A
Project Report
On
"Smart Irrigation System Using IoT"

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CHARUSAT
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CERTIFICATE

This is to certify that the report entitled "**SMART IRRIGATION SYSTEM USING IOT**" is a bonafied work carried out by **Mr. Parth Savaliya(D20DCS163), Mr. Rudra Patel(D20DCS167)** under the guidance and supervision of **Assistant Prof. Nilesh Kumar Dubey** for the subject (CS357)-**Software Group Project-IV** (CSE) of 6th Semester of Bachelor of Technology in **DEPSTAR** at Faculty of Technology & Engineering – CHARUSAT, Gujarat.

To the best of my knowledge and belief, this work embodies the work of candidate himself, has duly been completed, and fulfills the requirement of the ordinance relating to the B.Tech. Degree of the University and is up to the standard in respect of content, presentation and language for being referred to the examiner.

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DECLARATION BY THE CANDIDATE

We hereby declare that the project report entitled "**Smart Irrigation System Using IOT**" submitted by me to Devang Patel Institute of Advance Technology And Research, Changa in partial fulfilment of the requirement for the award of the degree of B.tech in Computer Engineering DEPSTER/FTE, is a record of bonafied CS-354 Software Group Project-lV (project work) carried out by us under the guidance of **Prof Nilesh Kumar Dubey** DEPSTAR. I further declare that the work carried out and documented in this project report has not been submitted anywhere else either in part or in full and it is the original work, for the award of any other degree or diploma in this institute or any other institute or university.

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With sincere regards,
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ABSTRACT

Over the last decade, there has been an immense progress in science and technology. This has poured a great interest among scientists and researchers about designing smart farming system. Smart farming system can benefit us in various ways such as increase in production, water conservation, real time data and production insight, lowered operation costs, increase in quality of production, accurate farm and field evaluation, remote monitoring, equipment monitoring etc. For farmers and growers, the Internet of Things has opened up extremely productive ways to cultivate soil, easy-to-install sensors and an abundance of insightful data they offer. But as this technology are unable to reach majority of the farmers, they are unaware of this useful and efficient techniques for farming. In this paper a novel system model based on Internet of Things (IOT) is designed and implemented. This proposed system is equipped with various sensors for measuring environmental parameters required for the crops. It includes node MC and various sensors for executing the whole process. The main features of this system is to collect all the environmental data and give to the farmers so that they can take an accurate decision about farming. The system will execute the tasks such as soil moisture sensing, temperature and humidity sensing, indicating detecting an intruder in the field and switching an electric motor on/off manually and automation is also provided. The proposed system has been tested, readings have been monitored and satisfying results have been obtained which enables this system to be very useful in smart farming.

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

In most of the countries, agriculture has played a vital part in the economic development. In the developed countries farmers have been provided with various technology to increase the production. While in the under-developed countries farmers don't have enough knowledge about those technologies and so farmers are still relying on old techniques. They do not know about the power of emerging latest technologies which can drastically increase the crop production. Various factors contribute to the yield of crops such as proper soil preparation, different varieties of crops and respective techniques for production, chemical fertilizer's volume added to the soil, various natural hazards occurring in the cultivated place, number of seeds added in the related area, proportion of moisture in the fields, plant disease detection, adoption of modern technologies etc.

Farmers lose a huge amount of money because of usage of wrong irrigation mechanisms, insect pests and attack of plant diseases, usage of the uncalculated amount of pesticides and insecticides, and inaccurate prediction of weather. Smart farming techniques enable the farmer to use latest technologies and increase the crop yield by eliminating various risk factors involved in the farming. The farming systems which are used currently is helping the farmers up to some extent by reducing labor costs but somehow these systems are unable to consider and predict the weather conditions suitable for the crop. Thus, the yield of crops is limited while we can still increase it. On the other hand, not every farmer uses this system as they are very expensive.

Thus, there is a need of currently available wireless technologies and automation in farming which is not much expensive and everyother farmer can use it. Various sensors such as rain detection level indicator, soil moisture detection, temperature and humidity sensing, can be used to collect various environmental data for accurate future decision making and replacing the labor work by automation. This will improve crop yield significantly. The most advanced technology which can be used in the farming is IoT (Internet of Things) which has revolutionized all major sectors such as industries and business across the world. Using IoT one can interact many things with each other to produce required information. It is used to determine the working status of the implemented system remotely from anywhere around the world.

There are mainly four benefits that farmers get from loT application in agriculture. They are as follows.

1. Increase in the yielding by making a better decision from the accurate data.
2. The cost of production is reduced to a greater extent.
3. With precision farming techniques it reduces the wastage coming from the production.
4. It also automates most of the processes by reducing the physical effort.

1.2 PROJECT OVERVIEW

India is an agricultural country. India ranks second worldwide in farm output. Farming in India is done using the mundane ways. The fact that most of our farmers lack proper knowledge makes it even more erratic. A large portion of farming and agricultural activities are based on the predictions, which at times fail. Farmers have to bear huge losses and at times they end up committing suicide. Since we know the benefits of proper soil moisture and its quality, air quality and irrigation, in the growth of crops, such parameters cannot be ignored. At present, farmer manually irrigates land at regular interval. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Thus, we need automatic watering system which will not only reduce human labour.

Our Smart Farming system will help farmers by doing automatic watering to the plants. For this we are using water-level indicator sensor to map the level of water required for the plants. Also, we will make an algorithm for the detection of water-level and according to the level of water it will decide whether to start water pump for releasing required water or to stop the pump whenever the amount of water exceeds its specified level. Due to this facility farmers won't have to manually come and release or stop the water. So as human work will get reduce, the problems such as wastage of water and electricity will be solved up to some extent.

1.3 PROBLEM DEFINITION

In farming, farmers work very hard to get the good volume of crops. But due to the lack of awareness about the new technology, they cannot reduce the physical effort like going to farm just to start a motor for water plantation. So, we are creating a smart farming system in which various sensor like temperature and humidity sensor, water level sensor and soil moisture sensor will be used.

1.4 OBJECTIVE

To build Smart Farming model for providing automatic watering to the plants based on the readings provided by water-level, humidity, and temperature sensors. To build an algorithm which will provide the instructions for whether to release water or to stop water flow by reading data provided by all the sensors. To notify the farmers regarding the current situation of humidity, temperature, and soil moisture sensors.

Also, to provide the notification so that they can handle the process manually until the system recovery. To provide the farmers with the data of every sensors on the website using graphs every minute so that they can take accurate decisions about farming. To provide switching options on our website to the farmers so that they can switch on/offthe system from anywhere in the world. They will not have to present at particular placeand also they won't have to walk all the way to the farm to switch on/off the system. Thusthis reduces the manual labour work. To provide the farmer with the system model whichis made by using Internet of things so that it can help in the improvement of crops.

1.5 SCOPE

Our system will be able to fetch the data from all the sensors i.e. temperature, humidity, soil moisture and water level. This all sensor data will be send to the server through NodeMCU ESP8266 module. All the data collected from sensors will be stored in the server database. The data will be presented in the form of graphs on the website to the farmers. The graph will get automatically updated with the latest data when refreshed.

The farmer will be able to control the system i.e. will be able on/off the system through the switches provided on the website, from anywhere in the world.
Our system also provides the facility of filling the water tank automatically whenever the water-level gets low than the desired level. As this task is done by the

system itself manual labor work will get reduced and farmers will not have to worry about it. The future scope of our system is to include data mining techniques with the help of which future predictions of the environmental conditions for the suitability of the crops will be determined. This will help the farmers in taking accurate decisions about crop. This will ultimately help in more profit.

CHAPTER 2
ANALYSIS OF EXISTING WORK AND LIMITATIONS

2.1 WORKING OF EXISTING SYSTEM

Today, smart farming can be implemented in number of ways with the use of different equipment like node MCU, Arduino, Raspberry Pi etc. Arduino is the basic controller on which numerous equipment can be mounted and can work efficiently. There are many implemented existing working system. All have their advantages and disadvantages. At present smart farming is implemented on Arduino where they have given two modes i.e. manual mode and auto mode. The implementation has included sensors like DHT11, LDR sensor, PH sensor, PIR sensor, Water-level sensor etc. Data from the devices are sent to the server which is hosted online through node MCU. Node MCU in turn is connected to the internet through predefined router. All the data are represented in the form of graphs. And in the manual mode user have to take action manually according to the data send from the node MCU. While in the auto mode the algorithms work on the basis of predefined threshold and help to take action automatically.

2.2 LIMITATION OF EXISTING SYSTEM

Smart farming using IT have progressed a lot and new issues are resolved and added to the system. Main issue with the model is that the mode cannot be converted automatically i.e. the manual mode cannot converted to auto mode but they have to do it manually. It creates problem if a user has forgotten to convert it back to auto mode. Consider a situation in which a user has manually started to send water to plants but after sometimes he forgets to turn it off this will lead to disruption in the farm.

The data provided in the website also doesn't refresh automatically unless it is refreshed manually which can be solved with the help of ajax. The status of system is not appropriate on the website site which will lead toincorrect decision. Overloading of data is also a problem when number of request is sentin a low internet connection. These are the limitations of the existing system.

CHAPTER 3

PROPOSED DESIGN

3.1 INTRODUCTION TO PROPOSED SYSTEM

In this model, Sensors like humidity, temperature, soil moisture and water-level will be fixed in the required position. Data from the sensors will be taken and will be sent to the online hosted server with the help of node MCU. All the sensor will be attached to the node MCU. The power is supposed to be given 5V to the sensors. Due to lack of interaction between two modes, implemented in the field, we have proposed a model in which all the basic data sensor will be collected and will be saved in the database. In the auto mode all the tasks would be accomplished with the predefined threshold value. While in the manual mode, it will override the tasks of auto mode but not for two long. After one-hour, manual mode is automatically converted back to auto-mode which will help user if he/she have forgotten to convert back to automatic mode. Graphs will be generated on the website and all the data can be seen in the database. Ajax will be used to help to provide data whenever it changes or take action in the field. This interconnection between mode will make situation more clear.

3.2 ALGORITHM OF PROPOSED SYSTEM

```
Initialize all the variable.
        While true until connected do
Connect to predefined WiFi.
end
        Get all the data from the instruments.
        Upload all the data on server.
        Upload status of the switch.
Take action according to the data.
        While true(loop)  do
        Get data of instruments.

End

Get switch status from the server for manual interaction.
While true(convert to manual mode for given hour) do
Take action done by user.
End
If condition changes and no manual interaction then
Take action according to data and threshold given.
End
```

CHAPTER 4

IMPLEMENTATION DETAIL

4.1 block diagram

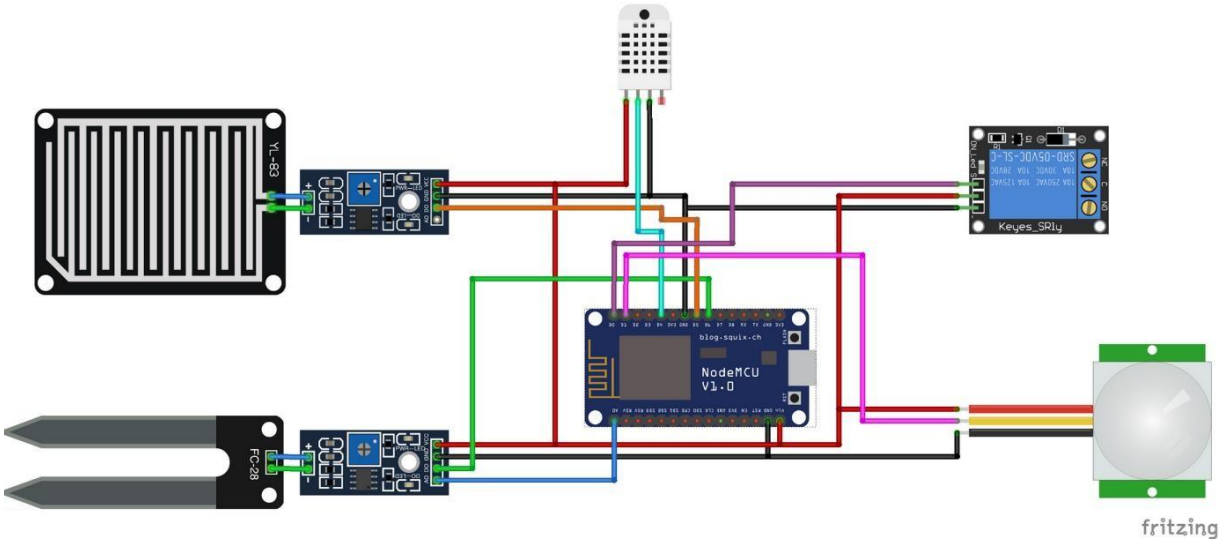

Figure 1 BLOCK DIAGRAM

THE BLOCK DIAGRAM:-

In this model, Sensors like humidity, temperature, soil moisture and water-level are fixed in the required position like in the land soil moisture sensor is fixed, water-level sensor is fixed in the water tank and PI, humidity and temperature sensor is fixed at the centre of the field in order to get the overall reading. Initially, the height of water tank is measured and according to that the water-level sensor readings are set. The sensors are attached to the Node MC where the readings will be fetched. All the sensor will send the data to the Node MCU. The values to be used as the threshold is calculated from the field and also according to the crop. These values will be used in automation of most of the processes and hence they are predefined in the Node MCU as the threshold for each and every sensor. Whenever any sensor reaches a threshold, the trigger is sent and in turn, it will On/Off the respective motor related to that sensor.

The Node MC is connected to the hotspot from the mobile which is defined in the Node MCU and hence when that specific hotspot is available it gets connected to it.
Whenever the internet connectivity is provided it starts sending the data to the web server. All the data fetched from instruments to the Node MC is uploaded to the website after every one minute. The data of tasks performed on the detection of the threshold is checked and uploaded after every two seconds. The graphs of the data are represented on the website. There are two modes in the model. First one is the automatic mode in which the Node MCU itself takes the action on detecting the threshold. Manual mode is activated when the user manually changes the status of various devices attached to the

sensor. The manual mode is activated for one hour and it will not automate the process. After one hour the mode is set back to automatic mode. It will help the user if he forgets to On/Off the specific device. Those modes are the important features provided to the user. The following figure shows the basic connection of model.

4.2 Hardware used

4.2.1 DHT11

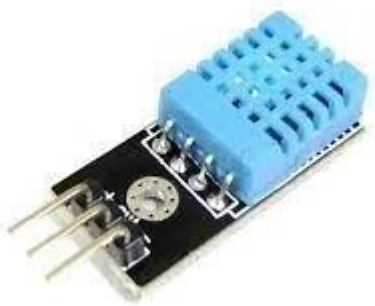

Figure 2 DHTI SENSOR

DHT11 sensor measures temperature and humidity and send the digital signal to the Node NOU where it uses this data to do various tasks. The cost of this sensor is very low and can be fixed at any location. To measure the temperature, it uses a thermistor. and to measure the humidity it gives the capacitance value. Humidity indicates the amount of water vapor present in the air. This sensor measures the humidity present in the air and gives the result directly in a Node MCU (Integrated development environment)

4.2.2 Soil moisture sensor

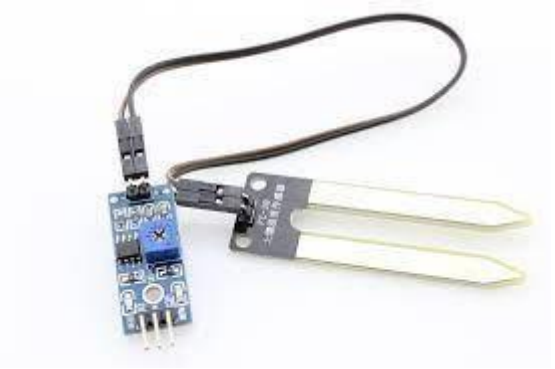

Figure 3 SOIL MOUSTURE SENSOR

Using soil moisture sensor, we can get the data about the wetness and dryness of the soil. It represents value ranging from 0 to 1024. Where 1024 is the complete dry soil while O represents the highest proportion of water measured by this sensor. It uses the capacitance to calculate the proportion of water droplets in the soil. It gives the output in the form of analog signal and it is fetched by the Node MCU.

4.2.3 Node MCU

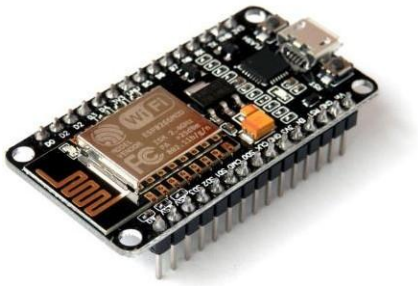

Figure 4 MODE MCU

Node MCU is one of the best development board for IT Project. It is very easy to use and is cheaper in comparison to combining the Arduino and the various wi-fi module or GSM module. There is no requirement of external prototyping board to process the data as it can itself process the data and can trigger to the information just like Arduino, raspberry.

4.2.4 Motion detection sensor

Figure 5 MOTION DETECTION SENSOR

A motion sensor, or motion detector, is an electronic device that uses a sensor to detect nearby people or objects. Motion sensors are an important component of any security system. When a sensor detects motion, it will send an alert to your security system, and with newer systems, right to your mobile phone

4.2.5 Rain detection sensor

Figure 6 RAIN DETECTION SENSOR

A rain detection sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. Most rain-sensing wipers use a sensor that's mounted behind the windshield. It sends out a beam of infrared light that, when water droplets are on the windshield, is reflected at different angles.

4.2.6 Relay module

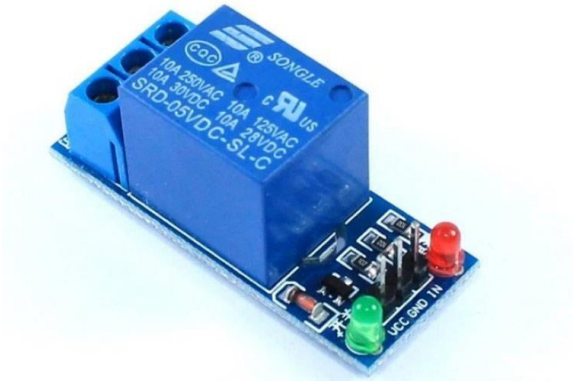

Figure 7 RELAY MODULE

The relay module is an electrically operated switch that can be turned on or off deciding to let current flow through or not. They are designed to be controlled with low voltages like 3.3V like the ESP32, ESP8266, etc, or 5V like your Arduino. A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.

Chapter 5

EXPERIMENTAL RESULT

5.1 EXPERIMENTAL RESULTS

The implementation of the model has provided various results that are shown in the figure.

5.1.1 initial state UI

Figure 8 INITIAL STATE UI

5.1.2 Prototype

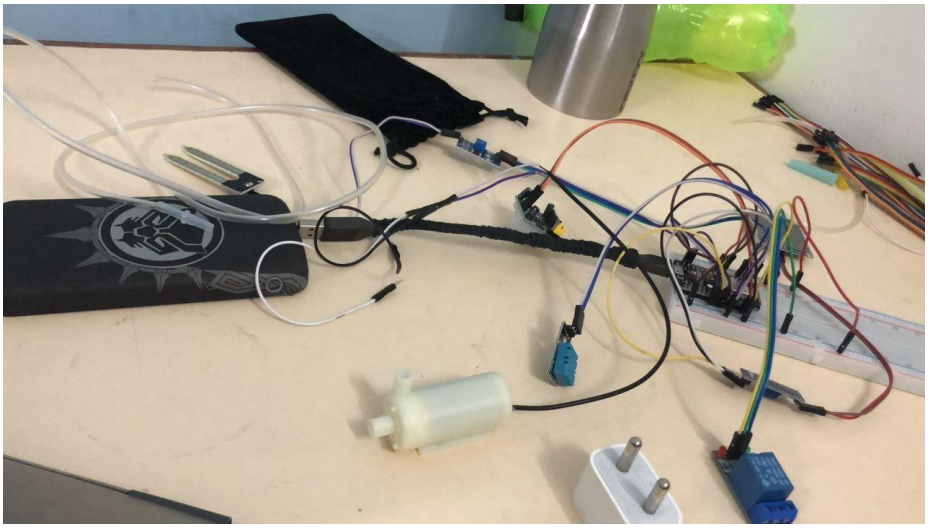

Figure 9 PROTOTYPE

5.1.3 Motion detection sensor

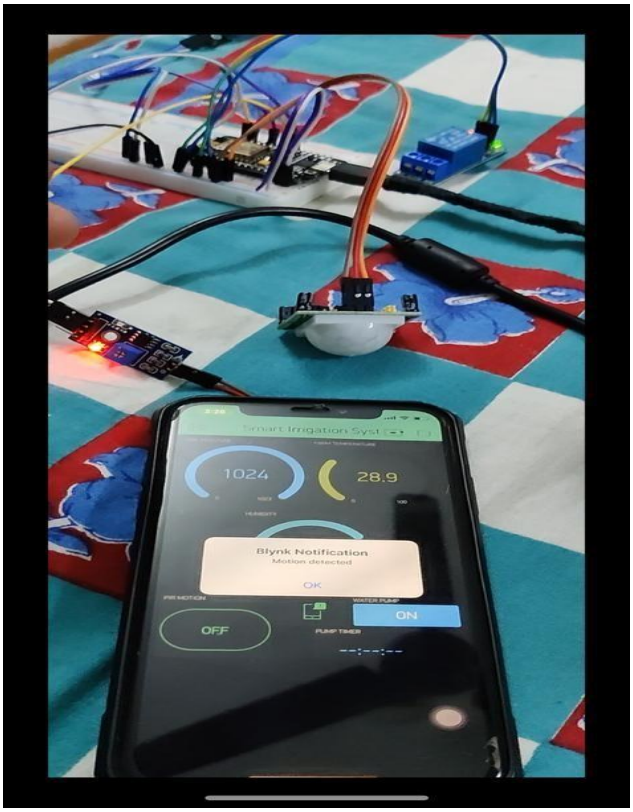

Figure 10 MOTION DETECTION

5.1.4 Humidity and temperature sensor

Figure 11 HUMIDITY AND TEMPRATURE SENSOR

5.1.5 Notification to water the plants for water is not sufficient for plants

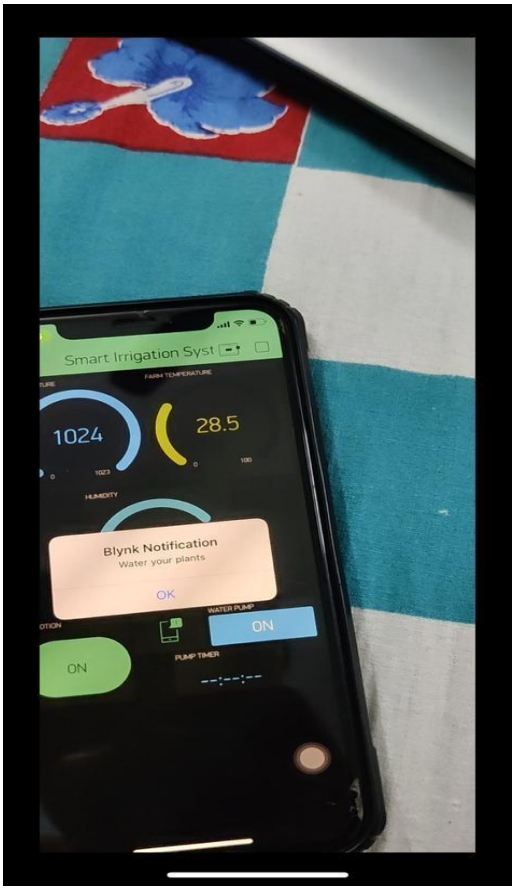

Figure 12 Notification to water the plants for water is not sufficient for plants

5.1.6 Rain meter sensor detecting rain

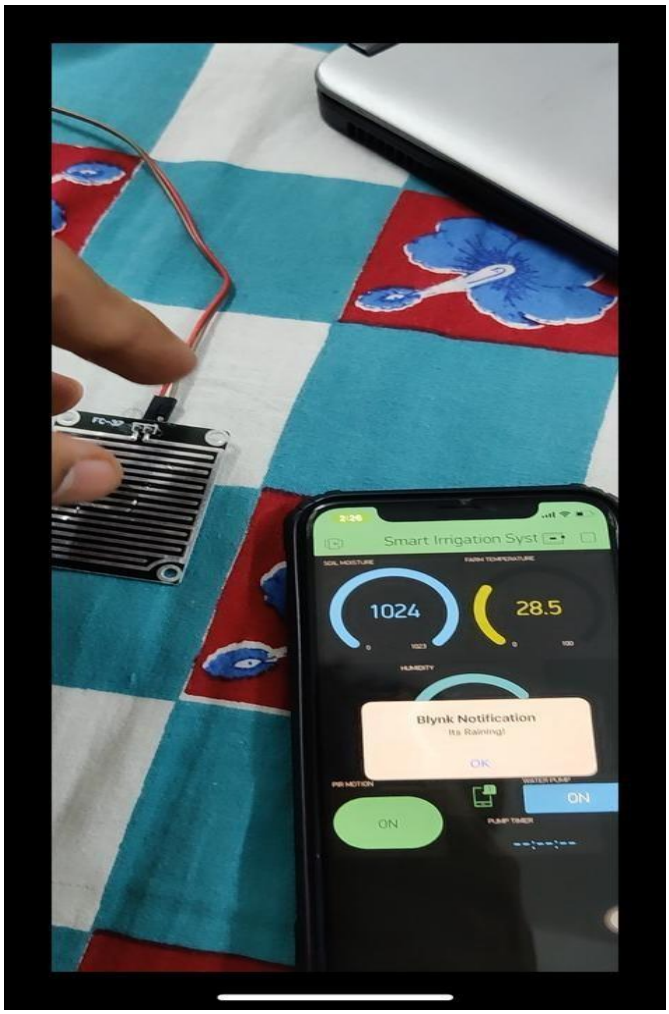

Figure 13 Rain meter sensor detecting rain

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

We have proposed modem approaches of smart farming which will result in the good and higher crop yield that will ultimately benefit the farmers who will be able to take out a higher profit. The best thing is that now they don't have to do the labour work. Our system has provided manual support as well as automation for various tasks. In future, all the data collected from the sensors will be processed and mined on the cloud. This mined data will be very helpful in determining the future condition of the crops and also will tell that which place will be much suitable for the particular crops so that there is less probability of loss.

6.2 ENHANCEMENT

So through the semester we have developed a system that has the sky's as a limit this project can be integrated with ai/ml to make the whole system automatic and more and more the data models can be trained. the motion detection can be included to make the farm more secured and can also be embedded with the cameras also.

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