

Title

Mastermind Algorithm

Course

CSC-7

Section

40517

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Introduction

Mastermind is a code breaking game invented by Mordecai Meirowitz in 1970. In the version for this class, the code can be anywhere from '0000' to '9999'. The user or AI has to guess the correct string and their number of guesses is recorded.

Statistics

The algorithm I created guesses the correct string after receiving feedback on the guesses from the program. There was no way to loop through the program several times because of the static variables in the AI function. I manually recorded 100 playthroughs and the average was 12.3 guessed. The lowest my program guessed a correct answer was 3 times but the realistic lowest was 7. The highest possible number of guesses is 16.

How It Works

My algorithm first tests each digit by going from '0000' to '1111', etc. If the program responds that there were no matches, then any combination with that digit is removed. If the program finds the total of 4 colors before reaching '9999' early, it terminates this part of the program. After my AI reaches '9999', it starts to guess the remaining combinations. If match again, the AI compares the rest of the available guesses and removes ones that have any digits from that guess. If a guess has 0 spots correct, it removes every possible guess that has one digit in the same spot. This continues until the program guesses the correct string.

Pseudocode

Fill vector with all the combinations from '0000' to '9999'

Guess '0000' and increment by 1 in every digit

If there are no right spots, remove all combinations with that digit from vector

If found all correct digits, terminate early and start next part of program

Guess from the remaining combinations

If the guess has 0 right spots, remove all combinations with the same digits in at least one spot

Remove any combinations that do not have any matching spots from a semi-correct guess

Continue until the guess is correct and game is won