

Automated Greenhouse

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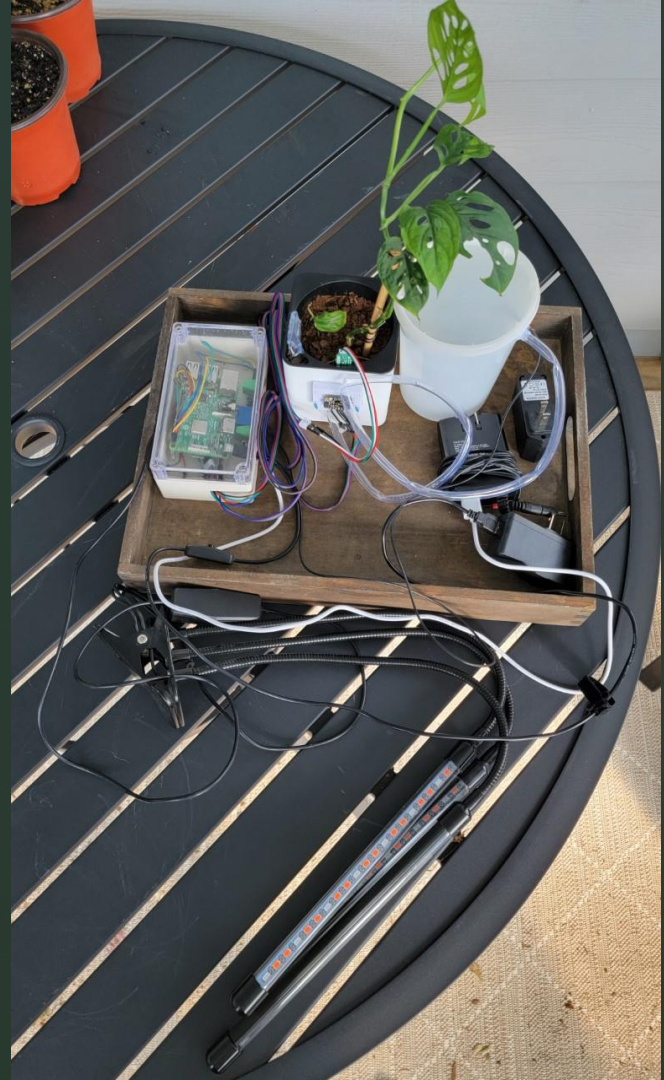
Introduction

- Why: Plants are a popular hobby and we wanted to make their care more efficient.
- Problem: It is easy to forget about plants. It could also be used at a higher level for more sustainable farming.
- Goal: Create a greenhouse that can be tracked with an app and controlled remotely with an automatic or manual watering system

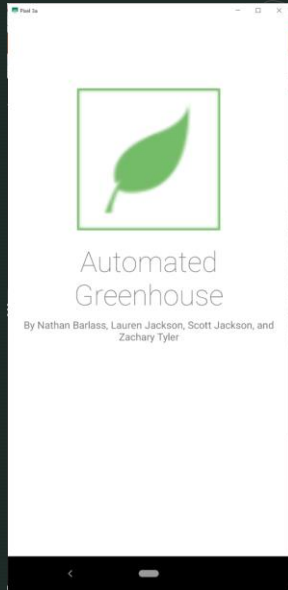


Overview

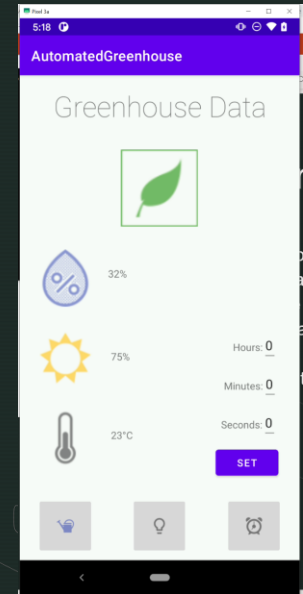
- Three main components:
 - Raspberry Pi
 - Database
 - Mobile device



Project Design: Android App



- The general design of the application consists of a Splash screen activity that launches to the Greenhouse Data view allowing the user to see the live Database values. The app constantly pulls data from Firebase every time the data changes. This activity contains three buttons, one to immediately activate the pump, one to schedule a timer for the pump to periodically turn on, and one to activate the light.



Project Design: Firebase

- The intermediate layer between the Greenhouse and the Mobile app is the Firebase Real-time database. Firebase was chosen because of its ability to easily implement real-time concurrency between every device connected to it. This allows the sensor data to update on the phone as it changes in almost no time and allows the app to control the pump almost instantly.
- The schema for the real-time database is simply one record that contains moisture, sunlight, and temperature fields which store a JSON Number corresponding to the respective Sensor data and a Boolean to control the water pump and the light. This single record is simply updated with the new data from the Raspberry pi periodically and the Booleans are controlled by the app.

```
Greenhouse
├── has_watered: true
├── light: false
├── moisture: 322
├── sunlight: 75
├── temperature: 24.085846900980002
└── water: false
```

Demonstration

- The following video shows the app running and receiving the sensor data from the greenhouse, and the app's ability to control the water pump:
- [Demo Video](#)

Project Design: Raspberry Pi & Other Electronics

- The Raspberry Pi is programmed in python and uses I2C communication to interface with sensors.
- Pyrebase python module is used to send/read data to/from Firebase database.
- A water pump is connected to the Pi and waters the plant when the Pi's program enables the output.
- A grow light is connected to the Pi and is enabled the same way as the pump
- Other features like overwatering prevention are also included
- Future features: light spectrum adjustment and temperature control