ChessOverIP

Team Name:
(AA)^2

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Project Introduction:

A setup which allows two people to play the same game of chess on physical chessboards sitting in two different corners of the world via the internet.

Details:

The Raspberry Pi module will be connected to a camera that will continuously take images of the board from the top view. A python program running on the raspberry pi will process the images and will get the current state of the board.
We may colour the top of the chess pieces to help us identify them during the image processing.
After the player plays his move, the python program detects the move. It determines the legitimacy of the move. If the move is not legit, the speaker notifies the corresponding player. The move (if legit) is sent to the Raspberrry Pi of the second player over the internet.
We will be learning network programming to implement this. Python has a great module for sockets which we will be using.
After the second RasPi module receives the move, it will pass on the signal to the stepper and servo motors to implement the move physically, working of which is discussed in a later section.

Construction of the Mechanical System:

Two drawer channels are placed parallel at 2 opposite sides of the board. Just adjacent to them is the rack gear. The stepper motor is placed on one of the channels. A circular gear (pinion) is attached to the motor. The rack and pinion system facilitates movement along one axis (say x).

A simple wooden block is kept on the opposite channel at the same position as the stepper motor.

A similar channel and rack system is mounted across these two. The second stepper motor is for movement along the y axis. The servo motor (with the electromagnet) is attached to the stepper motor on this channel. The servo allows the electromagnetic to move along the z axis.

This entire mechanical system is placed a few centimetres beneath the actual board.

Working of the Mechanical System:

The second raspberry pi receives the move from the first one. It determines a path (zig zag with lines along x and y axis). The electromagnet moves along the x axis first, then the y axis, finally reaching the initial position of the piece to be moved. The servo motor then moves the electromagnet closer to the board (along the z axis). The electromagnet is switched on. The desired piece will attach to the electromagnet as a result. Then the electromagnet moves along the determined path. After reaching the final position of the piece, the electromagnet is switched off and the servo moves it away from the board.

The base of each piece will have a magnet. To avoid any unwanted movements, the pieces will be about one third of the size of each square.

Plan of Action:

Week 1:
One group starts learning Raspberry Pi and acheives basic usage and internet communication using 2 Raspberry Pis. The second group starts working on making the automated parts of the boards operational.

Week 2:
Should get a good grasp on how to use the Rasp Pis to relay chess moves and how to make all possible chess moves automatically in this week. Start work on image processing to be able to read the state of the board.

Week 3:
Will finish image processing in this week and start integrating the 3 modules (i.e. Communication, ImageProcessing, Automated Chess Board).

Week 4:
Will finish integrating the 3 modules and start the debugging process and improvising our bot. If we have more time we can even think of add ons on our bot.

Week 5:
We will keep the last week as buffer for any last time emergencies and thorough testing.

Components:

1. 2 Webcams
2. 2 Chessboards
3. Magnetic Chess Pieces
4. 2 Raspberry Pis
5. 4 Stepper Motors
6. 2 Electromagnet
7. Drawer Channels
8. 2 Servo motors
9. Speakers
10. Wires, Tape, etc.

Estimate Cost: About Rs. 10,000 mainly the cost for 2 Raspberry Pis

Learning:

1. Using Raspberry Pi.
2. Learning internet protocols.
3. Implementing a model to enable motion of objects using magnets.
4. Image Processing.
5. Integrating multiple modules.