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IOT USE IN A FARMING AREA TO MANAGE WATER CONVEYANCE

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SUMMARY

Agriculture is the most advanced civilian profession. However, farmers in India continue to use traditional agricultural supervision approaches, resulting in water failure problems. Currently, Automatic irrigation systems using humidity detectors, rain sensors, and temperature sensors are used for effectively managing water in an agricultural field where the perpetration of sensors that descry the humidity in the soil of a chosen agrarian field has been carried out. This system uses a wireless sensor network, in which sensors in the selected field are not activated until the field has enough water for the crops. Once the field gets dry, detectors smell the water demand in the field and shoot a signal to the Arduino which supplies water to that field which has water demand till the sensors are killed, considering the rainfall data using the installed rain sensor. In case, when there is more than one signal for water demand also the Arduino will prioritize the first entered signal and wash the fields consequently. This work has been enforced in a pastoral area with an agrarian field of 10 hectares and validated.

Key words: *arduino, wireless communication, water conservation, automated irrigation*.

INTRODUCTION

Water sources are an essential demand for mortal survival. Presently, about 85 of the global water force is used in agrarian conditioning. With the rapid growth of the population and globalization, the water demand is also increasing at a substantial rate. Thus, changing ways to reduce water operation in husbandry while still icing the product of fresh and nutritional food is a delicate task. This highlights the critical need to develop dependable strategies grounded in scientific and technological advancements, to ensure the sustainable use of water coffers. This entails considering progress in agronomics, operation, technology, and institutions [6]. Internet of Things (IoT) can break these challenges efficiently and effectively by exercising sources with lower trouble [17]. It is a technology that allows a mobile device to cover the functionality of another device. This technology focuses on connecting and communicating objects installed at colorful locales, indeed if they're far piecemeal. Also, a network technology that collects data from different detectors enables any object to connect to the Internet and exchange information [14]. To explore the current advancements in automating irrigation and achieving the necessary nutritive quality of crops, a check of being literature was conducted [20]. There are primarily two types of irrigation systems sprinkler systems and drip irrigation systems [11]. The primary thing of irrigation is to supply shops with enough water to avoid stress and maintain high yields. The quantum and frequency of watering are told by factors similar to the original climate, crop type, growth stage, and soil humidity characteristics [3]. There are colorful ways to determine the need for irrigation without knowing evapotranspiration rates. One approach is to cover crop pointers such as changes in color or splint angle, but this information may come too late to help a drop in yield or quality. Other scheduling styles also involve determining irrigation requirements [7]. A new interpretation of an irrigation system has been created by exercising advancements in communication technology. This system utilizes wireless detector networks to cover the humidity situations and temperature of the soil and terrain. The data collected by the detectors is also transferred to a central computing garçon, where it's anatomized to determine if irrigation is necessarily grounded on the detector readings. Automate irrigation, while Arduino serves as the primary regulator for all of the detectors [19]. The system also includes an Arduino that works in confluence with the wireless detector network Arduino to regulate the motor pumps that are an element of the system. When the soil requires water, the directs the motor pumps to supply water to the field [22]. growers need not be present at their cropland all the time, 24/7/365, to make sure they can operate drag wells effectively [23]. Water flows via the sidelines when a zone is initiated, eventually arriving at the irrigation electrode (drip) or mechanical device heads. Some drips have pipe thread covers at the bottom which allows for a befitting pipe to be attached to them [2]. The use of a variable ascites system helps minimize dependence on rain and other irrigation systems that operate manually using ON/ OFF scheduling control [16]. In real-time, the use of automated water inflow check gates at the field position could potentially alleviate the issue of unstable water delivery [12]. We separate places with advanced irrigation needs from those with lower water requirements [5]. It's suggested to integrate automatic watering depending on soil humidity and other factors like moisture, rain, and ground exposure to minimize water operation [13]. Modifying irrigation according to the soil and rainfall, the system enables growers to meet their requirements while enforcing a recently espoused strategy that conserves water for the irrigation process [21]. Our proposed fashion uses detectors to give accurate irrigation cautions to growers to implicit intrusions in their fields and give a TV Board to display the temperature and moisture value [8]. Gardeners to maximize the yields use resources such as water, seeds, etc in limited quantities, as a part of effective husbandry [9, 10]. Future data can be predicted using effective model creation [4, 15]. Thus, leading to a creative on-the-ground monitoring system for the expansion of agriculture. Soil humidity detectors, Temperature detectors, and Rain detectors play an important role in the growth of factory [1].

METHODOLOGY

A detailed search was carried out before formulating a sequential order for obtaining a precise knowledge of the project's needs. The gathered data was verified in detail to find out any significant features that occurred throughout the process development. To have an effective survey, a questionnaire was carefully prepared considering the various possible aspects of agricultural water usage. Once the survey is completed, data will be analyzed to discover any issues that may be ignored during the literature study. Issues such as water shortage and a lack of skilled personnel were the major concerning factors preventing effective management from getting fruitful results. Therefore, automation with the help of sensors such as soil moisture, temperature, and rain sensors, chosen based on their precise nature, and ability to collect effective real-time data on weather and soil characteristics, was installed and monitored further in the selected agricultural field. Initially, a detailed survey comprising of land size and usage pattern was carried out, and then the positioning of sensors was finalized based on a trial-and-error method considering all the parameters such as soil type, slope, and vegetation cover. Sensors were programmed with a unique set of codes for effective and efficient management of the prototype developed. Further, the report was generated and analyzed in detail to identify the areas needed for further improvement or modification. Thus, this comprehensive approach ensured the successful implementation of the project, which addressed the significant issues related to water scarcity and inadequate manpower in the agricultural fields.

Figure 1 shows the Flow chart of the method proposed in the project work.

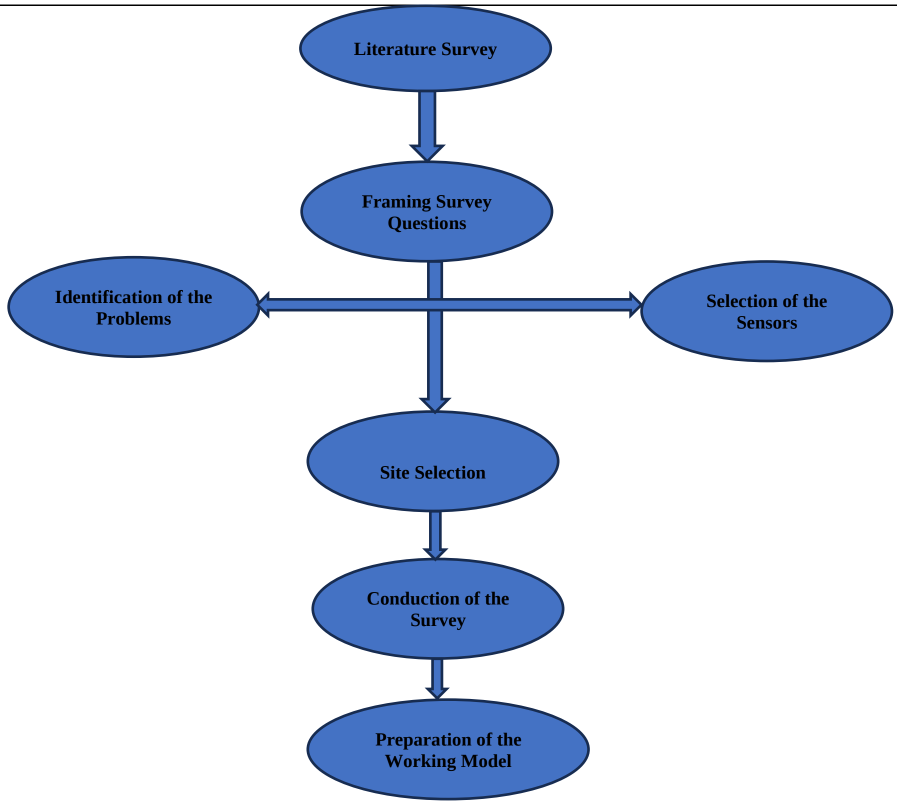


Figure 1. Flow Chart of the Method Proposed in the Project Work

Problem Identification

A comprehensive survey was conducted in the agriculture sector within the Salem region, encompassing various farms. During the survey, farmers highlighted a prevalent concern related to efficiently conveying water from its source to their fields. In response to this issue, the proposal is to implement an advanced automated irrigation system that incorporates suitable sensors. This innovative solution aims to streamline water distribution processes, enhance agricultural productivity, and alleviate the burden on farmers of managing irrigation effectively.

Sensors and Electronic Devices

A detector is a device that detects environmental changes and transmits the quantified data to another connected device, generally the main control (Arduino) system [18]. An analog detector produces a nonstop affair electrical signal or voltage symmetrically with the input volume measured (e.g. moisture, pressure, or speed). A digital detector produces separate affair electrical signals, which are digital depictions of the measured volume. A digital detector produces a double (0, 1) or logical (ON, OFF) affair signal. The circuit illustration shows the main factors of the Robotbanao soil humidity detector, ROBO dHT11 – moisture and temperature detector, snowdrops humidity rain rain rainfall discovery module.

Soil Moisture Sensor

When determining the moisture content of mint soil, the Robotbanao soil moisture sensor with a working range of 0 to 1023 ADC is used. It consists of two conducting probes that, in proportion to the two conducting plates' disparity in resistance, can measure the amount of moisture in the soil. Measuring soil moisture is essential for agricultural applications so that farmers may better control their irrigation systems. Accurate knowledge of the soil moisture content in a field helps agricultural producers better control the soil moisture at critical times for plant growth, resulting in increased yield and quality and reduced water usage overall shows in figure 2.

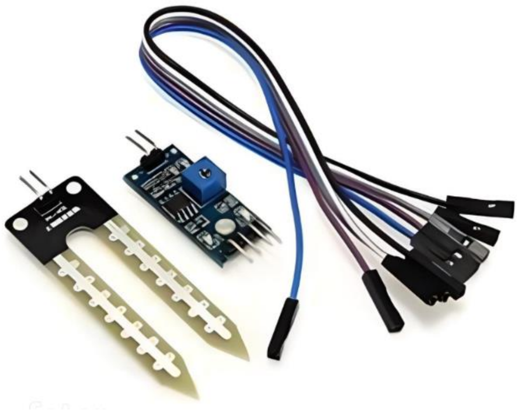


Figure 2. Soil Moisture Sensor

Temperature Sensor

A digital temperature detector with a working range of -55 to 125 °C and a delicacy of -5, the ROBO DHT11 moisture and temperature detector is used to determine the temperature of mint soil. Figure 3 illustrates it integrated with a 4.7 KΩ resistor. The reading from the temperature detector is 31.44 °C.

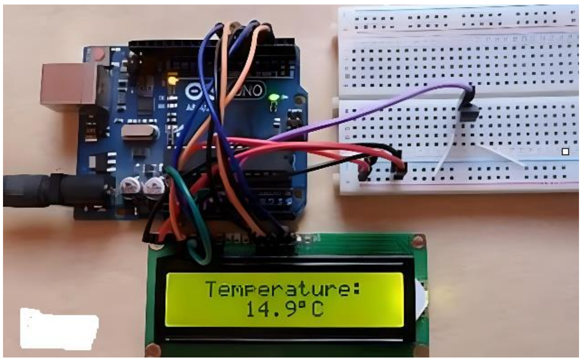


Figure 3. Temperature Sensor

Rain Sensor

The Rain Weather Detect Sensor Module serves as a water preservation device, and it's attached to the irrigation system to shut it down in the event of downfall. The rain detector module has nickel-carpeted lines and a workshop on the resistance principle in figure 4. This detector module measures humidity using analog affair legs and provides a digital affair when the humidity threshold is exceeded. Give a measurable quantum of downfall for irrigation decision- timber. Stops you from overwatering your shops and fields.

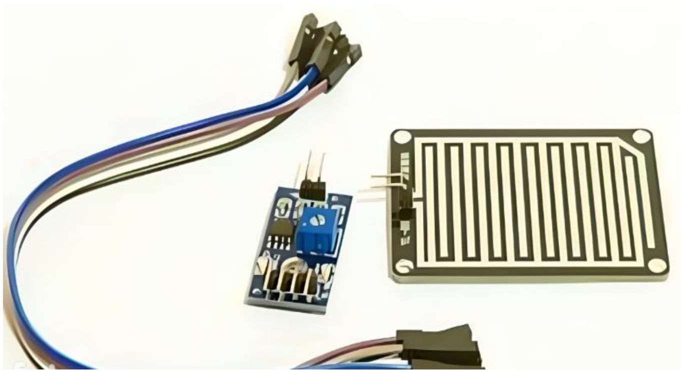


Figure 4. Rain Sensor

Water Pump Motor

The Sea YF-S201 water inflow detector, which is displayed here, has a working range of 1 to 30 L/min and a water pressure of less than 1.95. It is connected to the submersible water pump's pipe, as seen in Figure 5. The water inflow detector uses an integrated glamorous hall effect detector that is kept off from the water to produce an electric palpitation with each turn, keeping the detector dry and safe. The water pump is a rotary electrical motor that uses direct current (DC) to transform electrical energy into mechanical energy.

Figure 5. Water Pump

Arduino

In figure 6 and 7 shows the Arduino board is an open-source platform for building electrical devices. Arduino is a programmable circuit board that allows to creation of software based on the requirements. The Arduino program will be uploaded using IDE (Integrated Development Environment) software, which runs on a computer and allows to creation and upload of computer code to the Arduino physical board. The Arduino language is essentially a set of C/C functions that may be utilized at later stages.

Figure 6. Arduino Board

Model Layout

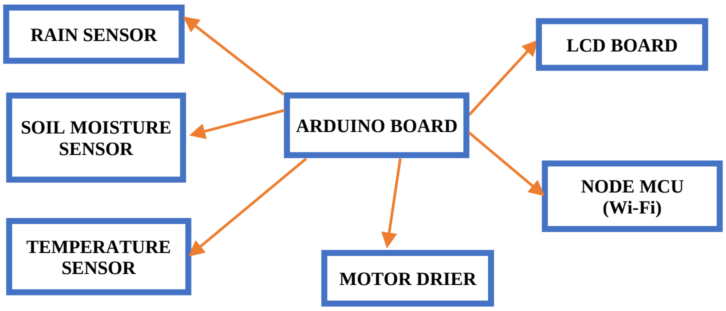


Figure 7. Model Layout

APP IDENTIFICATION

MQIT Dash

With the use of MQTT (MQ Telemetry Transport), a featherlight open communication protocol, network guests with limited coffers can fluently distribute telemetry bandwidth surrounds. The protocol uses a publish/ subscribe communication medium to grease machine-to-machine (M2M) communication. MQTT was designed to function in a layered environment, providing a dependable, effective mode of communication. It was designed as a minimal outflow protocol to handle bandwidth and CPU constraints. MQTT is an appropriate alternative for wireless networks that experience intermittent quiescence due to irregular bandwidth restrictions or unreliable connections. With a modest legal footmark, MQTT is a viable solution for wireless networks that see various instances of quiescence due to intermittent bandwidth restrictions or poor connections. In figure 8 shows the MQTT dash app in the play store.

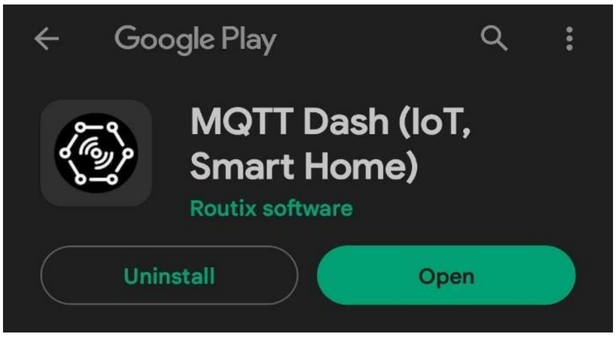


Figure 8. MQTT Dash App in the Play Store

Internet of Things (IoT)

The Internet of Goods(IoG), also referred to as the Internet of Effects, is a network of linked computers, digital and mechanical bias, information beasties, and humans that may exchange data via a network without engaging in computer-to-computer or mortal-to-mortal commerce. Each of these impulses is issued a unique identifying number, or UID. An IoG ecosystem is made up of web-enabled smart biases that employ integrated systems, which are similar to CPUs, detectors, and communication biases, to gather, communicate, and act on data from the environment.

Program Structure

The following code is used in the audio.

```
#include<LiquidCrystal_I2C.h>#include <OneWire.h> #include
<DallasTemperature.h>#define ONE_WIRE_BUS 8
OneWire oneWire (ONE_WIRE_BUS);DallasTemperature sensors(&oneWire);LiquidCrystal_I2C
lcd(0x3F,16,2); const int ldr = A0;
const int soil = 3; const int fan = 4; const int light = 5; const int motor1 = 9; const int motor2 =
10;void setup()
{
lcd.init(); lcd.backlight(); sensors.begin(); Serial.begin(9600); pinMode(soil,INPUT);
pinMode(fan,OUTPUT);
pinMode(light,OUTPUT); pinMode(motor1,OUTPUT);pinMode(motor2,OUTPUT);
digitalWrite(motor1,LOW); digitalWrite(motor2,LOW);
digitalWrite(fan,HIGH);
digitalWrite(light,HIGH);lcd.clear();
lcd.print("        WELCOME        ");lcd.setCursor(0,1);lcd.print("
                ");delay(1000);
}
```

```
int i = 0; void loop()
{
sensors.requestTemperatures();
int t = sensors.getTempCByIndex(0);
int read_ldr = analogRead(ldr); read_ldr = map(read_ldr,0,1023,0,255);lcd.clear();
lcd.print("TEMP: ");lcd.print(t); lcd.print((char)223);//shows degrees characterlcd.print("C");
lcd.print(" L:"); lcd.print(read_ldr);lcd.setCursor(0,1);lcd.print(" S:");
if( digitalRead(soil) == LOW) lcd.print("NORMAL");if( digitalRead(soil) == HIGH)
lcd.print("LOW"); delay(100);if( read_ldr < 100) digitalWrite(light,LOW);
        if( read_ldr > 100) digitalWrite(light,HIGH);if( t >= 40) digitalWrite(fan,LOW);
if( t <= 39) digitalWrite(fan,HIGH);if( digitalRead(soil) == LOW)
{
digitalWrite(motor1,LOW); digitalWrite(motor2,LOW);
}
if( digitalRead(soil) == HIGH)
{
digitalWrite(motor1,HIGH); digitalWrite(motor2,LOW);
}
i++;
if ( i >= 5)
{
Serial.print(t); Serial.print(","); Serial.print(read_ldr); Serial.print(",");
if( digitalRead(soil) == LOW) Serial.print("NORMAL");if( digitalRead(soil) == HIGH)
Serial.print("LOW"); Serial.println(",");
i = 0;
}
```

Figure 9 respectively shows the coding for the sensors was written using this website (ardunotive.com) and figure 10 shows which are the models used in this project.

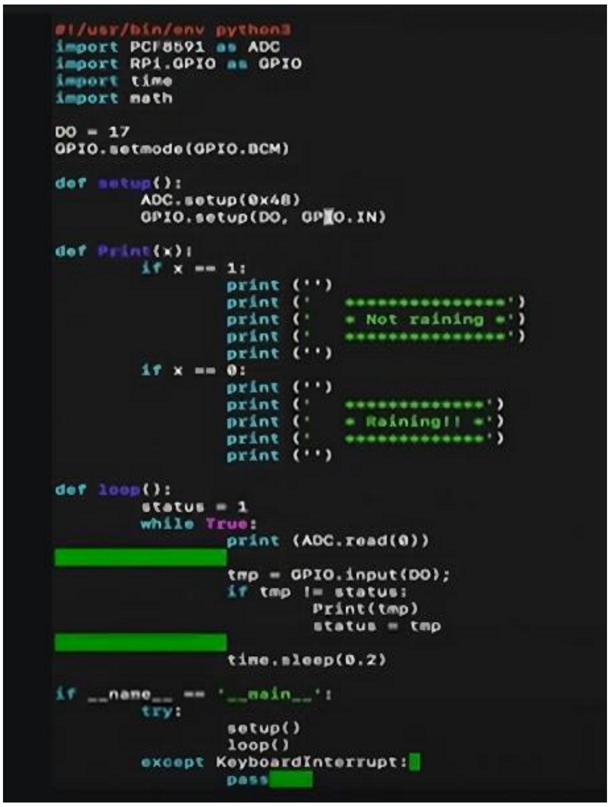
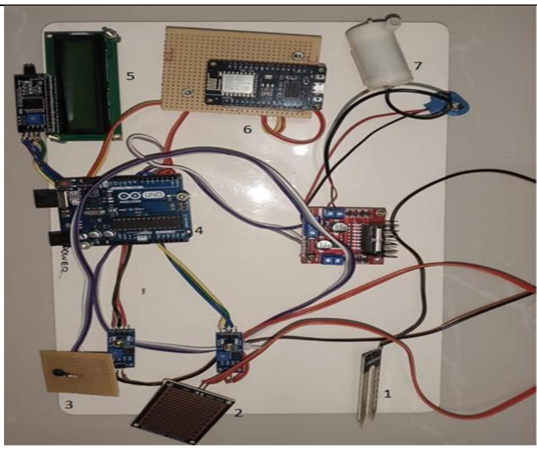


Figure 9. The Coding for the Sensors was Written Using this Website (ardunotive.com)



1. Soil Moisture Sensor
2. Rain Sensor
3. Temperature Sensor
4. Arduino Board
5. LCD Display
6. Node MCU (WiFi)
7. Water Pump Motor

Figure 10. Model Used in the Project

RESULTS AND DISCUSSION

After Conducting surveys from more than 50 farmers of the local agricultural land area chosen, a prototype as described in the earlier section was developed and installed in the farms at a spacing based on the crop water requirement. Then the soil sensor, Temperature sensor, and Rain sensor are chosen based on the crop's water demand. More than 50 sensors were installed to make a precise study. At every interval of 2 days, the result of water usage by the crop has been monitored and sent to a centralized system. All the sensors were programmed and the program structure has been mentioned above. The results revealed that during November-December where the average rainfall in the study area is around 800 to 1600mm, this prototype was beneficial in conserving the water requirement of the crop by 40%. If further, the prototype was developed, more water conservation and productivity of crops could be achieved.

CONCLUSION

The proposed automated system responds to the soil's water requirements by watering it exactly as needed. When the appropriate amount of soil moisture is attained, the device automatically turns off the water flow. To enhance the system's functionality, a rain sensor is connected to the irrigation system. This sensor detects rainfall and triggers the system to shut down, effectively conserving water. Furthermore, any rainwater collected by the system is intelligently diverted to nearby fields or wells, ensuring efficient utilization. Additionally, the system is equipped with a moisture sensor that accurately measures the water requirement of the crops. This sensor plays a crucial role in controlling the amount of water supplied to the field to maximize crop yield. As part of the plans, a prototype is being developed to validate the effectiveness of the system in real-time situations. This prototype will serve as a practical means of ensuring that the system consistently delivers accurate and timely measurements.

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