EE 201 Final Assignment

This assignment corresponds to the final lab, and contains questions that you *should answer as you complete the lab*. ***Work in groups of 4***to complete this assignment. This means you should turn in one assignment with all of your names on it. Working alone or in a smaller group is acceptable, but ask your instructor before working in groups of more than four. This assignment should take you considerably longer than any of the previous assignments - that is okay!

**Challenge #1:**

1. Do counterclockwise or clockwise twists of the potentiometers increase the value printed to the serial monitor?

Clockwise twists increase the value printed on the serial monitor.

1. How can you change the circuit so that turning the potentiometer clockwise increases or decreases the value printed on the screen (the opposite of what your potentiometer currently does)?

Reverse the order of the potentiometer so that the positive terminal of the potentiometer goes to the ground on the Arduino and the negative terminal goes to 5 volts.

**Challenge #2:**

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1. What is the best distance for your sensors to be from the surface to properly differentiate when the sensors are hovering over black or white (line or no line)?
   1. As close as possible while still allowing light to hit the surface.
2. How do surrounding light and shadows affect the readings?
   1. When there are shadows around the photoresistors, the readings go up.
3. How sensitive are the sensors? Are they able to detect small changes in light intensity?
   1. The sensors are very sensitive, and they can detect small changes in light intensity.
4. If the sensors are not reading the difference in colors properly, how can you improve the reading?
   1. Increase the lighting on the color you are trying to detect.
5. If you add an LED next to the photoresistors so that the LED shines on the surface they are reading, does this help the reading?
   1. Yes, it will increase the accuracy, because it will provide a consistent light source
6. Is there anything else you can do to improve sensor accuracy?
   1. You could put a color filter over the sensor to detect only a certain color.

**Challenge #3: *Just TA checkoff***

**Challenge #4: *Just TA checkoff***

**Challenge #5:**

1. Does each knob work? How do you know?

Yes, when we show the serial monitor and twist one of the knobs we see that reflected on the serial monitor.

1. Does each photoresistor work and sense the difference between a black and white surface? How do you know?

Yes we once again opened the serial monitor and then shined a phone light at each of the photoresistors and saw the values fluctuate significantly on the serial monitor. This proves that we will be able to sense the difference between a black and white surface.

1. How do you know each motor is connected correctly and turns when it should?

We know that each motor is correctly connected that when we ran the final piece of code the car moved both forwards and backwards, just as the code specified. The wheels turned the same direction when specified

1. Does the cart drive forward and backward?

Yes, it does drive forward and backward.

**Challenge #6:**

1. What hardware did you implement (light shield, PCB, etc…)? What problems did your hardware attempt to solve? How successful were your hardware implementations?

**Challenge #7:**

1. After calibration, what do the photoresistors read when a black surface is placed in front of them? What about when a white surface is placed in front of them? (hint: use the serial monitor)

**Challenge #8:**

1. What were the PID values checked off by your TA?

**Challenge #9:**

1. How did your robot do? What would you do differently if you had to do this project again?