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# SMAR IRRIGATION SYSTEM USING IOT

**A Report for the Evaluation 3 of Project 2**

***Submitted by***


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**Under the Supervision of**

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# SCHOOL OF COMPUTING AND SCIENCE AND ENGINEERING

## BONAFIDE CERTIFICATE

Certified that this project report **"SMART IRRIGATION SYSTEM USING IOT"** is the bonafide work of "**PARAG VIJAYVARGIYA (1613101475)"** who carried out the project work under my supervision.

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**ABSTRACT:-**

Water scarcity is a major concern for farmers nowadays and with this growing population of our country agriculture is becoming a serious and significant problem facing our framers today. The project's main objective is to provide automatic irrigation system that switches an ON / OFF motor pump by sensing soil moisture material via Internet of Things (IOT) application. Human interference may be minimized by proper irrigation system.

The project consists of Arduino microcontroller and sensor, where Arduino microcontroller is programmed to obtain via sensor the input signal of the soil's varying moisture state. Once that signal is transmitted by the transmitter, the output then relays when the water pump is worked. The sensing arrangement consists of two metal rods that are inserted into the field of agriculture which must be regulated. An automatic irrigation network has been suggested for effective water storage and intruder detection. Soil parameters such as soil temperature, pH, ph are measured and the LCD shows the pressure sensor and the sensed values. The intruder monitoring device is achieved using a PIR sensor under which the birds are repelled from reaching the area. The GSM module was used to create a connection between the farmer and the field. The current state of the field will be intimated via SMS to the farmer and also posted in the web page. The farmer may access the server at any time regarding the state of the field, thus the man power and time everywhere.

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## 1.Introduction:-

India is one of the world's major freshwater consumers and our nation consumes huge volumes of freshwater when opposed to other nations. There is a significant deal of water used in agriculture rather than in the domestic and commercial sectors. As a soil, 65 per cent of gross precipitation belongs. Today water has been one of the most essential assets on Earth and widely utilized in the area of agriculture. As the soil-moisture sensor and temperature sensor are mounted in the plants' root region, this knowledge can be transmitted by the device through the wireless network.

Farming is the foundation of all developing nations. This utilizes 85 percent of the globally usable fresh water supply, and this figure remains influential in water use owing to population increases and rising food production. Because of this, effective water control is the main problem in many arid and semi-arid cropping systems. There is a need for an integrated irrigation network to improve water usage for farm crops. Overcoming irrigation and under irrigation is the need for an integrated irrigation network. Over irrigation happens when the excess water is improperly treated or controlled, a process that contributes to water contamination. Under irrigation, soil salinity is raised, with the consequent accumulation of radioactive salts on the soil surface in heavily evaporated fields. Smart irrigation network has been used to solve these challenges and to that man strength.

IoT is changing the domain of agriculture and empowering farmers to combat the enormous difficulties they face. Agriculture has to address increasing water shortages, restricted land supply, thus fulfilling a world population's rising consuming needs. Fresh, creative IoT technologies tackle these issues and improve agricultural output efficiency, quantity, productivity and cost-effectiveness.

Agriculture is Indian Economic backbone. In today's environment, when we see massive population increases in the nation, agriculture becomes increasingly necessary to fulfill the needs of the human race. Farming, though, needs irrigation and with each year we have more water use than rainfall, seeking ways to save water while also producing the best yield is important for farmers. But the farmers used irrigation strategy in the present era by the manual supervision under which they irrigate the soil at regular intervals.

The Internet of Things (IoT) is a system through which a computer may be used in a mobile app to control its work. The Internet of Things (IoT) is about interconnecting interacting devices that are mounted at various places that might be remote from each other. Internet of Things (IoT) is a kind of network technology that detects input from various sensors and allows whatever it takes to access the Internet for information sharing. It can also be used to change system status. The central processing unit will also include a communication device for receiving sensor data and relaying it to the user's device. This would be achieved with a higher system for connectivity, such as a Wi-Fi network. The data that the central module collects is translated to usable data and transmitted to the customer. Using a portable device such as a cell phone or tablet the consumer may display the results. Water shortage is a huge agriculture issue today. This project allows the farmers to successfully irrigate the farmland with an integrated soil moisture-based irrigation network.

## 2.Literature Survey

### 2.1 Automated Irrigation System using WSN and GPRS Module

The main goal of an automated irrigation system using WSN and GPRS module hav- ing is to optimize water use for crops in agriculture. This device consists of distributed wireless sensor network with WSN soil moisture sensor and temperature sensor. Gateway units are used to transfer data from sensor unit to base station, to send the irrigation control command to actuator, and to manage sensor unit data. Algorithm used in the water quantity control framework as per submitted necessity and situation. It is programmed in a microcontroller and sends a command to control the water quantity through a valve unit via actuator. Photovoltaic panels are used to drive the entire device.Communication is duplex through Mobility network. Web technology controls the irrigation by Continuous scheduling of the monitoring and irrigation. It May be done via web pages.

### 2.2. Crop Monitiring System based on WSN

The segment that follows describes the Bluetooth technology. Wireless Sensor Network Seed Tracking Technology is useful for precision farming farmers. The program uses Internet Of Things ( IOT) to track the whole farm from a remote location. Application works on netowrk sensor and two types of nodes. Energy saving algorithm is used to conserve resources in nodes. Tree-based protocol is used from node to base station to collect data. Device has two nodes, one node gathering all the importance of the environmental and soil parameters and the other comprising of camera taking photographs and tracking crops. Environmental changes for sensor reading are not considered in this System. Device is not programmable for machine users.

## 2.3. Automatic Drip Irrigation System using WSN and Data Mining Algorithm

Data mining algorithm is used to make choices regarding a device for drip irrigation. Automated drip irrigation device that positions WSN in both farms and various forms of sensors. WSN utilizes an ad hoc network that allows functionality and versatility for itself. Sensor data is sent to the base station and zigbee is used to retrieve the data. Data preparation is performed for decision taking at base point. Data min- ing algorithm is used to determine from sensor to drip on results. All measurements are tracked remotely via web application. This machine runs on the Naïve Bayes irrigation management algorithm. Algorithm operates on preceding data collection for decision taking because there is no regular outcome attribute zero.

## 3. Existing System:-

### 3.1. SMARTPHONE IRRIGATION SENSOR:-

An automatic irrigation system has been developed and deployed for use in farm crops. The sensor uses a smartphone to collect and process visual photographs of the soil near to the crop's root region, and to measure the water content optically. The sensor is confined under controlled illumination in a container, and buried at plant root point. Within the mobile, an Android App was built to access the processing and communication elements directly, such as the digital camera and Wi-Fi. The mobile app wakes up the smartphone, with user-defined parameters triggering the system.

Then, via an antireflective glass panel, the built-in camera takes a shot of the soil and an RGB to gray method is done to approximate the ratio between the wet and dry region of the photograph. After the Wi-Fi link is enabled, the ratio is transmitted to a gateway through a router node to power an irrigation water pump.

### 3.2. IRRIGATION Integrated Device Utilizing A WIRELESS SENSOR NETWORK AND GPRS MODULE:-

An IoT-based irrigation network is for an effective farm management program that helps farmers to deal with the difficulties they face. There are several applications of IoT that tackle big problems such as soil moisture identification, water quality control, crop growth tracking, etc. This project allows stronger and smarter irrigation to interact with the customer through temperature, moisture and other networked sensors. The device has a distributed wireless network with sensors with soil moisture and temperature located in the plants' root region. In addition, a gateway device manages details regarding sensors, activates actuators and transmits data to a web browse.

4. **Proposed System:-**

An IoT-based irrigation system is for an effective farm management program that helps farmers to cope with the difficulties they face. There are several IoT apps that tackle the big issues such as soil moisture sensing, water quality control, crop growth tracking, etc. This project allows for better and smarter irrigation by networked temperature, humidity and other sensors to interact with the customer. With the usage of inexpensive, easy-to-install sensors and an array of informative data they provide, Internet of Things has created increasingly efficient ways to develop soil for farmers and growers.

Agricultural sector faces multiple challenges nowadays owing to a shortage of water supplies. Intelligent irrigation network has been used to help the farmers resolve the difficulties. Numerous sensors such as pH, soil moisture, DHT11, PIR (intruder detection system), and pressure sensors are attached to the arduino microcontroller input pins in this device. The sensed sensor values are shown in LCD. If the sensed value reaches the threshold values specified in the system, the relay circuit automatically switches the pump ON / OFF and it is connected to the driver circuit which helps to turn the voltage.

An IoT-based irrigation network seeks to use embedded system technologies to improve agriculture. The device reads the soil moisture, temperature and electrical conductivity of the soil after getting sensors attached to the controller and then the sensed data are stored in the processor. The system's decision-maker is the microcontroller. It checks the value of moisture and the temperature. The threshold value of moisture and temperature must be defined initially. The sensor searches for the temperature as the perceived moisture value approaches the threshold value. Therefore where the perceived temperature value reaches the threshold value is irrigated and the customer is remembered.

That is because if the temperature is low, both crops will tolerate moisture in the dry soil conditions. This will protect the water used for irrigation Sending SMS across the field to the user helps the consumer to control the agricultural region remotely. The SMS provides warning to the impacted device and advice to it.

## 4.1. ADVANTAGE OF PROPOSED SYSTEM:-

- Easy and effective
- Conserves water used for irrigation
- Accurate sensing
- Small maintenance costs
- Approval by field users

## 5. Block Diagram:-

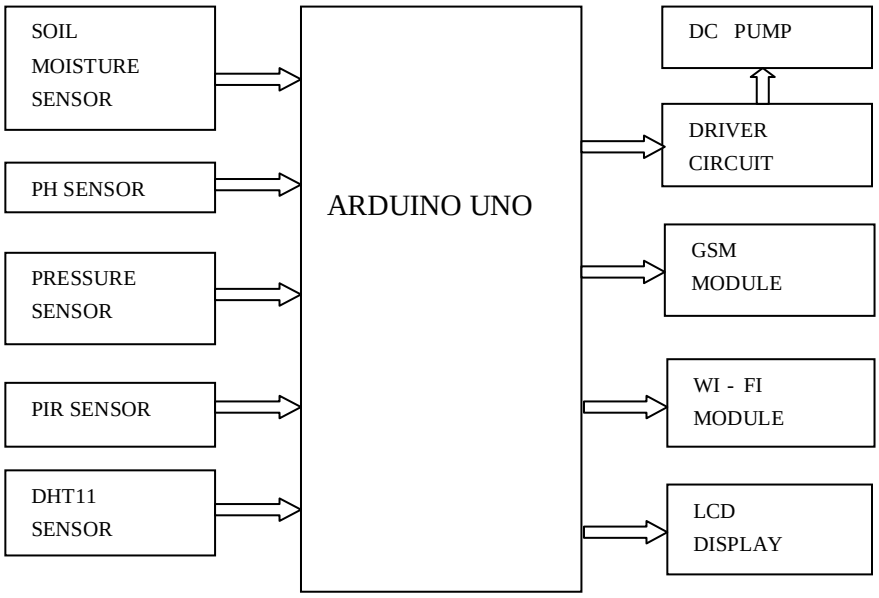


Fig 5.1. **Block Diagram**

### 5.1. ARDUINO UNO:-

The Microcontroller used here is an Arduino UNO. The UNO is an ATMEGA 328P based microcontroller unit. The ATMEGA 328P has 32kB of flash memory to hold information. The board has 14 optical pins for input and output, 6 analog inputs, 16 MHz quartz crystal, USB, ICSP cable, and a reset switch. The UNO can be configured using tools from Arduino.

### 5.2. SENSORS

#### 5.2.1. SOIL MOISTURE SENSOR:

The sensor Soil Moisture is used to determine the moisture level of the soil. If the sensor detects the soil moisture value above the threshold point, the digital output will be low level (0V) and, if it is below the threshold level, the digital output will be high level (5V). Using the wireless button, the present soil moisture value is read explicitly to see whether it is above threshold or not. With the help of a potentiometer the threshold voltage may be controlled.

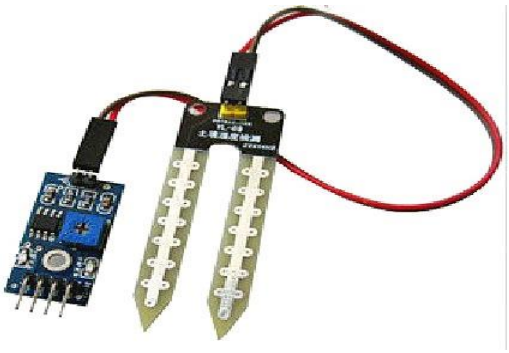

**Fig.5.2.1. soil moisture sensor**

### 5.2.2. TEMPERATURE SENSOR

The LM35 series are precision integrated circuit control machines with a linear-proportional output voltage to Centigrade control. The LM35 unit has an benefit over Kelvin-calibrated linear temperature sensors, because the consumer is not expected to remove a significant constant voltage from the display to achieve convenient Centigrade scaling. No external adjustment or trimming is needed for the LM35 system to provide standard accuracies of ±1⁄4 ° C at room temperature and ±3⁄4 ° C over a maximum temperature range of −55 ° C to 150 ° C. Lower costs are guaranteed by wafer-level trimming and adjustment. The LM35 device's low-output impedance, linear performance, and precise inherent adjustment render it especially simple to communicate with read or monitor circuitry.

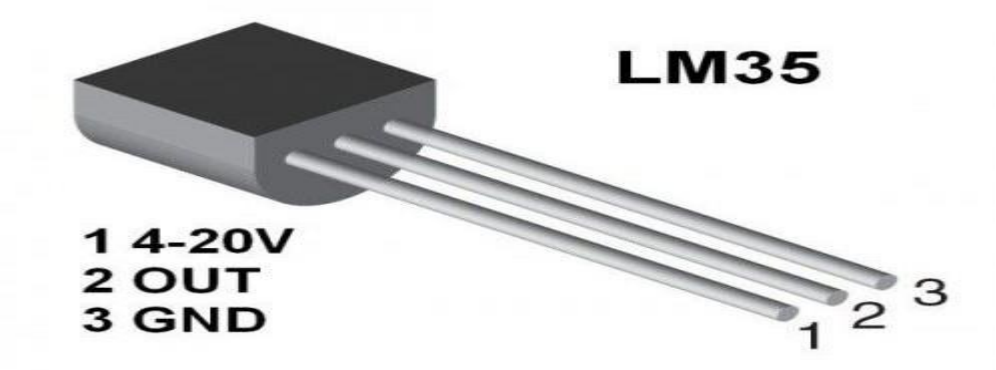


**Fig 5.2.2. Temperature Sensor**

### 5.2.3. PH SENSOR

PH is the indicator of water solution acidity or alkalinity and is calculated by the total amount of ions found in hydrogen (H+) or hydroxyl (OH-). The pH meaning (below 7) is said to be acidic, and is said to be simple (above 7). A solution's pH may differ with temperature, respectively.

### 5.2.4. DHT11 SENSOR

DHT11 sensor is used to calculate humidity and temperature. To test ambient air it requires a capacitive humidity sensor and a thermistor. This sensor is cost-effective, offers low power consumption and it can relay up to 20 meters of signal.

### 5.2.5. PRESSURE SENSOR

The differential pressure transmitter is used to calculate differential pressure track, PCB can turn it into a differential pressure signal, enabling it to be used for weather forecasting.

### 5.2.6. PIR SENSOR

It is a Passive Infrared sensor which detects movement with Infrared radiation variation. At an angle of ±15 degrees it will extend up to 10 metres. As with the motion detector, PIR is the same as outdoor light and responds to motions produced by artifacts that radiate heat.

## 5.3. WI-FI MODULE

The ESP8266 Wi-Fi module is a self-contained SOC (System on Chip) with embedded TCP / IP (Transmission Control Protocol / Internet Protocol) protocol stack that can provide connectivity to any WiFi network through any microcontroller. Each ESP8266 module comes with pre-programmed sense, to get Wi-Fi capabilities it can simply be hooked up to Arduino computer. This module has a strong enough on-board mechanism and a large storage space that enables it to be combined with the sensors and other different devices for the application.

## 5.4. GSM MODULE

GSM (Global Mobile Communication System) is a framework established by the European Telecommunication Standards Institute (ETSI) to define the protocols used by mobile phones for second-generation (2 G) wireless cellular networks. GSM defines a wireless, circuit-switched network designed for complete duplex voice telephony and often extended to provide internet communications, GPRS (General Packet Radio Services) packet internet transport. In realistic words, the maximum distance promoting GSM requirements is 35 kilometers (22mi).

**Fig 5.4. GSM Module**

## 6. Implementation:-

### 6.1 HARDWARE CONNECTIONS

The planned device contains multiple sensors and machine controls. They all need to be incorporated in such a way as not to impact the results for any reason. The soil moisture sensor and the Arduino uno board are interfaced as follows. The moisture sensor is comprised of four wires, analog and digital panel, vcc and field. It works at 5V voltage.

The analog button on the arduinouno board is interfaced with each of the analog input pins. The sensor is then positioned within the soil to measure the substance of moisture.

The LM35 temperature sensor is interfaced with the device in the same way as the humidity sensor. LM35 has three pins, one for voltage, one for ground and one for interpreting analog inputs. The 5V voltage is required for its successful activity. The following figure provides the LM35 and Arduino Device circuit link.

### 6.2 SOFTWARE IMPLEMENTATION

Implementation of the program involves deployment of the Arduino device IDE into the framework. Microcontroller requires basic coding, and can be imported for implementation into the monitor.

The moisture cap value is calculated to be 800. If the perceived moisture is greater than 800, this indicates low moisture and irrigation of the soil is needed. If the sensed value is less than 800 it implies that the soil has ample water.

## 7. Conclusion:-

This research lays forth the concept of an automated irrigation network based on IoT.

The proposed program will slash farmers' efforts and produce large yields.

It also maintains water for irrigation by placing the sensor in the correct location above ground level. This work has shown that when the temperature is moderate, plants can still sustain at low humidity levels. Through evaluating more than one aspect, this program has become an effective one for field management.

A smart irrigation device's main aim is to make it more advanced, user-friendly, time-saving and more effective than the existing network.

The calculation of four parameters such as soil moisture, temperature, humidity and pH values and the system also offers intruder tracking process. Farmer can at any stage know about the life of the crop sector, anywhere, thanks to server updates.

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