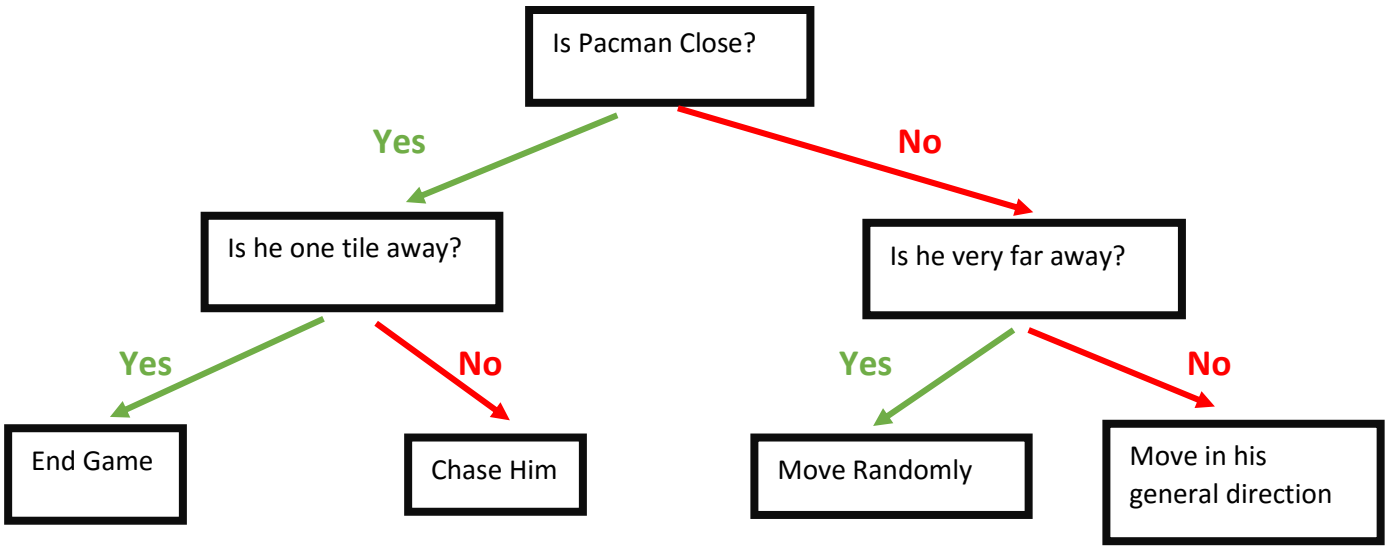
Performance Analysis:

It is always best if you start PacMan far away from the starting location of the ghosts. This gives him more time to eat as much pellets as possible before the ghosts catch him. Our algorithm is the best because Pacman is given a chance to find a further away group of pellets to eat if ghosts start approaching him. Instead of waiting till the ghosts are right on top of him, PacMan is pro-active on staying alive. Also, when the ghosts are far away from PacMan, they move randomly because they have no idea where he is. If they're semi-close, they move in his general direction to move the game along and, when very close, they chase him as best they can.

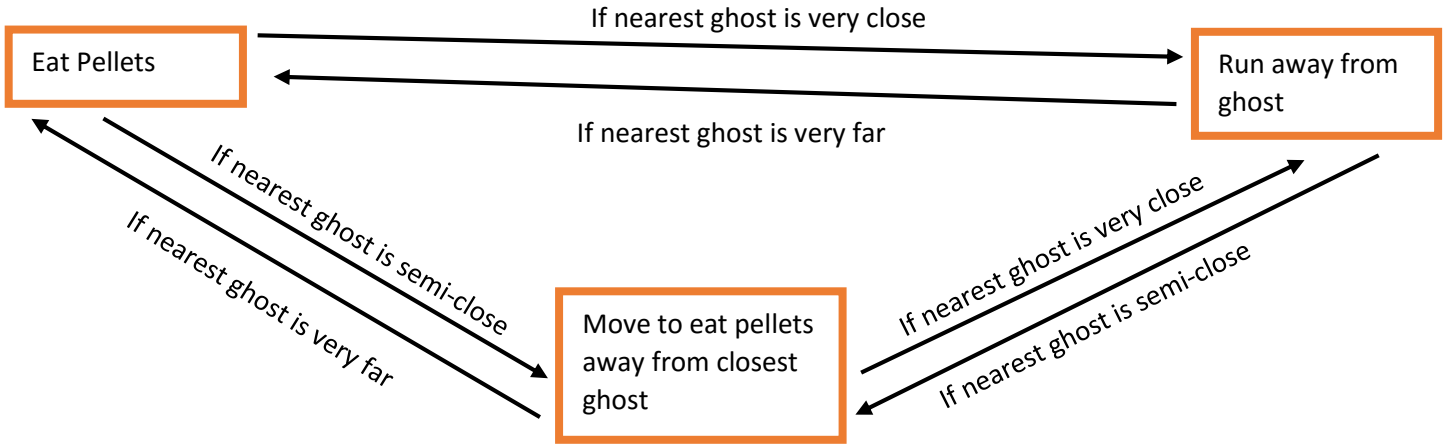
Ghost Finite State Machine:



Ghost Decision Tree:



PacMan Finite State Machine:



PacMan Decision Tree: