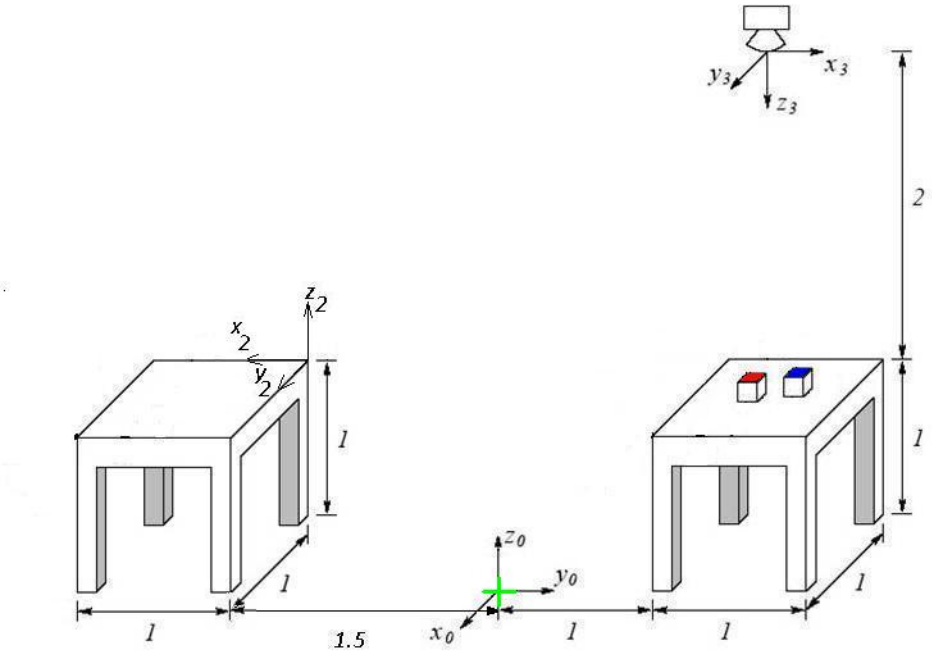
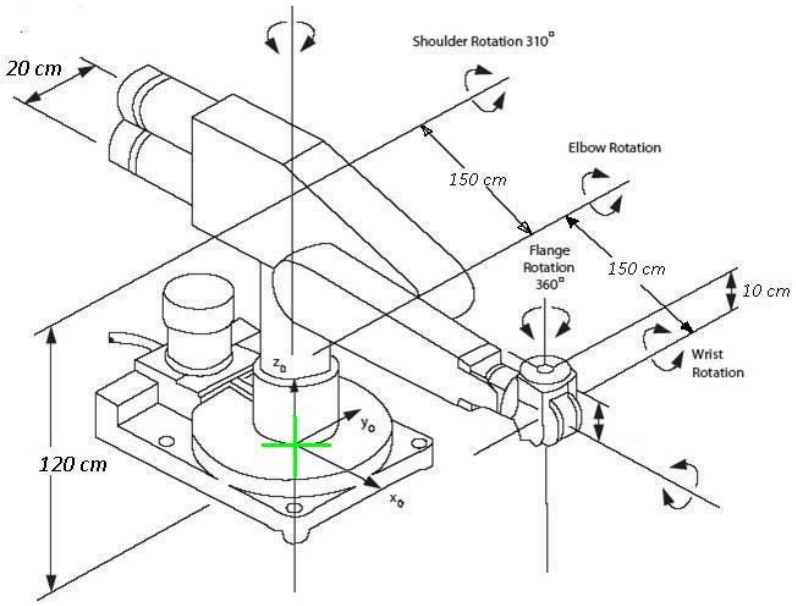
CSCI-571

Project 1 Due Date:8/1/2009 11:59:59 PM

Consider the set up in a room as follow:



The camera is placed on the top of the center of the table. The output of the camera returns the color, location and the orientation of the small boxes (10cm x 10cm x10cm) on the table in $o_3x_3y_3z_3$ frame. One blue and one red box are left on the table. We have a PUMA 260 manipulator which is located at o_0. It is shown in following figure:



PUMA 260 manipulator.

The robot is placed in the setting in a way that its frame matches the $o_0x_0y_0z_0$ frame in the room i.e. the green plus point in the robot picture will be installed on the plus point on the room picture, and the frame of the robot will be aligned to the $o_0x_0y_0z_0$ in the room. The application requires that the robot picks the blue box first and place it on an arbitrary chosen point (in $o_2x_2y_2z_2$), on the second table. Then it should pick and place the red box on top of the blue box. While the robot is accessing and moving a box it should not touches the other box.

You need to add a gripper to the end of the manipulator. When the gripper holds the cube the center of the cube will be 15 cm away from the attach point of the manipulator. We have a square magnetic end gripper which can pick a cube when its 4 edges touch the edges of a cube. The size of the end of the gripper is 10 cm x 10 cm.

Write a program in MATLAB which receives the camera output (in $o_3x_3y_3z_3$) and the destination (location of the center and orientation) of the boxes on the second table (in $o_2x_2y_2z_2$) and returns the joint variables for the manipulator in different stages of the process. You need to use the robotic toolbox for MATLAB (http://petercorke.com/Robotics_Toolbox.html).

You need to submit all of your files and a write up. The write up should include description of all of the submitted files and an instruction to run and test your code. Please submit all of your files at black board. You should submit files one by one and should not submit zip files.

(New Requirements added 7/28/2009)

You need to determine the robot status during the process of picking and placing the boxes and visualize the robot movements.

(Updates at 1/30/2009)

Implement PRM to avoid collisions and explain your solution and implementation in your write up. (20 extra points)
Perform blending in the robot motion and explain your solution and implementation in your write up. (20 extra points)