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Survey on Smart Irrigation based on Smart Farming to yield profits using IOT Sensors

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Abstract

Smart irrigation has become one of the primary concepts today as many educated people in India are showing their interest towards farming. As we are the second highest in population all over the world we should have enough food to feed all. Agriculture plays a key role in food production. Food production is purely depending on monsoon conditions because all crops cannot yields in all climatic conditions. Based on the soil condition, climate people plan to cultivate that crop in their irrigation process. Even though the planning is easy the process is very difficult. As the Farmers in India were dedicating their entire life into farming the bitter fact is they are still struggling for their survival. Their primary concern is whether the soil will support the crop growth, whether the crop will dry because of lack of rainfall or is there any chance of floods so that there is a chance that entire crop can get damaged. In the recent times as there are severe floods in India most of the farmers got huge loss. But they have got habituated in cultivating the same crop even though they know that there is a probability of getting loss this time. To overcome this challenge, we can use IOT sensors so that there is no need to worry about irrigation timing as per crop or soil condition. As IoT Sensors are used to sense the data. It can be sensing the soil moisture, temperature, Rainfall or floods. It depends on the type of the sensor we use. The data read by the sensor will be sent to the actuator who performs action based on the data sent be sensor. This technique is very useful for the people who don't have sufficient water .Sensor helps them in giving idea about their soil type so that they can cultivate the crop based on their soil condition. If we give proper awareness for the people in all these aspects then we can automatically reduce loss in cultivation and the one we who is feeding food will not die for hunger.

1. Introduction

Internet-of-Things (IoT) is a very trending topic now in the market. IoT sensors are using in every domain. IoT is playing a vital role in agriculture sector also. As we already know by now more than 10 billion sensors are connected to the internet and every one were moving towards smart way of living (Gayathri, Shunmugam, and Ishwariya) . As farmers are the one who are the ones who are filling our stomach, we have to teach them how

they can become smart farmers by using these sensors. Usually in hilly areas oranges, carrots, apples were grown. Depends upon the weather conditions and soil conditions that particular crop can be cultivated (Gupta and Arakere) .

The primary goal of IoT based Smart irrigation is to find the quality of the soil, weather conditions and to bring awareness in the farmers so that they can get better profits. As food is very valuable and if the food is not properly available then the survival of mankind will be a big problem. To perform all these tasks we are using IoT sensors (Baptist and Dcunha) .

In the proposed system we will be using one of the familiar components which is ARDUINO UNO Board which will be connected to so many sensors DHT-11, Soil Moisture sensor, Rain detection soil. It is totally IoT based application where the sensors connected to the internet will sense or reads the data (Gutiérrez et al.) . The data now will be sent to the actuator via internet. Actuator performs necessary actions based on the data sent by the sensor.

2. Existing system:

In India, agriculture sector plays a very major role and now-a-days people are very much interested into food business as they could achieve more profits. But to get that food agriculture and farming plays a vital role. Most of the farmers still are using the traditional methods of farming as they got habituated to that (Elbasiouny et al.) . Since from our childhood we would be seeing the same crop would be cultivating all the time in our villages because they don't have any idea about farming they are just following the footsteps of their elders. It is not based on the monsoon conditions or soil condition.

Usually most of the places in India will cultivate mango in summer and mango business mostly yields profits only (Kumar et al.) . In every quarter year they will cultivate rice and wheat. But as there are floods this year mango crops were severely damaged and farmers got severe loss. (Miškić, Pukšec, and Duić) If the crop is harvested most of the farmers wait from three months to cultivate next crop. It is because of lack of knowledge about irrigation & cultivation as they don't have awareness about their soil condition (Mohr and Kühl) . It is proven that we can cultivate something or the other in the whole year if we know the condition of our soil. Usually farmers will spend most of their life time into agriculture only. They don't know that irrigation is a science or technique; they just follow it as a routine process. They will go to their field every day to water the plants by turning on the motor (Sayed et al.) . It is a daily mechanism and if there is no water they will wait for the rain. Meanwhile the entire crop will get damaged resulting in huge loss. If they know (D'amato and Korhonen) that their soil can yield good results with enough water when cultivating other plants that consume less water then all farmers will live a happy life in harvesting something not the same all the time throughout the year.

2.1. Drawbacks of existing system:

1. Due to lack of knowledge about soil condition improper cultivation of crops.
2. Farmers are fighting for survival because of loss.
3. Crops can get damaged because of less moisture in the soil.
4. If the soil got damaged because of heavy rainfall the plant will get damaged.
5. Bugs can damage the plant if it is not detected properly.

3. Literature Survey:

Literature survey is mentioned in the Table 1.

4. Proposed System:

To overcome the drawbacks and challenges of existing system we are proposing new methods of irrigation so that agriculture sector will get fruitful results all the time. The primary challenge is lack of awareness for the farmers as most of them were not educated. So we have to give awareness for the farmers by directly interacting with them and teaching them the new methods or smart methods of irrigation. We can even conduct them online classes so that they will understand the truth about agriculture and irrigation. If we understand our soil then soil will give us benefits only. To check the condition of the soil whether the soil is dry or normal or wet all the time we can use a sensor called Soil Moisture sensor.

Some of the components required are :

4.1. Soil Moisture Sensor

Soil moisture sensor is mainly used to check the quality of the soil whether it is a dry land or wet

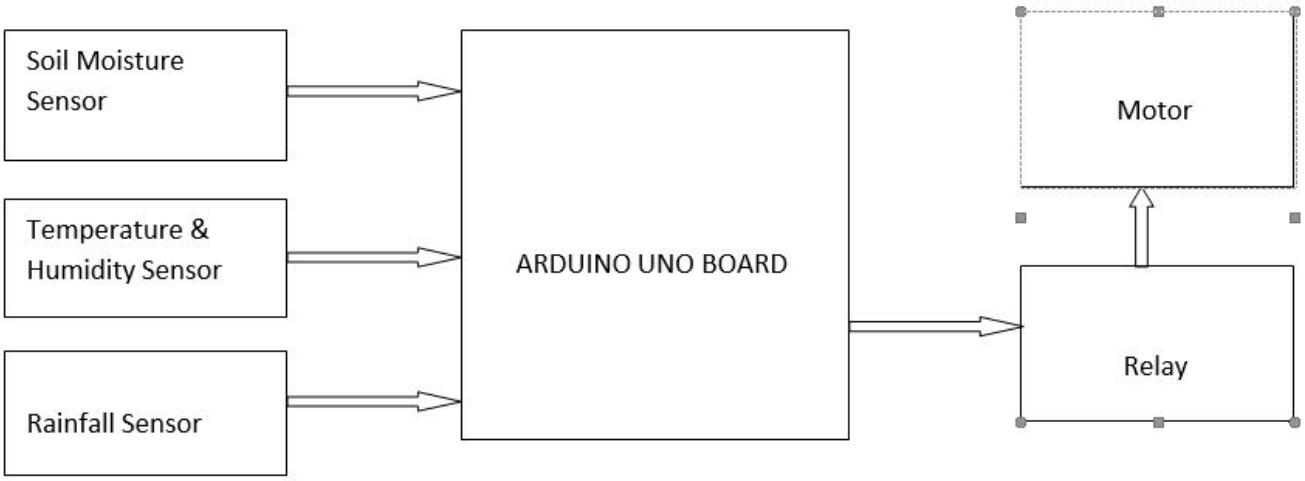

FIGURE 1. Block diagram

TABLE 1. Literature Survey

S.No	Title	Authors	Method used	Shortfall found
1	Smart Irrigation System using IoT	M Gayathri, DArunShunmugam, A Ishwariya	Drip irrigation	It is evident that the pumps and valves are manually operated by a controller and recycling the waste water is not clearly explained.
2	A Study On Smart Irrigation Systems For Agriculture Using Iot	Dr. J. Jegathesh Amalraj, S. Banumathi, J. Jereena John	Water management	Accuracy is less and no proper technique specified to manage water and to monitor the crop.
3.	The Smart irrigation system using IOT	C.Gomathy,Vamsikumar, Mr. B. Karthik, Mr. A. Purushothamreddy	Agriculture using IOT	Proper methodology was not specified
4.	An IoT-Framework-Based Automated Wastewater Irrigation System	Shabana Habib, Saleh Alyahya Muhammad Islam Abdullah M. Alnajim Abdulatif Alabdulatif	Designed monitoring dashboard	Data collection and connection is not accurate
5.	A Study on Smart Irrigation System Using IoT for Surveillance of Crop-Field	Ashwini B V	Automatic irrigation	Sequence diagram is not clear and android mobile application is not feasible.

land. It is mainly used to read the values from the soil. We will get knowledge about our soil quality so that we can pump water to the soil based on that. Depending about the quality of soil farmers can think of alternative crop when one crop is harvested instead of wasting or polluting the soil until the next harvest.

4.2. Rainfall sensor

Rainfall sensor is mainly used to detect the water drops or rainfall. It can be used in all weather conditions. It detects the intensity of the rain. If harvested crop has been stored in farm for drying we

FIGURE 2. Soil type and damages due to heavy rainfall

FIGURE 3. Soil Moisture Sensor

can immediately protect that one by shifting it to a go down or by covering with some sheet if our sensor predicts and informs earlier. As water scarcity is more in India we can even preserve the rainfall water so that it can be useful in the future.

FIGURE 4. Rainfall sensor

4.3. Temperature and Humidity sensor

Temperature and humidity sensor is mainly used to track the temperature and humidity values. We can use DHT-11 or DHT-22 sensors. The sensor senses the temperature and humidity readings and the values will be displayed on the screen. Then the actuator will perform necessary action. If the temperature identified is very high then the humidity level also will be high or vice versa. Based on that we can pump water to the soil.

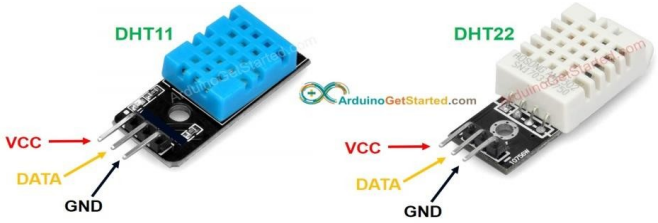

FIGURE 5. DHT-11 & DHT-22

4.4. Node MCU (ESP8266)

It is an open-source IoT platform which mainly consists of 32 pins. It can be used as a replacement for Arduino UNO board as Arduino UNO microcontroller doesn't have WIFI- compatibility. In order to send the readings to the cloud or to receive the sensor values to devices internet compatibility must be there. So Node MCU-esp8266 could be the better choice.

FIGURE 6. Node MCU-Esp8266 module

5. Software's required

5.1. Arduino Board

Arduino software's can be downloaded directly from the official website. https://www.arduino.cc/

5.2. Mobile Application(blynk)

Blynk application can be downloaded directly from the official website. https://blynk.io/

6. Sample Output

Sample Output is shown in the Figure 9.

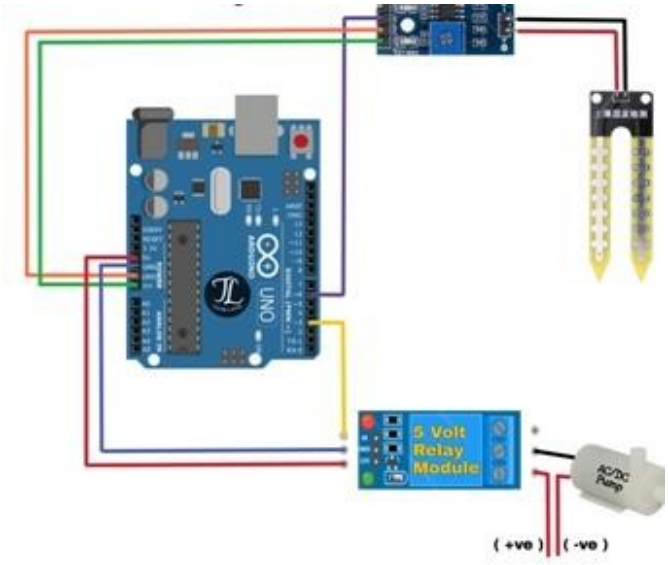

FIGURE 7. Circuit Diagram

Sample Code

```
int water;
void setup() {
  pinMode(3,OUTPUT);
  pinMode(6,INPUT);
}

void loop() {
  water = digitalRead(6);
  if(water == HIGH) ;
  {
  digitalWrite(3,LOW);
  }
  else
  {
  digitalWrite(3,HIGH);  }
  delay(400); } |
```

FIGURE 8. Sample Code

FIGURE 9. Pumping water automatically after reading the values

7. Conclusion and Future work

The smart irrigation system was implemented to make irrigation easy and convenient. Instead of depending on the traditional old methods of cultivation, it helps in learning about soil and gives knowledge about different types of crops and their growth based on different climatic conditions. It provides awareness about the nature of the soil and gives better ideas in giving profits during harvesting.

In future we would like to use flood detection sensor along with these sensors which helps the farmers in protecting the crop from floods. We would like to take this idea to wider range so that it can be useful to everyone. Smarter way of living is not only related to smart home or smart devices but also we have to make farmers as normal farmers to smart Farmers by providing awareness to them about irrigation ,agriculture , harvesting etc so that they can adopt easily to the new form of irrigation.

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