Connect-4 Bot

Team Name: <Team Name Goes Here>

Introduction

Connect Four (also known as Captain's Mistress, Four Up, Plot Four, Find Four, Fourplay, Four in a Row and Four in a Line) is a two-player connection game in which the players first choose a color and then take turns dropping colored discs from the top into a seven-column, six-row vertically suspended grid. The pieces fall straight down, occupying the next available space within the column. The objective of the game is to connect four of one's own discs of the same color next to each other vertically, horizontally, or diagonally before your opponent. Connect Four is a strongly solved game. The first player can always win by playing the right moves.
(Source: http://en.wikipedia.org/wiki/Connect_Four)

(Image Source: http://www.hamleys.com/connect-4-grid.ir)

Motivation

The bot must give a tough time to the human player and try its best to win/draw the game. If the human plays perfectly, lose the game after maximum number of moves (when Bot is second player). The bot must play according to the difficulty level set by the player.
We have been motivated by a past attempt of a similar project, link to which has been provided: http://www.stab-iitb.org/wiki/2RE31_Connect-4 in ITSP-2013
Here is a link to a Connect Four Robot made at MIT:
https://www.youtube.com/watch?v=7uiPhECQtrs

Demonstration

A working robot which can play intelligently against a human player. The bot can gauge the given situation to play the most suitable move to ensure a greater chance of victory.

Implementation

1. The bot's moves will be decided using artificial intelligence. Algorithm for bot as well as the Heuristic function will be coded.
2. Image processing will be used to find the present state of the game. OpenCV will be used for image processing. Other ideas include usage of IR sensors/lasers for finding the human's move. These will be explored.
3. Mechanism to
    a. control the linear movements of the bot
    b. ensuring that the dispensing happens at the column and not anywhere in between
    c. ensuring that only one coin is dispensed at a given time, the coin should be dispensed completely.

Timeline

Week 1: Artificial Intelligence part must be completed.
Week 2: Image processing/IR part must be completed.
Week 3: Work on mechanical and electronic components must be started.
Week 4: Completion of mechanical and electronic components.
Week 5: Integration of all 3 components.
Week 6: Buffer Week.

Skills to be Learnt

The project is aimed at equipping us with the basic rudimentary knowledge of a variety of issue specific skills. Through the implementation of the project we would be learning the basic skills of image processing, electronics and mechanical mobility. We will also be learning more about coding algorithms (Minmax/Negamax) which we will be using to execute our designs.

Components Required

Connect-4 game, Rack and pinion, Beagle Board/ Raspberry-Pi, Stepper Motor, Servo motor, Hopper, Other basic electronic, mechanical components.

Cost Estimate

Estimated cost is about six thousand rupees.

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