IJITCE

ISSN 2347- 3657

International Journal of
Information Technology & Computer Engineering

Email : ijitce.editor@gmail.com or editor@ijitce.com

International Journal of Information Technology & Computer Engineering
ISSN 2347-3657
Volume 12,Issue 2,May 2024

REAL TIME SMART ENERGY METER FOR SMART AGRICULTURE APPLICATION SYSTEM

Project Guide
Mr.B. Nagarjuna
Assistant Professor
L. JITHENDRA NAGI REDDY
J. KONDA REDDY
U. VENKAT RAO
S. VENKATESH

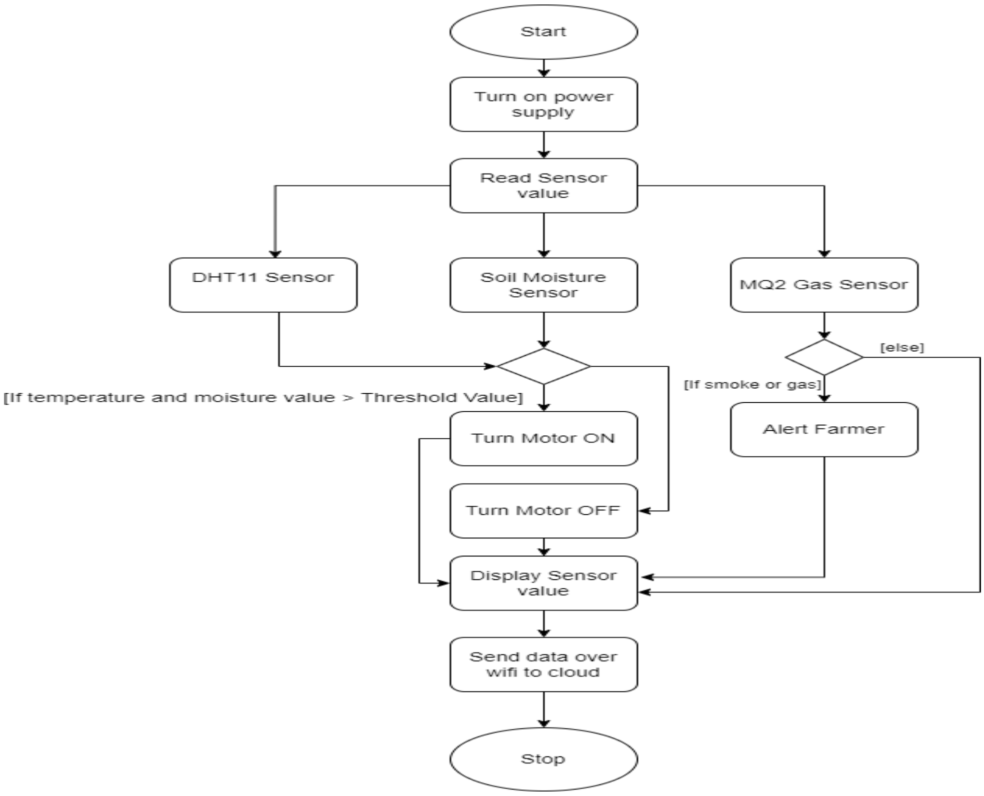
ABSTRACT

The agricultural industry expanded thanks to better planter practices and higher yield. The use of IoT technology in agriculture has the most potential to increase production. The global population continues to grow annually. Since there is a huge population that needs food, the agricultural industry has to use innovative technology like the Internet of Things to increase profits. Two advantages of smart farming that use IoT technology are the reduction of water waste and the improvement of field monitoring. This study presents a smart agricultural monitoring system that is based on the Internet of Things. Using a mobile app, farmers may control and monitor the irrigation system in this proposed setup from anywhere. The user may keep tabs on the system using the mobile app, which receives these statistics from the cloud and shows them to them. Cloud computing receives sensor readings from the IoT system. The microcontroller receives the moisture levels continuously from the sensors. The microcontroller activates the sprinkler system as soon as the detected values above the threshold value. When they fall below the predetermined level, the irrigation system is turned off. When the gas or smoke detectors detect an alarm, the farmer is notified via their mobile app. This initiative enhances irrigation and monitoring by connecting farmers with networked sensors that measure temperature, humidity, and other variables.

INTRODUCTION

Agriculture is the backbone of India's economy and the country's primary sector of employment. Rural people in poor and developing countries have a lot of job options in agriculture, which also produces food. More than 58% of Indians make their living in some way related to farming. Extreme weather events will have a devastating effect on farming because of increased demand for water and reduced crop yields in areas with the highest irrigation needs. Despite the potential inefficiency of water consumption, methods such as groundwater irrigation, rain-fed agriculture, and irrigation systems allow for the cultivation of better crops. Silo storage fires are another major concern. Because silos have all the conditions for a fire to start, agricultural producers who own silos should take measures to lessen the likelihood of silo fires and be prepared to handle them when they do. For efficient water use and fire detection in silo storage, a smart system is developed. A "smart farm" makes use of a wide variety of technological tools, such as those connected to the internet, the cloud, and the internet of things (IoT). Without the farmer having to get their hands dirty, the equipment efficiently pumps water into fields. The farmer is kept informed if smoke or gases such as carbon monoxide or methane are detected by the gas sensors installed in the silo storage. This method may be useful for detecting fires in silos and making efficient use of water.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Guntur Engineering College
Jawaharlal Nehru Technological University, Kakinada.



METHODOLOGY

System Architecture

Using soil moisture and a MQ2 Gas sensor, this work creates a Smart Agriculture system that automates irrigation and detects fire in silo storage. This module will keep an eye on the soil moisture and gas sensor values as well as take the appropriate action. The values are uploaded to the cloud and are viewable on an Android app and website.

The proposed system workflow

The workflow of the smart agriculture system is explained in this section. The flow chart schematic for the suggested system is displayed.

Step 1: Start

Step 2: Turn on the power source.

Step 3: The soil moisture and temperature sensor values are read and analyzed.

Step 4: If the value is greater than the threshold value and the motor is OFF, then the motor is turned ON. **Step 5:** If the value is less than the threshold value and the motor is ON, then the motor is turned OFF. **Step 6:** The Gas sensor value is read and analyzed.

Step 7: If there is Smoke/Gas detected, then the farmer is alerted and the buzzer is turned ON.

Step 8: The sensor values are displayed on the LCD.

Step 9: The sensor values are sent to the cloud.

Step 10: Stop.

Figure 1: Flow chart of the proposed system.

ISSN 2347–3657
Volume 12,Issue 2,May 2024

I. MODELING AND ANALYSIS

Figure 2 depicts the block diagram of the system that we have proposed.

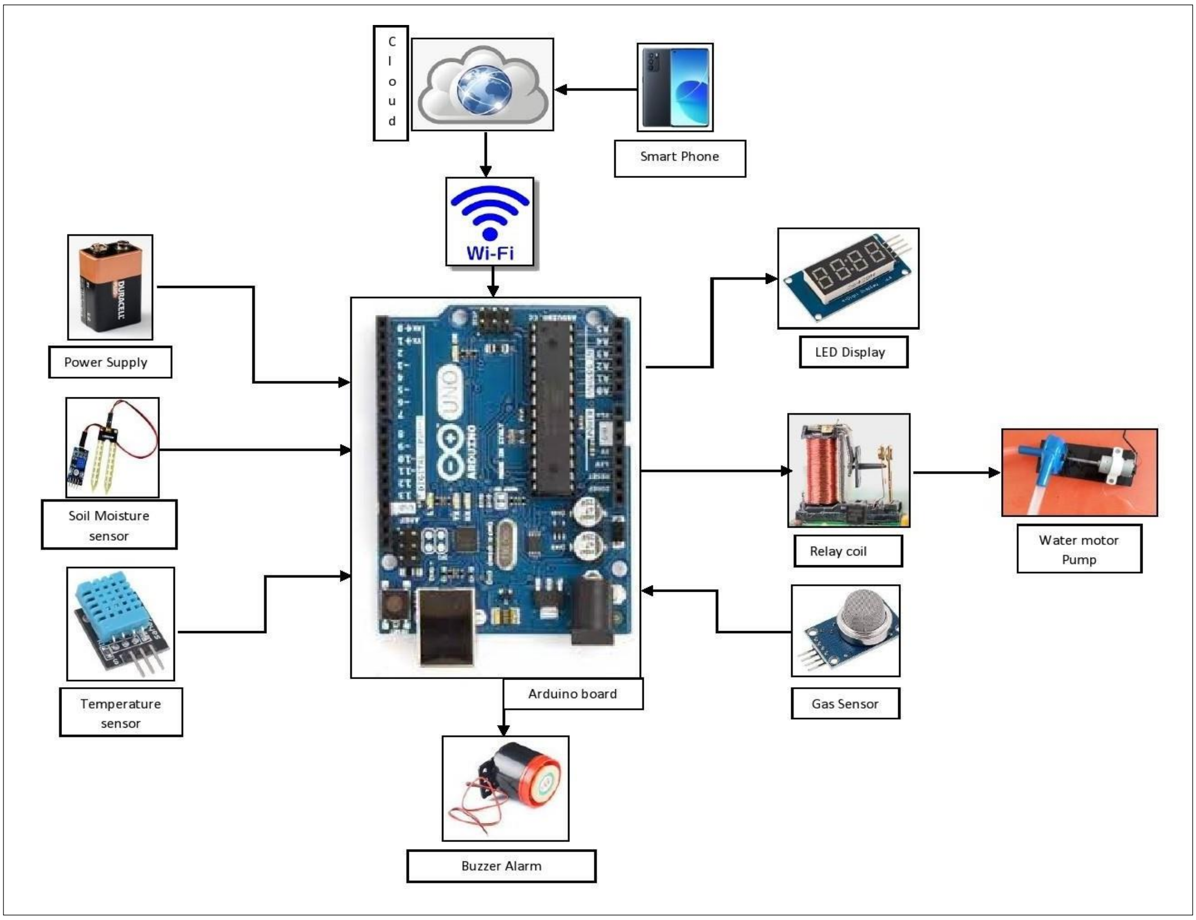


Figure 2: Block Diagram.

The module consists of the following components.

Arduino board: It is based on the Microchip ATmega328p microprocessor developed by Arduino.cc. A number of sets of digital and analogue input/output (I/O) pins are included on the board, allowing it to be interfaced with other circuits and expansion boards. The Arduino IDE is used for writing the code and it is injected into the board using a USB cable. It consists of 6 analog and 14 digital pins.

DHT11 Sensor: A straightforward, incredibly affordable digital temperature and humidity sensor is the DHT-11. It provides a digital signal on the data pin and measures the humidity of the air using a capacitive and thermistor humidity sensor.

MQ2 Gas Sensor: One of the MQ sensor series most widely used gas sensors is the MQ2. When gas comes into touch with the detecting material, the resistance of the material changes, allowing the sensor to detect the presence of gas. Concentrations of gas can be found using a straightforward voltage divider network. The 800mW MQ2 Gas Sensor consumes 5V DC power. It is capable of detecting carbon monoxide, methane, propane, smoke, hydrogen, alcohol and LPG.

Buzzer: Buzzers are devices that generate electricity-based sound. They fall under the categories of Piezo buzzer and magnetic buzzer, and are often driven by DC voltage. A piezo buzzer may be connected straight to an Arduino and functions as a miniature speaker. The reverse piezoelectric action is the basis for the piezo buzzer's sound production. The farmer can be warned with these buzzers.

Soil Moisture Sensor: The soil moisture level is measured by this sensor. These sensors measure the volumetric water content indirectly using the electrical resistance, neutron interaction, dielectric constant, and other soil laws as well as replacement of the moisture content.

ISSN 2347–3657
Volume 12,Issue 2,May 2024

Battery: 4.5v battery is used to power the water pump.

LCD: A 16 column 2 row Liquid crystal display is used. There is a 16-pin interface on the LCD display. The parallel interface of the liquid crystal display is present. This indicates that the microcontroller controls the LCD display by simultaneously operating several pins.

Relay Switch: Relays are electrical switches that can be programmed, and an Arduino or any other micro-controller can control them. It is used to automatically turn-on and off equipment that uses high voltage and/or current.

Water Pump: It is a water motor pump with a 3-to-6-volt operating range. It features a single water intake valve from which it draws water and a single water output valve from which it expels water. It is powered by a 4.5-volt battery.

NODEMCU – ESP8266: NodeMCU is a development board and open-source Lua-based firmware that is specifically designed for Internet of Things (IoT) applications. It has hardware based on the ESP-12 module and firmware that runs on Espressif Systems' ESP8266 Wi-Fi SoC. It is used to establish connections with the HiveMQ cloud.

HiveMQ Cloud: HiveMQ is a MQTT broker and messaging platform for transferring data quickly, effectively, and reliably to and from linked enterprise systems and IoT devices.

RESULTS AND DISCUSSION

The main aim of this work is to use water efficiently and to help farmers to detect fire in Silo storage. The water pump is automatically turned ON/OFF by the Arduino board through a relay switch, based on the soil moisture sensor value. The MQ2 gas sensor continuously senses the environment and if there is a smoke/ gas detected then it informs the farmer via android application. The android application and hardware module are linked through HiveMQ cloud.

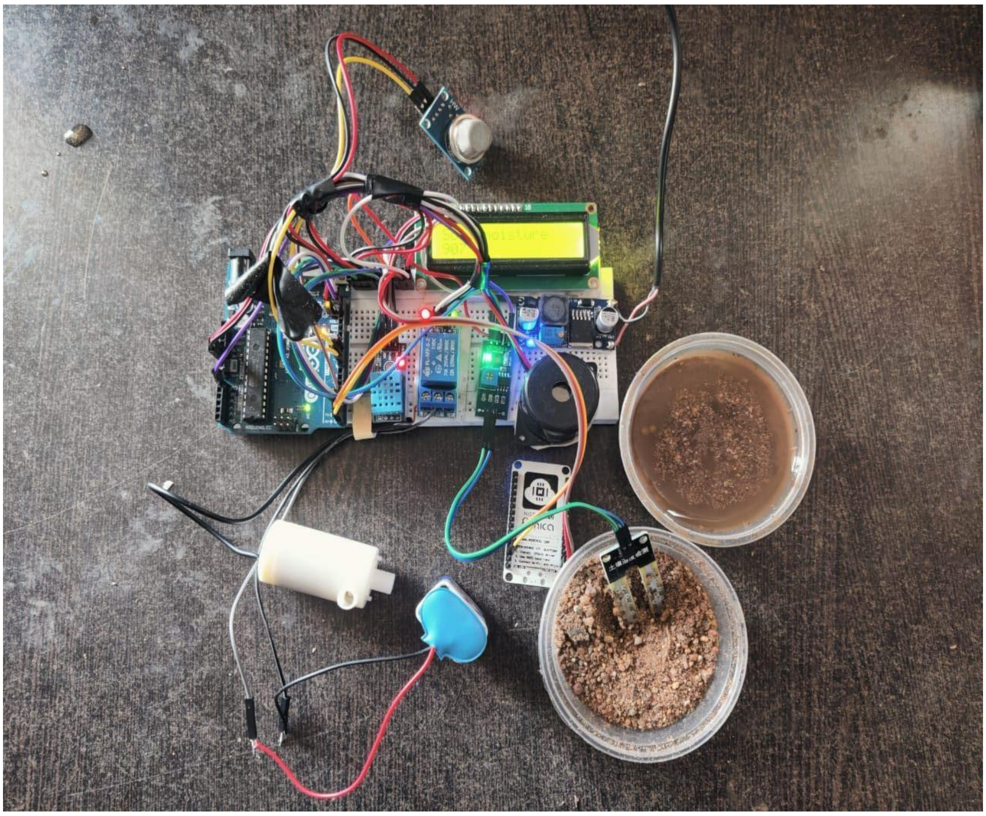


Figure 3: Hardware module.

The communication model used is the publish-subscribe model. The NodeMCU publishes the sensor values to the HiveMQ cloud on the named topic “sensors” and the results can be seen on the HiveMQ browser client shown below.

ISSN 2347–3657
Volume 12,Issue 2,May 2024

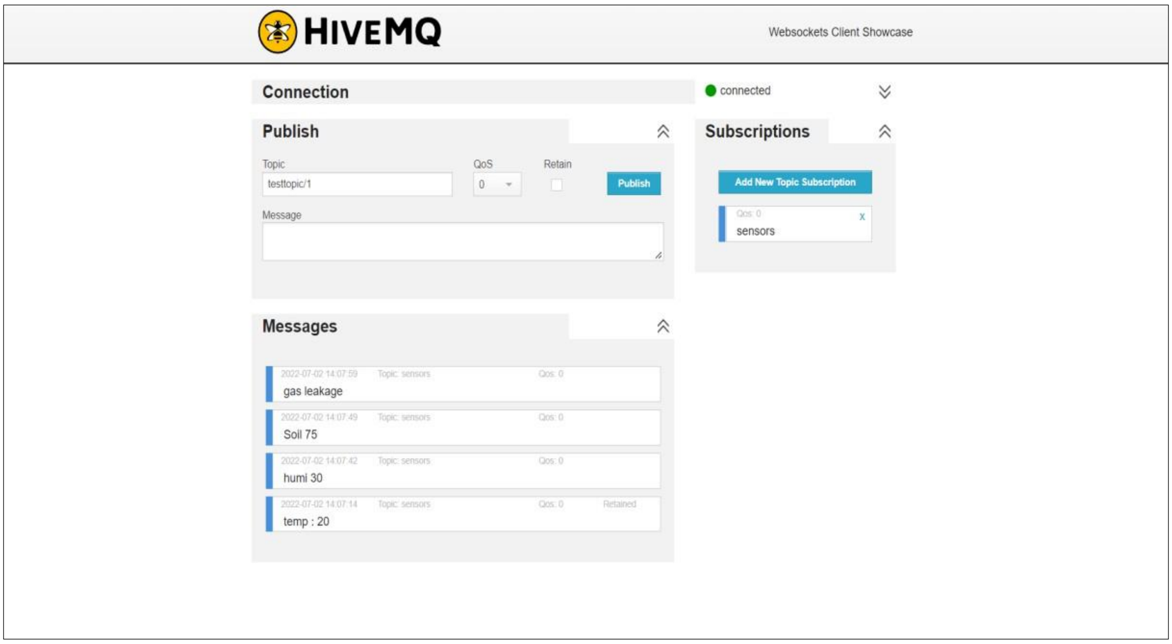


Figure 4: HiveMQ Browser client.

The android application receives the sensor values by subscribing to named topic 'sensors' and alerts the farmer when smoke/gas is detected. The android application is shown below.

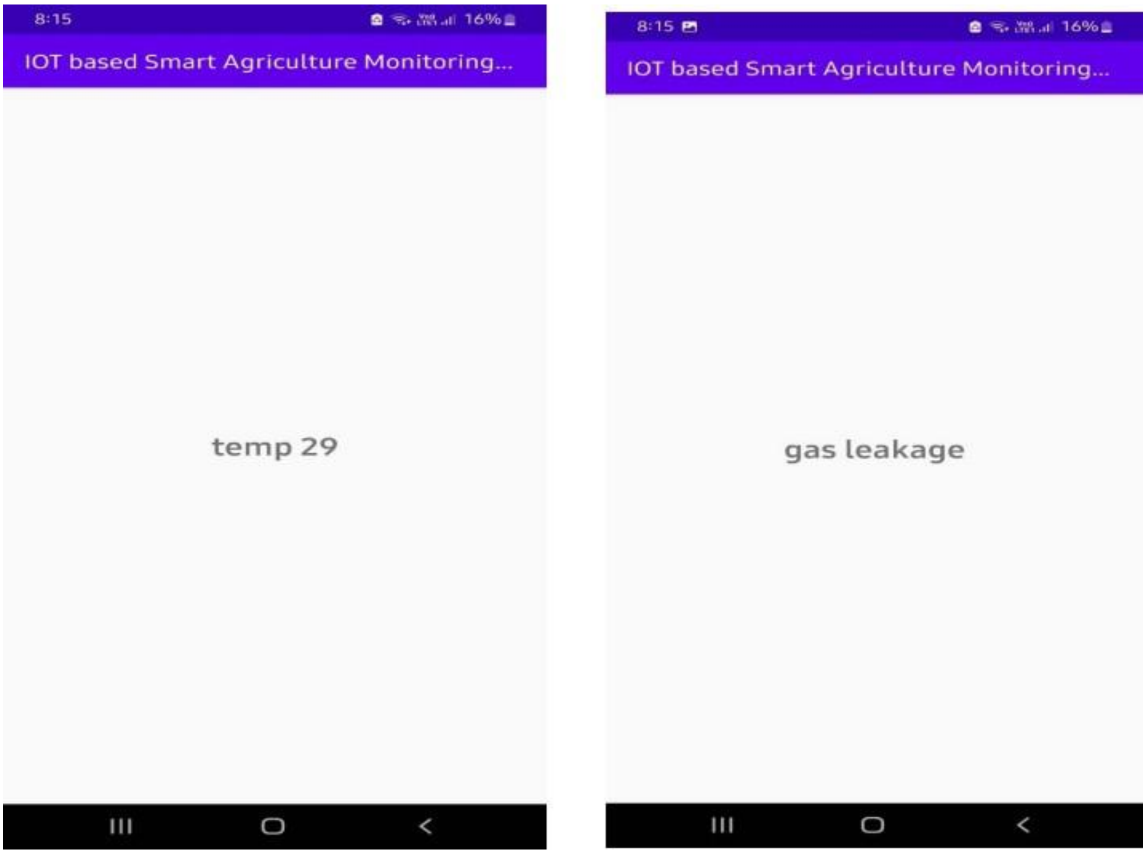


Figure 5: Android Application.

Advantages

1. Reduced Operating Costs.
2. Remote monitoring.
3. Silo storage fire detection.Efficient use of water.

Disadvantages

1. A power source is always necessary because when the power supply is switched OFF, the entire system also goes dark.
2. Access to WIFI is required to connect to the cloud.

CONCLUSION

Using state-of-the-art methods and resources, the suggested approach would fix the most pressing issues that farmers are experiencing. In addition to helping with efficient water use and fire detection in storage silos, this study's strength is that it allows remote field monitoring. Now that the Farmers have this proposed paradigm, their difficulties will no longer exist.

REFERENCES

[1] "IOT Based Agriculture Monitoring and Controlling System," presented at the 2021 6th International Conference on Communication and Electronics Systems (ICCES), pages 609-615, with the DOI: 10.1109/ICCES51350.2021.9489198, written by A. Lakshmi, Y. R. Kumar, N. S. Krishna, and G. Manisha and published in 2021. [2] "A Review on Smart Agriculture using IoT," in B. D. Thakare and D. V. Rojatkar (eds.), 2021's 6th International Conference on Communication and Electronics Systems (ICCES), pp. 500-502, doi: 10.1109/ICCES51350.2021.9489109. "Smart Farming System using IoT for Efficient Crop Growth," presented at the 2020 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), was written by M. S. D. Abhiram, J. Kuppili, and N. A. Manga. The paper can be found on pages 1-4 and has the DOI: 10.1109/SCEECS48394.2020.147.
[4] "Survey on IoT and its Applications in Agriculture," conducted by P. Kanupuru and N. V. Uma Reddy in 2018, was published in the 2018 International Conference on Networking, Embedded and Wireless Systems (ICNEWS). The paper can be found on pages 1-5 and has the DOI: 10.1109/ICNEWS.2018.8903969. [5] R. Dagar, S. Som and S. K. Khatri, "Smart Farming – IoT in Agriculture," 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), 2018, pp. 1052-1056, doi: 10.1109/ICIRCA.2018.8597264. [6] M. Ayaz, M. Ammad-Uddin, Z. Sharif, A. Mansour and E. -H. M. Aggoune, "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk," in IEEE Access, vol. 7, pp. 129551-129583, 2019, doi: 10.1109/ACCESS.2019.2932609.