

ParWordle - Wordle Solver

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1 Introduction

Wordle is an extremely popular game in which the player has 6 guesses to guess a random word. With every guess the player is given clues. If the letter is in the word but in the wrong position, the letter is yellow. If the letter is in the word and in the right position, the letter is green. Wordle is basically a recreation of the game MasterMind, except with words. We are proposing a project that focuses on solving Wordle in the fastest time with the fewest guesses.

2 Plan of Attack

ParWordle will use a Wordlized-version of Don Knuth's algorithm to solve Mastermind¹

1. Generate the set S of all possible words. Wordle uses a dictionary of 2315 possible answer words. That will be our S . Wordle also allows the player to guess 10657 other words that can never be answers.² These words will not be included in S , but we will allow the program to guess them if it determines them to be the best guess in step 6. We will call that separate set G .
2. Choose our initial guess. Everyone has different opinions of the best initial guess, and we can change this to how we see fit.
3. Play the guess and get the clues in response.
4. If all clues are green, we have found the word. Terminate
5. Else, remove from S and G any word that would not give the same clues if that word was the guess.³
6. Apply a minimax technique to find the best next guess. For each possible remaining guess in S and G , calculate how many words in S would be eliminated for each possible combination of clues. The score of a guess is the minimum number of words it would eliminate from S . Choose the next guess to be the guess with the maximum score. If there is a tie, prioritize words in S over words in G , and if there is still a tie, choose randomly.⁴

7. Go to step 3 and repeat.

3 Parallelization

The biggest opportunity for parallelization is the minimax technique applied during step 6 of the above algorithm. The computation of each guess' score is independent of each word, which means that we can parallelize the work during this step. Minimax is the bulk of the work, so if we can parallelize it well we should see much faster runtime.

4 References

1. <https://www.cs.uni.edu/wallingf/teaching/cs3530/resources/knuth-mastermind.pdf>
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3. <https://math.stackexchange.com/questions/1192961/knuths-mastermind-algorithm>
4. <https://puzzling.stackexchange.com/questions/546/clever-ways-to-solve-mastermind>
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