



Development of Wireless Gas Detectors



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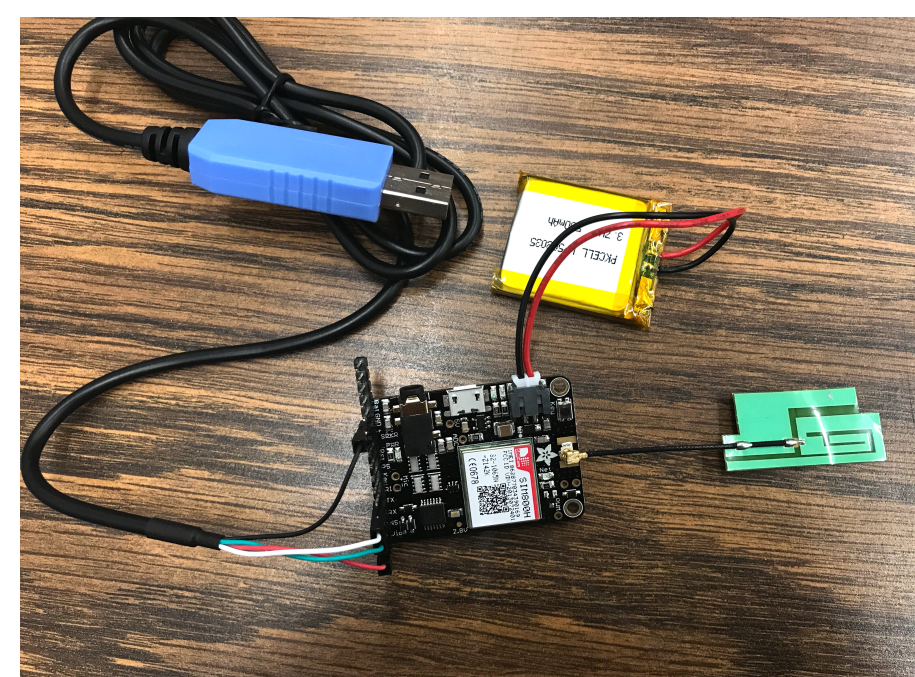
Abstract

Micro-scale technologies are being developed to accomplish the same amount as other technology while using less materials. It is advantageous to have micro technology because, due to their small size, resources such as energy and building materials can be conserved. Hydrogen may be a source of clean energy in the future, but it is odorless, colorless, and highly flammable [1]. Therefore, it is necessary to create a sensor that can detect hydrogen and have a device that can read and distribute the readings.

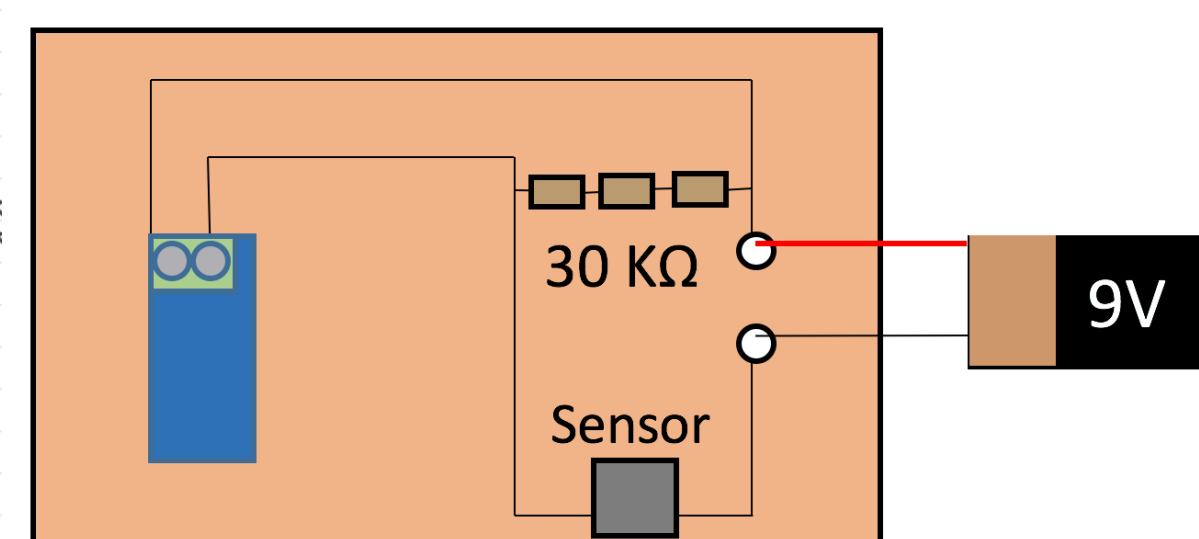
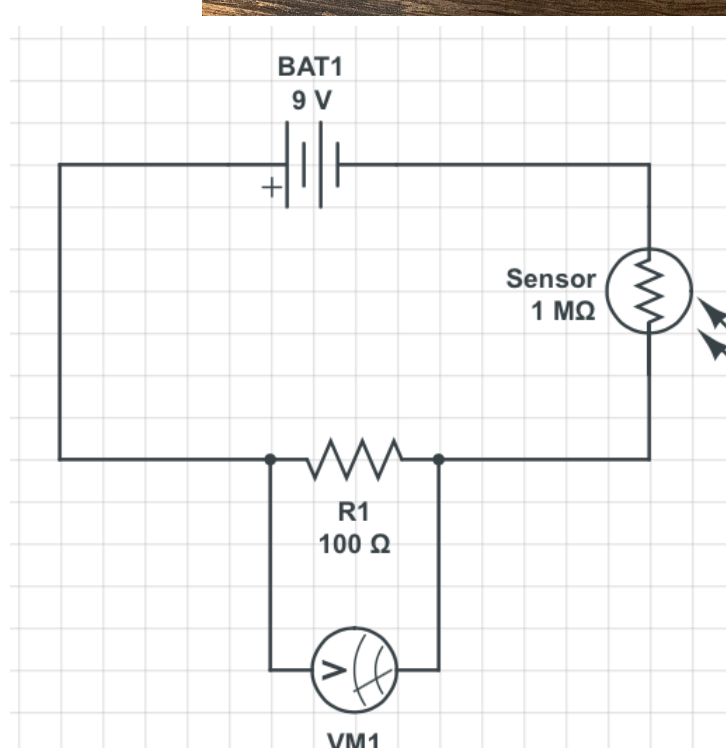
Goals

- Improve last year's prototype aesthetically and functionally
- Create device that connects people to gas sensor information
- Make the data more accessible to interested audiences

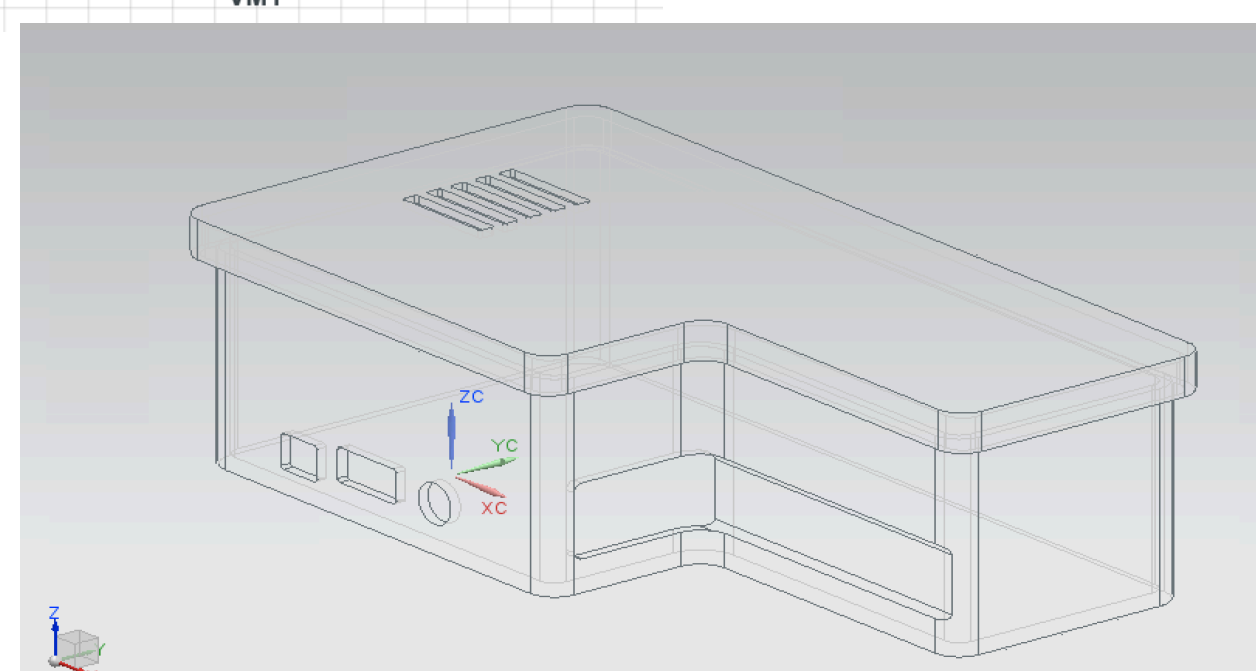
Enhancement of Prototype



Adafruit FONA allows the ammeter to connect to 2G data. The ammeter can now work from anywhere with a 2G signal



Copper circuit board replaces the breadboard prototype



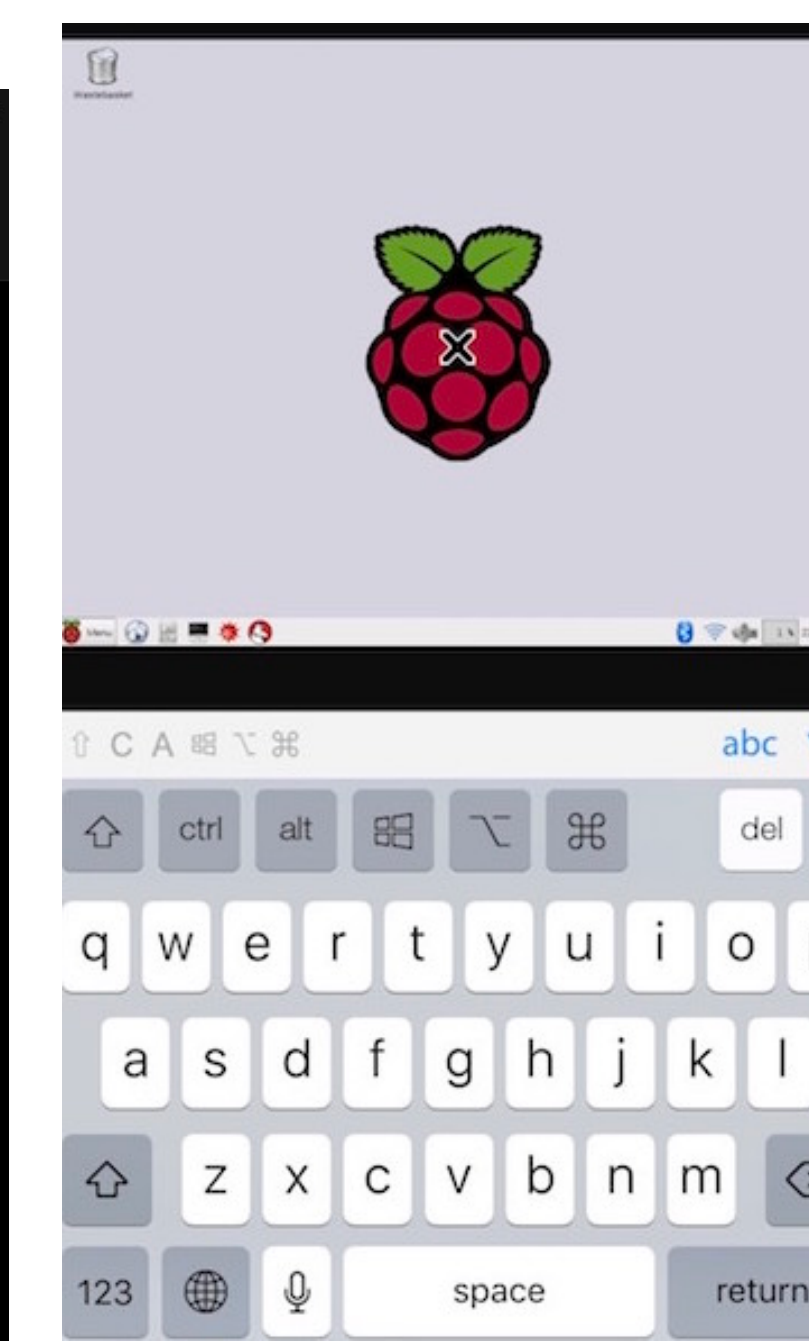
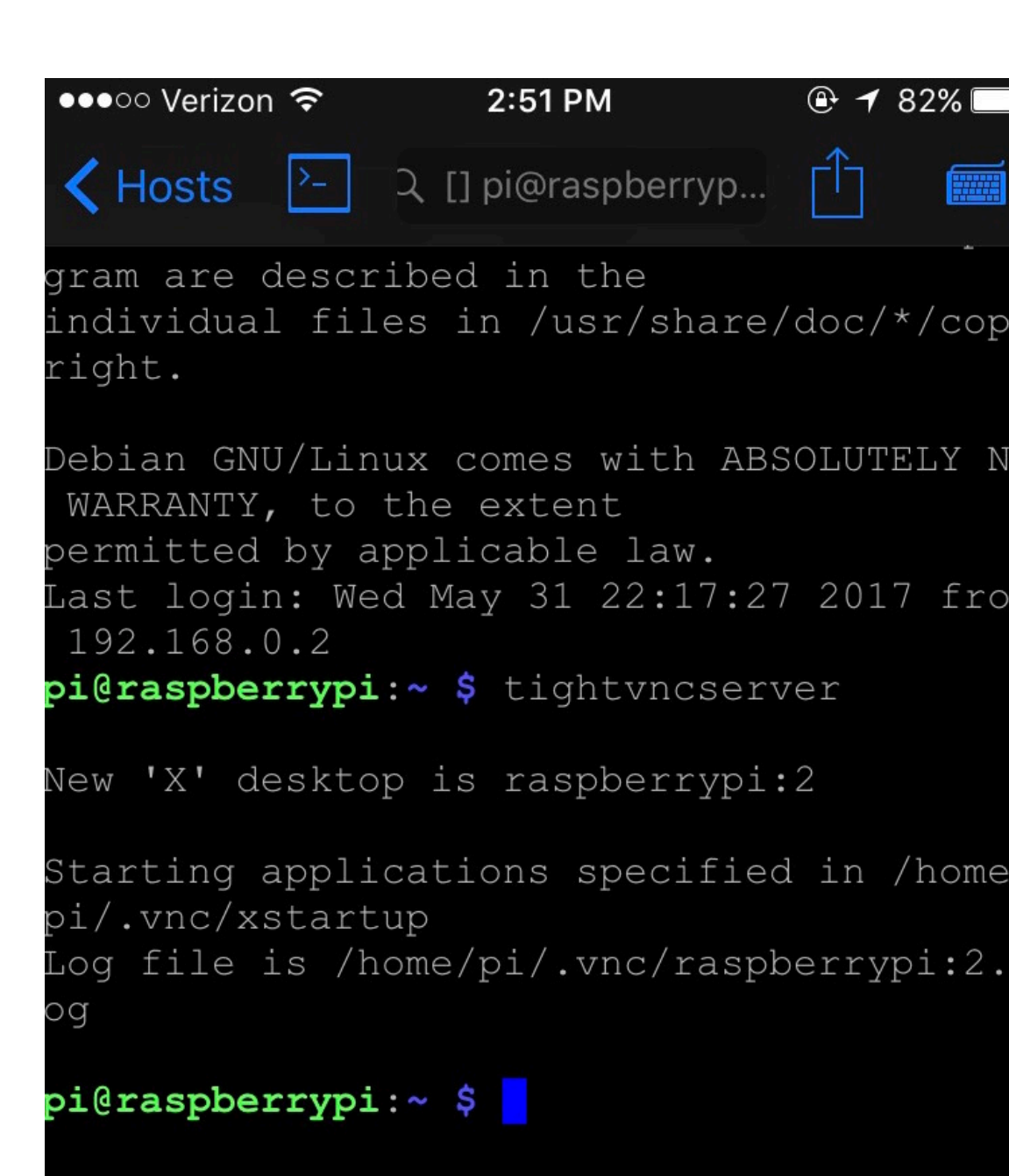
Housing unit gives a home to all the parts of the ammeter. It was modeled in NX 11 and then 3-D printed

Interface

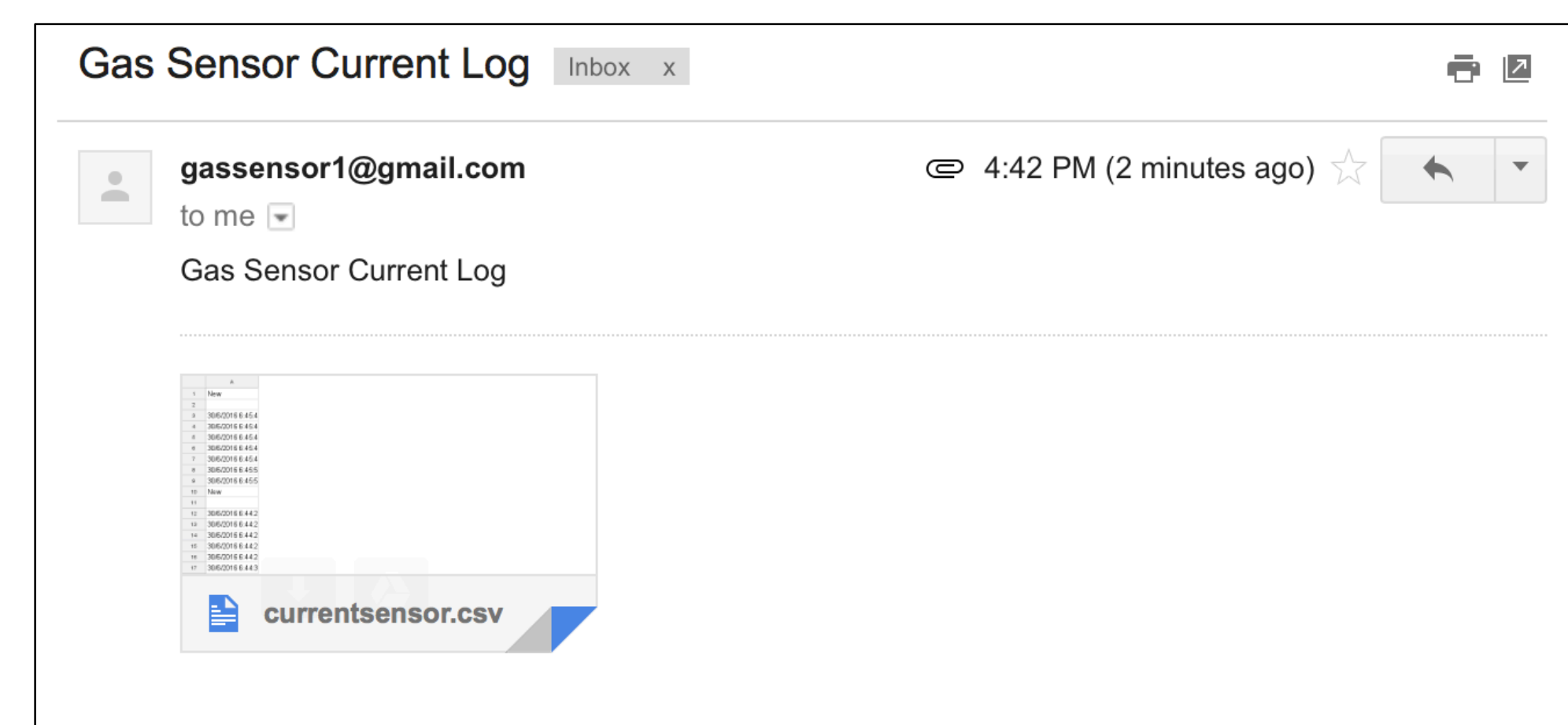
Raspberry pi desktop can be accessed from an iPhone. Tests can be run using a phone with no laptop required

Mosquitto MQTT(Message Queue Telemetry Transport) allows the python code to publish sensor data; anyone interested may subscribe to the data

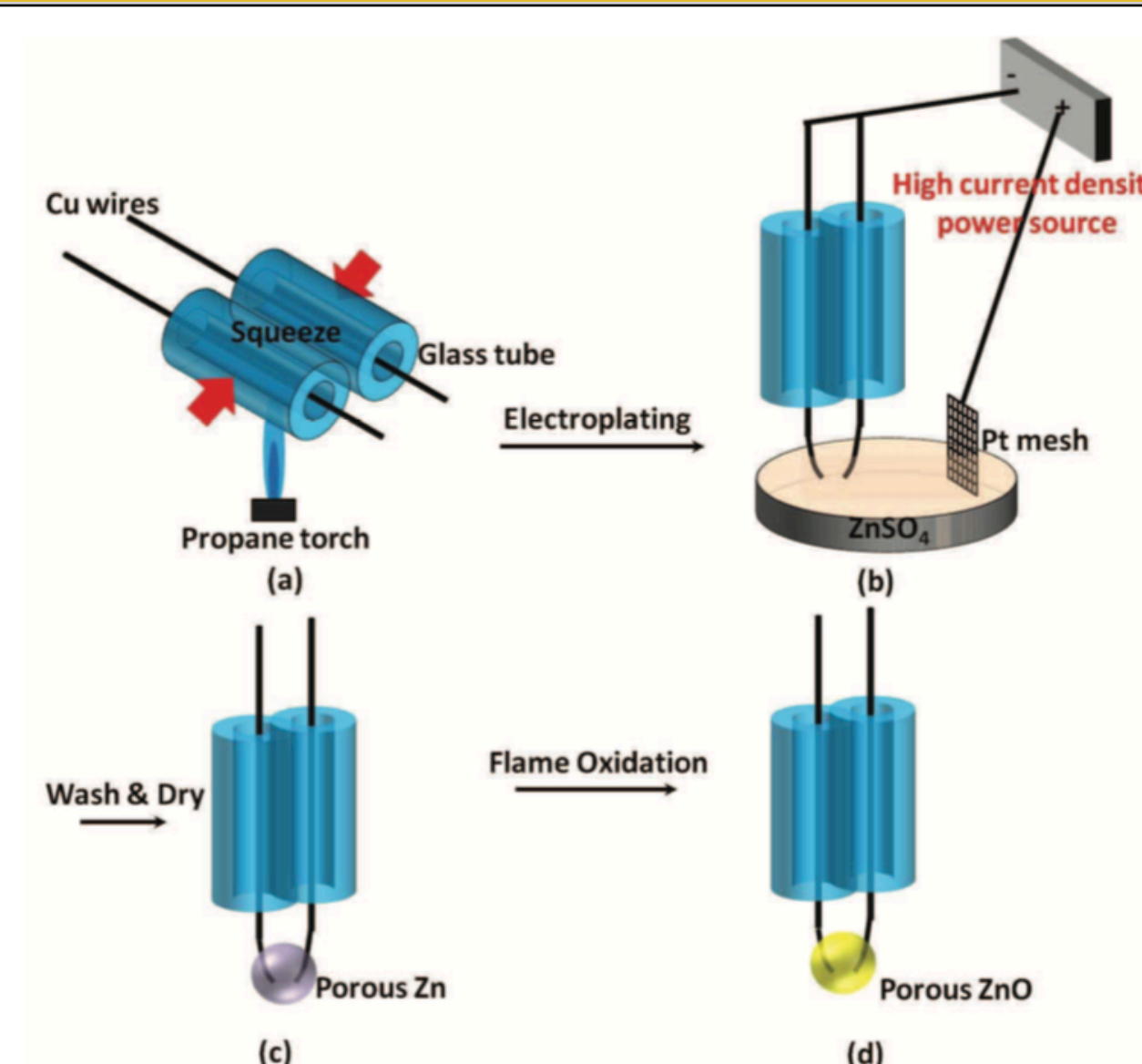
Python code automatically sends the sensor data to an e-mail as an attached csv file



```
jillianchandler ~ mosquitto_sub -h m13.cloudmqtt.com -t Gas_Sensor_Current...  
Last login: Sun Jul 23 14:20:19 on ttys000  
[Jillians-MacBook-Pro-4:~ jillianchandler$ mosquitto_sub -h m13.cloudmqtt.com -t ]  
Gas_Sensor_Current -u Sensor -P gas -p 14202  
0.0000000000000000 Amps
```



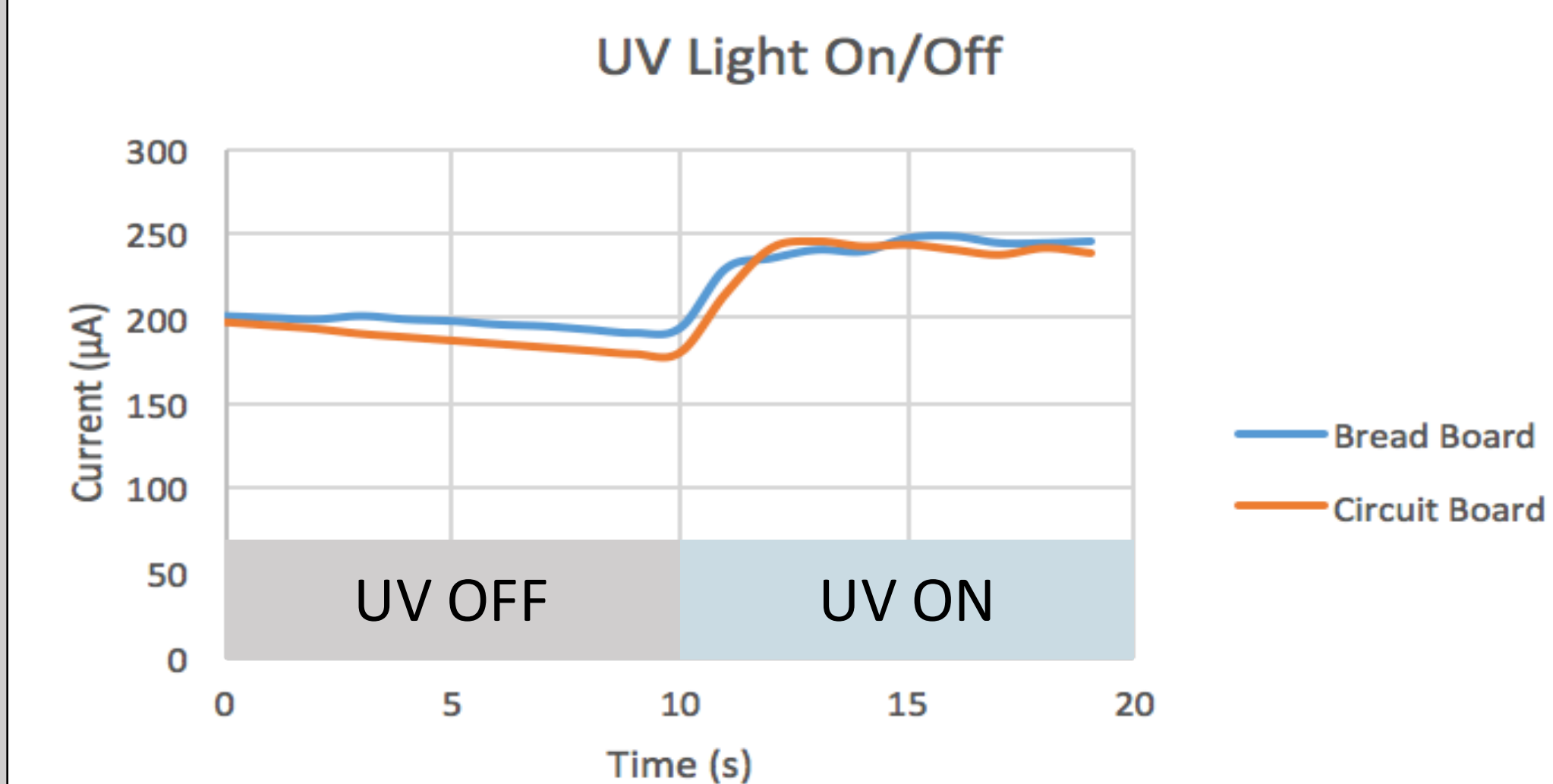
Sensor Construction



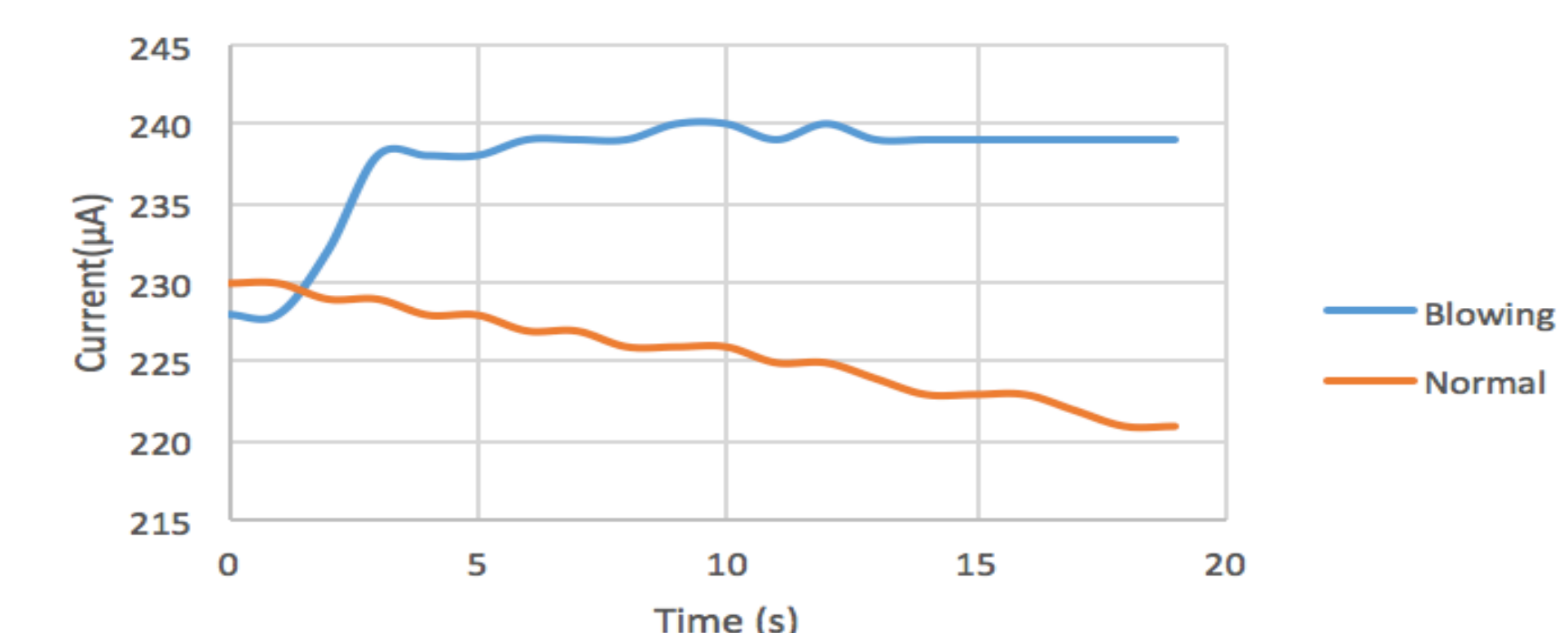
UV Sensor [2]

- A UV light sensor was created and used to demonstrate the ammeter's capabilities
- ZnO reacts to UV light and causes change in current

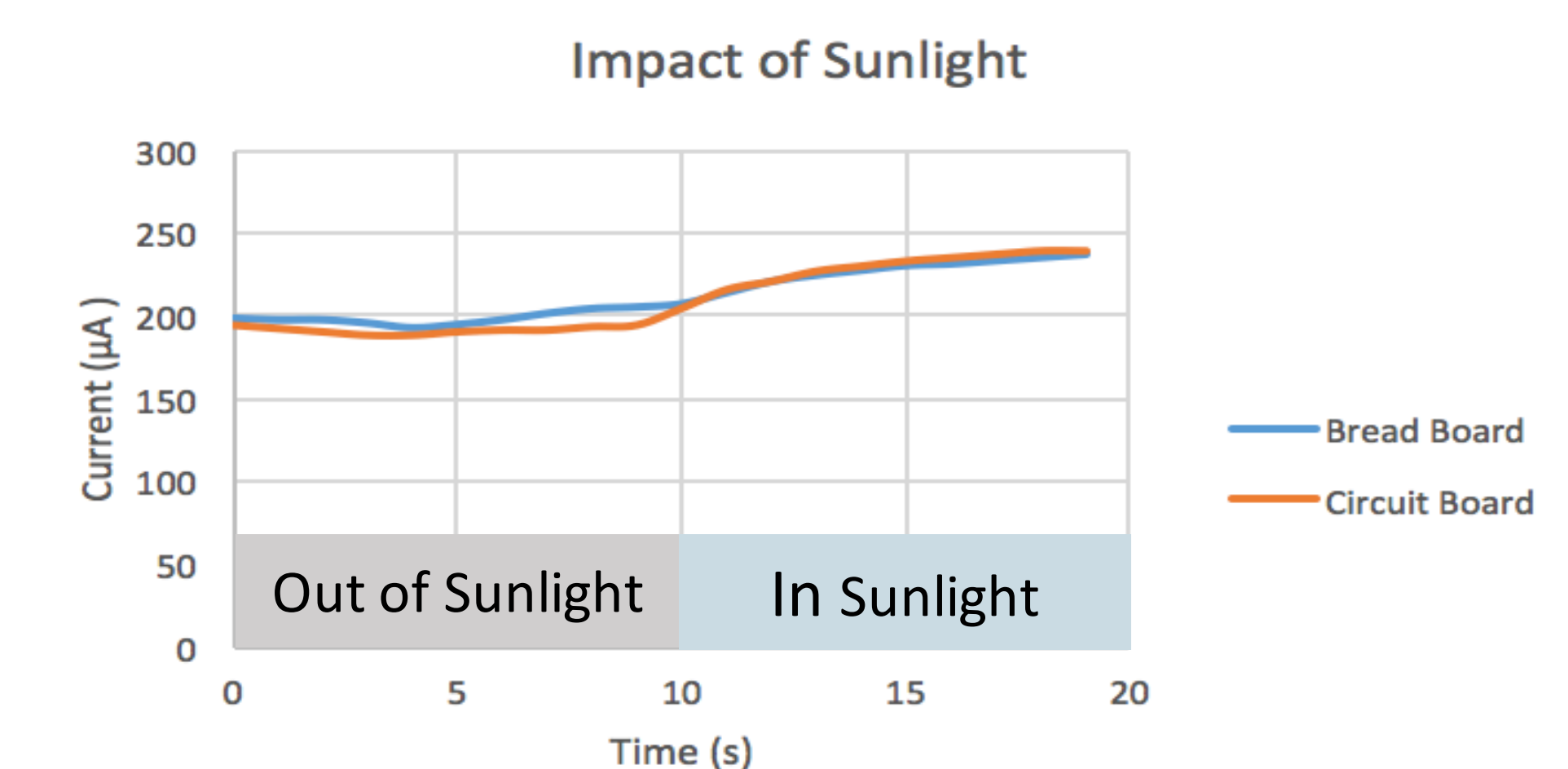
Results



The bread board shows a difference of 57 μA while the circuit board shows a larger difference of 67 μA



Added humidity to UV sensor did increase the current by 18 μA



The bread board shows a difference 46 μA while the circuit board shows a larger difference of 50 μA

Future Improvements

- Attach lid to housing unit and secure with a latch
- Connect iPhone or computer through Bluetooth
- Allow code to run continuously and only send data when an important change in current has been detected

Acknowledgements

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References:

- [1] A. Kaniyoor, R. I. Jafri, T. Arockiadoss, and S. Ramaprabhu, "Nanostructured pt decorated graphene and multi walled carbon nanotube based room temperature hydrogen gas sensor," *Royal Society of Chemistry*, 2009.
- [2] X. Wang, S. Park, X. Ma, and H.J. Cho, "ZnO Nanoparticle-based Optical Sensors Fabricated by High Current Density Electrodeposition and Flame Oxidation," *ResearchGate*, 2016.