# **Design & Implementation Of Real-time Crop Management System By Using Arduino & IoT**

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ABSTRACT : Now a days it's a challenge to enhance development of plant in respect of its growth and to cut back costs which ends up in an innovative idea of using crop monitoring with IOTs system which is able to further help in better management of water and human resources. An crop monitoring with IOTs system using GSM are developed using sensors technology with Arduino UNO and GSM module to efficiently utilize water for irrigation purpose. This project consists of microcontroller ATmega328 family which collects the input signals within the soil through soil moisturing sensor. GSM module receive the request call and send the all current status of sensor riding through SMS. An LCD screen is additionally linked to the micro- controller to indicate moisture conditions of the soil and water pump. The water level sensor is employed to detect the extent of tank so tank contains efficient water to transfer into crops.

## Keywords - Arduino, wireless sensor network, sensors, IoT, Agriculture.

#### I. INTRODUCTION

One of the main things which are required for the survival of human life is the food. Unfortunately the farmers in our country use the traditional methods for farming. But as the time goes on the methods of farming also evolved. Agriculture is one of the main aspects of enrichment of a nation. Agriculture is the backbone of financial system of country like India. Because, most of the land of our country is fertile and also supports various kinds of crops. Like wheat from Punjab, Maharashtra, Haryana. Rice from the southern states like Tamil Nadu, Kerala, Andhra Pradesh, Maharashtra, Karnataka and many more states cultivates different kinds of crops. This traditional method of farming can be overcome by advanced modern technologies. As the agriculture is one of the main aspects of financial sector, it is the need of an hour to introduce the automation in agriculture which will relatively increase the crop yield and will help the economy very much. This automation can be introduced with the help of Wireless Sensor Networks (WSN). In the wireless sensor network, it is the self-configuring network which communicates with each other with small sensor nodes and provides information to the system with the help of broadcasting signal. This WSN contains various sensors like MQ-2, MQ-135, MQ-7 and other sensors which will collect data from field and transfer that data to the arduino system. With the combination of GSM technology the field information will be provided to the farmer via SMS.

#### **II. WIRELESS SENSOR NETWORK**

Wireless Sensor Network (WSN) is a network which consists of various sensors that works wirelessly. Sensor is device which measures a physical value and converts it into an observer or by an instructor. There are several types of sensors are present such as thermal, electromagnetic, mechanical, chemical, optical radiations and so on. WSN are network that consists of sensors which are distributed in an ad-hoc manner. Using this sensors we can determine various physical and environmental conditions such as temperature, sound, pressure, home automations, traffic control, health care applications. As shown in figure 1 there are various sensor nodes which are connected to each other and forms a chain which is connected to the gateway sensor node. Your mobile, laptop, tablet is acts as a wireless node in the wireless sensor network. Some characteristics of WSN is that it can also be deployed in extreme environmental condition, it can also be used to detect enemy drones, fighter planes & Unmanned Arial Vehicle (UAV) in the defence sector.

#### 2.1 ARDUINO

Arduino is a hardware component used for building electronics projects. Arduino is made up of both a physical programmable circuit and a bunch of software, or IDE (Integrated Development Environment) that runs on your computer. It is having input, output pins & AC connector as shown in below figure 2.1



Fig 2.1 Arduino

## 2.2 SOIL MOISTURING SENSOR

The Soil Moisture Sensor is used to detect water content of soil. This sensor can be used in various fields of soil science, agricultural science, environmental science, horticulture, botany, and biology. The Soil Moisture Sensor uses capacitor to calculate the water content of soil (by measuring the dielectric permittivity of the soil, which is a function of the water content). As shown in the figure 2.2, two metal pins are deep inserted into the soil and the moisture present in the soil is shown in the form of percent of the screen.



## 2.3 LDR (LIGHT DEPENDENT RESISTOR):

A Light Dependent Resistor (LDR) is a register which totally depends upon the light. The amount of resistance determines by the light whether it is low or high. The best example of LDR is the street light system which automatically turns ON or OFF.



## 2.4 MQ2:

MQ2 sensor is also known as gas sensor, this gas sensor senses the different kind of gases such as hydrogen, carbon monoxide, alcohol, methane, propane, carbon dioxide, etc. Its main application is to detect the unwanted gas leakage from an industry or home. It is cheaper, durable & it senses the unwanted gas quite fast.



#### 2.5 MQ7:

MQ7 is a gas sensor which used to detect to carbon monoxide where CO is found in fumes fabricate through burn fuel in car, truck, small engines, stoves, lanterns, grills, fireplaces, gas ranges and furnaces. In this project the MQ7 will detect the carbon monoxide (CO) present in the atmosphere.



Fig 2.5 MQ7

#### 2.6 MQ135:

MQ135 is air quality sensor and also knows as pollution sensor. It detects a broad range of gases, such as NH3, NOx, alcohol, benzene, smoke and CO2. It is highly sensitive to Ammonia, Sulfide and Benze steam, smoke and other harmful gases. It having only four pins :Digital output, Analog output, Ground, Supply (5V).



#### 2.7 DHT11:

DHT11 stand for Digital Humidity and Temperature. It gives the value of temperature and humidity in digital format this sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. This sensor is also factory calibrated, hence easy to interface with other microcontrollers.

Fig 2.7 DHT11

#### 2.8 pH Sensor:

pH sensor is a sensor which commonly used for water measurements. This sensor measure of acidity and alkalinity, or the caustic and base present in a given solution. This sensor generally expressed with a numeric scale ranging from 0-14. The value 7 represents neutrality.



Fig 2.8 pH Sensor

#### 2.9 SIM900A:

SIM900A is a GSM (Global System for mobile communication) is used for communication in mobile devices. It allows to users send or receive SMS, data,voice call.



Fig 2.9 SIM900A

#### **III. IMAGE PEROCESSING:**

Image processing is the method in which various operations are performed on a given image to extract the information about the image. By using this concept, we are trying to identify different types of disease present in the given image of different leaves of crop. The database of various diseases are already stored on the cloud database, the image sent by the Arduino then it will be compared with the available database on the cloud. After comparison it will provide the available information about the crop disease.



Fig 3.0 Image Processing

#### **IV. BLOCK DIAGRAM:**

The block diagram of this project mainly based on the Arduino Mega. The arduino mega is a hardware component that used to control electronic devices. Anduino mega support the microcontroller that simply connect it to a computer with a USB cable or power supply to it with a AC-to-DC adapter or battery to get start. Cloud is referred as a server that can be used to store the large amount of data which is accessible from anywhere at anytime with the help of internet connection. There are mainly three types of clouds: Public, private, hybrid. It has three service models based on Platform, Software & infrastructure. It is known as Platform as a Service(PaaS), Software as a Service(SaaS), Infrastructure as a Service(IaaS), based on this various different kind of services are provided.



Fig: Block Diagram of the design & implementation of real time crop management system

As shown in Figure 4 all the required sensors are connected to it like MQ135,MQ2,MQ7,DHT11,SIM900A,LDR, Soil moisture sensor, ph sensor. This sensors are an input to the arduino microcontroller. The input given by all sensors are then stored in the cloud. SIM900A is a GSM (Global System for mobile communication) is used for communication in mobile devices. It allows to users send or receive SMS, data, voice call.

# **V. SYSTEM FLOW:**



# VI. IMPLEMENTATION:

The implementation of the project follows various steps such as registration page, then login page, user information and logout option.

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Fig6.1 Registration page of the project

The registration page consists of no. of fields such as username, name, contact no., password and it will ask you to re-enter your password after that your account will be created. If you are having already an account then just simply sign-in into the web portal of real time crop management system.





Fig 6.3 Homepage of the system

After the successful login into the account it will directly show the sensor values which are given by the arduino system.

#### VII. RESULT:

In this paper, we have implemented an idea for efficient crop monitoring for agricultural field. With the application of IOT the data can be stored and retrieved from anywhere. In this project, the sensor part is limited only for monitoring of crops and a software portal is established for giving the actual values retrieved from the sensors.

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