Current Balance

- **Power Supply**

We are using 4 AA batteries of 1.5V to supply voltage to all the components used for the robot. Since all the sensors require 5V and the servo motors requires voltages in the range of 4V-6V, we are using a 5V regulator. For the calculation, we are assuming the current provided by a battery is 2122mA/h based on an online source.

$$\frac{P}{h} = v\frac{i}{h} = (5v)\left(\frac{2.122A}{h}\right) = 10.61W/h$$

$$\frac{P}{h} = v\frac{i}{h} = (6v)\left(\frac{2.122A}{h}\right) = 12.732W/h$$

- **Grey Scale Sensor**

Sensor requires 5V to operate. We were unable to find any other information regarding overall resistance or current needed by the sensor, thus we cannot calculate the power needed for this sensor.

- **Line Following Sensor**

The line sensor requires 5V and 75mA to operate.

$$P = vi = (5V)(0.075A) = 0.375W$$

Since, we are using two sensors, overall we need to provide $0.750W$ to operate both sensors.

- **Servo Motors**

Servo Motors require 4V to 6V and 15 mA at 6V to operate.

$$P = vi = (6V)(0.015A) = 0.090W$$

Since, we are using two motors we need to provide $0.180W$ to the motors.

- **Speaker**

The speaker outputs 2W and has a resistance of 8Ω. We are using two speakers, which means we will be outputting 4W.

- **DAC**

$$\frac{V_{D0}}{2^8} = \frac{V_{D1}}{2^7} = \frac{V_{D2}}{2^6} = \frac{V_{D3}}{2^5} = \frac{V_{D4}}{2^4} = \frac{V_{D5}}{2^3} = \frac{V_{D6}}{2^2} = \frac{V_{D7}}{2^1} = V_{out}$$