Group #13 – Building Blocks

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For the Robotics course of 2015, Group 13’s project, Building Blocks, will consist of programming a robotic arm to be able to locate and autonomously build a stack of blocks. The components will consist of an ITRI Robot Arm for the robotic arm, Microsoft Kinect for the camera, and Lego blocks for the stacking blocks.

The reason the ITRI Robot Arm is used is simply due to it being what is provided for this course. As an industrial grade robotic arm, its functionalities are sufficient for the project’s purposes, with the only issue being the flexibility of the gripper. This is compensated by the use of Lego blocks, which will allow for the flexibility of being able to design the blocks. In addition, the colored properties of Lego blocks will also allow for the use of color recognition in guiding the camera’s object detection and differentiation. And finally, the project will use Microsoft’s Kinect camera is due to its ability to measure the depth of objects, which will be an important aspect of block stacking due to the need to be able to determine the current height of the stack thus far.

At its basics, the project will involve having the robotic arm pick up blocks from one location and stack them up at a marked location somewhere else. The project will attempt to accomplish this by experimenting with both color matching and contour matching. Color matching will consist of simply moving blocks to areas marked with the same color, while contour matching will attempt to match blocks to areas outlined with the same contour of the block.

With three people in the project group, work will be divided between working on the camera and working on the robotic arm. The person working on the camera will be involved in handling object detection and being able to grab the correct coordinates of object locations and destination and passing them to the robot. One person working on the robotic arm will need to work on converting the received coordinates into something that can be parsed by the robotic arm, and the other person will need to program the robotic arm to be able configure itself into the correct stance for grabbing or releasing the block object.

The main challenge to the project will be achieving the precision needed in building the block tower, and configuring the gripper to grab and place the blocks at the right angle. If Lego blocks are to be used, some amount of precision will be needed to connect the blocks together. If time allows, possible next steps in the project include obstacle avoidance for the robotic arm when moving to grab objects, the ability to determine and rotate blocks to the correct facing for stacking, and being able to take in schematics of some sort and constructing the tower as modeled in the schematic.