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Senior Project Log

Week 1:

* Progress:
  + began writing the game from scratch
  + got driver and keyboard inputs working
  + finished everything except function to move tiles
* Questions:
  + What would be a good design?
  + Should I mimic the source code’s design?
  + Should I use OOP?
* Goal for next week:
  + write function to move tiles
  + start looking as graphics packages to make GUI

Week 2:

* Progress:
  + Completed programming the game so it now works with full functionality
  + Wrote basic GUI that shows the board with tiles that update with the keyboard arrow key clicks
* Questions:
  + None
* Goal for next week:
  + Refactor/clean up game and GUI
  + Write driver for the heuristics, i.e. something that will work alongside the game, generate the four possible moves, and evaluate them on a dummy function (maybe random) that can later be replaced by the heuristics

Week 3:

* Progress:
  + Tried to refactor game and GUI so that game had an instance of GUI instead of vice versa, but not successful
  + Wrote basic bot that chooses the next move randomly and bot that choose next move based on points but that part I haven’t tested for correctness yet
  + Got GUI to show the bot playing the game
  + Added terminating condition and tile colors to the GUI
* Questions:
  + Want to discuss refactoring GUI to see if what I want to do is possible
* Goal for next week:
  + Test bot that chooses next move based on points
  + Start implementing a couple heuristics
  + Decide on all information I want to record when the bot play and write a script that will compile all this into a .txt file as the bot plays

Week 4:

* Progress:
  + Fixed error with game logic: not recognizing when game was over properly
  + Verified that choosing best score works
  + Wrote choosing move that makes most merges
  + Wrote choosing move that keeps highest tile in corner
  + Set up basic log file structure/data collection
* Questions:
  + None
* Goal for next week:
  + Write it such that if multiple moves are just as beneficial, it randomly chooses between them
  + Run experiments with the currently working heuristics
  + Write more heuristics
    - Higher weight to moves that have monotonic rows/columns
  + Write bot to look ahead n moves
  + Parameterize bot based on desired heuristic

Week 5:

* Progress:
  + Parameterized the bot based on heuristic
  + Changed bot to randomly choose between moves that are equally as good
  + Made progress in writing the bot to look ahead n moves
    - Implemented the tree building and searching for highest total score
    - Still need to debug/test to make sure it’s working
* Questions:
  + None
* Goal for next week:
  + Try to figure out a good way to handle the randomness when looking n moves ahead
  + Continue working on finishing the look ahead portion of the bot

Week 6:

* Progress:
  + Wrote the look ahead portion of the bot
  + Wrote heuristic to check monotonic rows and columns
  + Wrote method to score board state based on several properties instead of each heuristic just relying upon one characteristic
  + Fixed logging format
  + Wrote so it builds the look ahead tree n times to decide which move is best
    - This will hopefully “even out” the impact of the randomness
* Questions:
  + None
* Goal for next week:
  + Start running the bot a bunch of times
  + Add more to the board scoring method to make it take more into consideration
    - i.e. give board state points for lining up merges for next time

Week 7:

* Progress:
  + Ran bot with 1,2,3 look ahead moves for 6 different heuristics
    - To determine which heuristics are most impactful and need the most weight in the board scoring method
  + Added heuristics discussed last week, i.e. lining up merges for next time and keeping open spaces next to 2s
  + Determined that building the look ahead n times to decide the best move does in fact improve the bot’s performance
  + The bot got its first 2048!
* Questions:
  + None
* Goal for next week:
  + Continue running the bot a bunch with various look aheads and heuristics
  + Run with the board scoring method that takes a lot into account
  + Visualize the data to see trends and determine which heuristics are best

Week 8:

* Progress:
  + Ran new board scoring method
  + Created graphs
    - Score vs. look ahead moves
    - Highest tile vs. look ahead moves
    - Score vs. trials
    - Highest tile vs. trials

For all heuristics

* Questions:
  + For the board scoring method, the score contributes the most (could be ~100) whereas the number of merges is probably < 5. How could I reasonably scale these, so that the score doesn’t have that must more of an impact?
* Goal for next week:
  + Continue running more trials
  + Tweak characteristic weights in board scoring method
  + Plan presentation

Week 9:

* Progress:
  + Ran using turn as a weight for the board attributes
  + Ran more heuristics with a different number of trials
* Questions:
  + None
* Goal for the next week:
  + Continue running
  + Plan presentation

Week 10:

* Progress:
  + Wrote abstract
  + Worked on presentation: full outline and some parts complete
* Questions:
  + Just to review what I have so far
* Goal for the next week:
  + Finish presentation
  + Present 😊