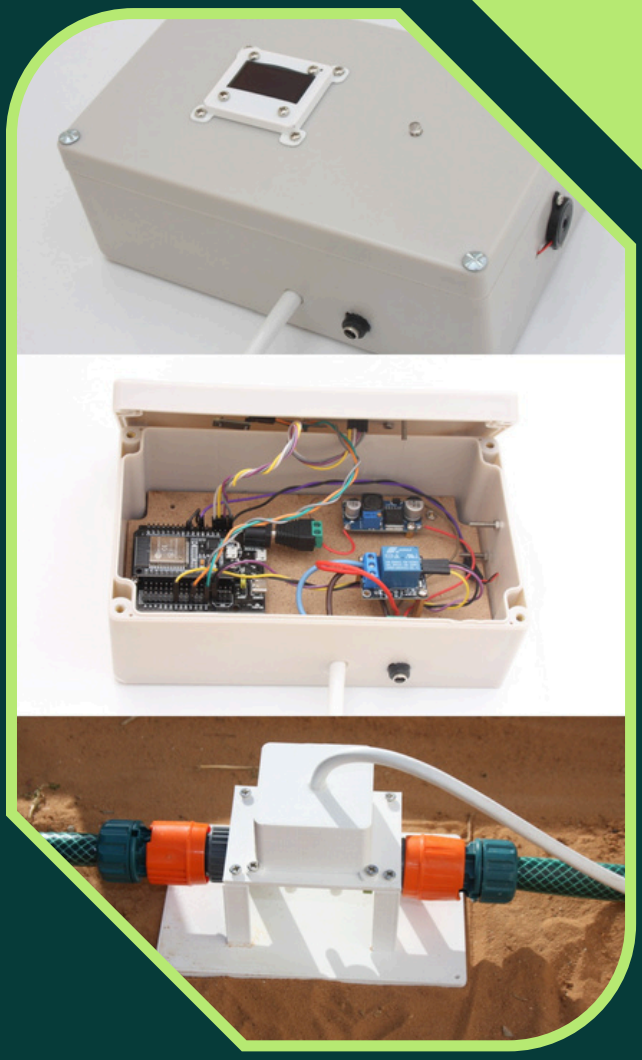

APRIL 2024 - JUNE 2024

Smart Watering System

Internet of Things Poject

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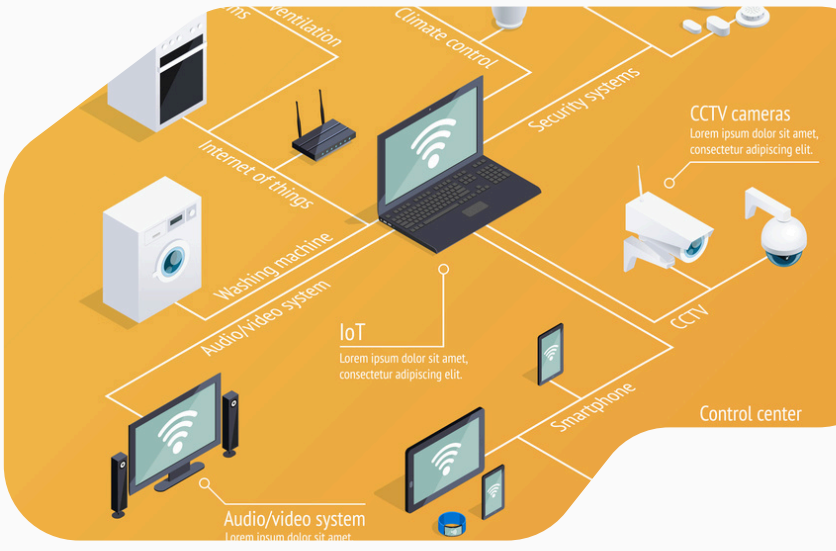
What is IoT?

The Internet of Things (IoT) refers to the network of physical objects—"things"—embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet.

These objects can range from ordinary household items to sophisticated industrial tools.

IoT enables remote monitoring and control of these connected devices from anywhere the internet is available, leading to improved efficiency, accuracy, and economic benefit by reducing human intervention.



Introduction

This project implements an IoT application for a smart watering system using the ESP32 board and Arduino IoT Cloud. It enables the remote control of a water valve. Also, it offers real-time monitoring of temperature and humidity values, which are displayed on an OLED screen, and integrates with the Arduino IoT Cloud for real-time data visualization.

This report provides a structured explanation of the Smart Watering System project. In addition, it represents how IoT principles enable efficient interconnectivity of devices.

Objectives

The main objectives of this project are:

- To develop a smart watering system using the ESP32 microcontroller and Arduino IoT Cloud.
- To enable remote monitoring and control of the watering system from anywhere in the world where the internet is available.
- To integrate time and weather APIs for real-time monitoring of temperature and humidity.
- To implement automatic shutdown features to prevent accidental overuse.

Methodology

Hardware Components

The system utilizes the following hardware components:

- ESP32 microcontroller board for system control and connectivity.
- Voltage regulator to power the ESP32 board safely.
- 12V electrical valve controlled via a relay.
- 1.3-inch OLED screen for displaying system status and environmental data.
- RGB LED and passive buzzer for visual and auditory feedback.

Methodology

Software Components

- Arduino IDE and libraries for programming the ESP32 indclude:
  - U8g2
  - HTTPClient
  - ArduinoIoTCloud
  - Arduino_ConnectionHandler
  - ArduinoJson
- Arduino IoT Cloud for remote data visualization and control.
- External APIs (Open Meteo and timeapi.io) for obtaining weather and time information.

Methodology

Implementation Steps

1. Hardware Setup:

- Connecting the ESP32 to the voltage regulator, relay, the OLED screen, the passive buzzer and the RGB LED.

2. Software Development:

- Developing software to control the valve, which connects to the internet via WiFi, in order to fetch data through APIs and communicate with the Arduino IoT Cloud.

- Implement features such as automatic shutdown after one hour of operation and status indicators using a buzzer, an RGB LED, and an OLED screen.

Results

System Functionality

- The system successfully enables remote monitoring and control of the watering system via the Arduino IoT Cloud.
- Real-time temperature and humidity data are displayed on the OLED screen and synchronized with the Arduino IoT Cloud dashboard.
- The RGB LED and passive buzzer provide intuitive system status indications and alerts for users.

Results

Performance Evaluation

- The system operates reliably under normal conditions, maintaining accurate data that is fetched through APIs, and offering a seamless, responsive remote control.
- The system status, time, date, and real-time temperature and humidity data are displayed on the OLED screen.
- Automated shutdown features effectively prevent overuse of the watering system, enhancing operational safety and efficiency.

Conclusion

In conclusion, this project successfully demonstrates the implementation of an IoT application using the ESP32 board and Arduino IoT Cloud for a smart watering system.

It highlights the remote control capabilities of the water valve, real-time monitoring of temperature and humidity via an OLED screen, and seamless integration with Arduino IoT Cloud for data visualization.

Through the application of IoT principles, the project enhances water resource management by eliminating the need for physical presence to open and close the valve, thereby overcoming challenges related to distance and time.

This showcases the potential of IoT in improving agricultural practices and resource efficiency.

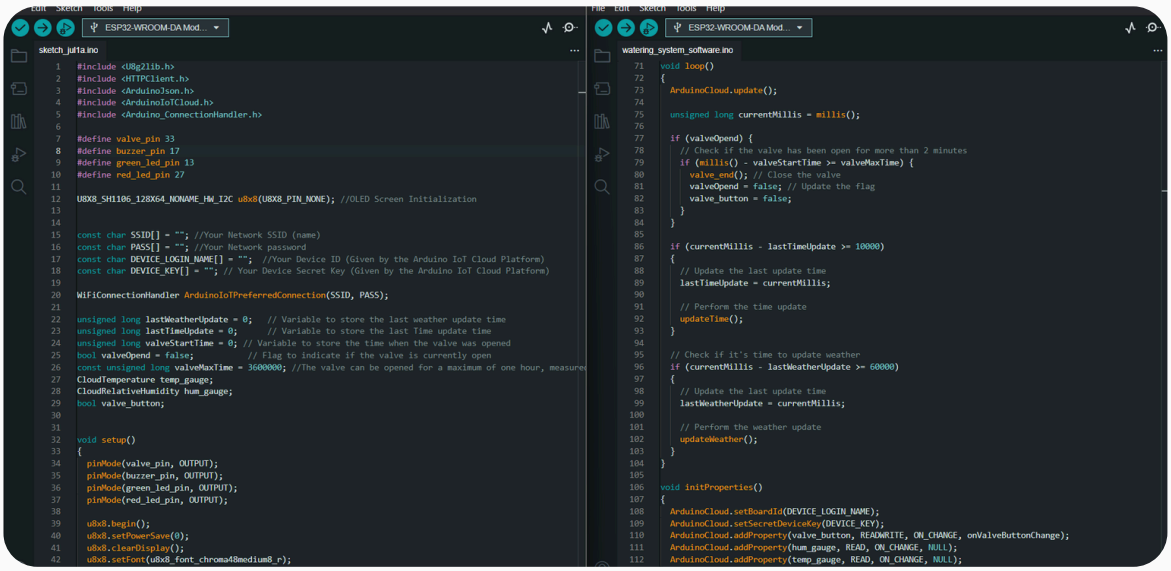
Code Source

Github Link

https://github.com/Mohamed-Adam-Jemal/Smart-Watering-System/blob/main/Software/watering_system_software/watering_system_software.ino

Drive Link

https://drive.google.com/file/d/1T4hvSLwMfM5LH_atdQyDVIXmYS1sz4vS/view?usp=drive_link



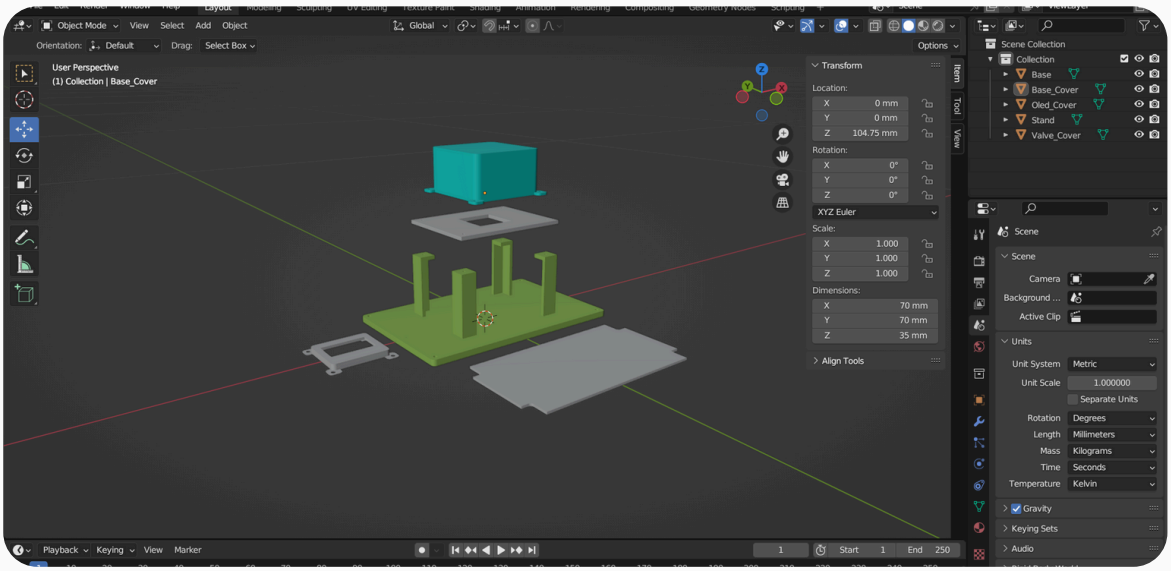
3D Models

Github Link

https://github.com/Mohamed-Adam-Jemal/Smart-Watering-System/tree/main/3D%20Models

Drive Link

https://drive.google.com/drive/u/0/folders/1jcyWkrPCs5DikDCS6Qa_xS-h-9EvUMFR



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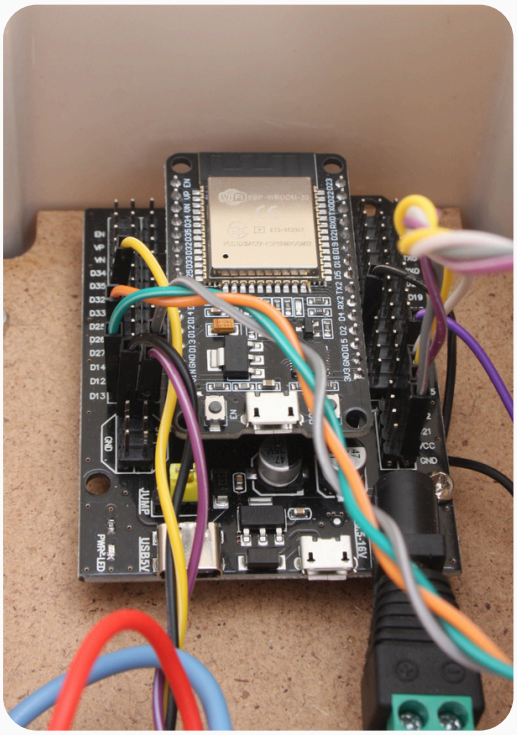

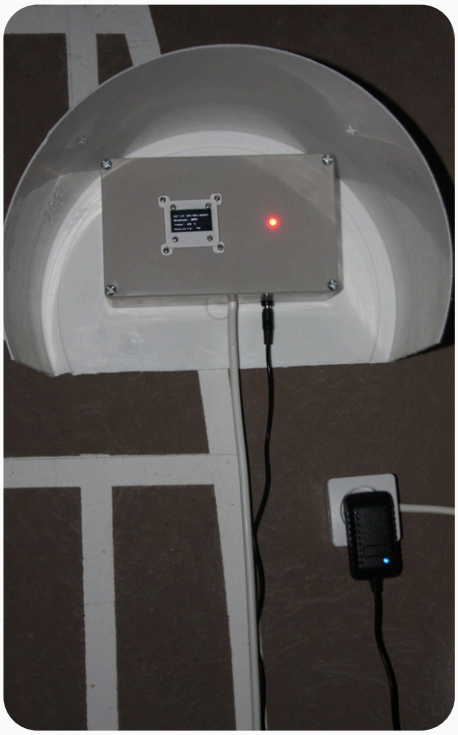

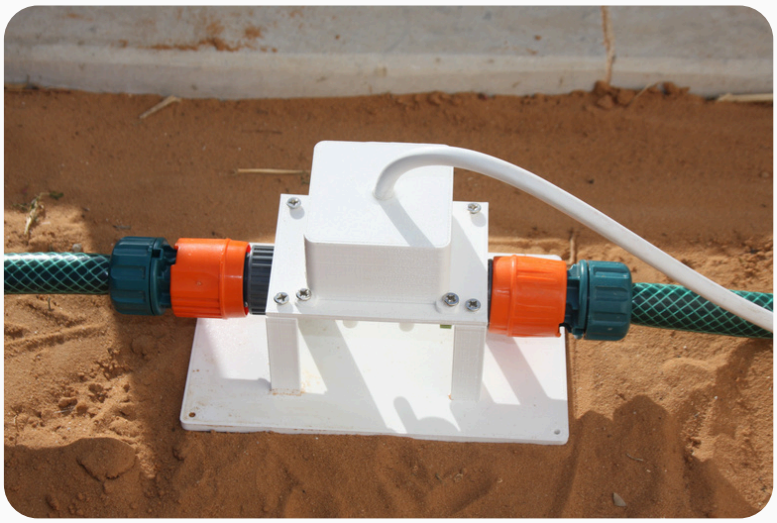

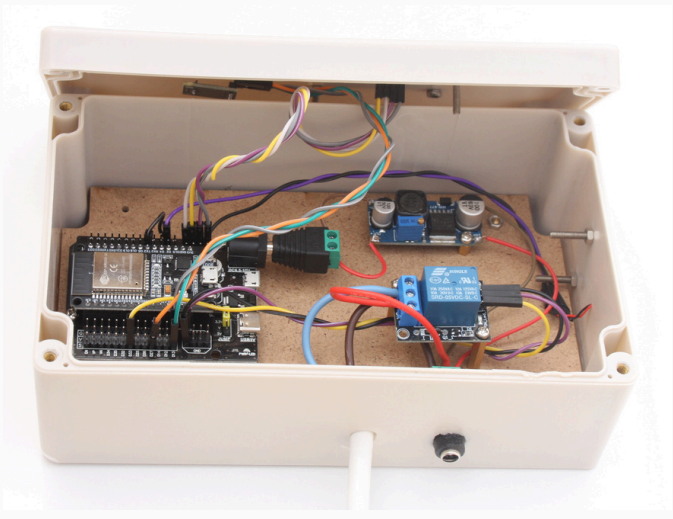

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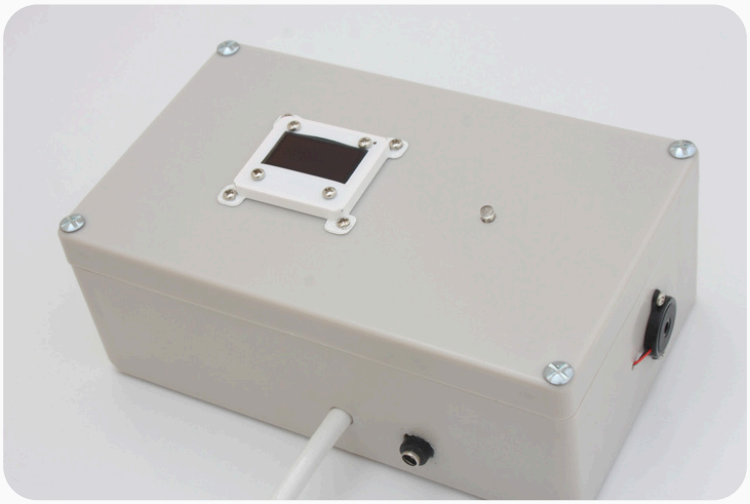

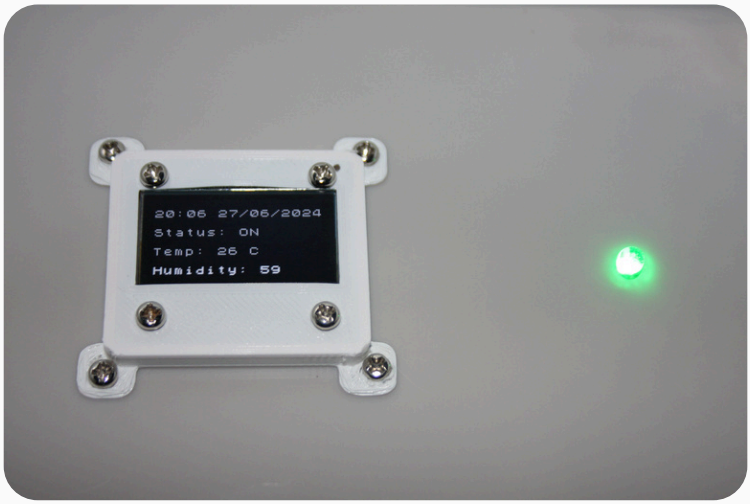

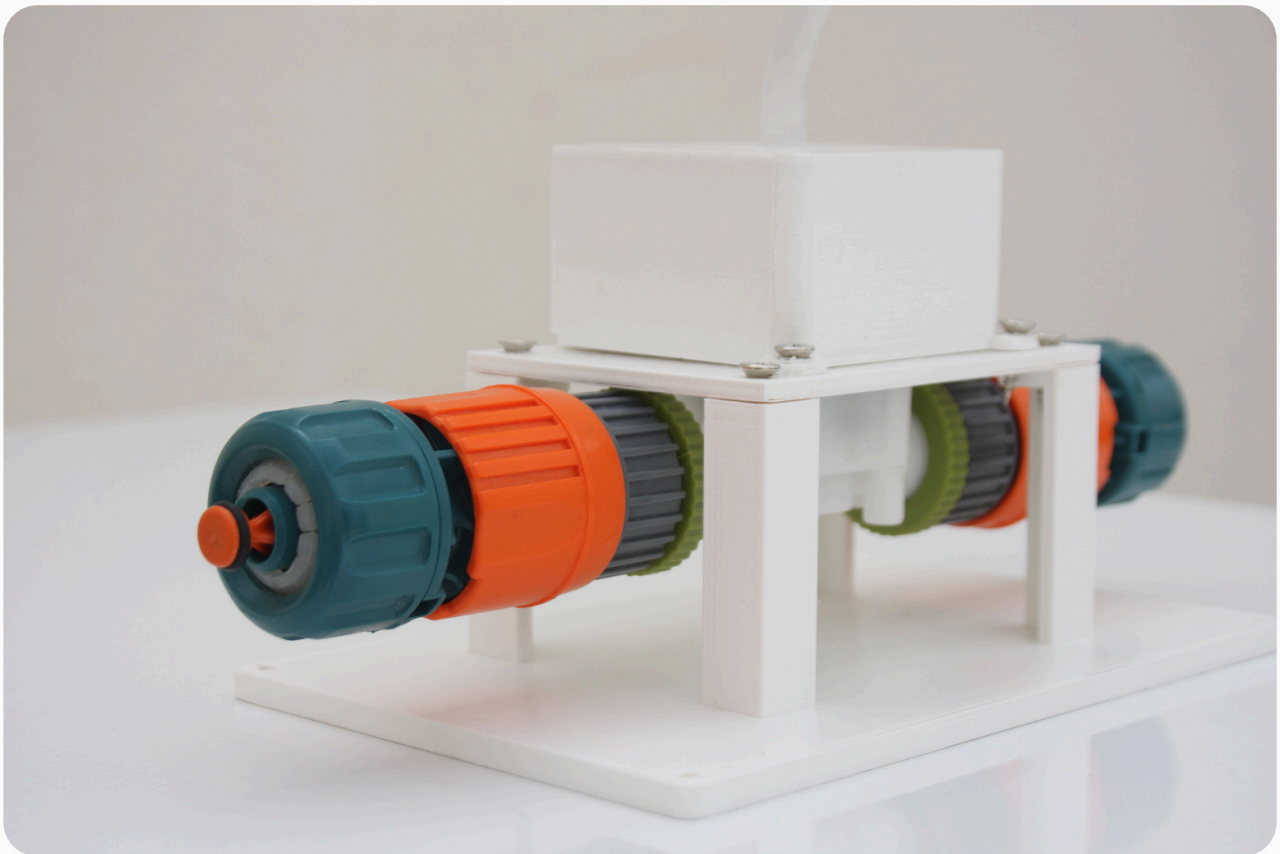

Video

HTTPS://DRIVE.GOOGLE.COM/FILE/D/15KWSG3-FLIUXG0EGQTEK3NPXRO4TNPB5/VIEW?USP=DRIVE_LINK

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