PROJECT TITLE: JENGA PLAYING BOT

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DESCRIPTION

Our bot is designed to play the game Jenga (for more information about this game visit http://en.wikipedia.org/wiki/Jenga). The bot would consist of two mechanical arms, one for pushing a block and the other for grabbing and placing it on top of the structure. Further, image processing of the structure will be done in 3-D and fed into an algorithm so as to decide which block is to be removed.

In the following document, the term "Jenga Structure" or "Structure" will be used often. To give you an idea of what this means, a photo is included below

MOTIVATION

We came up with the idea to make this project as it seemed a very intellectually stimulating and technically challenging project. Also it gives us the opportunity to apply the technical skills in the real world.

IMPLEMENTATION

1. Our Project will be composed of two modules:
   1.1. Module A: It will consist of simultaneously building the two arms, the mechanism to move them, and writing code to implement image processing of the Jenga Structure in 3-D and calculating which Jenga block is to be removed

1.2. Module B: Here, using the algorithm devised in module A as a set of instructions we will try to remove the Jenga block, from the structure, with one arm pushing it out of the structure and the other grabbing it and placing it on top.

2. The two arms will be fixed opposite to each other, and will have only two positions (0^0 and 90^0), which will be attained by a servo motor.

3. Hydraulic pistons will control the height of the arms.

4. The two webcams will be fixed at appropriate positions so as to provide a 3-D scan of the Structure during play.

5. The webcams will provide feed to a laptop, which will read the images provided, run the algorithm, and compute the optimal move to be played.

6. The results of this algorithm are passed to the robot control system by using the microcontroller. The arms will implement the move. The 'pushing' arm will have a finger to push the required block to a required distance. The 'grabbing' arm will then come into play, and use a gripper mechanism to grab the block, remove it from the structure, and finally place it on top.

MATERIALS REQUIRED AND ESTIMATED COST

MATERIAL	ESTIMATED COST (in Rs.)
Jenga	600/-
Hydraulic Piston	3x1500=4500/-(Two small, one large)
Two Webcams	700x2=1400/-
Servo Motor	700/-
Gripper	50/-
Microcontroller	?
Miscellaneous(building material, some other components)	3000/-
TOTAL	10,250/-

TIMELINE

Week 1: Designing and fabricating the framework on which the arms will move up and down. Working out the algorithm to find optimal move to play in Jenga.

Week 2: Controlling the movement of the arms. Doing image processing and implementing the algorithm.

Week 3: Achieving utmost precision of the mechanical components and the movement they perform.

Week 4: Combining the hardware and software components. Debugging and some final touchups.

To get a feel of what we are trying to achieve see this video https://www.youtube.com/watch?v=yD63f7MKPjI (Naturally, our attempt does not exactly follow what has been shown in the video)

DEMONSTRATION

Hopefully, by the time of the final review meet, we will have a fully functioning bot capable of playing Jenga versus a human opponent.