Homework Exercise #3

Developing a Differential Photocell Sensor

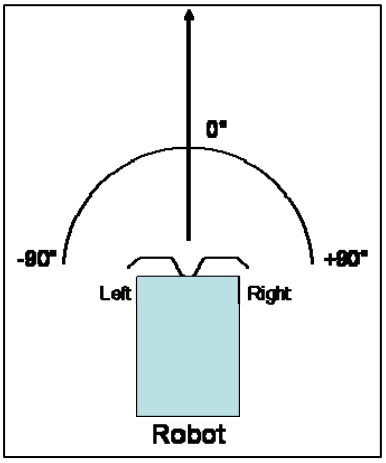
1. Measure the resistance of both photocells in the light using a ***bright*** flashlight and in the dark (ambient light) and record their results. Calculate the sensor voltage and then *predict* the Handyboard analog readout for the following cases:

Left Sensor (Ohms)	Right Sensor (Ohms)	V_{sensor} (Volts)	Predicted analog() Value (0 – 255)
Dark:	Dark:		
Light:	Dark:		
Light:	Light:		
Dark:	Light:		

2. Construct the differential photocell sensor for use on your robot. Draw a diagram showing how the photocells are connected (clearly defining the left and right sensors in accordance to the left (driver's side) and right (passenger's side) of your robot.

3. Measure the values of the analog port while moving a bright source (e.g., a flashlight) from left (-90°) to right (+90°) repeating 10 times (see sample table below).

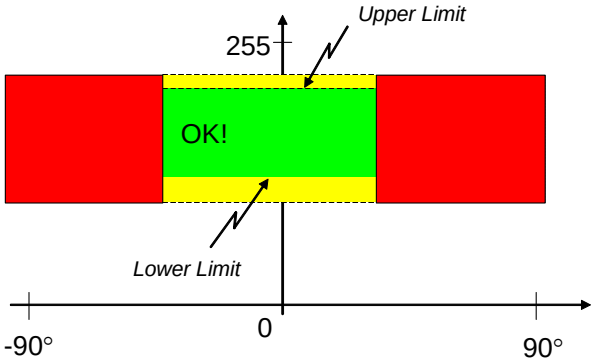
Readings	-90°	-80°	…	80°	90°
1			…		
2			…		
…					
10			…		



4. Average the first 2, 5 and then 10 measurements using a table (e.g., the Excel spreadsheet provided) for each set of averages. Provide a graph for each average (2, 5 and 10) showing error bars (standard deviation). Note: The Excel Spreadsheet provided does all this for you after you enter the data under the "measurements" tab.

# of Average Measurements: 2 (or 5 or 10)

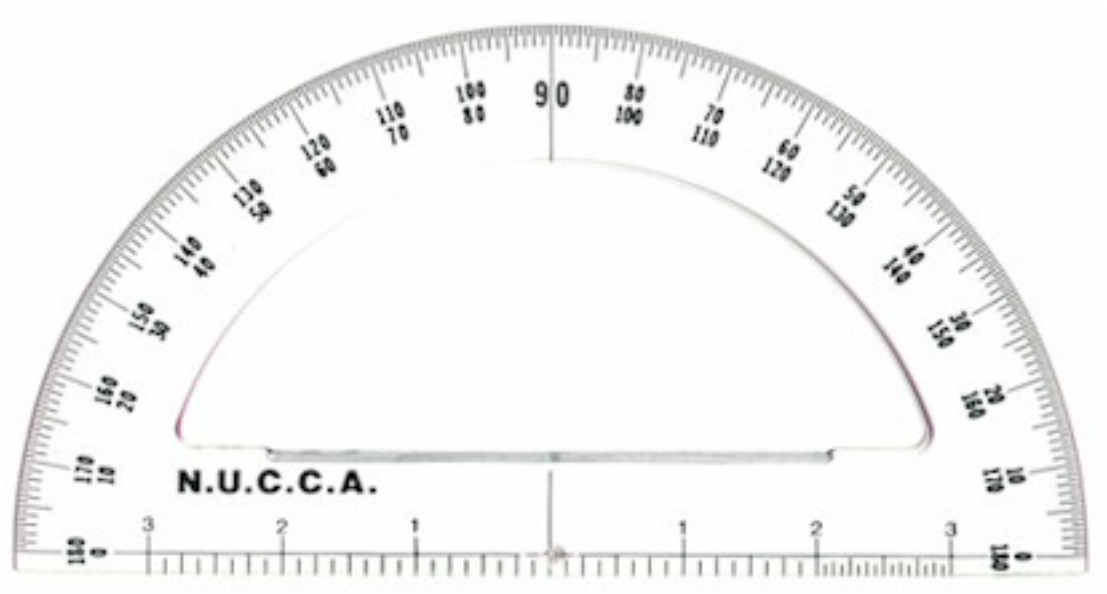
Angle	-90	-80	…	80	90
Mean	127	125	…	123	125
Std Dev	5	3	…	4	7



5. Explain any discrepancies between your predicted values and the actual values.

6. What values would you select for the upper limit and lower limit to locate the light source?

7. What value would you select for the setpoint?


90
N.U.C.C.A.