THE GREEN PILL
A MATRIX OF SOIL TESTERS

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ABSTRACT

This project is the design and construction of a non-centralized matrix of soil probes. These probes will gather information from various sensors on soil moisture, sun exposure, and soil temperature. This information will then be shared between probes and a user. This matrix is to provide a fast and accurate response that allows users to make the best decision for the care and growth of plant life in either an indoor or outdoor environment.

OBJECTIVES

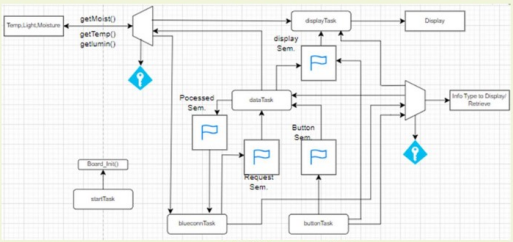
To develop a probe that can:

- Measure soil temperature, soil moisture, and light exposure
- communicate with other copies of the same probe within the matrix
- Display current information from individual probes
- Display information to someone's phone on all soil probes.

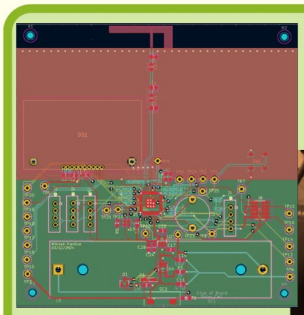
HARDWARE COMPONENTS

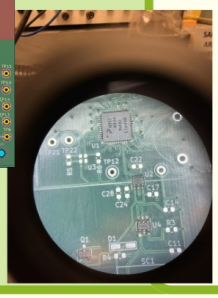
- 32 MHz External Oscillator ECS-2520MV-320-CN-TR
- Arduino Uno: ATmega 328P
- LCD Screen: NHD-C0216CZ-NSW-BBW-3V3
- Humidity and Temperature Sensor: T9602-3-D-1
- Light Sensor: LTR-329ALS-01
- 30 mm Button: MPC73831
- MCU: MKW36Z512VHT4
- Lithium Battery: PCIFR 1850-1500

SOFTWARE DESIGN



- MCUXpresso IDE
- Programming Language: C
- KiCad PCB Design Software
- SEGGER J-Link Connector





RESULTS

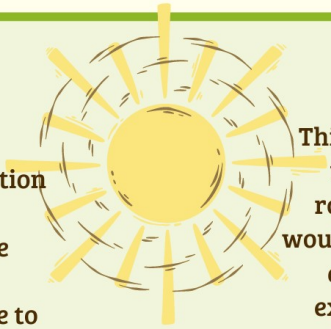
This project is incomplete. However, progress was made, and many things were learned along the way. Successes made along the way were:

- Verification of light, moisture, and temperature sensor functionality
- Verification of clock oscillation at 32 MHz
- Programing of MCU in C language using example code from NXP
- Supplying of appropriate battery power

CHALLENGES

I faced a number of challenges throughout the creation and manufacturing of my project:

- The bridging of pins when using solder paste
- The shipping of parts in a timely manner
- The improper routing of major components due to incorrect documentation
- Managing the scope of the project.



CONCLUSION

This project could use a number of improvements. The first would be the redesign of certain component routings during the PCB design process. The second would be more time allotted to work on this project. Over all, the learning curve on this project was a great experience. The design program was new to me, the soldering techniques necessary were new to me, and programing a MCU's with features like Bluetooth LE or low power functionality was new to me.

Acknowledgments: John Lund, Todd Morton