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

Non-blocking polling model

- Multitasking model
- Tasks executed inside the loop() function
- No hardware interrupts

Time-dependent behavior

- No blocking delays
- Software timers based on millis() function

Architectural choice

- Reliability and predictability
- No concurrency issues
- Easy to debug and maintain

Representative Code

```
132  int handleSoilAndPump() {
133    int soilRaw;
134
135    if (readSoilAverage(soilRaw)) {
136      lastMoisture = soilToPercent(soilRaw);
137
138      if (!pumpState && lastMoisture < PUMP_ON_THRESHOLD) {
139        pumpState = true;
140        digitalWrite(relayPin, LOW);
141      }
142      else if (pumpState && lastMoisture > PUMP_OFF_THRESHOLD) {
143        pumpState = false;
144        digitalWrite(relayPin, HIGH);
145      }
146    }
147
148    return lastMoisture;
149  }
```

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 the pump state changes

Possible improvements

- Water tank level monitoring
- Internet connection for weather interface
- Remote control of the LCD
- Mobile application for remote monitoring

Thank you for your attention!