Nina Lin & Vinitha Ranganeni
16-223 Project Proposal

Mimicking Robot Arm

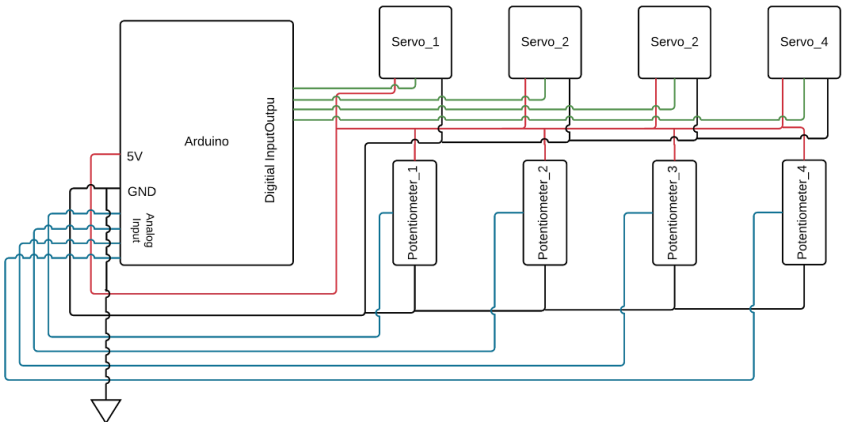
Introduction

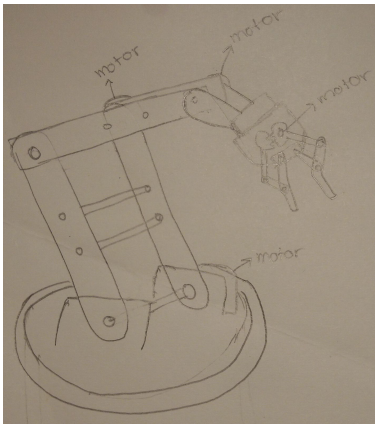
Our idea is to design and produce a robot arm that is controlled by external sensor input. In the center we will have a 4 degree of freedom (DOF) robot arm that is surrounded by 4 stations. Each station will have parts of the robot arm needed to control one DOF with a potentiometer in place of a motor at the joint. There will be objects around the arm that can be picked up and moved to different locations.

We hope to facilitate teamwork amongst the children, or children and parents, to successfully move the arm to pick up and place objects in their designated locations. In order to move the objects, users would first need to realize the connection between the 4 stations and the 4 degrees of freedom on the robot arm. Then they would need to learn how to move the arm collaboratively from their individual stations, and the items will vary in shapes that correspond to 'correct' bin placement. Through this task-oriented activity, not only do we want to promote a bonding experience, we also want to inspire fascination in robotics with an interactive interface.

Implementation.

Because the whole mimicking robot arm has 4 DOF, our implementation can be separated into steps according to the four moving parts. It will consist of a gripper, two joints, and a base that pivots. The gripper[1] has already been designed in inkscape and our first prototype consisted of just the robot gripper that moved with input from a potentiometer at the gripper station. For our second iteration, we will extend the robot gripper and include a second DOF to test the concept. In this next step, we will also determine the type of materials and motor best-suited for handling the weight of the gripper. Ideally, we would be using a stepper motor to actuate the motions and the construction of the arms and its stations should be sturdy enough to withstand museum use. We provided a sketch of the robot arm and the circuit diagram below:





Testing

Some measures by which we will assess the success of the robot arm are durability, intuitive user experience, and its ability to pick up various items. For the gripper and its first

[1] Design reimplemented from here

joint, we will begin by testing its ability to move in the intended direction. Then we will test a set of differently shaped object to observe how the gripper will handle varying dimension. We will also test the weight that the arm can carry without strain on the construction materials. In this second iteration of the robot arm, there will be two degrees of freedom, thus two stations where input is gathered. Our tests must show that the arm and stations are mapped to the correct angles and that the stations are clearly corresponding to a controllable robot arm.

Potential Problems

Our biggest potential issue/setback is creating a robust design such that the arm can handle its own weight. This can lead to another issue: developing mounting brackets for the motors without adding too much weight. We plan on addressing this issue by iterating the design one DOF at a time. Another potential issue would be the gripper's ability to pick up a range of shapes, textures, and weights in objects.