CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
J1606

Project Title
A. I. Connect-Four

Abstract

Objectives/Goals
I am using the game Connect-Four to study artificial intelligence. I wanted to determine the effects of ply depth (the number of plies, which are turns by a single player, that the program looks ahead) and the effects of getting the first move on both the chance of winning and the time taken.

Methods/Materials
To do this, I wrote some computer programs in C to simulate games between computer-controlled players.

Results
I found that increasing the ply depth increases the chance of winning, as does getting the first move. I found that the effect of a single ply depth increase was greater than the effect of getting the first move. I found that when two identical players faced off, there would be more draws if both had even ply depths. I also found that increasing the ply depth by 1 make the program take about 7 times as long per move.

Conclusions/Discussion
My results agree with my hypothesis, though I did not expect the result with more draws at even ply depths. Each extra ply taking 7 times as long fits with the prediction based on branching width.

Summary Statement
I created an artificial-intelligence program to play Connect-Four and used it to test the effects of going first and looking further ahead in possible moves on the chance of winning and on the time taken.

Help Received
My father, Kevin Karplus, mentored me on this project.