Mobile Integrated Smart Irrigation Management and Monitoring System Using IOT

Vaishali S, Suraj S, Vignesh G, Dhivya S and Udhayakumar S

***Abstract*—Agriculture has been the most important practice from very beginning of the human civilization. Traditional methods that are used for irrigation, such as overhead sprinkler and flood type, is not that much efficient. They results in a lot of wastage of water and can also promote disease such as fungus formation due to over moisture in the soil. Automated irrigation system is essential for conservation of the water and indirectly viability of the farm since it is an important commodity. About 85% of total available water resources across the world are solely used for the irrigation purpose. In upcoming years this demand is likely to increase because of increasing population. To meet this demand we must adopt new techniques which will conserve need of water for irrigation process. In automation system water availability to crop is monitored through sensors and as per need watering is done through the controlled irrigation. The almost infinite capabilities of storage and processing, the rapid elasticity makes cloud computing an attractive solution to the large amount of data generated. The idea is to focus on parameters such as temperature and soil moisture. This is a Mobile Integrated and smart irrigation system using IOT based on application controlled monitoring system. The main objective of this project is to control the water supply and monitor the plants through a Smartphone.**

***Index Terms*—Mobile controlled irrigation, Smart Irrigation system, Raspberry pi, Sensor controlled, IOT.**

I. INTRODUCTION

INIDA'S major source of income is from agriculture sector and 70% of farmers and general people depend on the agriculture. In India most of the irrigation systems are operated manually. Irrigation requirement depends on soil properties like moisture and temperature and the type of crop which is grown in the soil. Technologies have been developed for efficient use of water for irrigation purpose [1]. In India, agricultural area receives power supply usually in non-peak hours; also frequent power cuts and low voltage supply creates a big problem to farmers. The off-peak hours are usually night hours after 11 pm. If farmer fails to attend the irrigation, there is chance of wastage of water and electricity. Also, excess watering leads to soil damage. In order to control and monitor the irrigation process, smart and automated irrigation system is developed, Implemented and tested. There is a need for automated irrigation system because it is simple and easy to install. This system uses values ON and OFF to control water motor. Python programming language is been used for automation purpose.

The rest of the paper is organized as follows: Section II introduces literature survey. Section III deals with proposed system. Compound description is presented in section IV. Implementation are discussed in section V followed by conclusion in section VI.

II. LITERATURE SURVEY

This system developed an automated irrigation system for the farmer on the basis of wireless sensor network .This system continuously monitors the parameters temperature, humidity, and moisture of soil. An algorithm was used with threshold values of soil moisture to be maintained continuously. System starts or stops irrigation based on moisture content of the soil.

This system proposes low cost moisture sensor based data acquisition system required for automated irrigation system. The authors have developed an impedance based moisture sensor. Sensors works on the change of impedance between two electrodes kept in soil [2].

This paper represents irrigation management system using WSN and water pumps. Water level sensor is connected to main irrigation canals, and flow sensor is connected to water pump. These sensors are connected to wireless gateway which sends data periodically to web server. Database connected to web server monitors irrigation water level at all main .The web based IMS analyze the data stored in database and compares with specified values. Then it (IMS) sends SMS to farmers and engineers to make aware of water requirement [3].

This system is smart irrigation techniques using internet of things (IOT). In this system sensors are placed in the agriculture field, measures the soil moisture value, water level in the tank and well-water through mobile data communication network. The web servers use intelligent software to analyze

Vaishali S, Suraj S, Vignesh G is with the Rajalakshmi Engineering College, as an Under Graduate Student in the Department of Computer Science and Engineering, Thandalam Chennai 602105. India (vaishali.s.2013.cse@rajalakshmi.edu.in,suraj.s.2013.cse@rajalakshmi.edu.in vignesh.g.2013.cse@rajalakshmi.edu.in).

Dhivya S is an Assistant Professor, in the Department of Computer Science and Engineering, Rajalakshmi Engineering College, Thandalam Chennai 602105. India, (dhivya.s@rajalakshmi.edu.in)

*Udhayakumar S Associate Professor, in the Department of Computer Science and Engineering, Rajalakshmi Engineering College, Thandalam Chennai 602105. India, (udhayakumar.s@rajalakshmi.edu.in)

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the data and act according to the result obtained to perform desired action [4].

The system supports water management decision, used for monitoring the whole system using GSM module. The system continuously monitors the water level in the tank and provide accurate amount of water required for plant or crop. The system checks the temperature and humidity of soil to retain the nutrient composition of the soil managed for growth of plant [5].

III. Proposed System

The proposed automated irrigation and monitoring system consists of the raspberry pi, water pump, and moisture and temperature sensors. Smart phones module is used for communication. In the proposed work, crops or plants are considered along with their water requirement at different stages. The crops or plants are irrigated with respect to the water requirements at different stages of their growth.

Fig 1 shows the architectural design of the project. The smart phone is connected to raspberry pi through Bluetooth. The motor is controlled by the smart phone by the values ON and OFF.

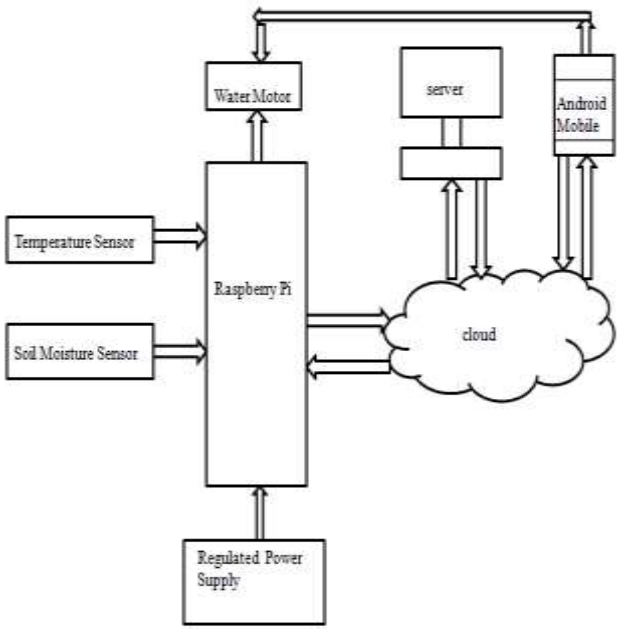

Fig. 1. Proposed System Design

IV. Component Description

1. Raspberry-Pi

The sensor technology to automate irrigation improves water usage efficiency. The raspberry pi is a small single board computer which is been used to teach computer science. The raspberry pi is been used as a computer where external memory can be used and it has four ports where any input devices can be connected. This project uses raspberry pi for easy process and installation.

2. Soil Moisture Sensor

Sensors are the device which converts the physical parameter into the electric signal. The system consists of soil moisture sensor Fig 2. The output of sensor is analog signal; the signal is converted into digital signal and then fed to the processor. The moisture sensor is used to measure the moisture content of the soil. Copper electrodes are used to sense the moisture content of soil. The conductivity between the electrodes helps to measure the moisture content level.

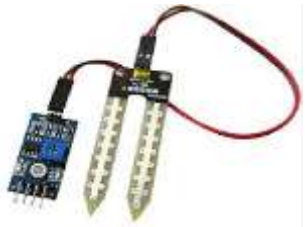

Fig. 2. Soil Moisture Sensor

3. Blue Term

Blue term is an android application used to write programs, codes and send these codes to the main controller using a local communication medium namely BLUETOOTH . A Bluetooth module is used to establish such a communication. Common commands like set passwords, set username etc. can be used to change configuration if the Bluetooth module used. The RFCOMM/SPP protocol emulates serial communication over Bluetooth.

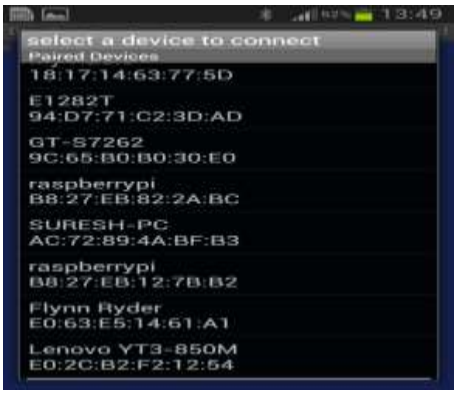

Fig. 3. Blue term Panel

V. Implementation

The system consists of different sensors such as Soil moisture sensor to measure water content of soil, temperature sensor to detect the temperature. DC motor based vehicle is designed for Irrigation purpose. The soil moisture electrode is inserted in soil. It will check the value of that sensor and read the temp value sensor. The set point for soil moisture sensor & temperature sensor is 1000 & 35 respectively.

If the soil moisture value is less than 1000, an alert message is sent ”MOTOR ON” to the mobile then water will be supplied till the plants reach the moisture level. If the soil moisture value is less than 250, an alert message is sent ”MOTOR OFF” to the mobile then water supply will be stopped. The Raspberry Pi will send all the Information to the

server using Wi-Fi. We are using an android app called “blue term” which will be connected to raspberry pi through Bluetooth to control the water motor using voice or text.

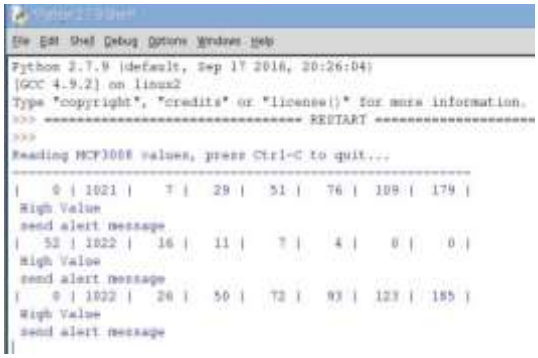

Fig. 4. Snapshot of system in operation

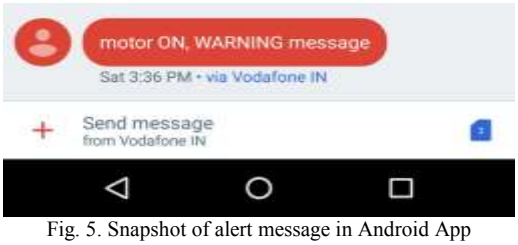

Fig. 5. Snapshot of alert message in Android App

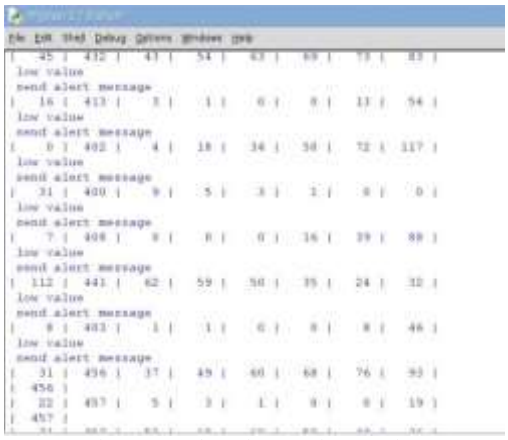

Fig. 6. Snapshot of system in operation

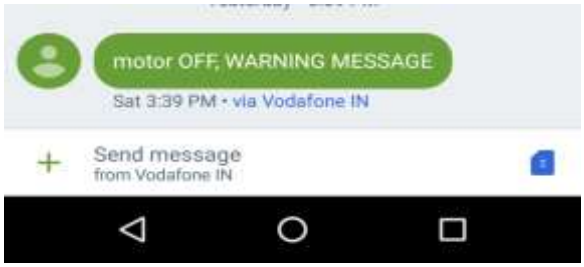

Fig. 7. Snapshot of alert message

The installation of the automated irrigation system is done. It is found that the system works properly and the water is passed to the plants as and when required. If the soil is dry, an alert message is sent ”MOTOR ON” to the mobile and through voice or text water pump starts which leads to water to flow. If the soil is wet, , an alert message is sent ”MOTOR ON” to the mobile and through voice or text water pump is turned off and water flow stop.

We have used an android application i.e. Blue term. These applications work totally on Bluetooth. To interface the android application and the master robot we require a Bluetooth module. The application Blue term is used for coding and writing programming instructions and this programming data is sent via Bluetooth to the paired Bluetooth module. This application acts like an emulator which then is given as the input to the microcontroller Raspberry pi. This Set of codes is then given to the input of the motor driver which is responsible for the movement of the motor. As a result of which the Motor will start and water will be supplied to plants. The same codes are simultaneously sent to the output pin of the microcontroller.

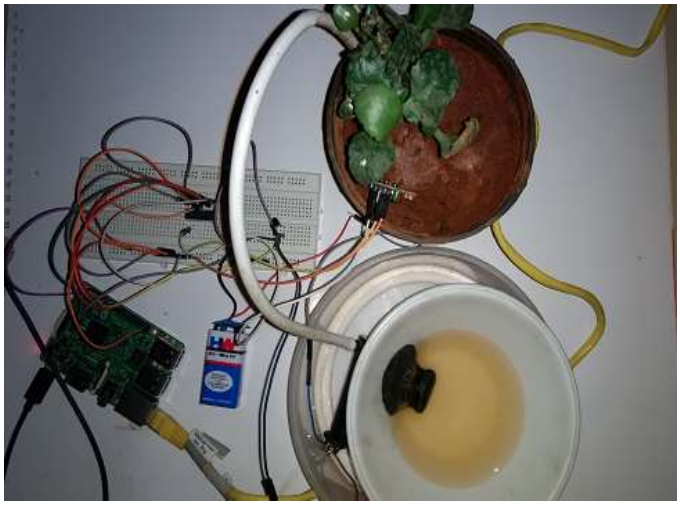

Fig. 8. Project setup

TABLE I

MOISTURE REQUIREMENTS

Moisture level	Timing/sec	Motor Applications
1000	1	ON
980	2	ON
870	2	ON
550	3	ON
300	4	ON
250	1	OFF
230	2	OFF
112	2	OFF
70	2	OFF
40	3	OFF
0	4	OFF

VI. CONCLUSION

In this work, we successfully develop a system that can help in an automated irrigation system by analyzing the moisture level of the ground. The smart irrigation system proves to be a useful system as it automates and regulates the watering without any manual intervention. The primary applications for

this project are for farmers and gardeners who do not have enough time to water crops/plants. The famers are facing major problems in watering their agriculture fields. It is because they have no proper idea about when the current available so that they can pump water.

The moisture sensors and temperature sensor measure the moisture level (water content) and temperature of the plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the raspberry pi and sends an alert message which alerts the Water Pump to turn ON and supply the water to respective plant. Also without visiting will get the status of the motor and temperature on mobile.

The system features a custom sensor design for power efficiency, cost effectiveness, cheap components, as well as scalability end ease of use. In future there are some tasks that should be done and would develop the system to a more mature state. The system may be further extended for outdoor utilization.

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