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# IOT Based Auto Irrigation System Using Soil Moisture Sensor

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## ABSTRACT

The paper is designed to develop an automatic irrigation system which switches the pump motor ON/OFF on sensing the moisture content of the soil. In the field of agriculture, use of proper method of irrigation is important. The advantage of using this method is to reduce human intervention and still ensure proper irrigation. The project uses an 8051 series microcontroller which is programmed to receive the input signal of varying moisture condition of the soil through the sensing arrangement. This is achieved by using an op-amp as comparator which acts as interface between the sensing arrangement and the microcontroller. Once the controller receives this signal, it generates an output that drives a relay for operating the water pump. A WiFi modem is interfaced to the microcontroller to send the current status of the soil and water pump. The sensing arrangement is made by using two stiff metallic rods inserted into the field at a distance. Connections from the metallic rods are interfaced to the control unit. This concept is more enhanced by integrating IOT(internet of things) technology, such that whenever the water pump switches ON/OFF, the concerned person or the farmer using this system get to know about it through the web page regarding the status of the pump.

**Keywords :** WiFi Modem , Internet of Things.

## I. INTRODUCTION

The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes to waste. At the present era, the farmers have been using irrigation techniques in India through manual control in which farmers irrigate the land at the regular intervals. This process sometimes consumes more water or sometimes the water reaches late due to which crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic micro controller based auto irrigation system in which the irrigation will take place only when there will be acute requirement of water.

A method to reduce the problems associated with farming and as well increase food crop production is the implementation of a controlled technique to meet the soil The Intel MCS-51 (commonly termed **8051**) is an internally Harvard architecture, complex instruction set computing (CISC) instruction set, single chip microcontroller (µC) series developed by Intel in 1980 moisture requirement for different food crops grown in respective locations. Automatic irrigation is a form of irrigation system designed to control the irrigation in accordance with the crop requirements. In this system information of various parameters such as soil moisture content, humidity, etc., are sent to a microcontroller by sensors. The microcontroller uses this information to regulate irrigation by turning on or off a water supply. Previous technologies are developed by using distributed wireless sensor networks. Temperature and moisture sensors are fixed under the root zone of the plants to find the humidity present in the corps.

Temperature and moisture data are transmitted to the web page by using the GPRS technology we can access and view the data's and also an alert SMS will be send to the particular mobile when these data's are exceeded to the threshold values.

## II. DESIGN AND IMPLEMENTATION

The main objective of the project is providing Water Management in Irrigation System with monitor and controls the parameters in agriculture sectors. The proposed system has been designed to overcome the unnecessary water flow into the agricultural lands. The proposed system allows users to continuously monitor the water level in the field, remotely on a mobile application through internet. The mobile application can be used to shut the water supply automatically, irrespective of the physical location of the user, provided the user has internet connectivity. Thus the task of switching off the motor manually has been automated. The smart irrigation system can be installed in farms to monitor the moisture content of the soil continuously. It would turn on the sprinklers automatically when water content of the soil goes below a certain level. The user can check if the farm is well irrigated remotely on the mobile application, without visiting the farm. These systems would improve the livelihood of farmers extensively. Extraction of high level information from raw sensory data is one of the most important aspects of IOT. The machine interpretable data is processed to obtain useful information, which is the basis of implementation of the proposed model. The microcontroller, is the main component of the system. It controls the digital connections and acts as a bridge between the sensors and the mobile phone application. The Wi-Fi module connects the microcontroller board to the hotspot providing access to the Internet. It is then transmits the readings to the mobile application over the Internet.

## III. METHODOLOGY

The algorithm has following stages:

**Step 1:** Begin the process.

**Step 2:** The initial power is supplied to microcontroller from transformer.

**Step 3:** Check soil moisture level and the humidity level.

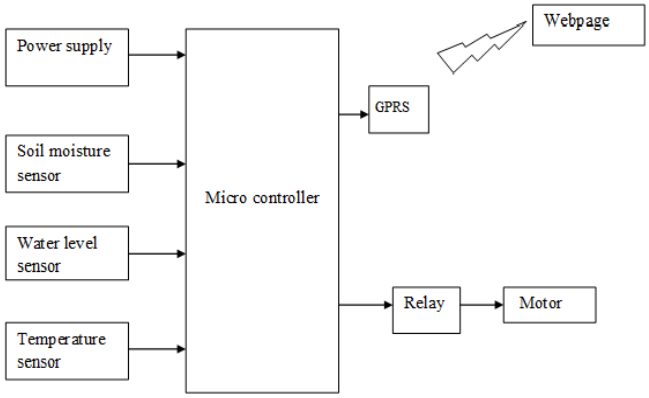
**Step 4:** If soil moisture content is greater than a fixed value, then there is no need of irrigation.

**Step 5:** If the soil moisture content is less than a fixed value, then start irrigation, same as for humidity, start sprinkler.

**Step 6:** When the water reaches the prescribed point of water level sensor then the irrigation system stops itself and send the message about the moisture content and the humidity.

**Step 7:** User can operate the system remotely through a web page.

### 3.1. BLOCK DIAGRAM




**Figyre 3.1.** IOT Based Auto Irrigation System

### 3.2. SOIL MOISTURE SENSOR

Measuring soil moisture is very important in agriculture to help farmer for managing the irrigation system. Soil moisture sensor is one who solves this. This sensor measures the content of water. Soil moisture sensor uses the capacitance to measure the water content of soil. It is easy to use this sensor. Simply insert this rugged sensor into the soil to be tested, and the volumetric water content of the soil is reported in percent.

### 3.3. HUMIDITY SENSOR*:*

The humidity sensor is used to measure humidity of the field. This sensor senses the field humidity and is connected to the microcontroller. We have to set points of humidity as 54%to 80% for standard irrigation but it changeable according to the climate and the type of soil

### 3.4. 8051 MICROCONTROLLER

For use in embedded systems.

### 3.5. GPRS MODULE

General Packet Radio Service (**GPRS**) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM). The Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial port.

### 3.6. WEB PAGE

A web page is a web document that is suitable for the web browser and World Wide Web. The language used here is PHP. It is a server side scripting language designed for web development. PHP code may be embedded into HTML code or it can also be used in Combination with various web frameworks, web content management, web template systems. In the web server PHP code is processed by PHP interpreter. In web page the values regarding soil moisture and temperature are displayed. By web page user can make the irrigation system ON and OFF remotely.

### 3.7. INTERNET OF THINGS

The internet of things collect and exchange data which is a network of vehicles, buildings, physical devices and other items embedded with sensors, electronics, software and network connectivity . IOT creates opportunity for more direct integration of the physical world into computer based systems which results in accuracy, efficiency and economic benefit. An IP address is used as a unique identifier by devices for integration with the internet.

### 3.8. REGULATOR IC (LM 7805)

The LM7805 monolithic 3-terminal positive voltage regulators employ internal current-limiting, thermal shutdown and safe area compensation, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1.0A output current. They are intended as fixed voltage regulators in a wide range of applications including local (on-card) regulation for elimination of noise and distribution problems associated with single-point regulation. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents. Considerable effort was expended to make the entire series of regulators easy to use and minimize the number of external components. It is not necessary to bypass the output, although this does improve transient response. Input bypassing is needed only if the regulator is located far from the filter capacitor of the power supply.

### 3.9. RESISTOR

Resistor is a component that resists the flow of direct or alternating electric circuit. Resistors can limit or divide the current, reduce the voltage, protect an electric circuit, or provide large amounts of heat or light. They are often color coded by three or four color bands that indicate the specific value of resistance. Resistors obey ohm's law, which states that the current density is directly proportional to the electric field when the temperature is constant.

## IV. RESULTS

Irrigation system is based on the soil moisture and humidity. Sensors are placed in the farm. Distance between the two sensors is based on the type of soil in farm. Micro-controller and sensors are used for capturing the moisture content in soil. Depending on the moisture content present in the soil, irrigation system works. Soil moisture and temperature values are displayed on the web page using PHP script. Sensor data is stored in the cloud. By Uniform Resource Allocator (URL) user can access the web page and by this user can monitor and control the system. This system provides several benefits and can be operated with less manpower. Over-watering and under-watering affects the crop so proper amount of water should be supplied. By analysing the soil parameters system waters the farm.

**MODE 1- MOISTURE LEVEL IS HIGH**

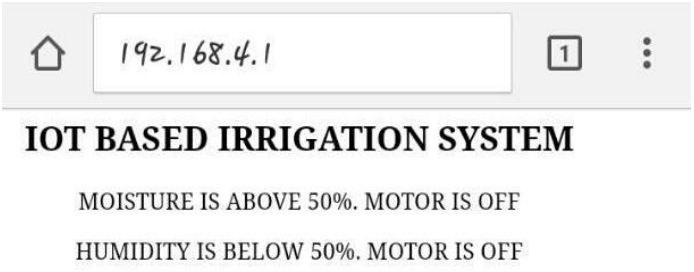



**Figure 4.1.** When Motor is OFF

**MODE 2- MOISTURE LEVEL IS LOW**

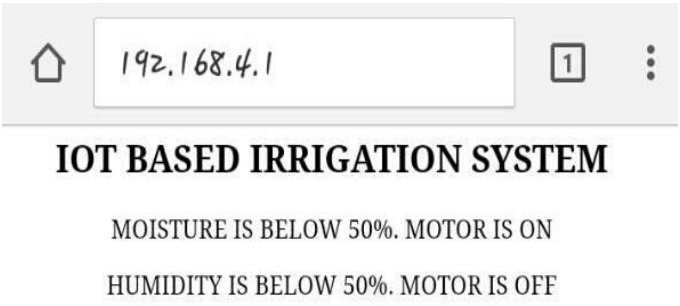



**Figure 4.2** When Motor is ON

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