

IOT BASED SMART FARMING AND CROP INTENSITY CULTIVATION PRACTICES

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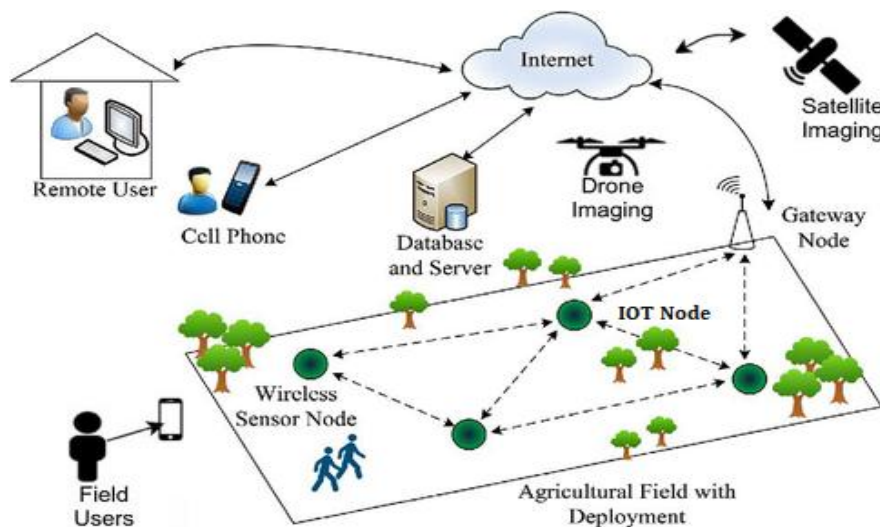
ABSTRACT-

As the world is developing towards new technology such as civic technology, crypto currency, cognitive cloud computing and artificial intelligence it is very much essential that there is a development needed in agriculture sector due to increase in population and decline food production due to various environmental factors. Some developments have been done in the field of agriculture and most of the developments that are network protocol based on placing various sensors in environment field and the work of sensors is to detect such as temperature, pressure, humidity, soil moisture, concentration of gas surrounding so on. Sensing the environment by using sensors is not a great development in yielding crops; the automation must be implemented to help in yielding more crops and development in agriculture too. So IOT based system is implemented to design farming system which ultimately yields better production by smart monitoring so existing food needs due to population diversity in coming years can be resolved.

Keywords: IOT, Smart Farm, Sensors, Embedded System, WSN, Gateway.

1. INTRODUCTION

The Internet of Things is booming technology in current situation for many applications; it is mainly used to connect devices. As the global population will reach about 10 billion in some year and to meet the needs of people for food is so hard. Hence IOT is implemented to design a smart system which ultimately yields better production by smart monitoring and farming so existing food needs due to population diversity in coming years can be resolved. The most important problem facing in present agriculture is the dynamic changes in weather, environment and its impact. IOT help us to and stop these problems and help in more agriculture cultivation [1-3].

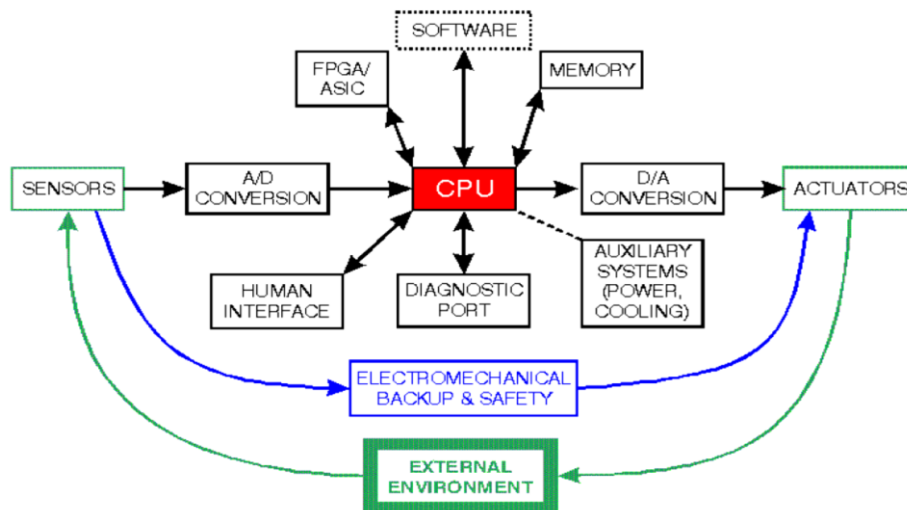


**Figure 1.** Typical IOT Based Agriculture farming

The application of IOT in agriculture are to detect temperature, pressure, humidity, gas detection, flame detection, water level detection, moisture detection in field and so on. IOT help farmer to get the status about their environment field. It helps the farmers to increase their productivity and decrease the active time. The fig. 1 depicts the typical IOT based agriculture farming [4-6]

**2. IOT BASED WSN APPLICATION IN AGRICULTURE FARMING**

An embedded system is commonly referred as a computer system and a combination of processor, memory; it performs function with larger mechanical or electrical system which mainly used to control devices by using embedded system we can perform a single or multiple function it has been designed in that way to perform the functions[7-9]. The main purpose of embedded system in IOT is used to control devices. Some smart farming methods are discussed by D. Boskovic where innovative fire detection in forest was proposed using a wireless sensor network. M. Saoudi talked about systematic mining using the wireless sensor network. P. Dhuliya converse about a finding about a disaster using wireless sensor network. The typical embedded system is shown in fig. 2. [8-10]



**Figure 2.** Block diagram of typical embedded system

**3. ARCHITECTURE & SENSOR DESIGN OF IOT BASED SMART FARMING SYSTEM**

The architecture of IoT based smart farming system consists of Arduino UNO, GSM SIM300, sensor for soil moisture, Temperature, Humidity and water level other sensors that have been used in the proposed model are discussed below:

**3.1 DHT11 Sensor**

DHT11 is used in this method to detect the temperature and humidity in the surrounding method. DHT11 sensor it is very fast responding and it offers a very high quality. It is attached to a 8-bit microcontroller which is a high performing processor. DHT11 sensor is referred as digital sensor which is less cost [11]. This sensor not only a high quality sensor but also give very accurate results in reading the measurement of temperature and humidity. It reads the relative humidity value in the unit of percentage and reads temperature in the unit degree Celsius. DHT11 sensor consists of four pin. In that one pin is dummy pin shows that it is not in use and the other three pins are connected to GND, DATA, VCC supply dc voltage of 3.3 to 5volt, DATA is a digital output pin, GND is connected to ground and NC is not in use. These are the structure of DHT11 sensor. [12]

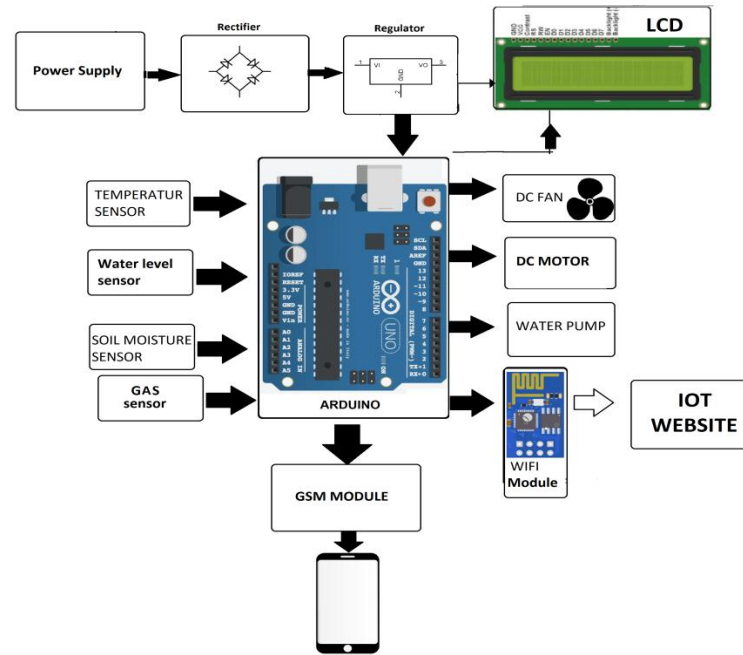


Figure 3. The overview of the System design

### 3.2 Fire Sensor

Fire sensor is also called as flame detection or flame detector. Fire sensor as the name implies this sensor has been used to detect the fire in the environment field. As soon as this sensor detects the fire the fire sensor turns on indicating a light in the fire sensor. To make us indicate about the fire that has happened. The fire sensor has been connected to a buzzer. As the fire sensor detect the fire the sensor turns on and send the signal to the buzzer. The buzzer after receiving the signal from the fire sensor the buzzer gives a sound alarm to indicate that there is a fire accident happens. As said above the fire sensor works in the environmental field [13].

### 3.3 Water level Sensor

In agriculture water plays a very essential role that is one of the important reason in agriculture to yield more crops. Water level sensor is used to find the water level in the tank or in any other material. By using this sensor we can detect the water in the tank is in required level or in below required level. Water level sensor has been connected to a water pump motor[14]. So that level sensor find the water is below the required level then it send signal to water pump motor to pump water from ground. Water level sensor is mainly used to find the water level in the tank. In agriculture as said above water is a very essential thing. So, that water level sensor is very useful in helping to know about the level of water in water tank.

### 3.4 Soil moisture Sensor

The soil moisture sensor detects the condition of the soil in the environmental field. Soil moisture sensor detects the type of soil, moisture level in the soil, nutrients in the soil and quality of the soil. The above said are the most important feature to yield more crops in the agricultural field. So, that soil moisture sensor helps the farmer to get more profit by yielding crops.[15-16]

### 3.5 Gas Sensor

The gas sensor detects the presence of gas in the atmosphere field. It is generally used to detect the concentration in the gas in atmosphere. Various gases are detected by the gas sensors like oxygen, carbon dioxide, nitrogen, methane etc. Gas sensor is mainly used to detect that there is any toxic content in the atmosphere. If there is any toxic content in air it affects in agriculture. So that gas sensor helps in finding way is there is any other gases in atmosphere. As said above gas sensor performs in such a about detecting of concentration of gas in atmosphere. [17]

### 3.6 Buzzer

A buzzer in other name called as a beeper. Buzzer is used as an indicating signal. Buzzer indicates by given a signalling in audio format. As the buzzer it is connected to a fire sensor. When the fire sensor detects fire the

fire sensor turns on and it indicates the buzzer through audio signal. As said above buzzer perform in smart farming.

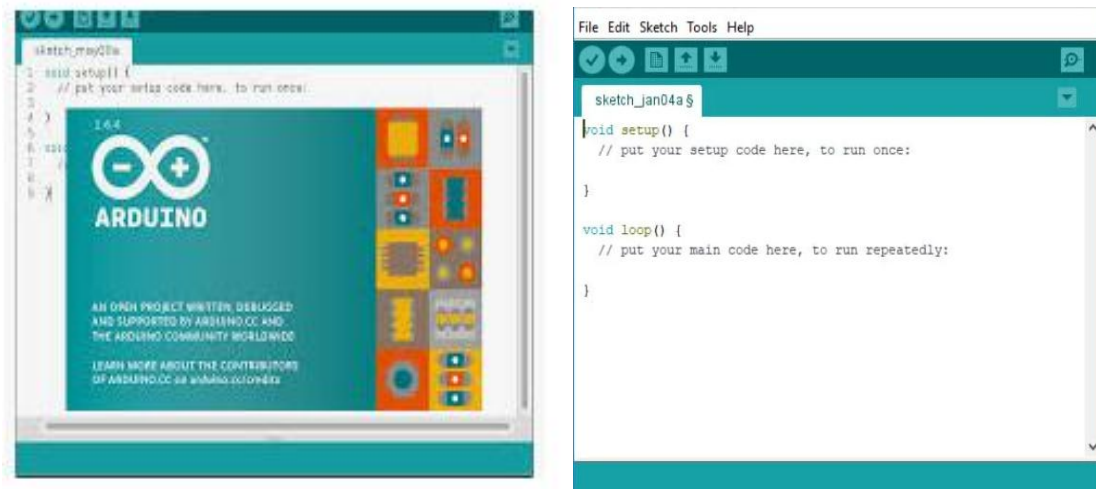
**4. SOFTWARE UTILISE IN IN SMART FARM**

**4.1 Embedded C**

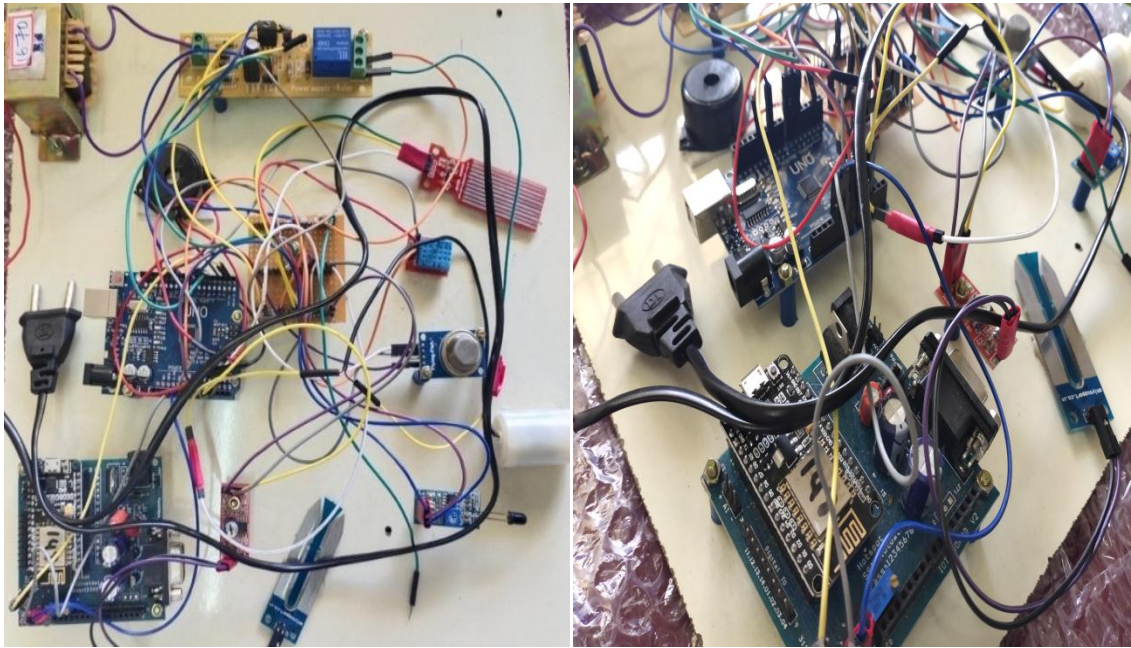
In our daily life hundreds of electronic device are by the embedded like TV, DVD, microwave and digital camera. These devices are composed of microprocessor and microcontroller inside their body. This microprocessor performs several operations. Embedded C is the most prominent embedded software language. Many embedded software is written in embedded C. Embedded C code written is for blinking the LED connection with port 0. Embedded C has a different kind of thought process to use. Embedded systems like camera, TV are designed to perform a single task. They designed like efficient and cheap when performing their task. Thus embedded system we have small hardware, small ram and rom. We want to write the program to run in the processor by maximum effect. Embedded C is programming language lies in high level and low level language. By the speed growth of human population the old farming methods are not able to grow. Thus smart farm method is needed for large growth. embedded system and Internet of things (IOT) jointly helps the SMART System getting famous among the people in coming years too. This paper is described about farming system based on embedded system, IOT and wireless sensor used in farms [18].

**4.2 Arduino IDE**

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller). Arduino software that has being installed to upload code to know about the result of the Arduino Uno board that has connected to the computer. The required programs in the software that is return using arduino software and it is also called as sketches. The fig. 3 shows the Arduino uno board screen.



**Figure 4.** Arduino software & Arduino software code structure



**Figure 5.** Prototype of the Smart Farm system

The above fig. 4 is the prototype of Smart Farming system which shows the various sensors that has been connected to an Arduino Uno board. The various sensors such as DHT11 sensor that has been used to detect the temperature and humidity of the surrounding, soil moisture sensor that has been used to find the type of soil moisture in the soil and the quality of the soil, gas sensor that has been used to detect the presence or concentration of gases in the atmosphere, fire sensor that has been used to detect the fire. Buzzer or beeper is device that has been used as an indication audio signal when there is fire accident happens, water pump motor that has been used when the level sensor shows the water is below the required level then the water pump motor has used to self-dug water from ground. The current status of the field is detected through the sensors and the values have been send through IOT and displayed in web page [19-20]. The entire cost of system design will be low cost and can be commercialised easily, will be added benefit to agriculture reforms.

## 5. CONCLUSION AND FUTURE WORK

In upcoming year and due to the world population increase will be close to 10 billion and to meet up the needs of foods, hence an essential transformation needed in agriculture system i.e. smart farming. The proposed system based on IOT brings a very good impact in agriculture yields. It helps the farmers to know about the accurate details on agriculture field, constant monitoring and knows the correct impact by the environmental changes. The future work in the proposed design is to groom the system so as to adapt for organic based smart farming. This also meets the global requirement of food demands and helps to serve the people in better way. A totally an Eco – friendly system can be implemented.

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