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EE 454 - Servo Sensor Tracker

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Project Description

A system that reads proportional sensors and uses the sensor information to track something with a PWM servo. The sensors are mounted to the rotating arm of the servo and information from the sensors are used to track an object placed in front of the sensors.

Features

a) Uses 2 sensors mounted to the servo and balances the output from each to track the object.
b) The system uses the entire range of the servo (-90° to +90°) and the motion of the servo is smooth.
c) The system tracks the object reliably.
d) The system has a search algorithm for when no object is detected.
e) The system is fast to respond with few errors.

Novel Features

When the project is powered, the servo makes a full 180 degrees rotation and the phototransistors measure ambient light. This value is then used in the tracking and searching algorithms to adapt to different room lightings.

Hardware Details

<u>Components used:</u>

- STM32L432KC Microcontroller - x1
- IR Phototransistor - x2
- 33 Ohms Resistor - x2
- 3300 Ohms Resistor - x2
- 180 Degrees Digital Servo - x1
- IR LED - x1

Discussion

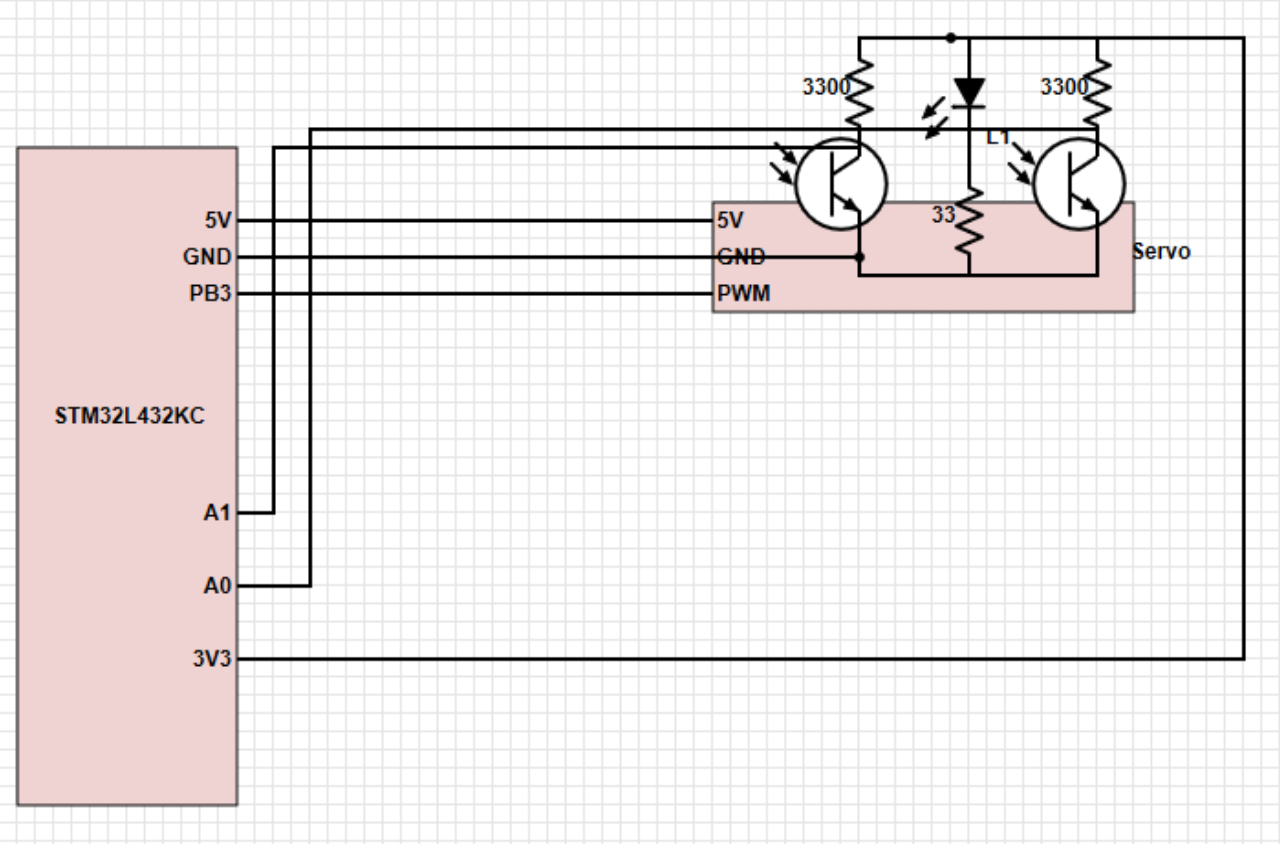
Design Choices:

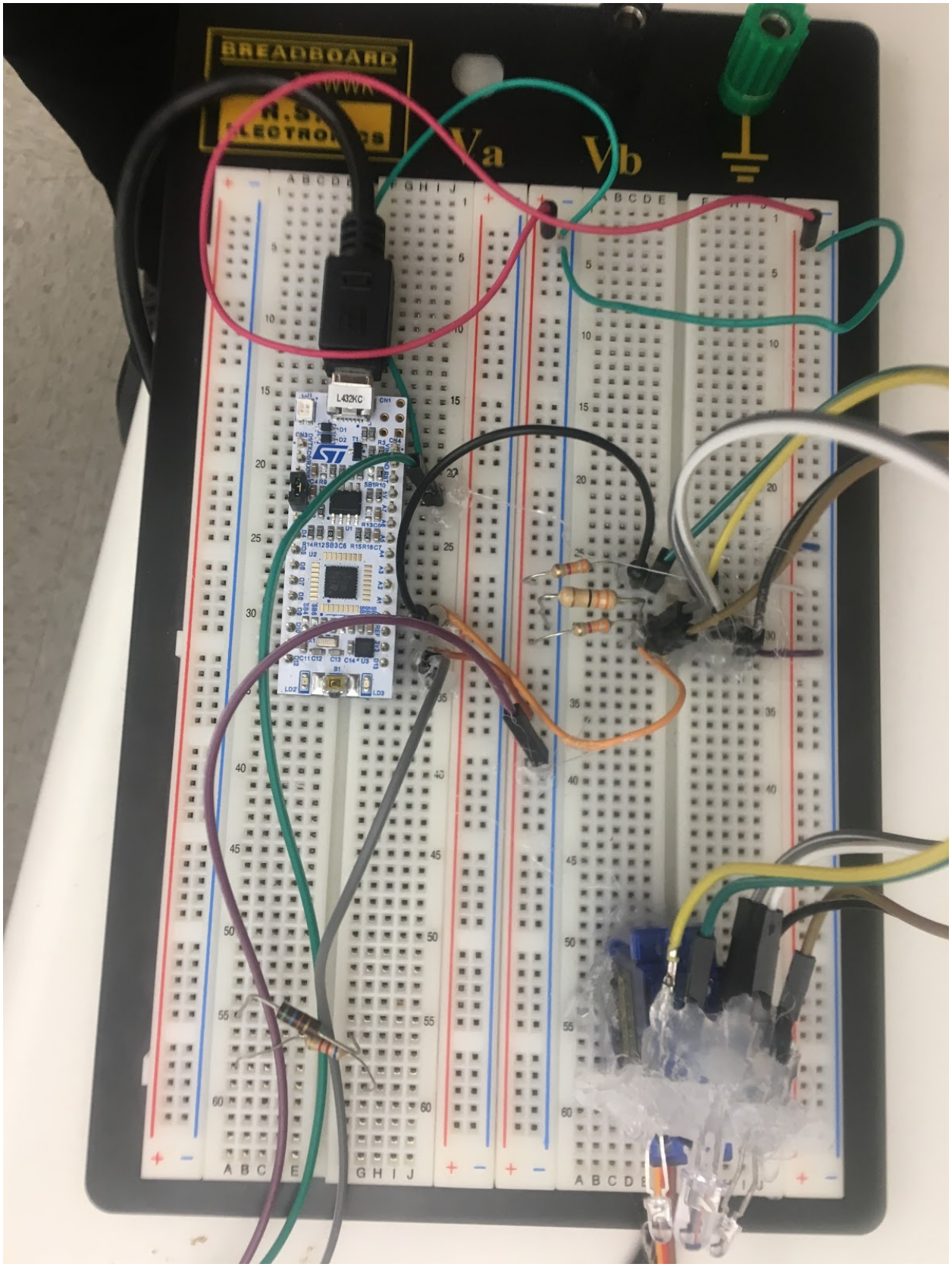
The resistor values are chosen to allow the maximum current through the LED and Phototransistors for good sensitivity. The current through the LED is designed to be around 100 mA to get maximum light, therefore, a 33 ohms resistor was used. While 3.3K Ohms resistors were used for the phototransistors to allow around 1mA of current. These values are also chosen so that the sensitivity is not too high and not too low.

Error Sources:

One of the error sources predicated was the environment. The product should work in all environments and not just the one it was built at. The difference in light depending on the room might affect the performance of the tracking. To eliminate this issue, this product measures the ambient when turned on. Another possible source of error is that one phototransistor is receiving more reflection than the other. To solve that, I made them stick to the IR LED with the same angle.

Circuit Diagram




BREADBOARD
Va
Vb
L432KC