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Advanced Smart water management using IoT in Agriculture AT-MEGA2560

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ABSTRACT: As India's population is increasing day by day after some years there will be issue of food, therefore the development of agriculture is more important. Today the farmlands has shortage of rains and scarcity of water. In the present era the greatest problem faced by world is water scarcity and agriculture being a demanding occupation consumes lot of water, therefore a system is required to use the water efficiently without wastage. The main objective of this work is to develop a smart and automated watering system for plants. Automated systems have less manual operations, reliability, flexibility and are accurate. The field of internet of things had a significant transformation to extend things from the data generated from devices to objects in the physical space.

Since every activity now a days becoming smart it needs to smartly develop agriculture sector for growth of country. This paper aims at developing the Smart Irrigation System Using IoT Technology with an objective of automating the total irrigation system which provide adequate water required by crop by monitoring the moisture of soil and climate condition in order to prevent the wastage of water resource. It will also have many advantages for farmers. The irrigation at remote location from home will become easy and more comfortable. In addition, it will not only protect the farmer from scorching heat & severe cold but also save their time for to journey to the field.

Agriculture plays imperative role in the development of a country. In India major population depends upon farming sector accounting of 16% of Gross Domestic Product (GDP) of India. So, in every new technology invented in a new era is created to solve the day to day life issues. We have introduced a new system based on some already made projects but with use of new technology and modern ideas. In old days in the agriculture sector there weren't many technologies invented. We have worked on the part of agriculture system which intelligently irrigates your yard with dynamic water cycles. It stops watering your yard if it is raining or has rained since your last watering. It uses the light sensor to detect the sunrise time and automatically adjust water start times accordingly. It also stops irrigation if your yard is too cold. Controlling of all these operations will be through any keen gadget or computer associated to Android based Web Applications and the operations will be performed by Soil moisture sensors, Temperature sensors, Wi-Fi modules and Arduino

I. INTRODUCTION

India's major source of income is from agriculture sector and 70% of people depend on the agriculture, most of the irrigation systems uses traditional methods which are operated manually. Two scare and valuable resources of irrigation that is water and energy are not efficiently utilized by the current irrigation system. Today's advanced society has turned into a digital world through the contribution of technology, now we are leaving in such an era where technology is studied to improve our life style. Hence to make life simpler and convenient SMART WATER MANAGEMENT had been introduced. A model of controlling irrigation facilitates to help millions of people.

Smart water management can be defined as the science of artificial application of water to the soil depending on the soil moisture content. With the advent of open source arduino boards along with the moisture sensor, it is viable to create devices that can monitor the soil moisture content and accordingly irrigating the fields or the land scape when needed. The proposed system makes use of microcontroller ATMEGA2560 on arduinouno platform and IOT which enables farmers to remotely monitor the status of water level in the soil by knowing the sensor values thereby, making the farmers work much easier as they can concentrate on other farm activities.



The new system was designed to eliminate the excessive flow of water through agricultural. The measurements of temperature, moisture and humidity are continuously monitored using the sensor of temperature, moisture and humidity and sent to the assigned IP address. Android application collects data from the allocated IP address on a continuous basis. The relay, which is attached to the Arduino microcontroller, controls the motor once the soil moisture values are reached. The whole project can be completely controlled through Android based application in which the user can decide at what time he/she wants to irrigate their yard and what water cycles command they want to give based on the weather conditions.

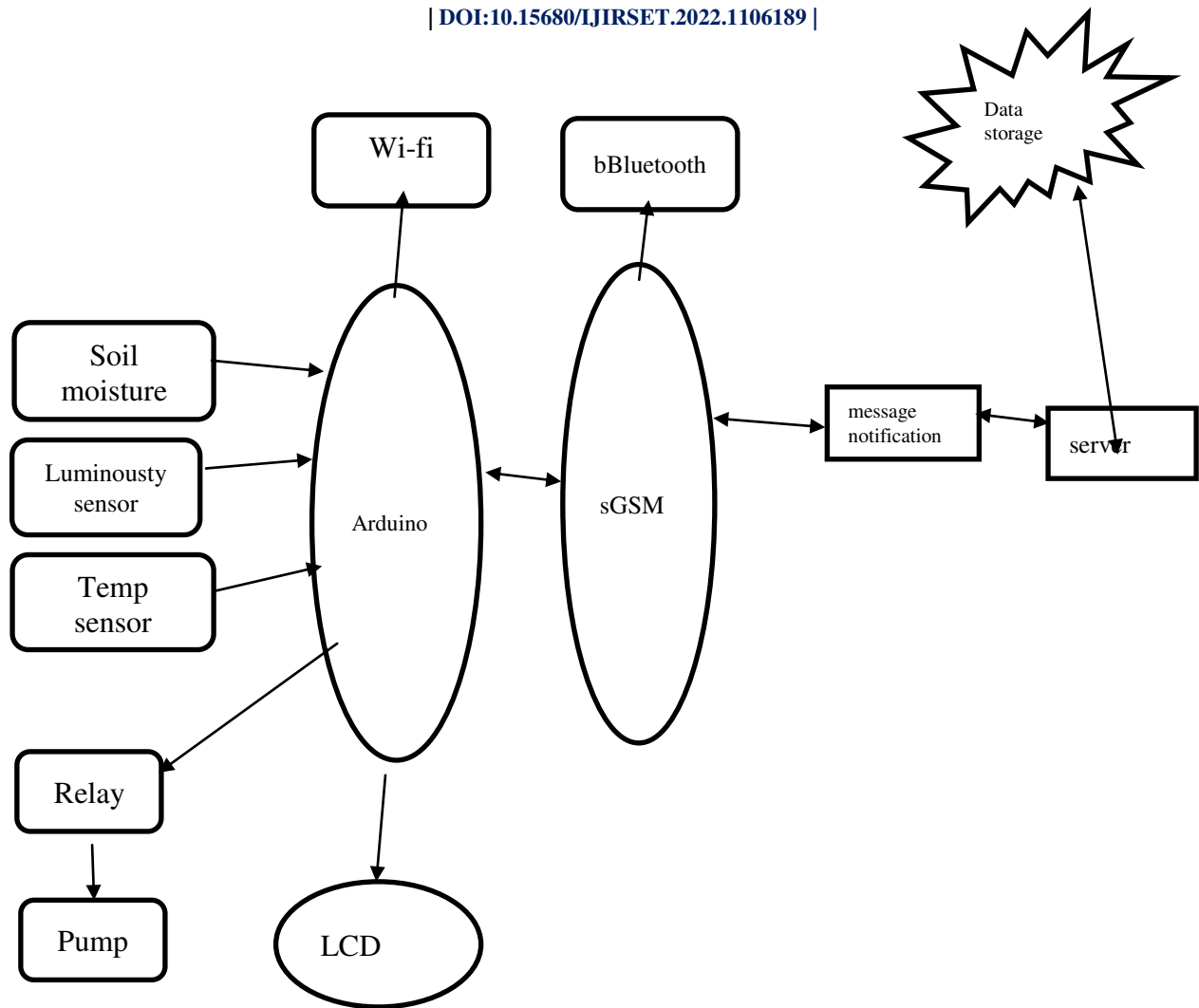
II. LITERATURE SURVEY

This paper proposes exactitude agriculture irrigation system, and focuses on the hardware design, specification and code method management of the irrigation system.

The newer scenario of decreasing water tables, drying up of rivers and tanks, unpredictable environment present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture sensor at suitable locations for monitoring of crops is implemented in . An algorithm developed with threshold values of temperature and soil moisture can be programmed into a microcontroller-based gateway to control water quantity . After the research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day [1]. However, use of technology in the field of agriculture plays important role in increasing the production as well as in reducing the extra man power efforts. Some of the research attempts are done for betterment of farmers which provides the systems that use technologies helpful for increasing the agricultural yield. The use of remote switching and monitoring of irrigation system using smart phones to address the need of automatic control of the water is presented. The data about soil moisture, temperature and humidity is sent to the smart phone for the user to make the decision. In the studies related to wireless sensor network, researchers measured soil related parameters such as temperature and humidity. Sensors were placed below the soil which communicates with relay nodes by the use of effective communication protocol providing very low duty cycle and hence increasing the life time of soil monitoring system. The system was developed using microcontroller, sensors while the transmission was done by hourly sampling and buffering the data, transmit it and provide the necessary water .

III. PROPOSED METHODOLOGY

This project includes a wireless sensor network for an irrigation system in real time. This system provides the agricultural farm with a consistent and sufficient water level and also allows farmers to utilize and manage the water. The module then automatically switches on the motor if the moisture level in the soil crosses below the threshold level [4]. The motor turns OFF automatically when the level of water reaches normal level. On the Android device of the customer the sensed parameters and the actual motor state are shown and can be saved to the internal storage of the user device. This memory can be read anytime so that farmer can know what previous commands they have given to the controller.



COMPONENTS USED

Arduino Microcontroller (Mega 2560 REV30): The MEGA 2560 is designed for projects that are more complex based on ATmega2560. There are 54 input and output digital pins and 16 analog inputs, 4 hardware serial ports, a 16 MHz quartz oscillator, USB connection, Power Jack, header for ICSP and push button. It includes all that the micro controller needs to support[3]. This hardware can accept programming language such as C/C++ to work upon the hardware of the microcontroller. This type of Arduino board is also used to connect many such external components like PIR sensor, ultrasonic sensor, soil moisture sensor, temperature sensor.

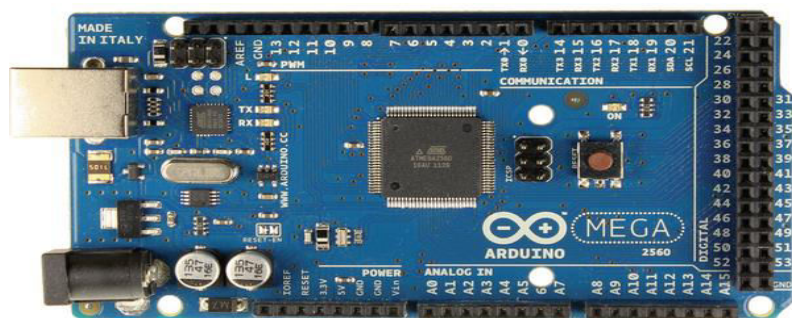


Fig 1.Arduino Mega 2560 REV30

Soil Moisture Sensor: The soil humidity sensor tests the soil water content and its temperature. This uses the value of the soil's electrical strength. It is calibrated and depends on environmental conditions such as temperature, soil type or electrical conductivity. The relationship between soil and property is calibrated. It is used for detecting moisture in the field and moving it to a microcontroller for monitoring the switching of the ON / OFF water pump.

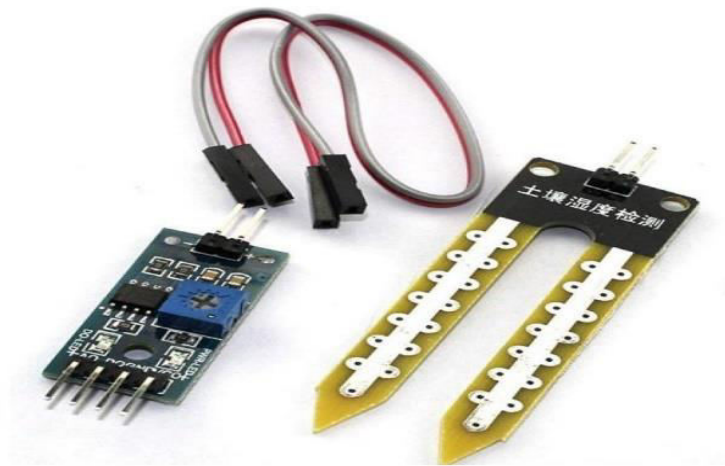


Fig 2. Soil Moisture Sensor

Optical Sensors: Soil reflectance and plant colour data can be aggregated and analysed by only two variables of optical sensors. To determine the content of clay, organic matter and humidity of soil, optical sensors are created.

Temperature sensor: The temperature sensor and Humidity sensor which is highly precise because its output voltage is linear with the temperature Celsius scaling. The temperature and moisture sensor DHT11 are a basic, ultra-low-cost sensor. A capacitive moisture sensor and a thermistor are used to measure the ambient air and propagate a digital signal on the data pin.

Humidity Sensor: To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor

Relay: Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal

Wi-Fi Module: Arduino will receive input from the temperature and humidity sensor in accordance with the soil moisture sensor conditions. This data is then sent to the node MCU in order to receive data to the final user. This can be further processed in the application name “Blynk” available to both the Android and iOS devices. The user can see how much temperature is logged in by the soil moisture sensor and can react upon whether watering is required or not.

IV. SOFTWARE IMPLEMENTATION

Android software development is the process by which new Android apps are developed. Applications are usually produced with the Android Software Development Kit using Java programming language. A comprehensive range of developing tools is available in the Android development software kit (SDK). These include a simulator, collections, QEMU based handset emulation, documentation, sample codes and tutorials. In case developers want to tailor their apps for older devices, the SDK can also support older versions of the Android Platform. Old versions and tools for compatibility testing can also be updated once the latest version and framework has been downloaded. Android apps are packaged in apk format and saved on the root-user folder of the Android OS in the /data / app folder. Dex files are included in APK package (compiled byte code files called Dalvik executable), resource files, etc[8]. Another software being used is the Arduino IDE. A cross-platform framework, written in C and C++ features, is an Integrated Development Environment (IDE) for Arduino (for Windows,



macOS, Linux). It is used to write and upload compatible Arduino based programs on boards and other manufacturer device boards with the support of third-party cores. The resultant code asformatted

```
int m= analogRead(A0);           // Soil Moisture Sensor 1 PIN A0
int n= analogRead(A1);           // Soil Moisture Sensor 1 PIN A1
Serial.println(m);
delay(10);
Serial.println(n);
delay(200);
if (m>=980)
{
myservo.write(90);           // tell servo to go to position in variable 'pos'
digitalWrite(8, LOW);       // Relay ON
delay(1000);
}
else if(m<=970)
{
digitalWrite(8, HIGH);     // Relay ON
}
if (n>=980)
{
myservo.write(0);           // tell servo to go to position in variable 'pos'
digitalWrite(8, LOW);       // Relay ON
delay(1000);
}
else if(n<=970)
{
digitalWrite(8, HIGH);     // Relay OFF
}
else
{
digitalWrite(8, HIGH);     // Relay OFF
}
}
```

V. RESULT

This smart system's GSM module helps farmers to reduce their workload and control water pumps by smartphones. There is no need to walk to the field just to start the pump and wait until the time when it has to be stopped. Linking the various previous techniques under IoT to render the Smart agriculture system, our proposed system is cost-effective and costs 10 times less than the present products in the market. By using our present system, it helps to analyse and predict the type of crops that are best grown in the particular agricultural field. In the future, deep learning technology will be further integrated and the proposed system will be fully automated. This system which is capable to send and receive the data from the sensors and also get the updated the precious data. The result analysis is also done with the help of Arduino IDE software which consist of serial monitor and serial plotter. The serial monitor is pop-up window which can establish connection in order to receive data and transmit data.

Sl.no	Modules Methodology	Covering region	Progress	User accessibility
1	With temperature and humidity testing	Area around the sensor	Better	helpful & accurate



2	With soil moisture & PH testing	Soil with a radius of 10cm	Better	helpful & accurate
3	With water pump start via call or text	Depends on the range of connectivity and used Sim card of particular service area	High	Very much helpful as it has reduced the manual effort & saves useful time

This smart system's GSM module helps farmers to reduce their workload and control water pumps by smartphones. There is no need to walk to the field just to start the pump and wait until the time when it has to be stopped

VI. CONCLUSION

The electrical irrigation systems used in the field of farming is discussed in this article. When the world transitions into new technology and designs, the trend in agriculture is also important. Some projects mean that data from different sensors are obtained from various nodes and sent through the wireless protocol through wireless network sensor use. The data collected provides information on the different environmental factors. Environmental monitoring is not the whole solution for burgeoning crop yield. Many other factors are more effective in reducing productivity. In order to overcome these issues, technological improvement needs to be implemented for agriculture. To solve such problems, an integrated system must be developed that will take care of all the productivity factors at each stage. Nonetheless, full automation is not achieved because of various problems in agriculture. Monitoring of crops wirelessly and irrigating the agriculture field with just tap of a button in a smartphone, allows reducing labour costs and also helps to track the changes in precise of instantaneous on the field in real time. The system proposed will track the necessary parameters for the growth of plants This proposed intelligent agricultural system of agriculture is very stable and user-friendly

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