



Embedded Software for the Internet of Things
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SMART GREENHOUSE

project by

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Project Aim

Automated plant maintenance within the greenhouse
→ no manual intervention needed



Software Architecture

Soil humidity and temperature

- Taking different samples for averaging
- Conversion from raw data to percentage
- Pump control based on fixed thresholds

LCD screen

- Screen 1: internal environment of the greenhouse
- Screen 2: soil and pump status
- Screen 3: external temperature

Ventilation

- Ventilation and stabilization of temperatures
- Door opening with temperatures $> 25^{\circ}\text{C}$
- Door Closing with temperatures $< 15^{\circ}\text{C}$

Representative Code

```
int updateSoilAndPump() {  
    int raw;  
  
    if (readSoilAverage(raw)) {  
        lastMoisture = soilToPercent(raw);  
  
        if (!pumpState && lastMoisture < PUMP_ON_THRESHOLD) {  
            pumpState = true;  
            digitalWrite(PIN_RELAY, LOW);  
        }  
        else if (pumpState && lastMoisture > PUMP_OFF_THRESHOLD) {  
            pumpState = false;  
            digitalWrite(PIN_RELAY, HIGH);  
        }  
    }  
    return lastMoisture;  
}
```

Testing and problems

Software testing on host machine

Individual sensors testing

Gradual code integration of the different sensors while testing on the hardware

Dry/wet variables calibration

LCD noise due to motors

Possible improvements

Water tank level monitoring

WiFi / Bluetooth connection

Remote control of the LCD

Mobile application for remote monitoring

Thank you for your attention