Distributed Environmental Sensing System for the Johnson Museum

Authors: Mingyang Feng (mf783), Yingjia Zhang (yz2723)
Advisor: Dr. Hunter Adams

Environmental Monitoring in the Herbert F. Johnson Museum of Art is Inconvenient

Art museum staff must regularly gather temperature and humidity measurements from throughout the museum. These measurements inform maintenance schedules and display locations for sensitive artwork.

Ultra-violet and ambient light exposure could also inform these schedules, but the museum does not presently measure these with the same regularity.

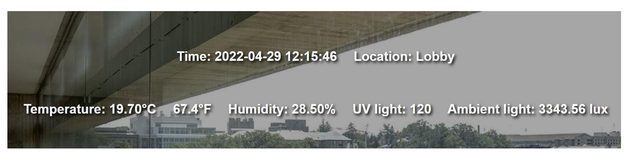
Museum Testing Results: Our System Has Been Running For One Month in the Museum

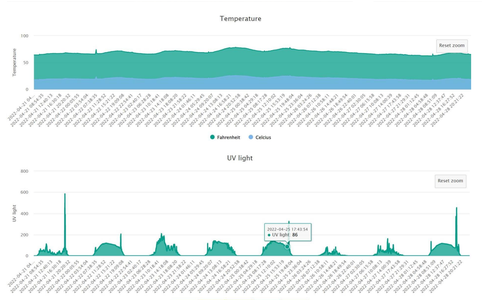
Testing Details

Location	Duration	Power Supply	Sleep Cycle
Lobby	30 days	Micro USB Jack	2 mins
Basement	4 days	Micro USB Jack	2 mins

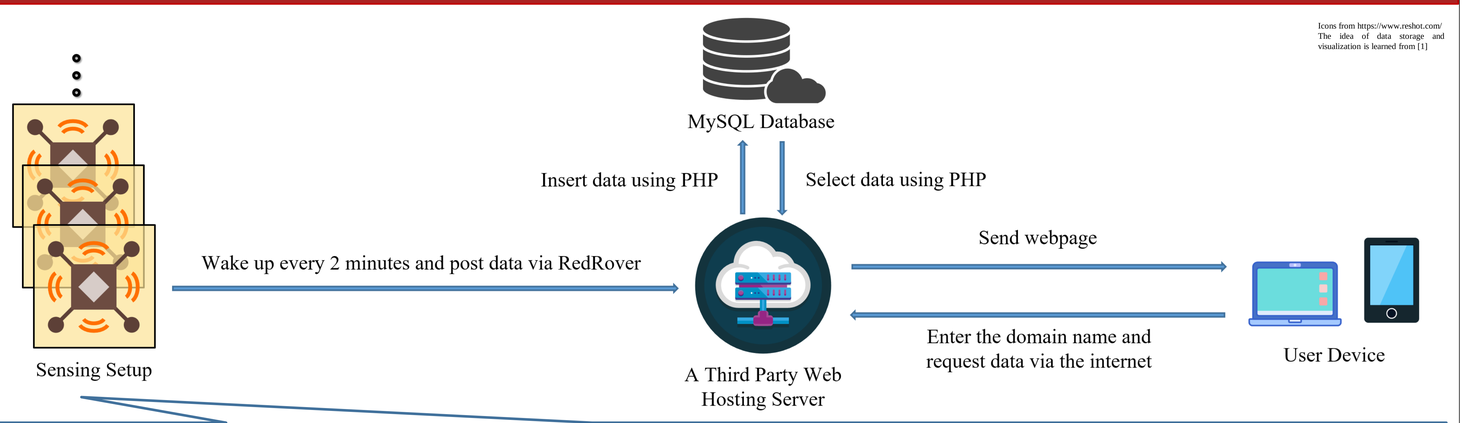
Sensing Setup Testing in the Museum Lobby

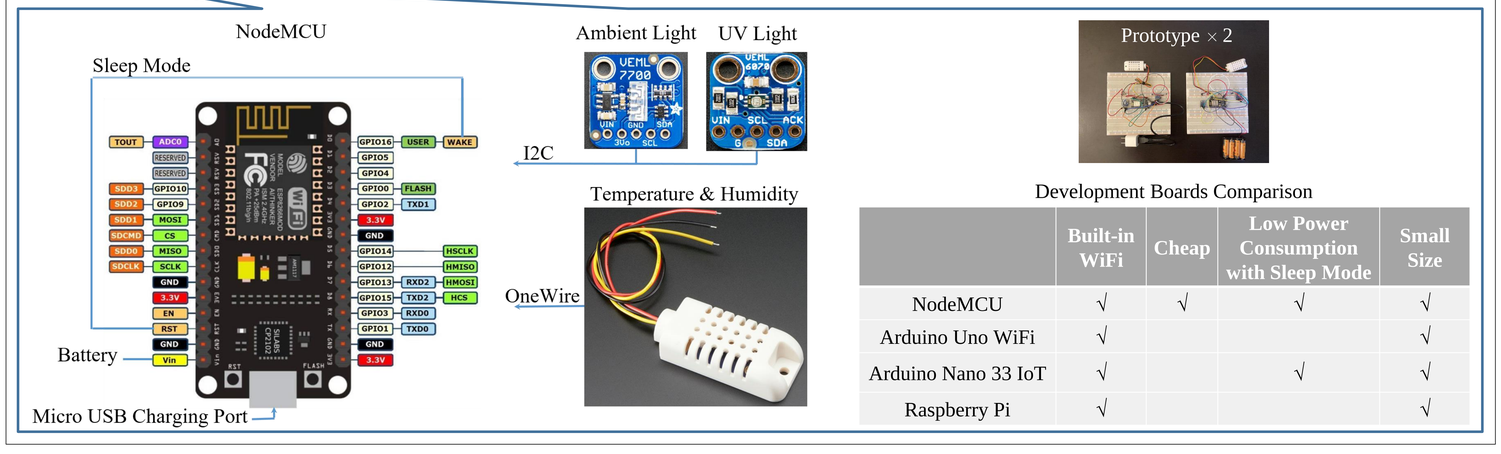
User Interface





We Developed an IoT System to Help Remotely Monitor Real-time Environmental Conditions in the Museum





Development Boards Comparison

	Built-in WiFi	Cheap	Low Power Consumption with Sleep Mode	Small Size
NodeMCU	√	√	√	√
Arduino Uno WiFi	√			√
Arduino Nano 33 IoT	√		√	√
Raspberry Pi	√			√

Discussion & Future Work

- Our tests to date have used building power. We will optimize our circuit and software for long- term battery powering.
- We will add an SSO login page to the user interface to reduce security risks.
- Printed circuit boards would save wires and increase reliability of the sensing devices.

Acknowledgements

We would like to express special thanks to our advisor, Dr. Hunter Adams for his tremendous help and guidance throughout this project.
We also thank the ECE Department and the Johnson Museum staff for their help on this project.

References

[1] Rui Santos. Visualize Your Sensor Readings from Anywhere in the World (ESP32/ESP8266 + MySQL + PHP).
[2] Amardeep Singh Manak, Rahul Sharma. Internet of Things: Environmental Sensor Control.