Game Trees Activity

1. Read [Solving Mazes with AI Pathfinding Techniques: A\* vs Tremaux](http://www.primaryobjects.com/2013/05/13/solving-mazes-with-ai-pathfinding-techniques-a-vs-tremaux/)
2. Watch the [Maze Solver](http://www.primaryobjects.com/maze/) for each of the two pathfinders:
   * Tremaux Algorithm
   * A\* Search
3. Provide a short description (1-2 descriptive sentences on each) on how each of the mazes are solved by these algorithms.

A\* uses a start point and an end point to calculate all available options or paths between that point and the end that are not blocked off. Using different methods, it can either go left to right, up, and down or fill vertically. Tremaux algorithm goes down one path and marks it red, if it reaches a dead end, it goes back and marks the red a different color as an incorrect path. This algorithm runs until it finds the end then displays the correct path by subtracting the wrong color path from the red.

1. Note: These are static mazes (i.e. it doesn’t change). What might have to be done differently if the problem meant trying to run away from a creature that’s also within the maze (such as a Minotaur)? Provide 2-3 good ideas of how the strategy to find an exit would be different.

I would think that the algorithm would try to avoid the minotaur or treat the minotaur as an obstacle and try to avoid it. Using the Tremaux I think it would use the distance of the minotaur and the player to calculate what distance they need to be away from, and the player would try to go the longest distance away from the minotaur. A\* would basically fill in all available spaces to search for the exit but then subtract the spots that the minotaur moves in, if the minotaur moves on the same path.

1. Create your own easy maze with the [Pathing AI on Scratch](https://scratch.mit.edu/projects/1034493/).  Make sure to take a screenshot once it finishes.

Chart

Description automatically generated with low confidence

1. How do you think the Scratch program solved this problem?  Provide brief 1-2 sentences.

I think the program run multiple instances to find the shortest distant path and then subtracts the position from the start. by removing the obstacles from the entire field, it can avoid going the wrong way. If the distance is the same as another path it will just choose one to go down.

1. Try creating a more difficult maze.  Take a screenshot.

A screenshot of a game

Description automatically generated with medium confidence

1. What makes this maze more difficult?  Do you think it solved it in the same way? Provide 1-2 ideas on how you would look at solving a maze problem.

I think this is harder due to many extra turns and lots of dead ends. I still feel like it used one of the algorithms to search all the available paths and when it was correct displayed the correct path from start to the goal. I think I would start by looking at the goal and then tracing it back to the start position, the opposite of start to finish because it is more likely to reveal the correct path. Not sure if that is factual but that’s how I solve puzzles. If I didn’t know where the ending is then I would have to search differently, like trying to find the path that leads furthest from the start point and check that way first.

1. Play the [AI Tank on Scratch](https://scratch.mit.edu/projects/933971).  How does it need to rely upon pathfinding?

The enemy tank must be able to track the players position using an x and y grid system. As you move one direction the tank will move closer to that position. If there is a direct line between the player and the tank with no obstacle, it will decide to fire a bullet at the position the player is at.

1. Look further down on this page and pick one of the remixes of the AI tank game to play.  Take a screenshot of which one you're using.

A picture containing graphical user interface

Description automatically generated

1. How has the user tried to modify the game to make the AI to be more realistic?  Provide 1-2 descriptive sentences to explain.

User shows where the enemy tank is going to travel to with blue boxes and it tries to predict where the player is going to be. Everything else like movement and firing is the same though.

1. How are path finding techniques used in technology (i.e. not games)?  Provide 1-2 strong ideas.

I feel like one of the things that can use pathfinding is a map program like google maps, using the algorithms along with data like traffic data. It can use these algorithms to find the quickest roads to travel down to get to a destination.

Path finding algorithms could also be used with decision making between humans and computers to generate values. These decision trees will look at all available options and try each option out to find the quickest path to the right answer.

1. Explain how this exercise is tied to the readings and related to your major/field. Remember to provide what your major/field is.

My major is programming and information systems. This ties into the readings because in the solving puzzles with search algorithms it shows us how these algorithms work and what type of programming is required to make the algorithm work. This also gives an idea on how algorithms work in general, this one being specifically using a current position and an endpoint to provide a function like marking the path red and remarking red to dark red if it’s the wrong tile. Finding a good use for these algorithms is hard because every reference that I have seen is about references using them to track computer decisions in chess or in games specifically. One of the uses I have seen this is a puzzle solver where you upload a picture of the finished puzzle and the current tiles that are mixed up and it calculates how to move the tiles to make the puzzle back into the correct form in the least amount of moves.