

Embedded System Lab
Final Project Report
Internet of Thing
ClimateChanged, Dust, and Environment

WATURE

By
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This report is for the course
2110366 (2022/2) - Embedded System Laboratory
Computer Engineering - Chulalongkorn University

Project name: WATURE

Description

IoT system to control plant watering system depending on temperature, humidity, soil moisture, and light using various sensors with STM and ESP boards.

GitHub URL: <https://github.com/ThanatWonsamut/embed-sys-lab-final>

Equipment

- *System Part*
 1. Light Dependent Resistor (LDR)
 2. Digital Temperature And Humidity Sensor (DHT11)
 3. Resistive Soil Moisture Sensor
 4. STM32 Board
 5. ESP8266 NodeMCU
 6. Cable
 7. BreadBoard
 8. Submersible water pump (AD20P-0510A)
 9. Relay 5V DC
 10. Battery Holder AA X3
 11. Female USB

- *Designing Part*
 1. Plastic Box
 2. Popsicle Stick
 3. Latex Glue
 4. Water container
 5. Rubber tube

Responsibilities

Thanat Wongsamut 6432067021

Role : Embedded System Development & System Architecture

NodeMCU

- Connection with STM32
- Connection with cloud (Firebase)
- Sent data from STM32 to database
- Read signal from Firebase and control water pump via STM32

STM32

- Connection with NodeMCU
- Calibrating percentage value for sensors (LDR, DHT11, and Soil Moisture)
- Control water pump via Relay module

Firebase

- Setting up realtime database
- Setting up API keys for teammates
- Skimming through documentations for useful resources

GitHub

- Creating github for updating work
- Making github to easier management

System Architecture

- Design which features need what components (LDR, DHT11, and Soil Moisture)
- Planning how each components will work with each other
- Designing circuit diagram

Responsibilities

Punyaphat Surakiatkamjorn 6432106821

Role : Embedded System Development & UI/UX Designer and Website Developer

Design and Create Web App

- Design UX/UI of the Web App
- Design first look of website
- Design how User will interact with Web App
- Create Web App using React
- Responsive design for any display size

Connect Web App to Firebase

- Get Data from sensors to Web App
- Sent signal into the database for control the water pump via nodeMCU

NodeMCU

- Debug code
- Programmed watering control

STM32

- Debug code
- Programmed Receiving data from NodeMCU to control other sensors and modules
- Calibrating percentage value for sensors (LDR, DHT11, and Soil Moisture)

Responsibilities

Thanakorn Suthamkasem 6430140721

Role : Embedded System Development & Team Management (Supplier)

NodeMCU

- Checking code (working with teams)

STM32

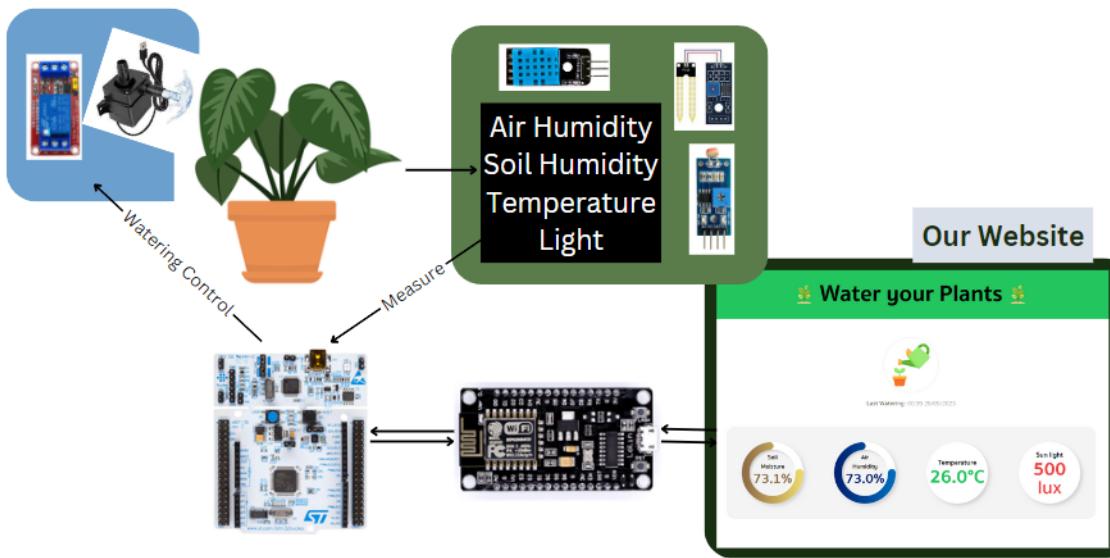
- Checking code (working with teams)
- Connect circuitry and programmed stm32 to read raw value from sensors (LDR, DHT11, and Soil Moisture) and send through UART
- Calibrating percentage value for sensors (LDR, DHT11, and Soil Moisture)

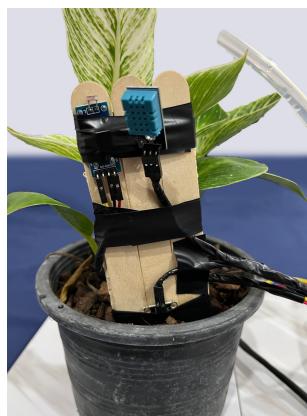
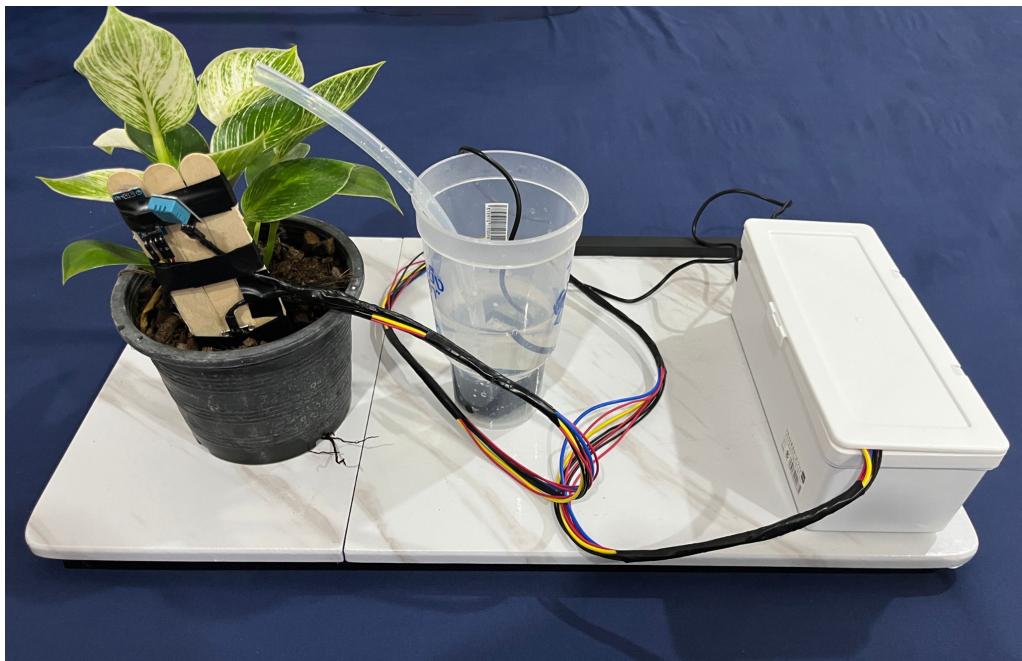
Supplier

- Asking teammates for updates
- Arranging meetings
- Finding and managing equipment used in this project and allocating funds
- Managing documents and information in this project
- Gather information to summarize the results for easier access
- Checking the overall operation of the system.
- Doing the rest of the work and reviewing

Overview

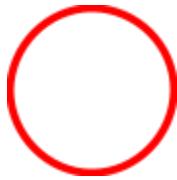
Represents an overview of our project



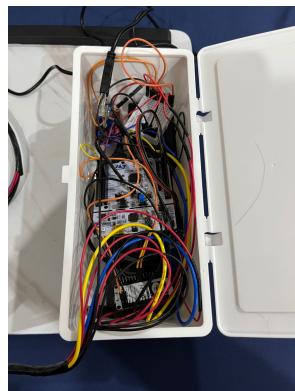


Sensors for measuring temperature humidity and light intensity





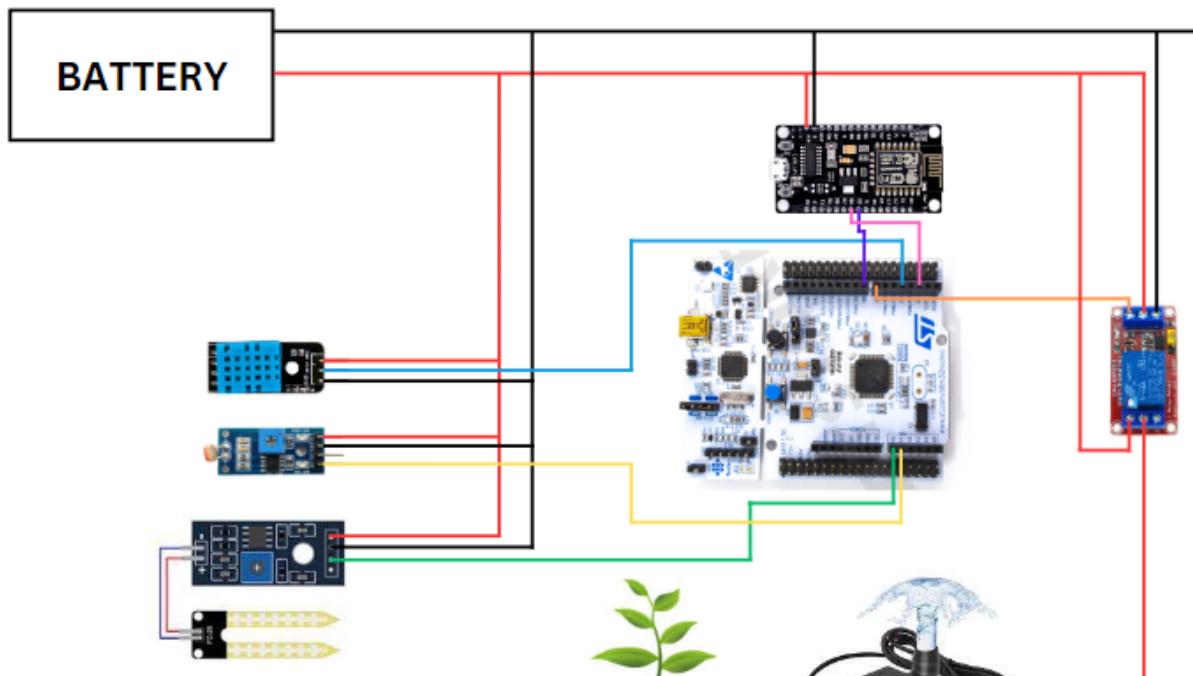
Water pump for water the plant

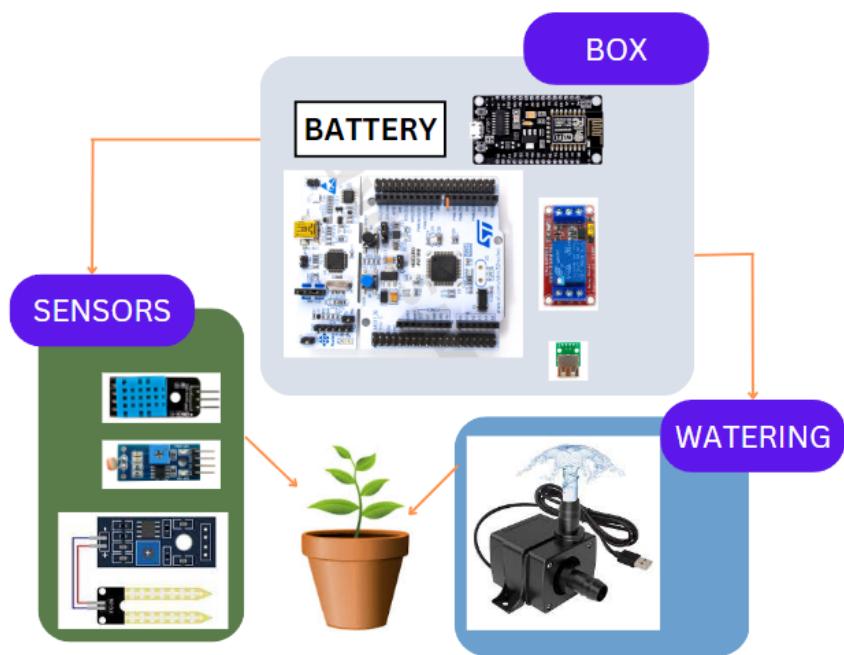


Control box

Circuit Diagram

Managed to pack the system into a box for compactness and aesthetics





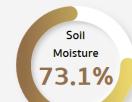
Our Website

Mainly used to monitor plant status and water plants

Water your Plants



Last Watering: 00:39 26/05/2023



Display Data from sensors from Firebase Database

- Data will update automatically
- Latest Update time will be displayed

Data from sensors are following

- Soil Moisture in Percentage
- Air Humidity in Percentage
- Temperature in Celsius Degree
- Brightness in Lux Unit

Website Decoration

- Hovering button
- Changing colors for over or under standard value
- Beautiful popup that displays the current status
- Smooth transition and real-time update when the data change
- Responsive design

Water your Plants



Last Watering: 01:31 26/05/2023

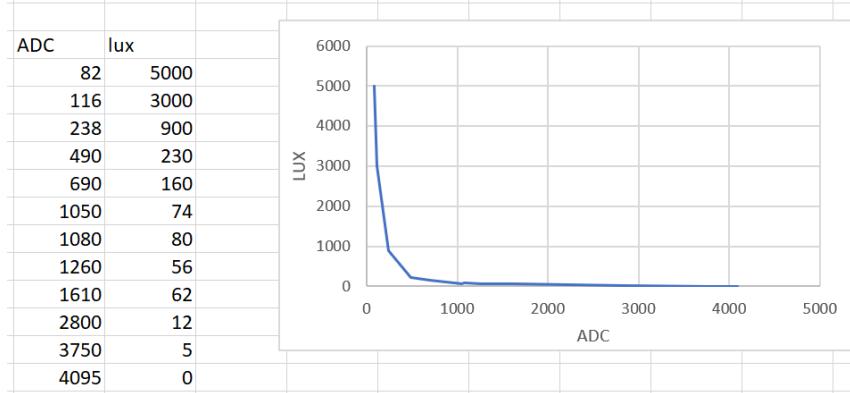
Calibrating S

Watering, Please wait

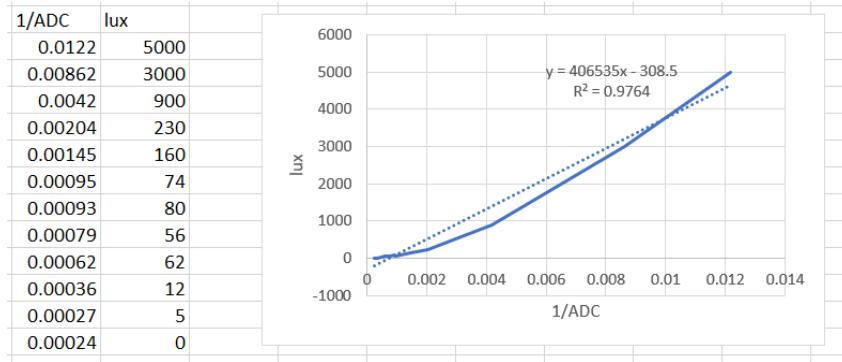
✓ Watering successful

Light Sensor

- Collecting the data by reading the data from sensor (ADC) and actual LUX from smartphone
- After we collect the data until it's sufficient, Plotting the graph in Excel



- Try to plot graph between 1/ADC and LUX



- Calculate the Trend line equation and adjust for accuracy
- Finally, we get "LUX = 406535 (ADC^-1) - 308.5" for converting ADC to lux

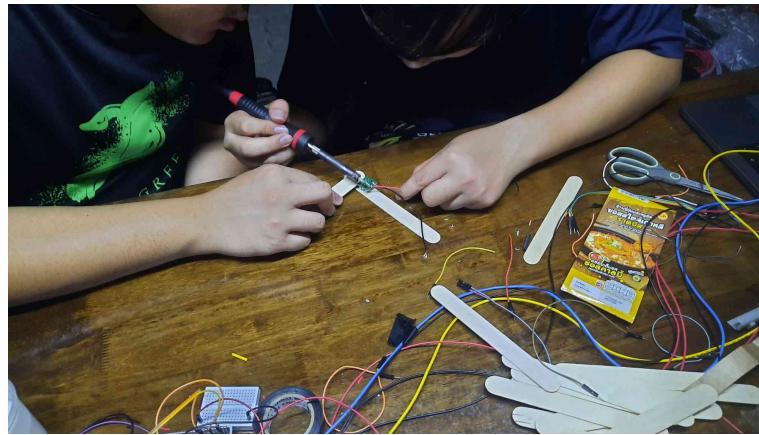
Soil Moisture

- We read the data when the sensor is in the water (Humidity 100%) and the data when the sensor is dry in the air
- Calculate the linear equation and adjust for accuracy
- Finally, we get "RH = -0.0503 (ADC) + 205.98" for converting ADC to RH (Relative Humidity)

Pictures



Pictures



Qr Code



Our GitHub

[<https://github.com/ThanatWonsamut/embed-sys-lab-final>]



Our Website

[<https://embed-sys-lab-final.vercel.app>]