

Plant Life Monitoring System

Gaining root access to your plants

Conception

- What is it?
 - WiFi-enabled sensor package for indoor plants
- Why Plant Monitoring?
 - Home automation is trending
 - Provide metrics that allow user to better care for their plants
 - Previous experience with frustration of trying to grow strawberries

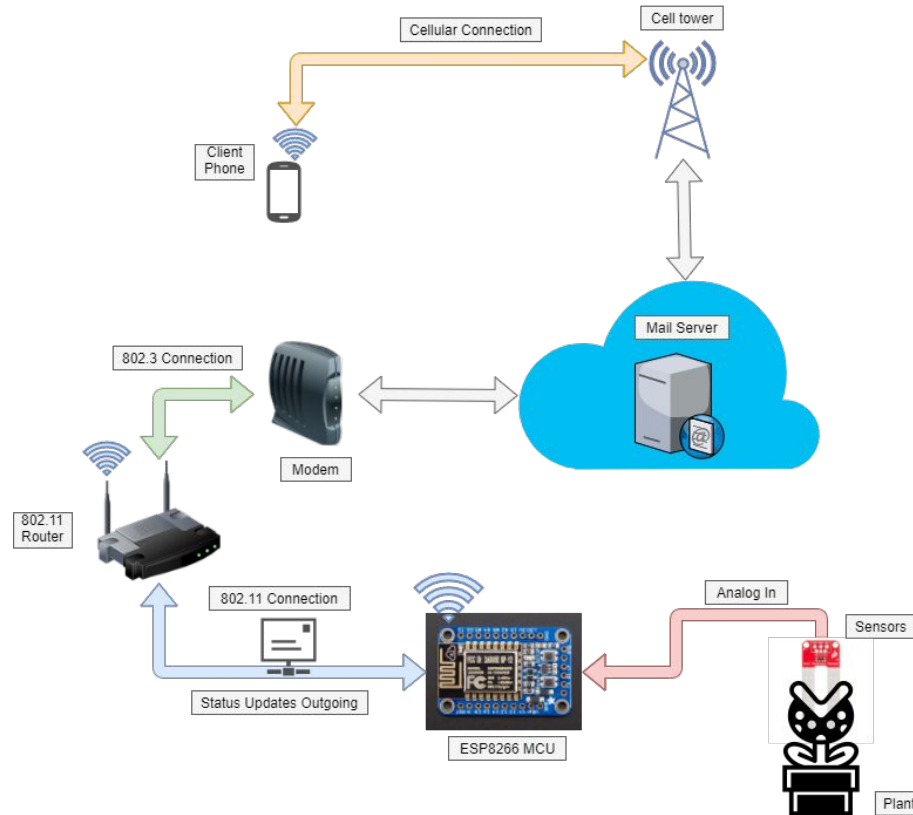
Core Features

- Low-power 32-bit MCU with full WiFi front-end and TCP/IP stack
 - Easily connect system to any wireless network and provide updates
- Low-cost
 - Total cost per node under \$20
- Multi-sensor package
 - Photoresistor to measure light intensity
 - Thermistor to measure temperature
 - Soil Moisture Sensor to measure resistivity of soil
- Battery life monitoring built-in
- SMTP-based plant updates
 - Common protocol
 - Easily integrate data into a more user-friendly mobile/desktop application

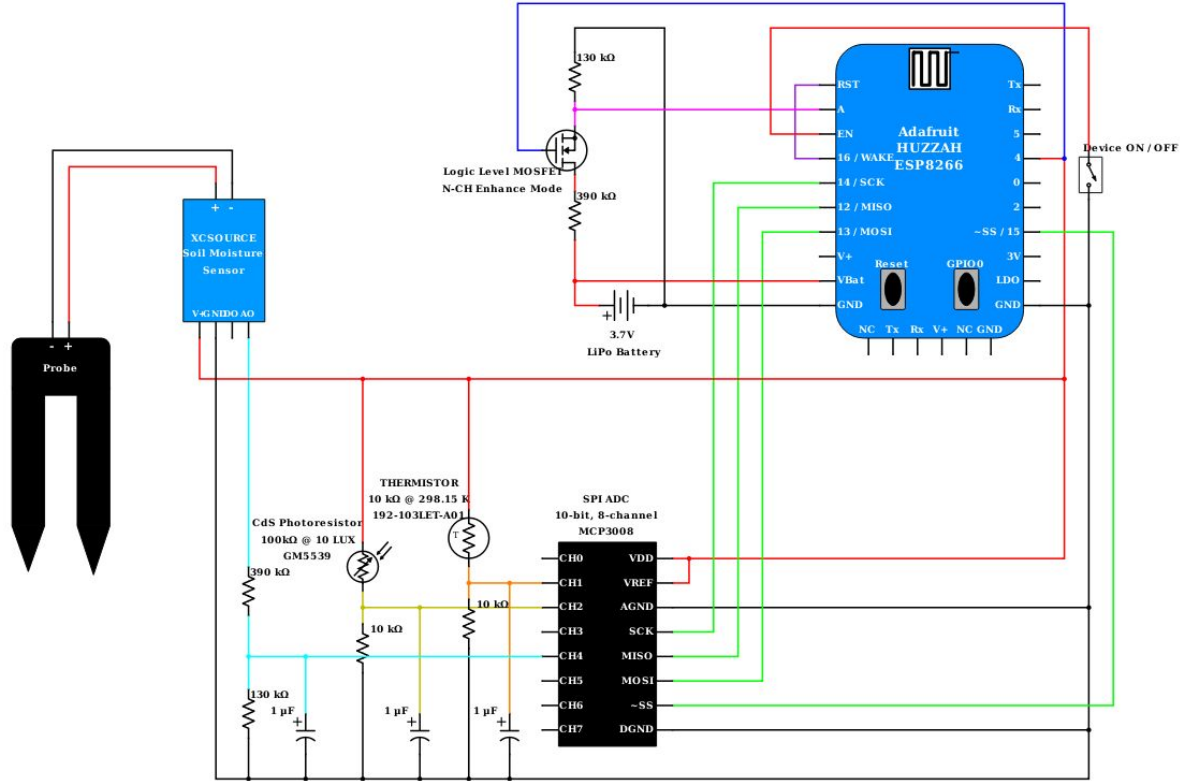
Ultra-Low Power

- Sensor circuits only powered when needed
 - Read all sensors in ~ 1 sec
 - MCP3008 ADC I_{\max} : 500 μA
 - Photoresistor I_{\max} : 330 μA
 - Thermistor I_{\max} : 330 μA
 - Moisture sensor I_{\max} : 6.346 μA
 - Battery voltage I_{\max} : 6.346 μA
 - Total I_{\max} : 1.173 mA
- ESP8266 MCU 802.11n Tx Mode: 120 mA (~ 60 sec. to transmit)
- ESP8266 MCU Deep Sleep Mode: 20 μA
- Average Consumption: ~ 2 mA with hourly updates
- 2200mAh battery gives ~ 32 day lifespan with hourly updates

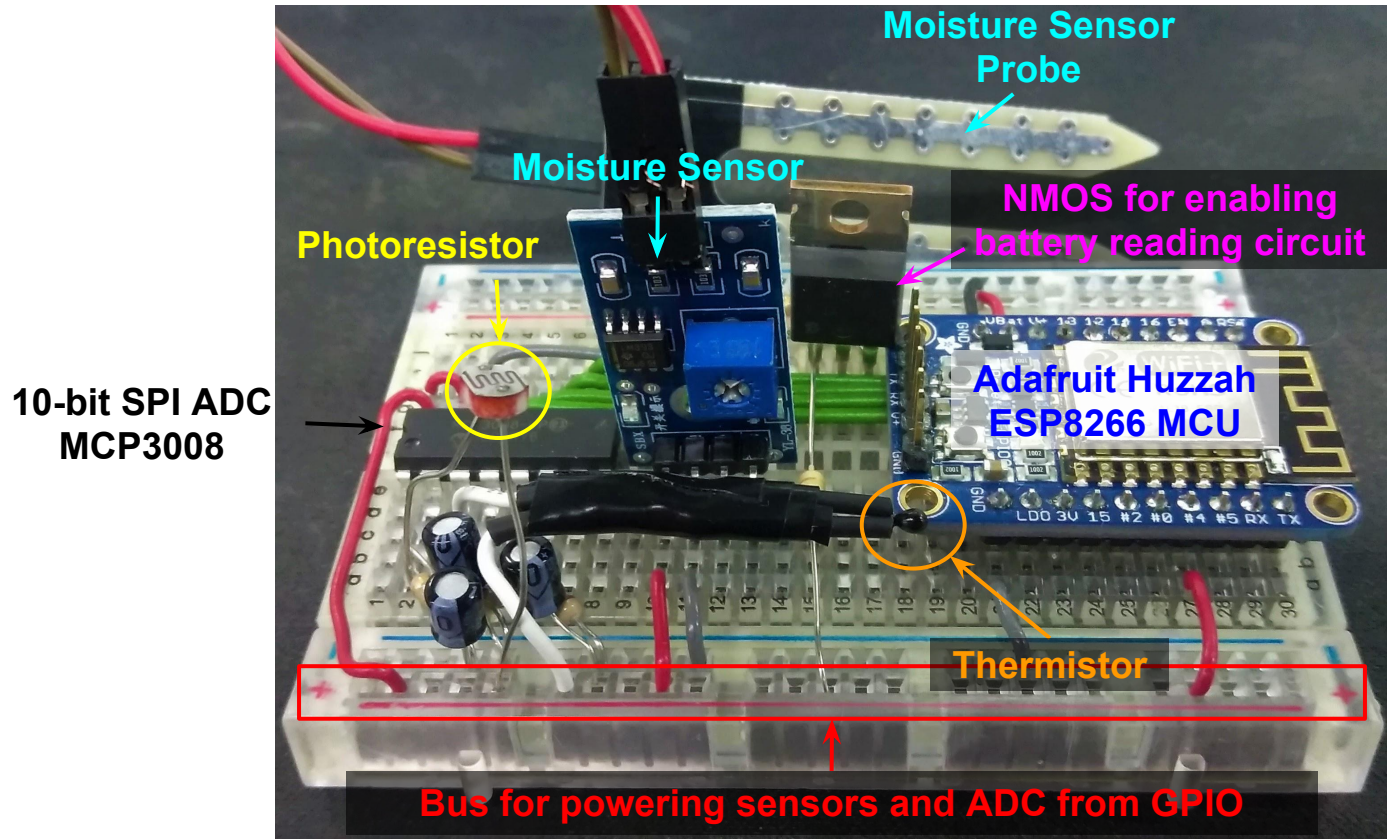
System Overview



Hardware Design

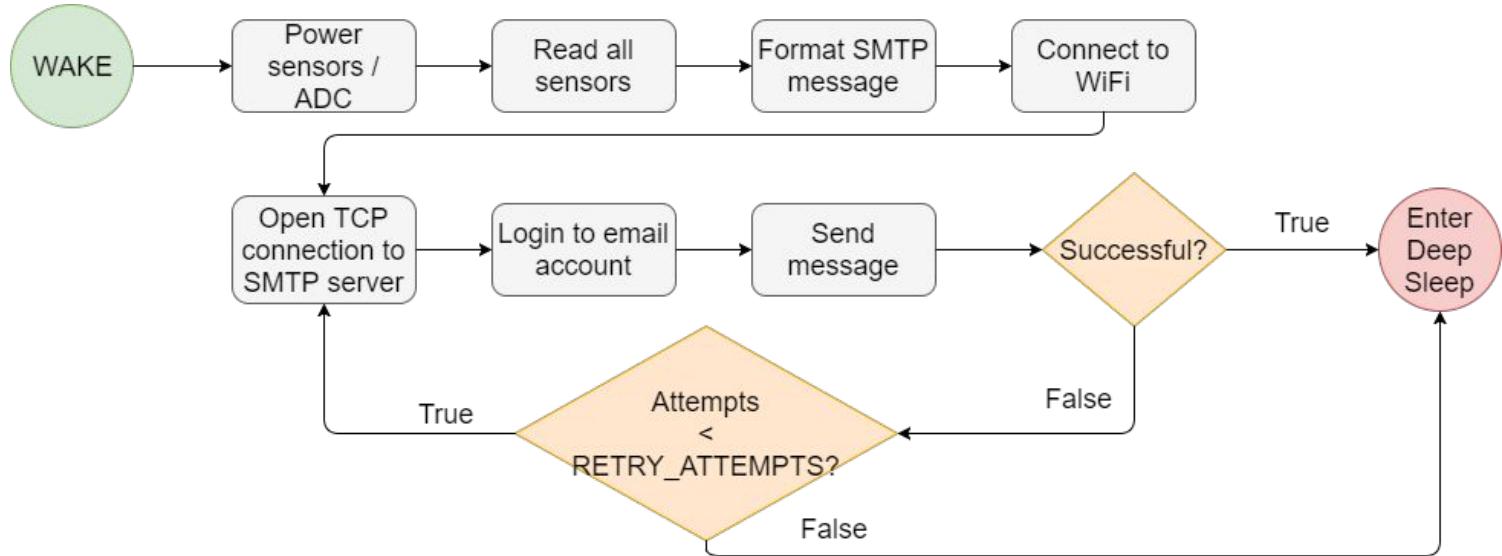


Breadboard Implementation



Software Design

- ESP8266
 - Arduino C

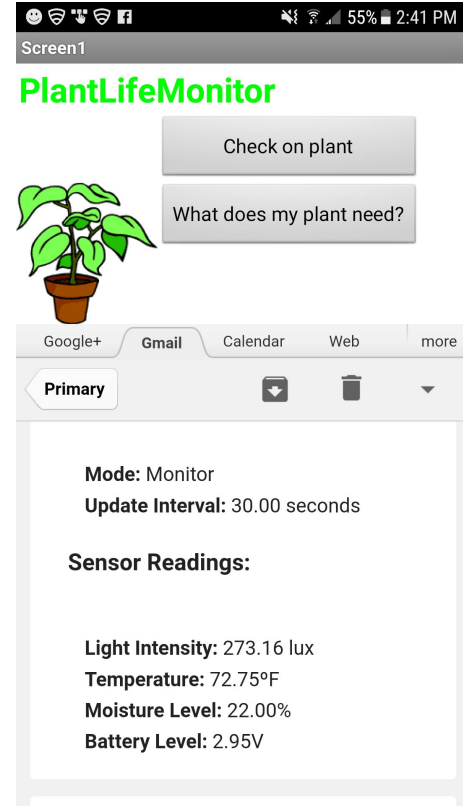
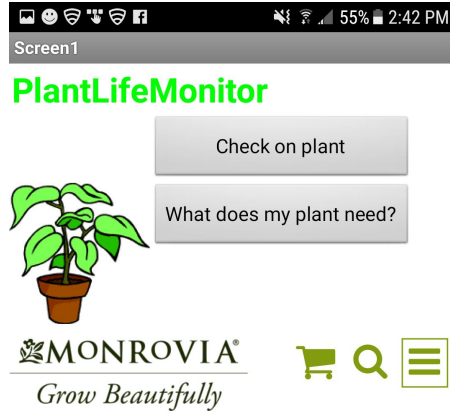
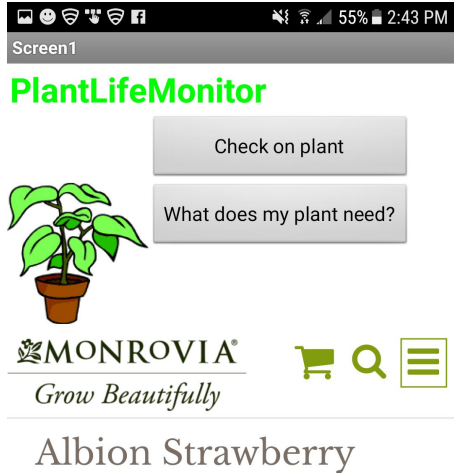


Software Design

- App
 - MIT App Inventor



Sample App / Plant Update



Future Possibilities

- Integrate auto-watering capabilities
- Waterproof case for outdoor usage
- Develop mesh network of sensor nodes
- Add solar panel to extend battery life
- Allow microcontroller to completely shutdown to prevent battery damage
- Create fully-featured mobile app
 - Neatly display node metrics
 - User-updatable settings for individual nodes (update-interval, auto-watering on/off, etc.)
 - Display ideal values based on type of plant the node is connected to
- Desktop app with GUI to initially configure the nodes
- OTA software updates

Questions?

References

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