CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

J1417

Project Title

Game On: Creating a Worthy Connect Four Opponent with Heuristic Algorithms

Abstract

Objectives/Goals

The objective was to design a computer program to model the game of Connect Four and to sometimes win against average human beings using defensive, offensive, and look ahead algorithms.

Methods/Materials

Four algorithms to play Connect Four against a human player were constructed using JavaScript: random, defensive, aggressive, and look ahead. The random algorithm placed pieces randomly on the board compared to the more strategic defensive algorithm that placed pieces using heuristic scoring to block the human opponent. The aggressive algorithm combined both defensive and offensive strategies, also using a heuristic scoring system. The look ahead algorithm built upon the aggressive algorithm by simulating one opponent move ahead on the game board and scoring the possible moves accordingly. The algorithms were tested against a variety of human subjects to find average success rates for the algorithms.

Results

The look ahead algorithm was the most successful of the four algorithms in trials against human opponents.

Conclusions/Discussion

Heuristic algorithms like these could be worthy opponents because their success rates are comparable to human players themselves. These are usable algorithms to create an engaging game play experience for a wide variety of practical applications.

Summary Statement

I designed a computer program to model the game of Connect Four and to be a worthy opponent against humans using several heuristic algorithms.

Help Received

Father helped understand and learn JavaScript language and debugging