Smart Irrigation Systems

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INTRODUCTION

- As India is an agriculture dominated country, it has huge impact on the economy of India. The income source of 70% population in India is based on an agriculture system. Government of India also declared varies scheme in this sector due to which lots of farmer can take the benefit of this scheme. Water consumption is main problem in farming sector. Crops do not get the required water supply.

- The problem with Agriculture is that most farmers are unable to afford these technology from big brands due to their large price marks. This result into a devastating fact that most of the irrigation systems are operated manually. This is a risky method as it may give rise to problems of wasting water, over watering, lack of watering. The available techniques that are used for irrigation are drip irrigation and sprinkler irrigation etc. These techniques are to be combined with IoT so that we can eliminate human error and analyze the soil through various sensors and conclude if there is a requirement for watering.

- In this project, we have attempted to built a smart irrigation systems using IoT and achieve the desired objectives of this system. The project is facilitated to simplify the irrigation systems by installing the system, and increase crop performance by reducing overwatering from saturated soil. The idea is to eliminate human error by assigning an engine to realize the need of watering and thus preserving water from wasting. Using IoT based system, Moisture level is sense in the soil, depending upon the threshold level water provided to the crops. Sense value is stored to the cloud. This system is solution to the crises that occur due to uneven use of water.

LITERATURE SURVEY

[1] Dr.S.Jothi Muneeswari , Merlin Janet E , Rajeshwari , G.Selvarani, “Smart Irrigation System using Iot Approach”, International Journal of Engineering Research & Science (IJOER), Volume 3, Issue 3, March 2017.

[2] Ashwini B V, “A Study on Smart Irrigation System Using IoT for Surveillance of Crop-Field”, International Journal of Engineering & Technology, 7 (4.5) (2018) 370-373.

[3] Yogesh G. Gawali, Devendra S. Chaudhari, Hitendra C. Chaudhari, “A Review on Automated Irrigation System using Wireless Sensor Network”, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5, Issue 6, June 2016.

PROPOSED SYSTEM

- The purpose of this system is to develop an automated irrigation system, which will turns ON/OFF the pumping motor depending upon the moisture content of the soil.
- In this system, less manpower is required. Water conservation takes place because water is directly transferred to the roots. The drawback of the system , if the system need excess water in any specific area then it will not possible using this system because it will only work depending upon sensing arrangement.
- This drawback can be overcome using DTMF Technology. Using DTMF Technology, user will be able to supply required water. It is also possible to provide excesswater, if needed.
- This proposed system consists of three sensors – rain, soil-moisture, and temperature, humidity sensors.

All the sensors along with the pump and the relay are connected with the microcontroller. After the sensor read the data from the environment, the microcontroller decides if the pump needs to be set ON/OFF.

- In this system is subdivided into three different sections,
  - In first section dealing with the IoT based device which will deal with collecting the data which will be on differentcollection.
  - Second section analyzes the data collected in the previous section then depending upon result it will decide automatically on/off the irrigationsystem.
  - In the third section, data related to the crop moisture level, temperature level, humidity, pH is send to the cloud for monitoring purposes.
- The proposed of this system is to automatic control of irrigation. This system can provide required water through irrigation. As the system is embedded, it provide uniform and required water supply to plant. In this system varies sensors are being used like Humidity sensor, Temperature sensor, Moisture sensor, Rain sensor.
- Depending on value sense by sensor the system will work accordingly. If the moisture sensor is dry in the line (its locations), the system will be checked by the rain sensor if there is rain, the system will not work because no need to irrigate at the same time of rain, otherwise the system will check the temperature sensor if the temperature is high then the system will not work because it is not the right time for irrigation process because the water will easilyevaporate.

- If the temperature is low and there is no rain but the moisture sensor is dry then signal will be sent to the controller to open the valve and pump.
- If water level is low in the tank then the system will shut down automatically and send SMS to the user, by using water level sensor. When the system is ON by using flow meter sensor connected to LCD we can know the amount of water goes from tank to each line so if there is a leak in the pipe we can know from LCD.
- The system respond to threshold value, if the value is below threshold level then motor will turn on automatically. When water level reaches threshold value then motor will automatically turn off. In the future, this system can predicts atmosphere changes like rainfall.

AIM & OBJECTIVES

Aim:

To build a basic model system of water irrigation and integrate this into an advanced model which can be produced and successfully be implemented into a real world.

Objectives:

- In this project, we have attempted to build a smart irrigation systems using IoT and achieve the desired objectives of this system.
- The Arduino plays an important role by supplying power to all the components and also controls them.
- The LCD display is used to view the information related to irrigationprocess.
- Motor connected to Arduino is ON/OFF, as and when irrigation is required.
- DHT11 sensor used to detect surrounding environment temperature which further aids in irrigation process.

Phase I Components

Microcontroller Arduino Uno	Soil Moisture Sensor (YL-69)
DC Motor	LCD (16x2)

Phase II Components

ESP01 Wi-Fi Module	Two Way Relay
AC Motor	I2C

Phase III Components

Rain Sensor (HL-83)	MIT App Inventor

PROGRESSIVE STAGES OF DEVELOPMENT

Phase 1:

- This is the basic version with prime objective is to deliver water to fields on a set (input) time period.
- Information regarding the irrigation process is displayed on the LCD.

Phase 2:

- This version is equipped with all the functionality of the version 1.0.
- It has some new features like a dedicated system which checks for soil's moisture level and if the moisture level goes down beyond the limit then the system automatically irrigates the fields.

Phase 3:

- Equipped with all features and functionality of version 1 and 2, this version also has a new feature that deals with over-irrigation problems. Rain plays an important role in this.

- To overcome such problems, the system checks for rain and then proceeds accordingly with the irrigation process.

- This version also supports cloud computing where farmers can view irrigation related information.

TIMELINE

Version 1.0

START DATE	END DATE	WORD DONE
04/10/2021	05/10/2021	Arduino Setup
05/10/2021	08/10/2021	16x2 LCD interfacing with Arduino
11/10/2021	12/10/2021	DC Motor interfacingwith Arduino
13/10/2021	15/10/2021	Version 1.0 Developed

Version 2.0

START DATE	END DATE	WORD DONE
10/11/2021	14/11/2021	16x2 LCD interfacing with Arduino
16/11/2021	20/11/2021	AC Motor interfacing with Arduino
22/11/2021	30/11/2021	Working with ESP01 and ThingSpeak cloud
01/12/2021	04/12/2021	Version 2.0 Developed

Version 3.0

START DATE	END DATE	WORD DONE
18/12/2021	20/12/2021	Rain sensor interfacing with Arduino.
24/12/2021	30/12/2021	MIT App Development
02/01/2022	05/01/2022	Version 3.0 Developed

RESULTS & DISCUSSIONS

COM7

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Smart Irrigation System
Motor Turned ON
Time: 3037
Time: 9054
Time: 15071
Time: 21088
Motor Turned OFF
Motor runs for 21 seconds
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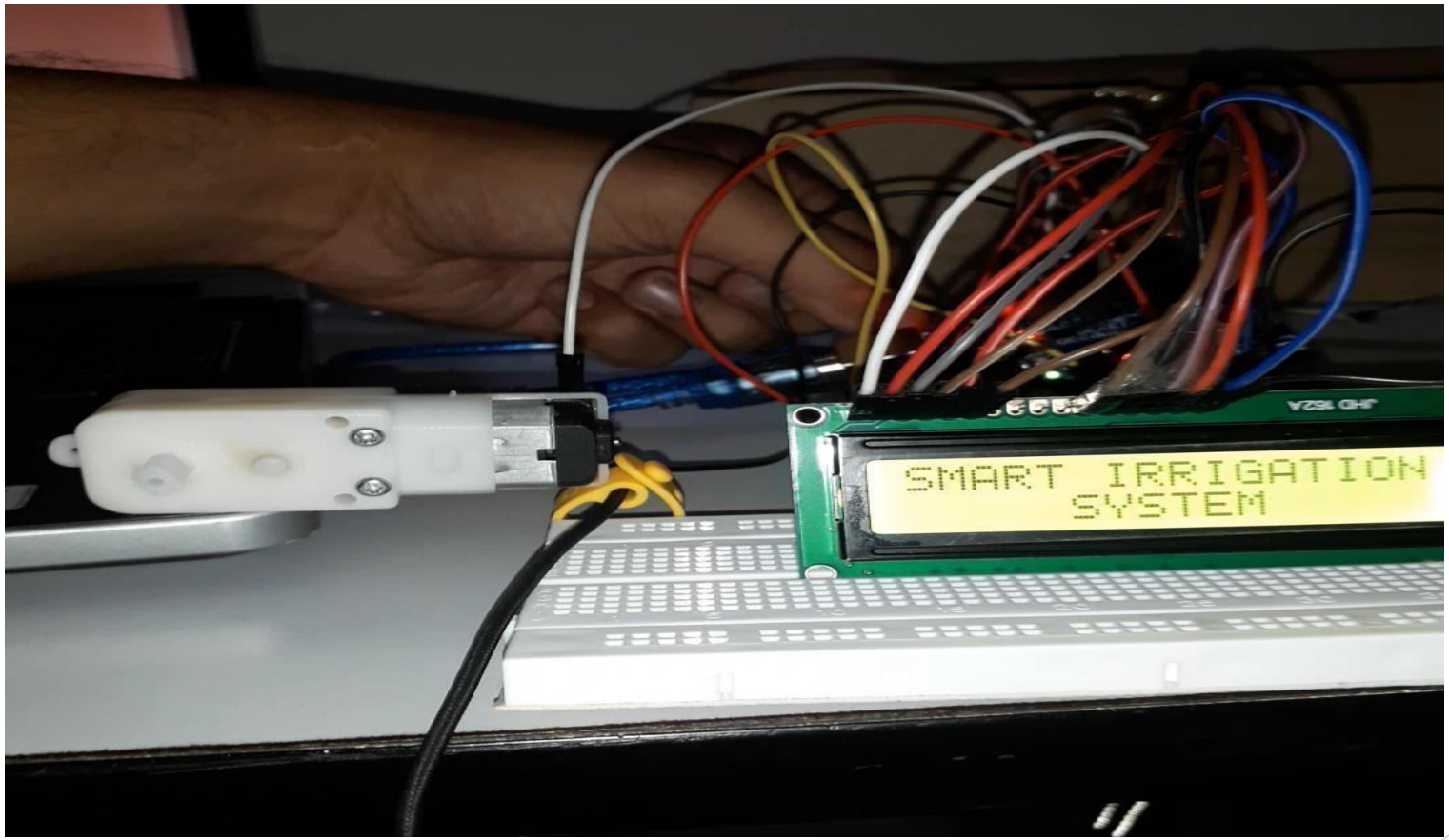
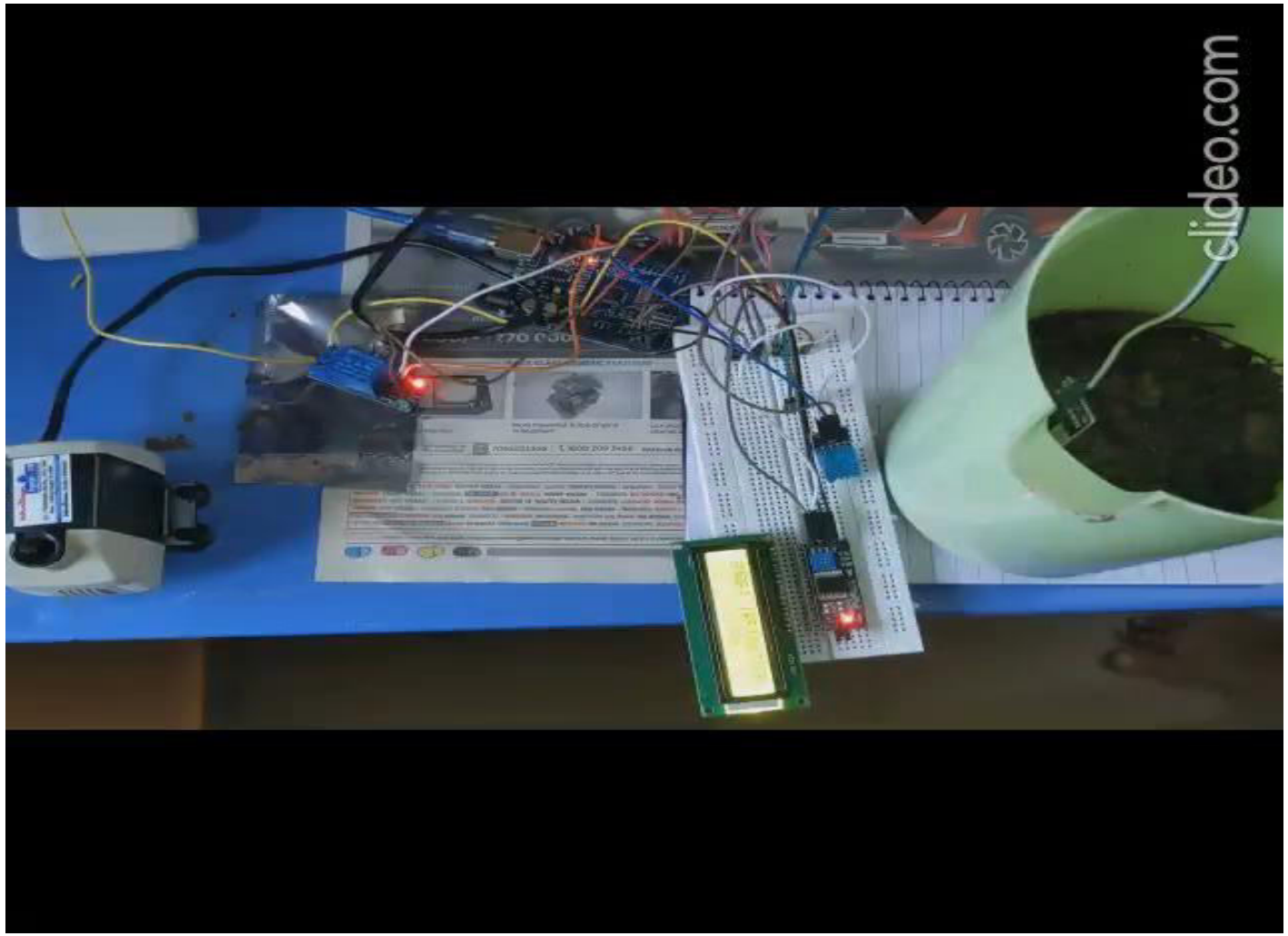


Phase 1 Output



Phase 2 Output

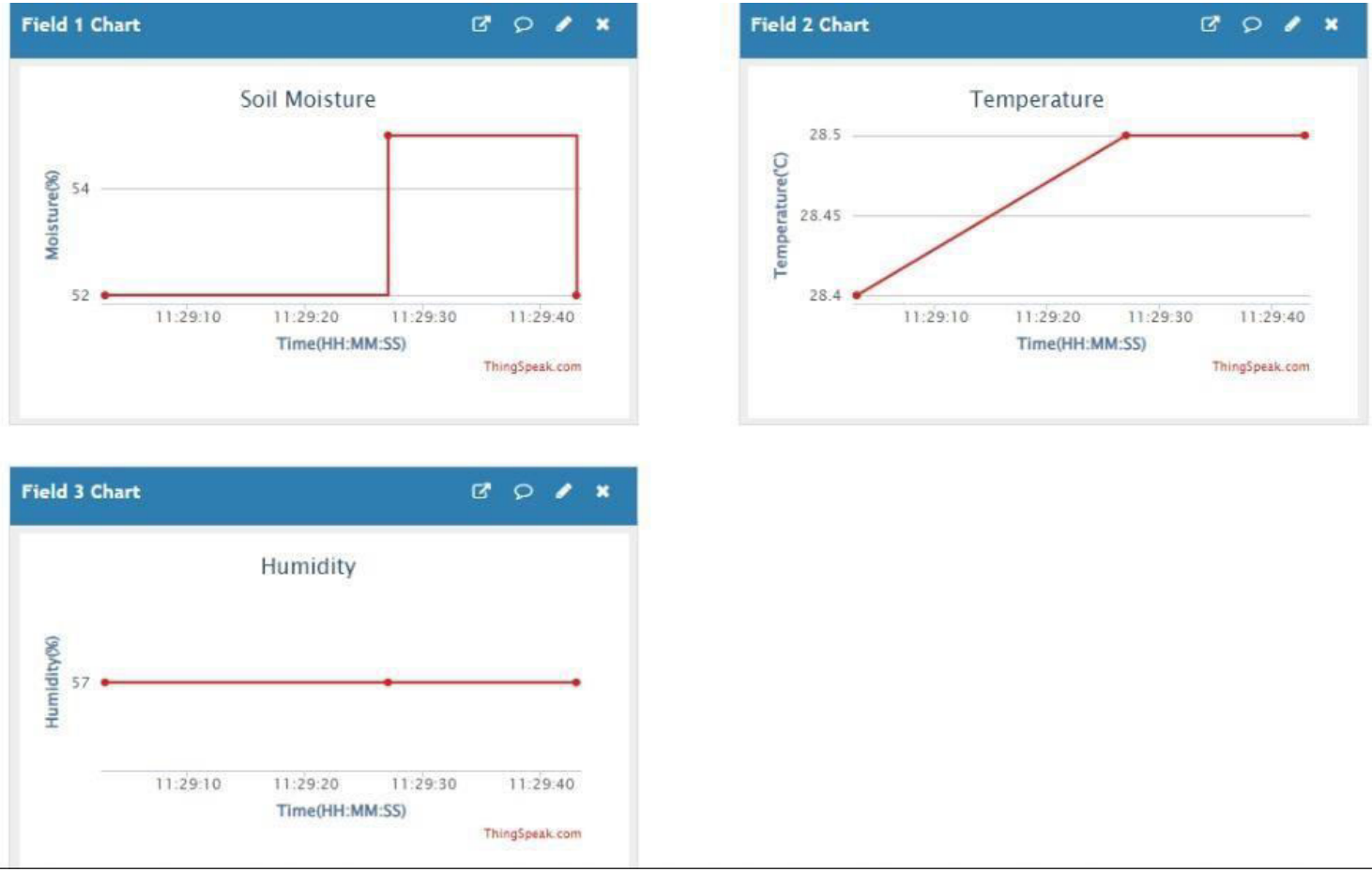
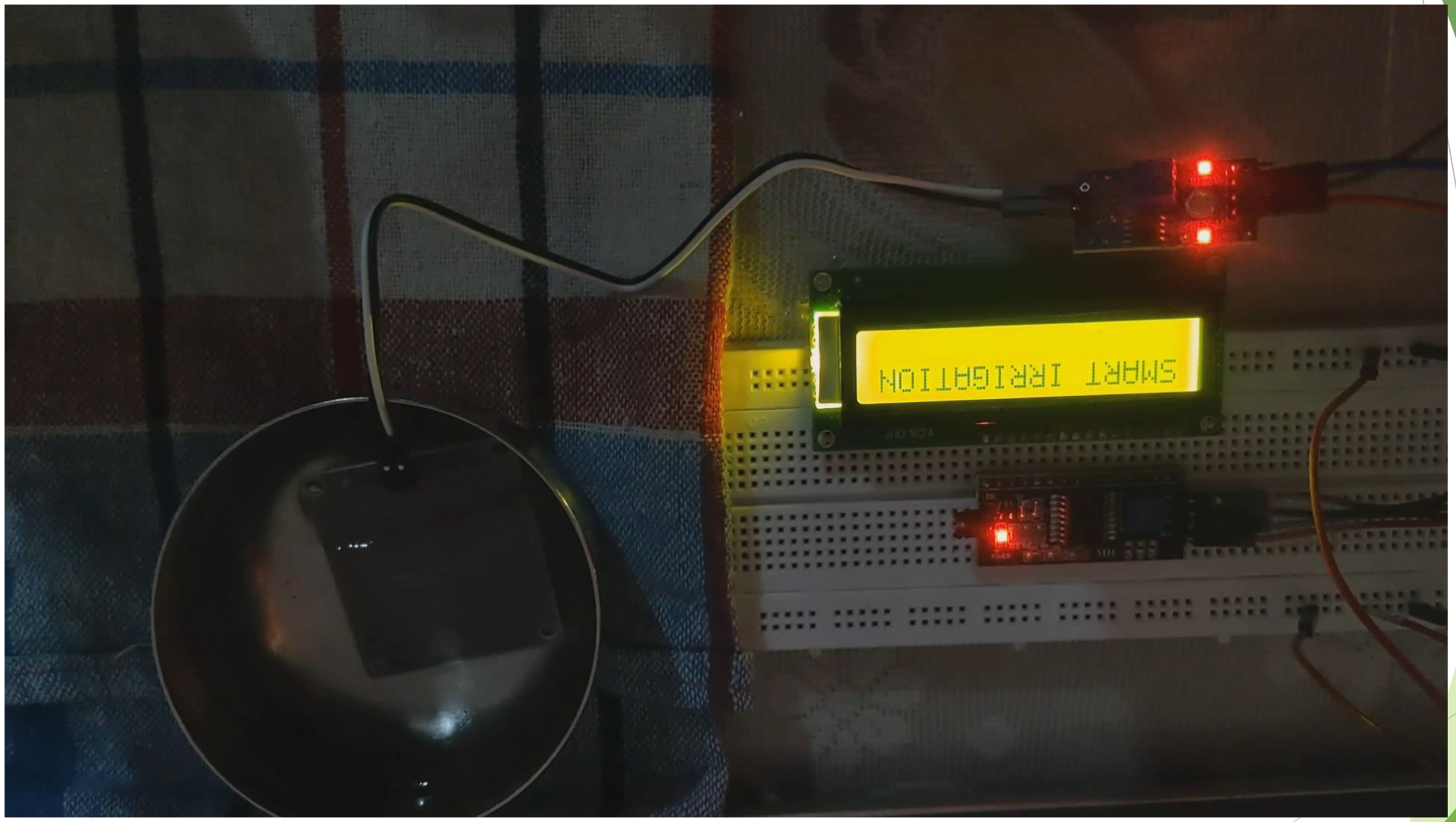
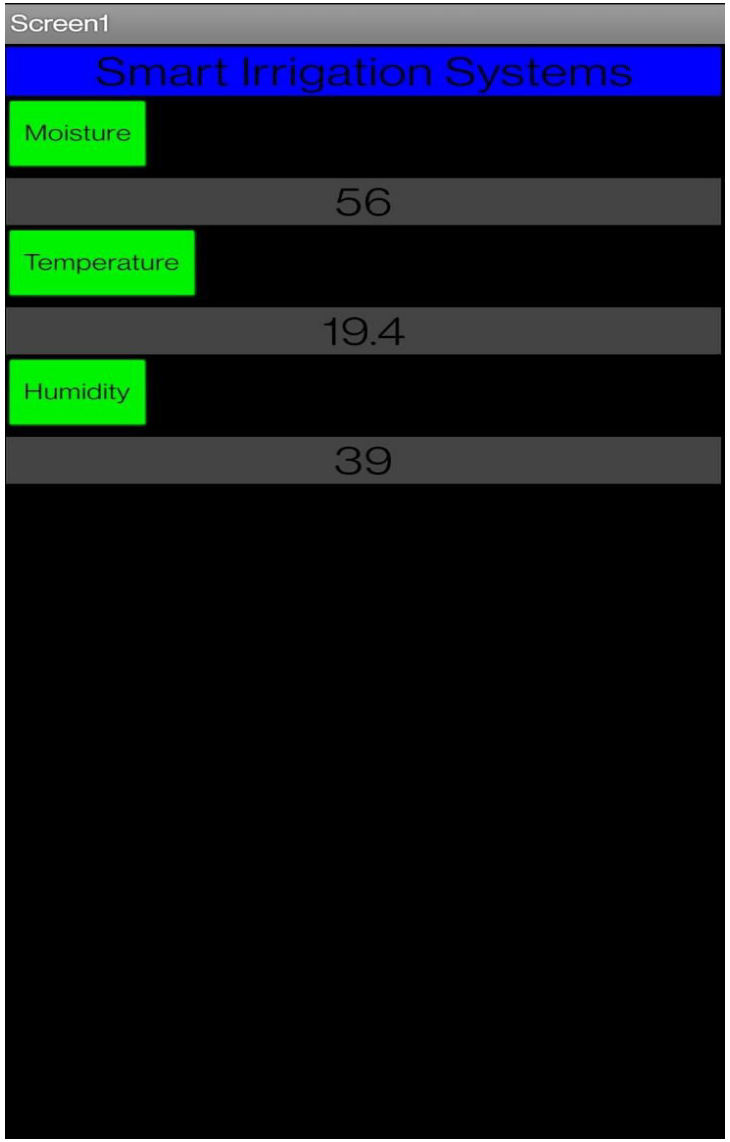


Figure: Sending data to ThingSpeak



Phase 3 Output



Smart Irrigation App

CONCLUSION

Phase 1:

- Smart Irrigation System version 1.0 has been developed.
- The system turns on a dc motor for a set input time period and then turns off the motor when the elapsed time has been passed.
- Also the system displays on a 16x2 LCD screen information like motor run time, motor running or not.
- Arduino being the center power hub controls both the components and ensures they work properly.

Phase 2:

- Smart Irrigation System version 2.0 has been developed.
- The system uses the soil sensor that measure soil moisture and when the moisture is below the minimum level, then the sensor sends signals to the Arduino.
- Arduino being the control centre takes the necessary actions, thereby turning on the motor. We are using an AC motor which is controlled by a two way relay.
- And also we are sending values to the cloud. For this, we are using ESP01 sensor. The sensor sends soil moisture, temperature and humidity to ThingSpeak cloud.
- All the operations that are performed are been displayed on a 16x2 LCD screen. This time we are using I2C communication between Arduino and LCD screen

Phase 3:

- Smart Irrigation System version 3.0 has been developed.
- The system uses the rain sensor which checks for rain and turns the motor on or off depending on the rain.
- The rain sensor used here addresses over-irrigation problems.
- It also supports cloud computing where formers can view irrigation related information using MIT app

SUMMARY

- In IoT Based Smart Irrigation Project the stages of development are comprised of 3. In the first stage, we followed the basic objective like delivering water to fields on a set of periods, and it is displayed on an LCD.

- In the second stage, we have used a soil sensor to measure soil moisture and when the moisture level is below a certain level, the sensor sends signals to the Arduino. The Arduino acts as the control centre, turning on the AC motor, which is controlled by a two-way relay. Additionally, we are uploading data to the cloud. For this, we are using an ESP01 sensor. This sensor transmits soil moisture, temperature, and humidity to ThingSpeak. The data that has been collected and the operations that have been performed are shown on a 16x2 LCD. This time, we have used I2C communication between the Arduino and LCD.

- In the third phase, we used a rain sensor to solve over-irrigation problems, and we also developed an MIT app that allows formers to see the humidity and temperature readings.

Thank You!!