Final Project Proposal

B351 / Q351

Basic Information

Game of 2048

Short Project Statement

This project is to develop the game of 2048 and to try to solve it in a reasonable time. 2048 is a very popular game especially among people who love mathematics and numbers. The idea of developing a project to solve this game is very exciting with a decent amount of challenges.

Team Members

1. **Xinran Dai**
2. **Yixing Hu**

Background

1. Describe the problem space. What are the objectives, challenges, and constraints? What are some of the variations found in the problem space?

   The objectives of this project is to build and to try to solve this game within a reasonable period of time. The problems here are: 1) to build the game, which can be a big challenge alone, and 2) to come up with a heuristics to solve this game, 3) to implement a search algorithm to find the best move.

   A constraint is that the numbers 2 and 4 generated as each move is made are in random places, which makes it really hard to find a good move.

2. What are some historical attempts to tackle the problem space? Include links and references where appropriate.

   Since 2048 is popular game, many attempts have been made. Here are some links that I think are most helpful to provide with a way to start:

   https://stackoverflow.com/questions/22342854/what-is-the-optimal-algorithm-for-the-game-2048

   http://www.randalolson.com/2015/04/27/artificial-intelligence-has-crushed-all-human-records-in-2048-heres-how-the-ai-pulled-it-off/

   http://iamkush.me/an-artificial-intelligence-for-the-2048-game/

3. What solution are you proposing? Are there any existing similar solutions? How will yours compare? Include links and references where appropriate.

   We're proposing to use minimax/expectiminimax (since we only have one player here, this algorithm will be slightly changed to fit this problem) and alpha-beta pruning to find the best move.

   Yes, there are many similar solutions to this project. We can compare our programs by calculating the best score, winning rate and running time to test our results.

Deliverables

Our goal is to build the game of 2048 and then to solve it, which means that in the end, a 2048 should be running, and if the player chooses to let the AI solve the game, then the AI would keep making moves so that the number of 2048 is obtained. And if the game is not over, then the AI should keep playing to get higher scores until there is no more move to make.

Timeline

- 4/10-4/17: The game of 2048 should be able to work. When the project is finished, the player should be able to chose from two modes: "manual" and "AI", where "manual" means that the player should make her/his own move (up, down, left, right), and "AI" means that the AI we developed would make moves for the player. At this stage, we should finish most parts of "manual".
- 4/17-4/24: At this stage, we should finish "manual" and most parts of "AI". The implementation of expectiminimax and alpha-beta pruning should work. Minor flaws and mistakes are allowed.
- 4/24-4/30: During this time, we should improve and finish the project. Both "manual" and "AI" should work. After finishing the coding, we should also finish the white paper as well as the poster.
- 5/1: Course Symposium: we will deliver a demonstration on this project.

Acknowledgement

Instructor Mentor 1 _____ Signature _____

Instructor Mentor 2 _____ Signature _____

Team Member 1 _____ Signature _____

Team Member 2 _____ Signature _____

Team Member 3 _____ Signature _____