# Description

In order to accomplish its task, our conveyer bot will require three primary subsystems: Object Location, Arm Control, and High Level Event Planning. For object location, the robot will require two external sensors in the form of two IR range finders. This will be placed so that one is parallel to the rotation axis of the arm and in line with it, and will be responsible for determining when the item on the belt has reached the robot, and the location along the horizontal translation axis (the robot’s x axis) of the object. The second IR sensor will be placed looking along the conveyer, and will be responsible for determining when there is an object on the belt, as well as serving as a redundant check for the first sensor in determining if the object is in grabbing range.

For arm control, the AVR will implement a simple two channel PID controller, similar to what was utilized in lab 2. The AVR will also be responsible for actuating the electro magnet, and determining the weight of the object being lifted. It will also monitor the IR sensors to calculate object position. It will then stream all of the relevant data (object position, joint angles, object weight, etc) to an external high level event planning controller. Object weights will be determined via the joint torque on the outer most motor.

The High Level Event Planner will be implemented in Matlab. This will simplify the task of performing complex transformations to extract useful information from the data collected by the AVR’s sensors. The HLEP will then stream target joint angles and special action flags back to the arm controller. The control logic in the HLEP will most likely be implemented through a simple state machine, and there will also most likely be a second simple state machine on the arm controller to interpret the commands sent back from the HLEP. Communication between the HLEP and the AVR will be over RS232 serial. The HLEP will also allow for real time graphing of the arm’s state for easy visualization.

# Evaluation Criteria

1. The rig senses the location of each of the boxes in two dimensions
2. The robot successfully picks up the box
3. The box is placed in the correct container
4. The arm performs a smooth transfer at a reasonable speed

# Flow Chart

Length-Wise IR Sensor is sampled

IR Sensor clearly detects a close object

Time of arrival at arm is approximated based on measured distances and known belt speed. This is updated regularly.

Position of the box at arrival is determined through Inverse Kinematics

Object passes by Cross-Wise IR Sensor

Arm moves to directly above the anticipated position of the box

Box reaches the position below the arm

HLEP Actions

Sensor Actions

AVR Actions

Event Occurrence

Arm drops the final gap and acquires the box

Arm moves to neutral weighing position

Torque measurements are made

The weight is determined

Box is placed in appropriate container

Arm returns to neutral position