

# Optimized Irrigation System using IoT on Cloud based Weather Monitoring

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**Abstract** - Internet of Things (IoT) is a shared network of objects or things which can interact with each other provided there is internet connection. IoT based crop-field monitoring and automated irrigation system which also can be called Smart farming system can help to reduce wastage, by enabling the effective usage of fertilizer and soil water thereby increasing crop yield. This system is built to monitor crop-field using sensors (Water level Sensor, pH sensor, Rain sensor,Ultrasonic sensor,Soil moisture Sensor, temperature sensor, humidity sensor) and to automate the irrigation system. The data from sensors are sent to the webpage using wireless transmission. The data can be visualized on the designed Web page where the readings from the sensors can be viewed. The irrigation is automated in that irrigation is only enabled when the soil moisture of the field falls below the threshold for optimal crop growth. The notifications are sent periodically to the web page as well as the mobile app developed for farmers. The farmer can monitor the field conditions anywhere, anytime.

**Key Words** : *Temperature Sensor, Humidity Sensor, Rain Sensor, pH Sensor, Water Level Sensor, UltraSonic Sensor, MicroController , Power Supply.*

## 1.INTRODUCTION

Internet of Things (IoT) is the interconnection or network of physical devices that is interrelated computing devices, digital and mechanical machines, people or animals, objects that can sense, accumulate and transfer data over web without any human involvement. Everything is provided with unique identifier. It is a progressed examination and mechanized frameworks which uses detecting, organizing, enormous information and man-made consciousness innovation to convey total framework for an administration. Basically IoT

is about extending the power of internet beyond smart phones and computers.

IoT has changed today's world. Smart cities, smart car, smart homes everything around us can be turned into a smart device with the help of IoT. It also has applications in agriculture, business sectors, healthcare, transport and logistics.

There are four main components of IoT-

- a)Low power embedded system- High performance and less battery consumption are the inverse factors that play an important role in design of electronic system.
- b)Cloud computing- Data collected from devices is stored on reliable storage servers so here cloud computing comes into action.
- c)Availability of Big Data- As IoT is highly dependent on sensors that are real time. So the usage of electronic devices is spread throughout every field that is going to trigger a massive flox of data.
- d) Network connection- For communication, internet connectivity is necessary where each physical object is assigned by an IP address. A network connection is build between the devices with the help of these addresses Technology today has not reached its 100% capability. So the advantages and disadvantages of this technology are given below-

### EXISTING SYSTEM

- The agriculture farm is controlled by monitoring and automation with embedded technology.
- The drip irrigation system is used to water the plant to reduce human system.

- Implementation of agri monitoring without inbuilt WiFi module with GSM enabled notification.

DISADVANTAGESG:

- Diseases & pests may spread quickly.
- System failure threats .
- Water and electricity risks.
- Organic debates.

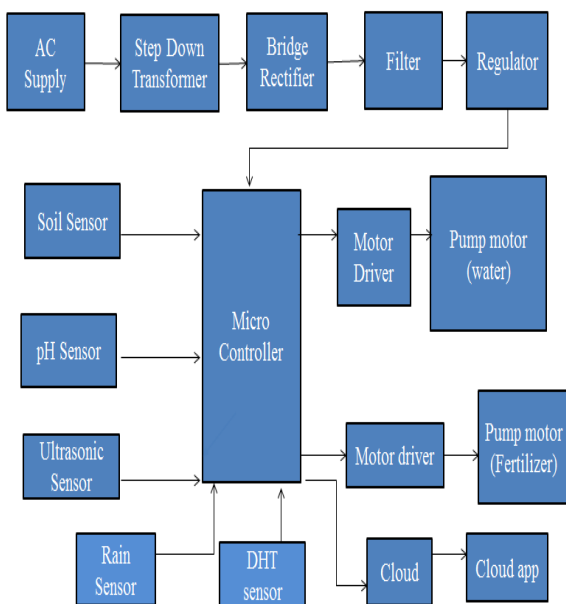
PROPOSED SYSTEM:

- a)In this project we used the “INETRNET OF THINGS” technology to maintain the field in good manner.
- b)If the water level in soil get decreases the motor automatically ON and the water will flow in the field.
- c)It also enhances the system with mail and telegram notifications rather than SMS technology .
- d)PH sensor used to monitor the field status to give the respected fertilizer to the field
- e)It also enhances the system with temperature and humidity level monitoring in a timely manner
- f)Ultrasonic sensor is used to monitor the plant growth level
- g)Rain sensor is used to sense the rainfall status in the field.

ADVANTAGES

- AI in Precision Agriculture provides better efficiency and accurate results.
- Improves plant growth.
- Fertilizing and pesticides can be automatically applied to the plant without human help.

BLOCK DIAGRAM:



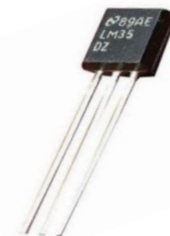
HUMIDITY SENSOR

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. A humidity sensor work by detecting changes that alter electrical currents or temperature in the air. Humidity sensors are used for determining the moisture content. Therefore, an accurate and precise means of testing moisture content in grain will help farmers monitor their crops. With the aid of monitoring, farmers may dry their grain until the preferred moisture content is achieved.



TEMPERATURE SENSOR

- Temperature sensor is used to measure temperature readings through electrical signals.
- The sensor is made up of two metals, which generate electrical voltage or resistance once it notices a change in temperature



THERMAL CONDUCTIVITY AND HUMIDITY SENSOR

Thermal Conductivity Humidity Sensors are also known as Absolute Humidity (AH) Sensors as they measure the Absolute Humidity. Thermal Conductivity Humidity Sensors measure the thermal conductivity of both dry air as well as air with water vapor. The difference between the individual thermal conductivities can be related to absolute humidity.

HC - SR04 ULTRASONIC SENSOR

HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. The following guide is

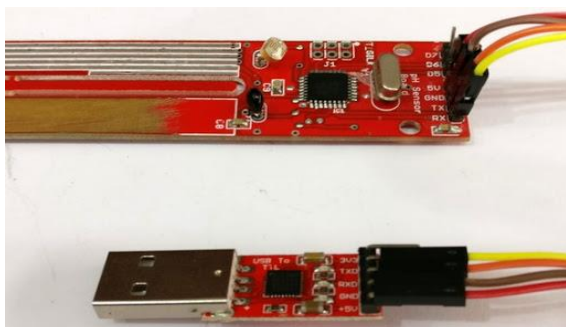
universally since it has to be followed irrespective of the type of computational device used. Power the Sensor using a regulated +5V through the Vcc and Ground pins of the sensor. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller. To start the measurement, the trigger pin has to be made high for 10µs and then turned off. This action will trigger an ultrasonic wave at frequency of 40kHz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor.



The amount of time during which the Echo pin stays high is measured by the MCU/MPU as it gives the information about the time taken for the wave to return back to the Sensor. Using this information the distance is measured as explained in the above heading.

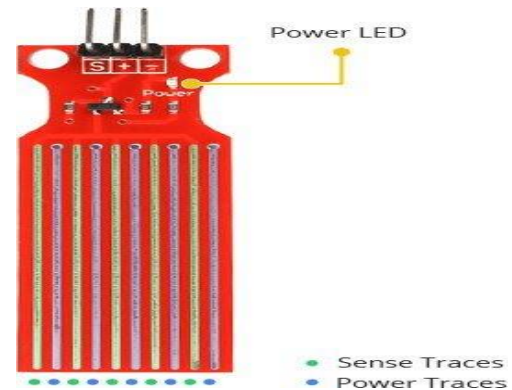
**PH SENSOR**

The Model PHE-45P pH Sensor measures the pH of aqueous solutions in industrial and municipal process applications. It is designed to perform in the harshest of environments, including applications that poison conventional pH sensors. All seals are dual o-ring using multiple sealing materials. The sensor is designed for use with the OmegaPHTX-45 Monitor/Analyzer.



**Rain Sensor**

- The sensor has a series of ten exposed copper traces, five of which are power traces and five are sense traces. The working of the Rain sensor is pretty straightforward
- The series of exposed parallel conductors, together acts as a variable resistor (just like a potentiometer) whose resistance varies according to the rain level.
- The change in resistance corresponds to the distance from the top of the sensor to the surface of the water.
- The resistance is inversely proportional to the height of the water:
- The more water the sensor is immersed in, results in better conductivity and will result in a lower resistance.
- The less water the sensor is immersed in, results in poor conductivity and will result in a higher resistance.
- The sensor produces an output voltage according to the resistance, which by measuring we can determine the water level.
- These traces are interlaced so that there is one sense trace between every two power traces. Usually these traces are not connected but are bridged by water when submerged.



**PUMP MOTOR**

The working principle of a water pump mainly depends upon the positive displacement principle as well as kinetic energy to push the water. These pumps use AC power otherwise DC power for energizing the motor of the water pump whereas others can be energized other kinds of drivers like gasoline engines otherwise diesel.

The water pump is a portable device and can be applied in several household applications. These pumps are used for pumping the huge amount of water from one place to another.

The main purpose of a water pump is versatile. A quality pump which can be selected carefully may be perfect for draining water from a low flooded region, refilling the

swimming pool, and bathtub, circulating pesticides otherwise fertilizers. The collection of water pumps are very large, therefore, while selecting a strong and consistent one, one should think about the requirement.

Water pumps are classified into two types namely positive displacement and centrifugal. These pumps are mainly designed for supplying water from one location to another constantly. Water pumps are used for dewatering reasons decreasing the downtime from huge rain events. The common applications of these pumps include buildings, wells, boost application, circulation of hot water, sump pits, protection of fire systems, etc

Thus, this is all about water pumps which are frequently used in construction fields for removing surplus water as well as dewatering. Because of heavy rains, the flow of water can increase & water pumps let you supply the water rapidly to reduce downtime. These pumps are appropriate for applications like electric, hydraulic, gas-powered, and otherwise manual.

These pumps are vast addition to our life because they make possible a huge variety of industrial, agricultural and household tasks. But, the variety of water pumps in the marketplace is so adaptable and plentiful that selecting the correct pump appropriate for your requirements is challenging.

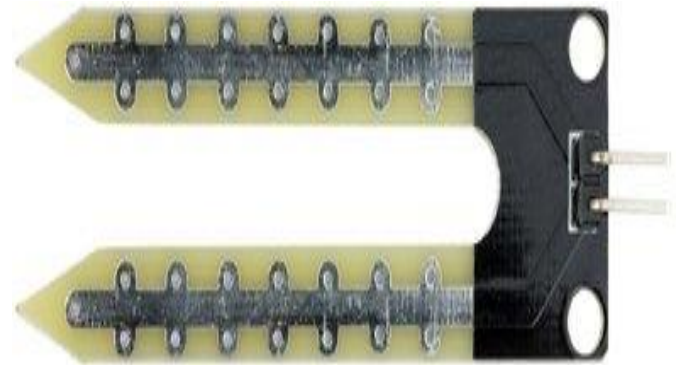


## SOIL MOISTURE SENSOR

The working of the soil moisture sensor is pretty straightforward. The fork-shaped probe with two exposed conductors, acts as a variable resistor (just like a potentiometer) whose resistance varies according to the water content in the soil. A typical soil moisture sensor has two components.

The sensor contains a fork-shaped probe with two exposed conductors that goes into the soil or anywhere else where the water content is to be measured.

Like said before, it acts as a variable resistor whose resistance varies according to the soil moisture.



## ARDUINO IDE

In this chapter, we will learn about the different components on the Arduino board. We will study the Arduino UNO board because it is the most popular board in the Arduino board family. In addition, it is the best board to get started with electronics and coding. Some boards look a bit different from the one given below, but most Arduinos have majority of these components in common.

Various kinds of Arduino boards are available depending on different microcontrollers used. However, all Arduino boards have one thing in common: they are programmed through the Arduino IDE. The differences are based on the number of inputs and outputs (the number of sensors, LEDs, and buttons you can use on a single board), speed, operating voltage, form factor etc. Some boards are designed to be embedded and have no programming interface (hardware), which you would need to buy separately. Some can run directly from a 3.7V battery, others need at least 5V.

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are –

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).

- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

### PROTEUS 8

It is a software suite containing schematic, simulation as well as PCB designing.

- ISIS is the software used to draw schematics and simulate the circuits in real time. The simulation allows human access during run time, thus providing real time simulation.
- ARES is used for PCB designing. It has the feature of viewing output in 3D view of the designed PCB along with components.
- The designer can also develop 2D drawings for the product.

### Features

ISIS has wide range of components in its library.

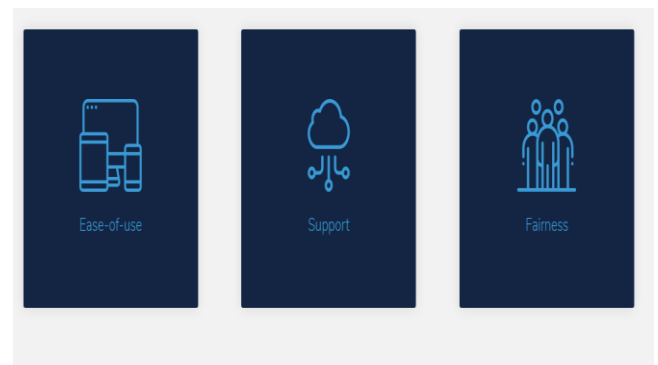
It has sources, signal generators, measurement and analysis tools like oscilloscope, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, switches, displays, loads like motors and lamps, discrete components like resistors, capacitors, inductors, transformers, digital and analog Integrated circuits, semiconductor switches, relays, microcontrollers, processors, sensors etc.

ARES offers PCB designing up to 14 inner layers, with surface mount and through hole packages. It is embedded with the foot prints of different category of components like ICs, transistors, headers, connectors and other discrete components. It offers Auto routing and manual routing options to the PCB Designer. The schematic drawn in the ISIS can be directly transferred ARES.

### UBIDOTS CLOUD

Ubidots is an IoT Platform empowering innovators and industries to prototype and scale IoT projects to production. Use the Ubidots platform to send data to the cloud from any Internet-enabled device. ... Your data will be protected with two more replication, encrypted storage and optional TLS/SSL

data support. Ubidots delivered end-to-end IoT solutions in tandem with its partner and co-founding company Netux, to remotely monitor, control, and automate processes for healthcare clients as well funded startups and Fortune 1,000s in the American Southeast and across Latin America.



### About Ubidots: IoT Analytics and Visualization

Ubidots is an Internet of Things (IoT) data analytics and visualization company. We turn sensor data into information that matters for business-decisions, machine-to-machine interactions, educational research, and increase economization of global resources. Ubidots exists as an easy and affordable means to integrate the power of the IoT into your business or research. Ubidots technology and engineering stack was developed to deliver a secure, white-glove experience for our users. Device friendly APIs (accessed over HTTP/MQTT/TCP/UDP protocols) provide a simple and secure connection for sending and retrieving data to and from our cloud service in real-time. Ubidots' time-series backend services are performance optimized for IoT data storage, computation, and retrieval.

Our application enablement platform supports interactive, real-time data visualization (widgets), and an IoT App Builder that allows developers to extend the platform with their own HTML/JS code for private customization when desired. Ubidots exists to empower your data from device to visualization.

## CONCLUSION

The proposed model explores the use of IoT (Internet of things) in the agriculture sector. This model aims at increasing the crop yield by helping in predicting better crop sequence for a particular soil. ubidots helps in real time sampling of the soil and hence the data acquired can be further used for analysing the crop. We have also taken many readings of the soil moisture, temperature and humidity, PH of the environment for various days at different times of the day. Data on the cloud also helps the agriculturists in improving the yield, evaluating the manures, illness in the fields. This system is cost effective and feasible. It also focuses on optimizing the use of water resources which combats issues like water scarcity and ensures sustainability. This model focuses on the utilization of IoT in agriculture and the solutions proposed in this paper will improve farming methods, increase productivity and lead to effective use of limited resources.

## FUTURE SCOPE

It includes making different data mining algorithms suitable for data analysis in agriculture. This would make the predicting and analysing processes more accurate.

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