Smart Irrigation System Using IOT

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Abstract: *The Clean Water is one of the rarest living fundamentals present on the earth. So, the measure should be taken to conserve it for future purpose. Coming towards the farming which is the base of Indian providence the approaches used are still the traditional. This leads to inappropriate use of water. So, to meet those conditions the end is to design the Smart Irrigation System based on the detectors. This System would seek the purpose with the help of humidity, temperature detectors and moisture detector that can be used for analyzing the environment. The humidity detectors and DHT11 detector will determine the factual humidity status and temperature give the parameter to the microcontroller and hence the left work will be done on those parameters by detectors. The total system will efficiently meet the water conditions by conserving water and will ease the tradition irrigation system.[3]*

1.INTRODUCTION:

In this current period the world has facing problem of water. As we all know water is fundamental need of Agriculture. The Irrigation known as Drip irrigation could be one of the result to this problem as it save large volume of water. But this not the proper result to this problem because we can't read volume of water needed for crops. Eventually water may be given in overdue volume or vice versa. The water in this system will supply a smarter way for irrigation. This system is an attempt towards the smart irrigation system concept and water conserving approach too. [1] An electronic device is responsible for perceiving the temperature and humidity conditions.[2] When soil humidity in irrigation field is not over to the required position additionally the motor is switched on to irrigate associated farming field and alert communication is transmit to registered mobile phone. Smart irrigation systems estimate and measure decrement of being factory humidity in order to operate an irrigation system, restoring water as demanded while minimizing extra water use.[3] To enhance water effectiveness there must be a proper irrigation scheduling strategy.

2. OBJECTIVE:

The main objective of this system is to give correct values of sensors on android application. By allowing the end user to ON/OFF the node using the WIFI or Bluetooth and by using this values water can be supplied to the farm. To make better use of our freshwater resources, growers need to have not only an efficient method of delivering the water to the plants, but also an efficient watering scheme, so that the plants are getting watered with the right amounts at the right time.

3.LITERATURE SURVEY

3.1 Automated Irrigation System Using a Wireless Sensor Network and GPRS Module.

The primary objective of the automated irrigation system that makes use of a WSN and GPRS module is to maximize water use. The soil moisture and temperature sensors in a WSN that are part of a distributed network typically make up this kind of system.[4] The gateway is primarily used to transfer data from the sensing unit to the base station. The actuator then controls the irrigation based on commands and manages data from the sensing unit. A specialized algorithm is utilized based on the field's condition for controlled water supply over the field. [5] The algorithm is programmed into a microcontroller and its primary function is to instruct the actuator to supply a predetermined quantity of water through the valve.[3]

METHODOLOGY: The microcontroller is the sole foundation for system computation. WSN provides service to the automated irrigation in order to conserve water. The soil moisture sensor, also soil temperature sensor gives Live readings. The information gathered by the sensor is sent to the microcontroller.[2] Using the GPRS protocol, this data is transferred to a remote location via cellular network. A connection to the Internet enables data inspection of the current temperature and moisture content of the soil, and their graphical representation makes it simple to make a decision.[3]

LIMITATION: The automated irrigation system only takes into account two parameters of the soil: temperature and soil moisture. Other parameters like humidity, light, air moisture, and the pH value of the soil are not taken into account when making decisions.[4]
The threshold values of the soil moisture and temperature sensors drive this system. It only demonstrates the state of the soil, and the system decides on a threshold value based on previous values. Sometimes, the system irrigates the farm with more or less water than what the crops need.

3.2 Automatic Irrigation System using Wireless Sensor Network and Data Mining Algorithm.

Algorithms for data mining are used to make decisions about drip irrigation systems. The control station and base station receive data from a WSN-enabled automated drip irrigation system with a variety of sensors, including soil temperature and moisture sensors.[1] WSN makes use of an ad hoc network that allows for self-configuration and flexibility. Sensor data are sent to the base station and received using ZigBee. The base station processes the data in order to make decisions.[3] A data mining algorithm is used to make decisions based on data from sensors to drips. Remote monitoring of all observation is done through a web application.

METHODOLOGY: The algorithm checks the probability of each attribute. The choice to turn on and off trickle water system is made. A previous set of agricultural data is provided for use in making decisions. All field data is sent to the web application for observation.

. **LIMITATIONS:** As a result of data shifting in response to soil and geological conditions, the system does not function properly.

3.3 Automated Intelligent Wireless Drip Irrigation Using Linear Programming.

Remote sensor network crop checking application is helpful to farmer for accuracy farming. The application monitors the entire farm from remote area utilizing IOT. Application works on sensor organization and two types of nodes. Energy saving calculation is utilized in node to save energy.[3] Tree based convention is utilized for data collection from node to base station. System having sensor node which gather all ecological and soil parameters esteem soil moisture, temperature, air, humidity, light, and so on.[2]

METHODOLOGY: Automated intelligent wireless drip irrigation system uses linear programming to get maximum profit from available water and crop water requirement. This system calculates water requirement of different crop, available water and maximum profit scenario for different crop field. Decision support system helps to take decision of irrigation for different crop field.

LIMITATION: System use linear programming for maximum profit on defined resources. It causes problem where constrain and objectives are not define. In real time situation object and constrain are not predefined then this system cannot be used.

3.4 A Crop Monitoring System Based on Wireless Sensor Network.

Remote sensor network crop checking application is helpful to farmer for accuracy farming. The application monitors the entire farm from remote area utilizing IOT. Application works on sensor organization and two types of nodes.[1] Energy saving calculation is utilized in node to save energy. Tree based convention is utilized for data collection from node to base station. System having sensor node which gather all ecological and soil parameters esteem soil moisture, temperature, air, humidity, light, and so on.[5]

METHODOLOGY: Crop monitoring application consists environment parameter collector. The data about crops is gathered by sensor. Sensor collects humidity, soil condition, and other information at the base station before sending it to the internet (web application). The analysis of the data occurs on the server side. The type of communication is duplex GPRS/CDMA.[5]
The purpose of communication between nodes is served by an RF transceiver. For the purpose of experimentation, this application was used in Beijing, Henan, and Shandong Province, where temperature, humidity data were collected. It's made possible by IOT.

LIMITATIONS: Sensor reading does not take environmental changes into account. The system user cannot program the applications. There is no application control system.[5]

4. System Design:

This system uses four types of sensors: DHT11 sensor, Moisture sensors, Rain sensor and IP sensor. These sensors are useful to calculate the amount of water required for particular crop and at correct of time. The system design uses WSN and GSM.

4.1 Moisture sensors:

A soil moisture sensor is buried into the soil and measures amount of moisture present in soil. It allows the smart irrigation system to irrigate the amount of water required for the particular crop with the right amount of time needed by the plants. It maintains the right amount of water required for the crop. Also if the soil is wet due rainfall or due to over irrigation these sensor avoids irrigation. By not watering when soil has enough moisture, it can significantly reduce the amount of water used for irrigation. This saves you money. [1]

4.2. DHT11 sensors:

These sensors are useful to detect **Temperature**, **Humidity** and display its information in the application. These temperature sensor displays information in Celsius or Fahrenheit of the farming field.

A DHT11 sensor are of two basic physical types they are given below:

- Contact DHT11 Sensor Types
- Non-contact DHT11 Sensor Types

Again, these detectors are divided into three types of detectors, Electro-mechanical, Resistive and Electronic. Among all this the thermistor detector are most generally used for husbandry fields. The Thermistor is type of temperature detector, whose name is a combination of two words THERM- supporter sensitive res- ISTOR. Thermistors are made up of ceramic type semiconductor material using raw material oxide technology similar as manganese, cobalt and nickel, etc. Thermistors have the resistive value at room temperature (generally at 25`C). But for seeing purposes those values are generally measured in kilo- ohms. Thermistors are unresisting resistive bias in which we need to pass a current through it to produce the voltage affair. Also, thermistors are connected in series with a proper turning resistor to form an implicit separator network and the choice of resistor gives a voltage affair at some pre-determined temperature point or value.[5]

4.3 Arduino (Micro Controller):

The MCU -based Arduino kits are used to construct digital and interactive hardware that can sense and control physical devices. An Atmel 8-, 16-, or 32-bit AVR microcontroller makes up an Arduino board. with a few parts that can be programmed and put into other circuits. The standard connecter that connects the CPU board to a variety of interchangeable add-on modules known as shields is an important feature of the Arduino. The Arduino integrated development environment (IDE), a Java-based cross-platform application, is available on the Arduino. It comes from the IDE for Processing and Wiring languages.[1] It was designed for people who are unfamiliar with electronics. It has a code editor with syntax highlighting, brace matching, automatic indentation, text cutting and pasting, text searching and replacing, and a simple one-click mechanism for uploading programs to an Arduino board. A text console, a toolbar with buttons for common functions, a message area, and a series of menus are also included.[5]

Diagram: Arduino device

4.4 Bluetooth Device:

Bluetooth is a wireless device used for connectivity. This device, which is use to provide wireless connectivity. The Bluetooth device is connected with Arduino microcontroller which used to provide connectivity with the other device via Bluetooth .The End user can control the Arduino from the smart phone.

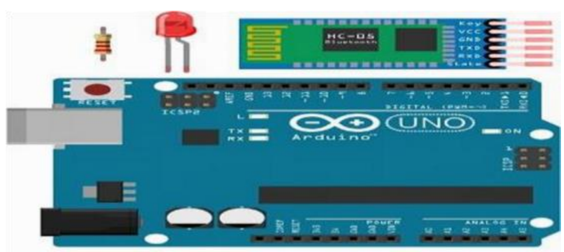


Diagram: Arduino with Bluetooth device

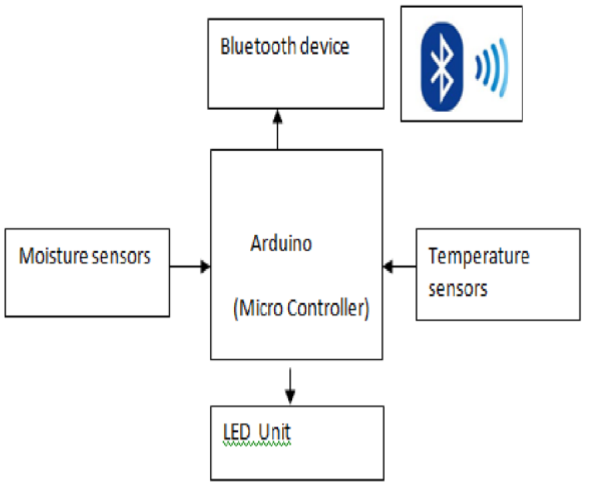


Figure 1: block diagram of monitoring unit

5. System Architecture:

The System Architecture for Smart Irrigation System using IOT are given below:

Hardware

1. Bluetooth Module HC 05/06
2. Arduino & Battery (with cable)
3. LED
4. 220Ω Resistor
5. Android device

Software

1. Arduino IDE
2. Android Studio.

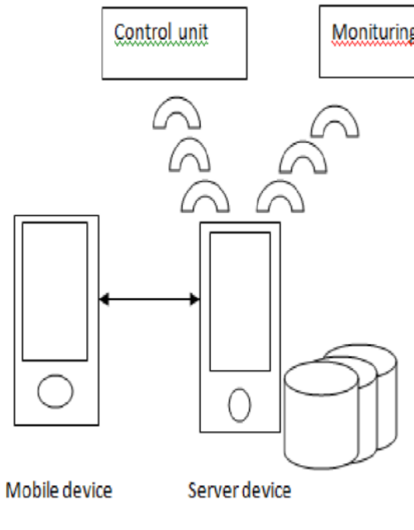
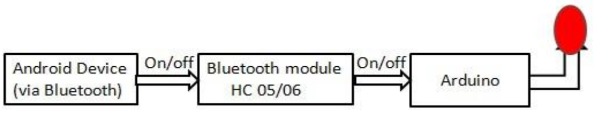


Fig: System Architecture

The Android smartphone, Arduino-Bluetooth device, and Arduino are the three main components of this System Architecture. The diagram depicts the connectivity between these three devices.[3]



Serial communication is how Bluetooth HC 05/06 works. When a button is pressed on the Android app, data will be sent to the Arduino Bluetooth module. The data is received at the other end by the Arduino Bluetooth module, which transmits it to the Ardunio via the Bluetooth module's TX pin (which is connected to the Arduino's RX pin). The uploaded code compares and checks the data that was received from the Arduino Bluetooth. The LED is turned ON if the received data is 01 Additionally, it will turn off when it receives data 00. While connected, you can open the serial monitor to view the received data. The Arduino Bluetooth hardware connection is depicted in the following diagram.[3]

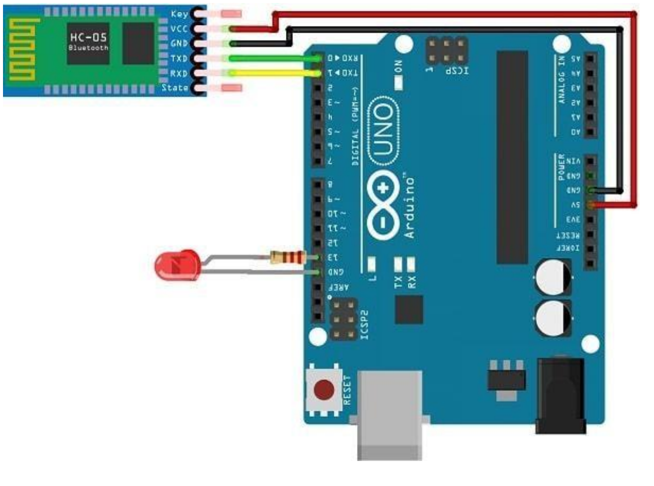


Diagram: Arduino with Bluetooth connectivity

There are four connection can be made between Bluetooth device and Arduino. For that for connection different pins are use, combination of those pins are shown below [1].

There are four ways to connect an Arduino and a Bluetooth device. Different pins are utilized for that purpose, and the combinations of those pins are depicted below

Arduino Pins vs. Bluetooth Pins:
RX (Pin 0) ———> TX
TX (Pin 1) ———> RX
5V ———> VCC

GND ———> GND Connect an LED positive to Arduino Pin 13 via a resistance with a value between 220 and 1K. Link the negative to GND. Utilizing jumper wires and a connector, connect the Bluetooth module to the Arduino processor.[3]

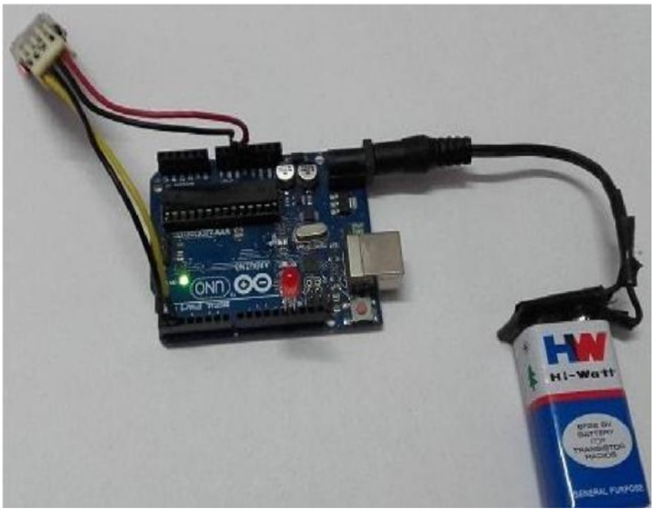


Diagram: connect the Bluetooth module to the Arduino using jumper wires and a connector.

6. IMPLEMENTATION

This section will discuss about the different module which is used in the whole project is discussed. The four sensors is interfaced with system and each node has the same architecture. The implementation of the system is discussed below.

A. Connecting all of the sensors to the NodeMCU or Arduinio: The soil moisture sensor that was used to analogously record the moisture value. The NodeMCU's A0 (analog) pin is used to send the data out. The NodeMCU's GPIO pin 5 is used to get the DHT22 sensor data. Lastly, the PIR sensor interfaced with the NodeMCU's GPIO pin 14 as well. The sensor has detected motion if it is greater than 1, while the sensor has not detected any motion if it is less than 0. At 3.3V, each sensor is working.[1]

B. Send data from sensors to a cloud platform: Temperature, humidity, motion, and soil moisture are just a few of the system-related parameters that the sensor measures. The ThingSpeak cloud platform receives data from a built-in WIFI module (ESP8266) on the NodeMCU board. The code first connects the wifi to the wifi spot, and then the HTTP GET request allows the user to send data to the ThingSpeak cloud platform.[1]

C. Analytical IoT: Data analytics can be applied to sensor data using the Thingspeak IoT cloud platform. After the data has been uploaded to the ThingSpeak channel, you can use MATLAB to analyze it. MATLAB analysis is used to publish all node data on a different channel in this system. Users can create react, time controls in the ThingSpeak platform to send sensor data at a predetermined interval.[1]

D. Notification Transmission: In the wake of applying the IoT examination to our sensor information the framework can send a notice to the client portable utilizing the IFTTT applet. The user can use the IFTTT applet to create the interface for sending SMS or email to the user's mobile phone after writing the MATLAB code.[1]

7. PROPOSED SYSTEM AND EXISTING SYSTEM

The temperature and humidity sensor, the soil moisture sensor, and the PIR sensor make up the majority of the system. The PIR sensor is used to detect motion in the field, the temperature and humidity sensor is used to measure the surrounding temperature and humidity, and the soil moisture sensor is used to measure the soil's moisture content. The in-built WIFI NodeMCU interfaces with all of these sensors. With the assistance of remote correspondence, the information is transfer to the ThingSpeak cloud.[3]

Current Solutions Software for Planning an Irrigation System:

We develop components for the planning of irrigation systems, such as bill of materials generation, energy calculators, custom automations, integrated land management functions, analysis of existing zones, and design of new systems.

Software for Customized Irrigation Design: Programming custom irrigation design software with features like Computer-Aided Design (CAD), Digital Terrain Modelling (DTM), land survey data, graphics, and modelling of hydraulic systems and irrigation patterns.

Software for Smart Controllers and Sensors: Software development for sensors and smart controllers, including rain, weather, pressure, and moisture sensors as well as applications for remote management of pumps, injectors, valves, sprinklers, and other equipment.

8. ADVANTAGES OF PROPOSED SYSTEM

Reliable: The objective is to design a reliable system because the component of the existing system does not meet reliability requirements by overcoming some limitations imposed by its limited use.[3]

Flexible: The proposed system would be quite adaptable to many other techniques, whereas the existing system could only be used with certain techniques.[3]

Economy of scale: The Google Cloud Service (gcs) module, which will take the place of the GSM/GPRS module in the current system, is introduced in the proposed system. This would result in a low development cost for the proposed architecture.[3]

Adaptable: The proposed system would serve as an adaptable means for the user, both in terms of cost and usability in many situations.[3]

9. RESULT AND DISCUSSION

Using the Internet of Things concept, we have successfully designed and implemented a smart irrigation system. Using a mobile IOT, this automated irrigation system is simple to operate. It functions as an intelligent switching system that, when necessary, irrigates the plant based on the level of soil moisture. [1]

10. CONCLUSION AND FUTURE SCOPE

In the agricultural sector, the design and implementation of a smart irrigation system are demonstrated in this paper. One of farming's most time-consuming processes is the irrigation process. Automated, efficient, and real-time monitoring of agricultural parameters was made possible by Internet of Things (IoT) technology. The irrigation system has been upgraded by embedding a number of sensors. In an open source Internet of Things platform, a channel is made to store and display information about soil moisture and other parameters. Additionally, the system is inexpensive and uses low power.The irrigation system can be predicted to behave in the future using deep learning and machine learning, and detailed weather forecasts can also be used to determine whether irrigation is necessary or not. We can use the drone system for live monitoring instead of the PIR sensor for motion detection.

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11.REFERENCES

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