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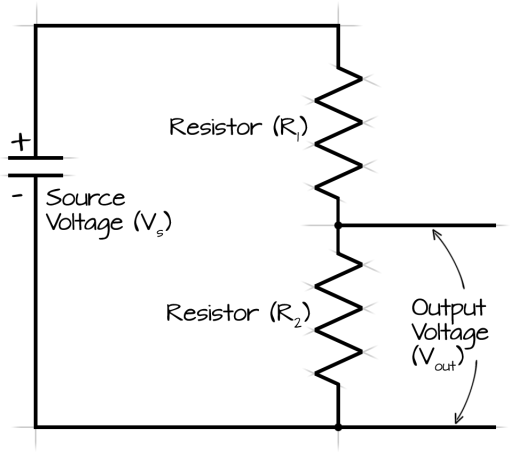
ECE 140A

Lab 2

(1) Resistor: 9.71k ohms
Photoresistor range: 0.7k - 9.3k ohms
The lower bound with a bright light seems correct. The upper bound is much lower than the rated 1 MOhms, but that is probably due to ambient light leaking in when covering the sensor.



(2) KVL/Voltage Divider
Equation: Vout = Vin * R2/(R1+R2)

Low Resistance/High Light:
5*9.71/(9.71+ 0.7)= 4.668V
High Resistance/Dark:
5*9.71/(9.71+9.3) = 2.555V

Voltage Range: 2.555 to 4.668V
ADC ~ 1023 bits over Vss to Vdd (0 to 3.3V)

(3)
5 V/1023 bits = 0.004888 volts / bit
Lower bound of ADC: 2.555 V*1 bit / 0.004888 V = ~521
Upper bound of ADC: 4.668 V*1 bit / 0.004888 V = ~954
The ADC is calculated to range from 521-954

Observed Results: Ambient Light: 1023, Dark: ~650, ranging from 650-1023
(4)
No, the observed results were higher by around 100 on both the lower and upper bounds.

(5)
It was determined that using 5V on the photoresistor circuit was causing the issue. To fix it, we changed the voltage source (Vdd) to 3.3V
Change circuit → Vdd on Photoresistor circuit to 3.3V
Low Resistance/High Light:
3.3*9.71/(9.71+ 0.7)= 3.081V
High Resistance/Dark:

3.3*9.71/(9.71+9.3) = 1.686V

Lower bound of ADC: 1.686 V*1 bit / 0.004888 V = ~344
Upper bound of ADC: 3.081 V*1 bit / 0.004888 V = ~630

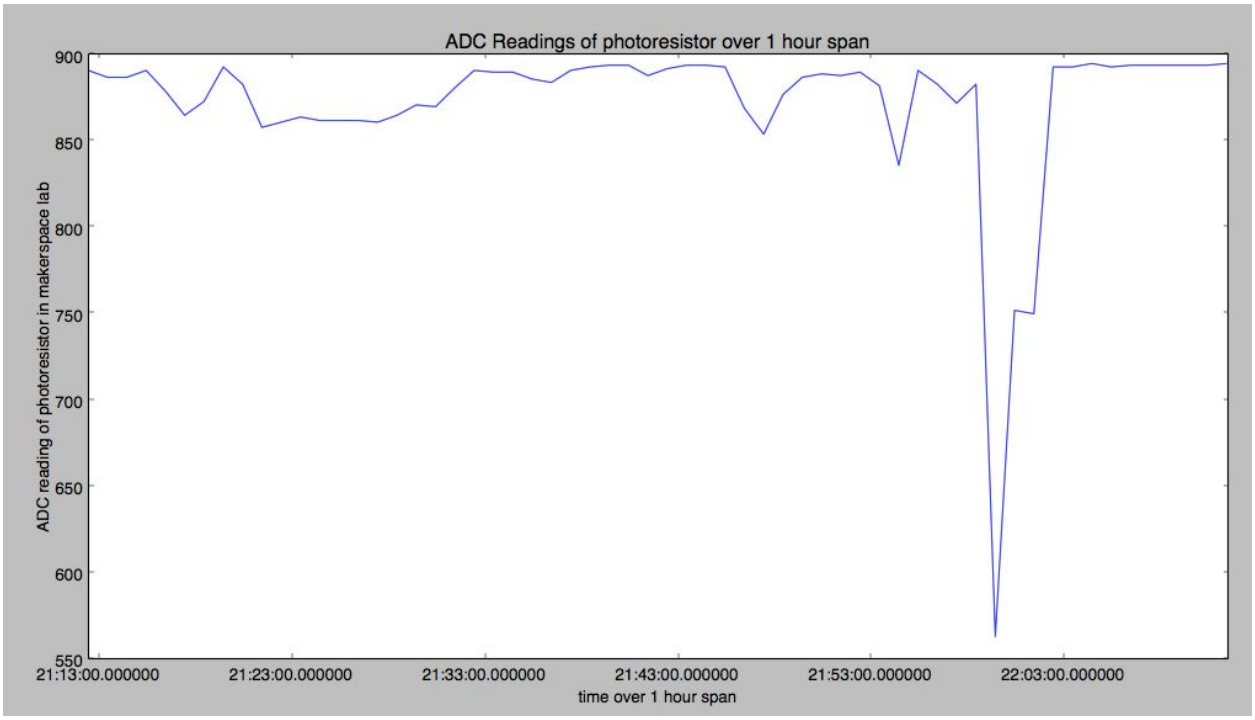
Observed Results: Dark: ~500, Flashlight: 1023, Ambient Light:~850

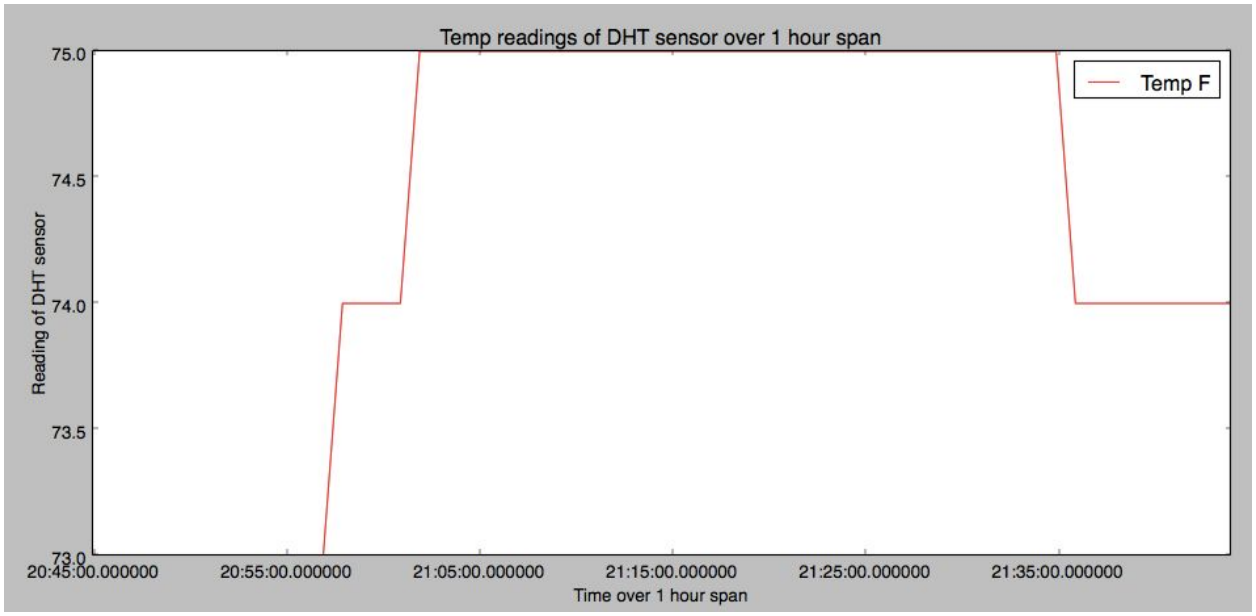
When obtaining the observed results, we did the lab in Galbriath Hall instead of the original Maker Studio. This may be why our observed results are so different from the calculated results. On the other hand, ambient lighting is no longer resulting in the max ADC value, as seen with the 5V photoresistor circuit, so the ADC is usable for dark and bright settings.

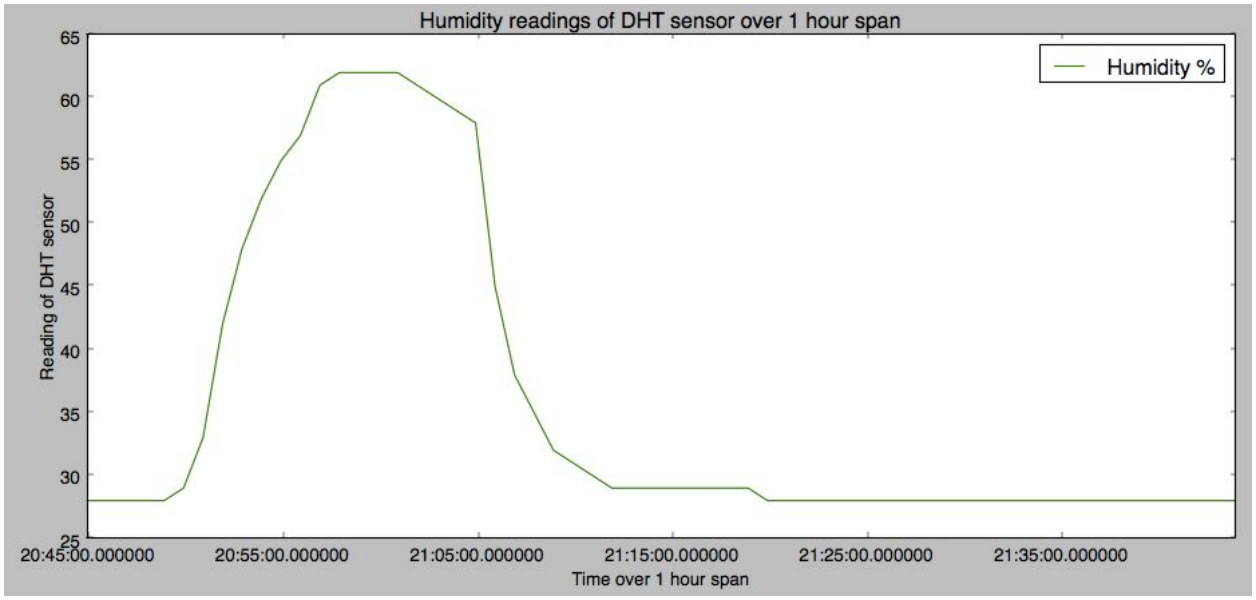
DHT22

```
pi@raspberrypi:~/SmartPlug-cljan-h3lui-m1shum-mil167-rly001/Adafruit_Python_DHT/
examples $ sudo python AdafruitDHT.py 22 4
Temp=26.6*  Humidity=17.4%
pi@raspberrypi:~/SmartPlug-cljan-h3lui-m1shum-mil167-rly001/Adafruit_Python_DHT/
examples $ sudo python AdafruitDHT.py 22 4
Temp=26.5*  Humidity=17.7%
```

Libraries







The hour on our Raspberry Pi is incorrect, possibly due to time zones, so it should start at 13:13 (1:13 PM) instead of 21:13. We obtained the ADC data in the Maker Lab in the basement of the ECE building, and the humidity and temperature data was obtained in Galbriath Hall. Because there was not much light fluctuation in the lab, we covered the light with a paper sometime in the later portion of the recording. This can be seen as the giant dip in the graph, where the voltage going to the ADC is lower due to higher resistance of the photoresistor. We covered the DHT sensor with a jacket at one point to see its effects, and the humidity spiked as a result. Temperature did not change very much.