

EET 503/617 Technical Project Proposal

Title: Articulating Robotic Arm

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Description: As parts are becoming bigger and heavier, the task requires more people to help move these parts. To cut cost and reduce injuries, a robot can be put into place to help carry and manipulate these parts around as they move down the assembly line. For this situation, an articulating robotic arm can help with more precision and speed up production time all while reduce human injury and cost.

Methodology: A device will be designed and manufactured to help pick up parts as they move down a conveyor belt and move them to another location. The goal is to pick up a part while the conveyor is moving the part along down but may have to fall back on the idea of stopping the conveyor to pick up the part.

The arm itself will consist of motors, most likely RC servo motors, to help the arm move and rotate, and an Electromagnet. For the conveyor belt, an old scooter motor may be used to drive it while proximity sensors will be used to determine the parts location. An Arduino microprocessor will be used to control all motors and read sensors.

Major Components/Budget: The major components to build this articulating robotic arm and accompanying cost before tax are:

4 RC Servo motors	\$ 111.99
DC brush motor	\$ 0.00 (From old scooter)
Electromagnet	\$ 20.24
Arduino Mega	\$ 20.86
3 Proximity Sensor	\$ 14.82
10 Push Buttons	\$ 0.00
DC Motor H-Bridge	\$ 0.00
Conveyor	<u>\$ 150.00</u> (estimated cost)
Total budget	\$ 317.91

Preliminary I/O List for controller:

I/O list			
Description	Type	Inputs	Outputs
Auto/Manual PBs	Digital	2	0
Start/Stop PB	Digital	2	0
E-Stop PB	Digital	1	0
Conveyor Forward/Reverse PB	Digital	2	0
Increase/decrease Servo PB	Digital	2	0
Servo Selector PB	Digital	1	0
Auto/Manual mode Lamp	Digital	0	2
Running Lamp	Digital	0	1
Servo selected Lamp	Digital	0	4
RC Servos	Digital	0	4
DC Motor H-Bridge	Digital	0	2
Proximity sensors	Digital	3	0
Total		13	13

Scope of original work: The design of the articulating arm will be original work. The programming and electrical design will also be original. The mechanical design and build of conveyor system maybe purchased or ideas borrowed if can be discovered.

Proposed Sequence of Operation:

1. Machine will start from origin location with electromagnet off
2. Wait for run mode
3. Running Lamp turns on
4. Conveyor starts moving (sensed by proximity)
5. Part reaches $\frac{3}{4}$ way down conveyor (sensed by proximity)
6. Robotic arm engages electromagnet
7. Robotic arm rotates
8. Robotic arm drops part into new location
9. Robotic arm rotates back to origin
10. Waits for next part

Potential Issues: A major issue that may occur with this robotic arm is the RC torque may not be strong enough to lift the part off the ground. This can be avoided by trying different servos and stronger servos if needed. Another issue can be caused by trying to sense where the part is on the conveyor belt.

Milestones: The major milestones in this project are expected to be:

1. Mechanical design completed
2. Electrical design completed
3. Flowchart design completed
4. Components ordered
5. Parts 3D printed
6. Assemble the mechanics
7. Assemble the electronics
8. Programming completed
9. System Testing and diagnostic completed

Submitted by:

Date:

Approved by:
(EET 503 Faculty)

Date: