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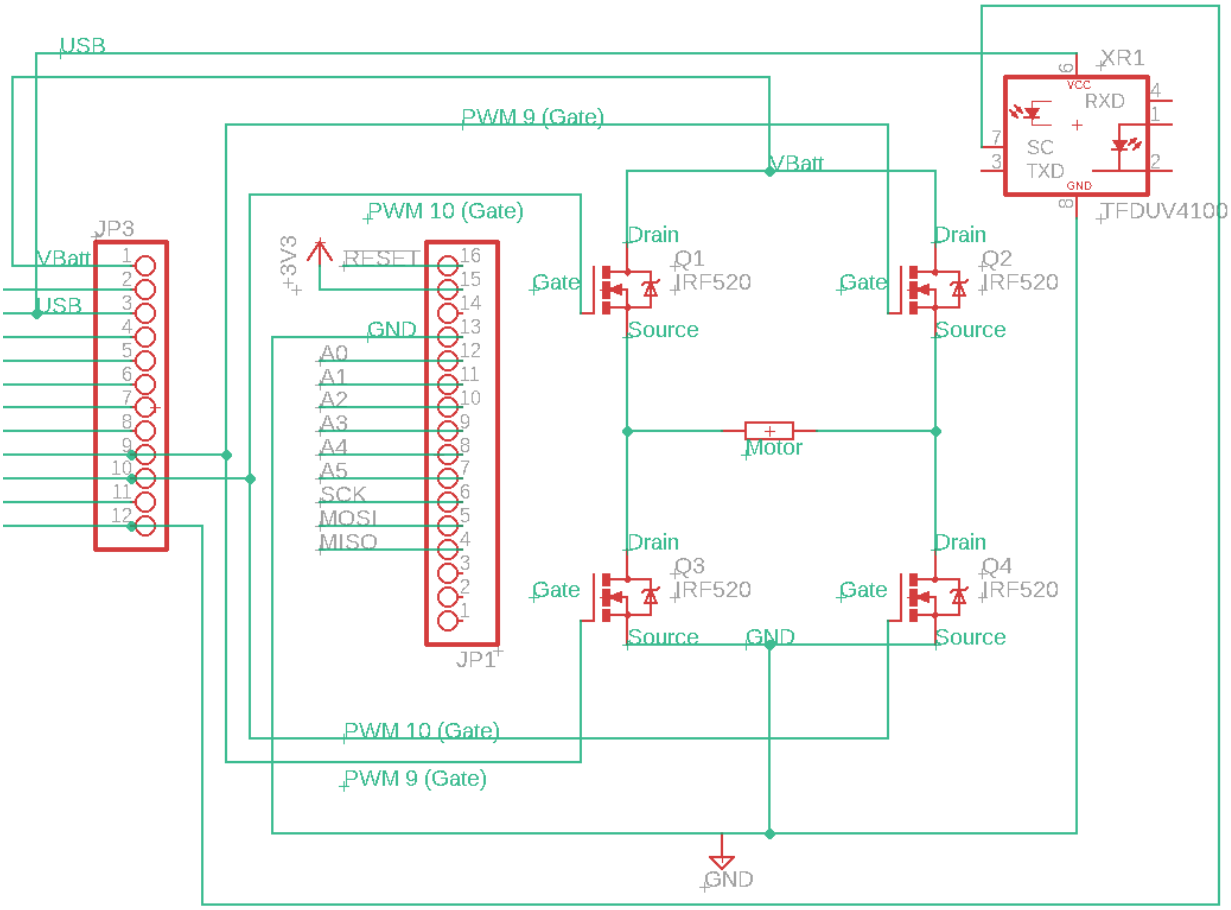
ECE 370 Lofaro

Project 1 Report

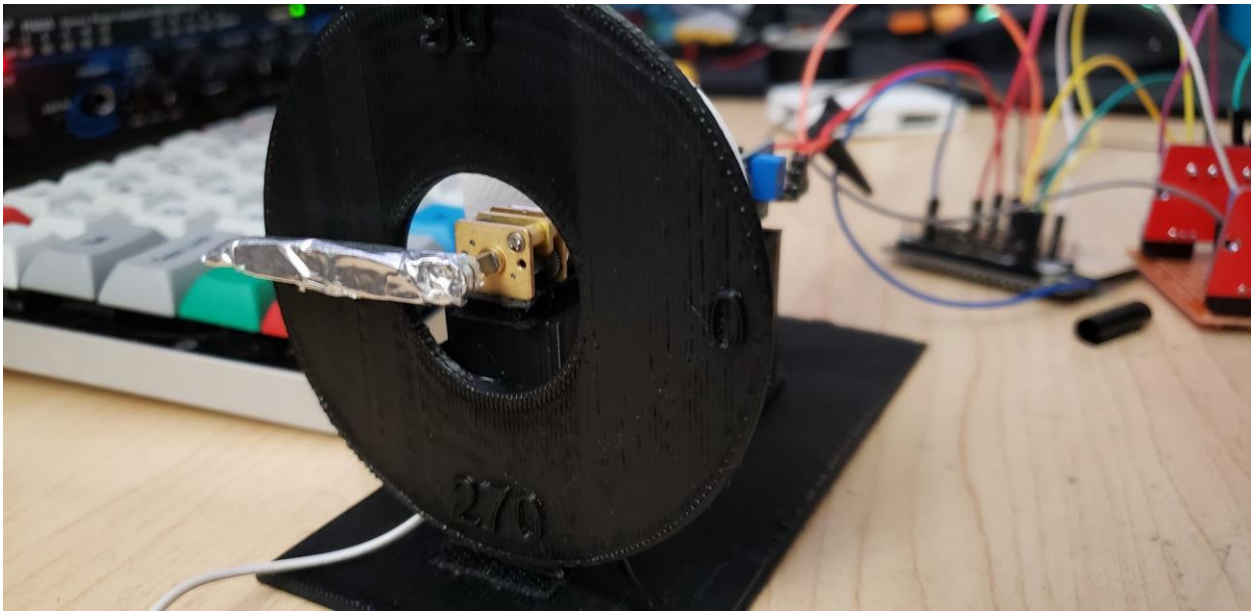
In this project we aim to achieve servo-like functionality from a dc motor connected to an h-bridge. A p-controller then sets variable speeds to the motor to ensure accurate angle measures.

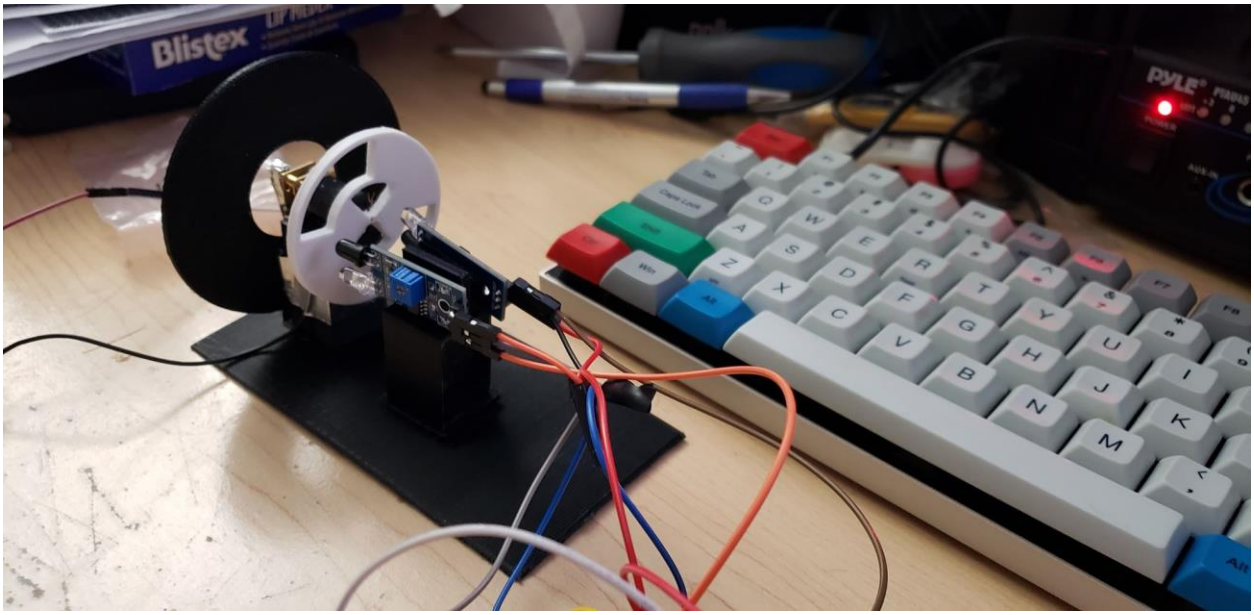
Video Link: https://www.youtube.com/watch?v=HngHbx2CC2I

Schematic:



Images of test setup:





Pseudocode:

Instantiate necessary variables

Set motor pins as outputs

Set IR pins as inputs

Attach interrupt to one IR, when interrupted increment ticks

Loop:

Read six bytes from UART Serial in (Serial1 for Arduino)

Check checksum

Calculate desired angle

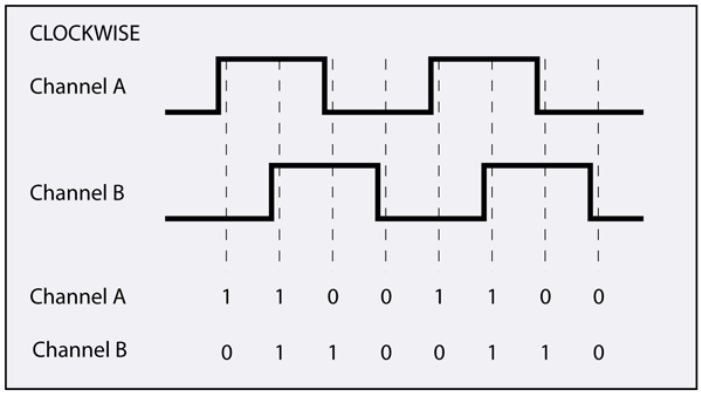
Update timer

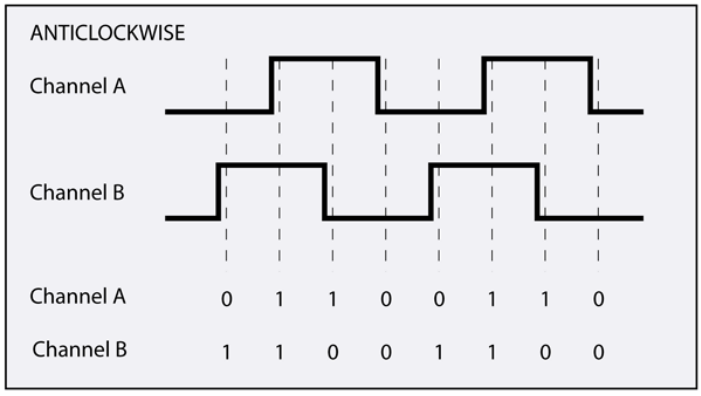
Use P-controller to get to angle, setting velocity of motors variable

Loop

Function for incrementing ticks

Quadrature Diagram





Above is the diagram for a quadrature encoder, in this diagram we can see the states the main and second IR sensors will progress through. One IR sensor will keep track of the tick count, and the other will be present for keeping track of direction. If the wheel is spinning forward or back while being corrected by the p-controller, the code will know based on the pattern of lights it currently sees. If they are both low and the first thing seen is a rising edge, forward movement is detected, otherwise the movement is backwards.

Results Table:

Expected Angle (Degrees)	Actual Angle (Degrees)
0	0
45	45
90	93
180	181
360	365
720	725
-45	-42
-90	-91
-180	-175
-360	-355
-720	-730
-721 (err)	Error
721 (err)	Error

Using the p-controller, desired values were observed at most angle measures. When measuring larger angles, a larger error was sometimes produced when Kp was not correctly set

for the p-controller. Above values were created using variable p-controller kp values based on the angle measure we planned to spin to.