An Intelligent Water Management in Farming through the IoT

Balakrishna K[1], Aishwarya B T[2], Anjitha H S[3], Chaithra D[4] and Venkataramana K[5]

[1] Asst Professor, Dept of ECE, MIT, Mysore, Karnataka, India
[2,3,4,&5] UG Student, Dept of ECE, MIT, Mysore, Karnataka, India
(Email: balakrishnak_ece@mitmysore.in, aishwaryataishu2@gmail.com)

ABSTRACT: Agriculture is the most important sector in the Indian Economy. It accounts for 18% of India's Gross Domestic Product (GDP) and provides employment to 50% of the countries workforce. In 2013 – 2014 only about 47.7% of total agricultural land in India was reliably irrigated. Therefore, the application of water utilization optimization in irrigation to the plants solves the problem of the inappropriate ways of irrigation to the farm fields. And depending on the soil condition, plants are to be provided with water through a proper irrigation system. Here worked on this problem by designing considering for the prototype of a microcontroller based intelligent irrigation system controller which will allow irrigation to take place from remote places where manual inspection is not needed. The amount of soil moisture, humidity and temperature are indicated through suitable sensors. Another feature of this project is to develop an irrigation controller through a mobile application where it consists of the agricultural values obtained and from the sensors and a decision making control option for irrigation.

Keywords: *Precision Agriculture, Sensors, GSM (*Global System for Mobile communications*), Water Management, Wireless Communication, Irrigation, IOT (Internet of Things), Blynk App.*

I. INTRODUCTION

Water and Food are the main necessity for all kinds of living beings. And agriculture is the major source of food. It gives most of the food but it also takes up most of the Earth's available freshwater resource. The amount of fresh water available is only 0.3 percent which has to be shared for drinking, Industrial processes, agriculture, etc, Agriculture requires large quantities of water for irrigation and of good quality for various products and processes. While feeding the world and producing a diverse range of non- food crops such as cotton, rubber, and industrial oils in an increasingly productive way, agriculture also confirmed its position as the biggest user of water on the globe. Irrigation now claims close to 70 percent of all the freshwater appropriated for human use.

To produce more nutritious food with less water and to ensure a greener and more sustainable food production optimized water saving solution has to be developed. Development of innovative irrigation systems that efficiently use water is a major priority. Taking into account not only the state of the soil and the plants but also climate information. All these data should be properly interpreted to decide the most suitable actions to carry out. Precision Agriculture (PA) is a set of techniques that provide a suitable solution to optimize field level management with regard to crop science by matching farming practices more closely to crop needs [1]. The main objective of this work is focused on designing a microcontroller based intelligent irrigation system controller which will allow irrigation to take place from remote places where manual inspection is not needed.

Through this project, the drawbacks due to less technological advancements were to be reduced by eliminating the strenuous efforts put in by farmers by saving their time and improving the quality of labor and efficiency. And also optimize the amount of water utilized in irrigation.

II. LITERATURE SURVEY

Pavankumar Naik et al., [2] developed an automated irrigation system to reduce the usage of water and power loss in agricultural fields. The system consists of a soil moisture sensor, temperature sensor, water availability sensor, level sensor, EB power availability sensor. Once the sensor information is collected, this automated system gives triggering signals to the actuators and also transmits the data to farmers through SMS. A FUZZY based algorithm is developed with set values of temperature and soil moisture and the level of water is programmed into a microcontroller-based controller system to control the water flow. A GSM modem is used to transmit the information about the crop collected from the sensors.

Prachi Patil et al., [3] worked on automating the agricultural environment in real time using IoT. In this paper, they have used PIC16F877A and GSM SIM300 modem for automating the irrigation system for the social welfare of Indian agriculture system. This system is used for monitoring the soil moisture condition of the farm and also for controlling the soil moisture by monitoring the level of moisture content in the soil and accordingly switching the motor ON/OFF for irrigation purposes. The system purposes a soil moisture

sensor where the moisture has to be monitored. Once the moisture content in the soil reaches a particular level, the system takes appropriate action to stop the water flow. This system also monitors the water in the water source so that if the water level becomes very low, it switches off the motor to prevent damage. The system also consists of a GSM modem through which the farmer can easily be notified about the critical conditions in his farm.

Rajeshwari madly et al., [4] worked on system aims at increasing the yield of crops by using an intelligent irrigation controller that makes use of wireless sensors. Sensors are used to monitor primary parameters such as soil moisture, soil pH, temperature and humidity. Irrigation decisions are taken based on the sensed data and the type of crop being grown. The system provides a mobile application in which farmers can remotely monitor and control the irrigation system. Also, the water pump is protected against damages due to voltage variations and dry running.

III. PROPOSED METHODOLOGY

Advancement in technology allowed human beings to ease their work at the same time complete the work with less human force, less time and with better results. The basic idea behind this project is to control the functioning of the agricultural load using wireless technology.

This project is a transform from the natural irrigation technique which was followed by the farmers to the automatic irrigation which for sure has benefitted in the less wastage of water and lessens the hard work of the farmers in farms [5,6,7 and 8]. Controlling of remotely located irrigation water pumps for an agricultural site without going and visiting the site again and again. With this project, the system results in achieving adequate water management due to which there is almost no wastage of water, saves men power, saves time, and is efficient.

The block diagram of the water management system for agriculture is as shown in Figure 1

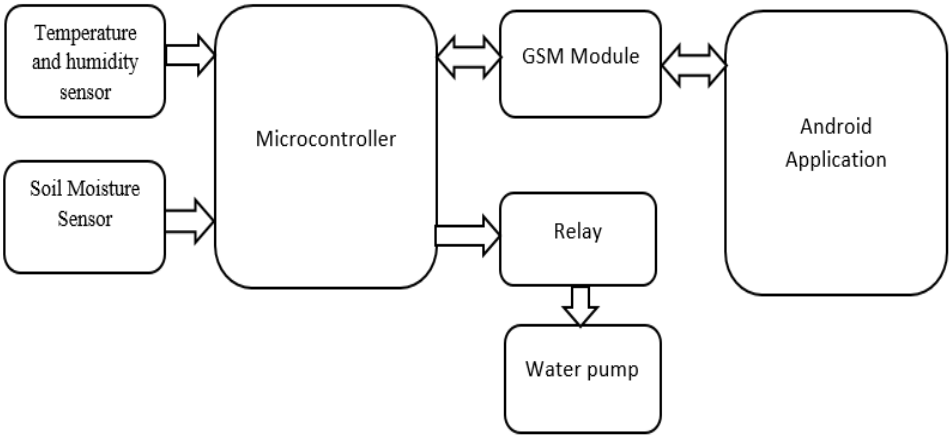

FIGURE 1: INTELLIGENT WATER MANAGEMENT SYSTEM

A sensor-based automated irrigation system provides a solution to farmers where the presence of farmer in the field is not compulsory. Using internet farmer can know about the irrigation status. Thus mobile applications will be helpful in fulfilling this purpose.

Plants require specific conditions for optimal growth and health, monitoring the condition of the crop is necessary so sensors are used. Temperature and humidity sensor – DHT11 is used for sensing the temperature and humidity of the surrounding crop so that it can be monitored properly [9]. LM393 type of soil temperature sensor is used to track the volumetric water content of soil for the growth of plants. These sensors will monitor the crop parameters and send the data to the microcontroller. The obtained information will be sent, using GSM, to the respective android application in the mobile phone of the user. The android application was built using the blynk Platform which provided a simple interface for creating the application and also provided communication between the hardware and the application [10, 11, 12 and 13].

Blynk Application

With this app, the user will get the notification at the time when the water supply motor gets on and off. And if the user wants to control the motor remotely, then also he has the controls with the user. Through this technique irrigation

system can be controlled from anywhere, one just needs a working internet connection and a Smartphone.

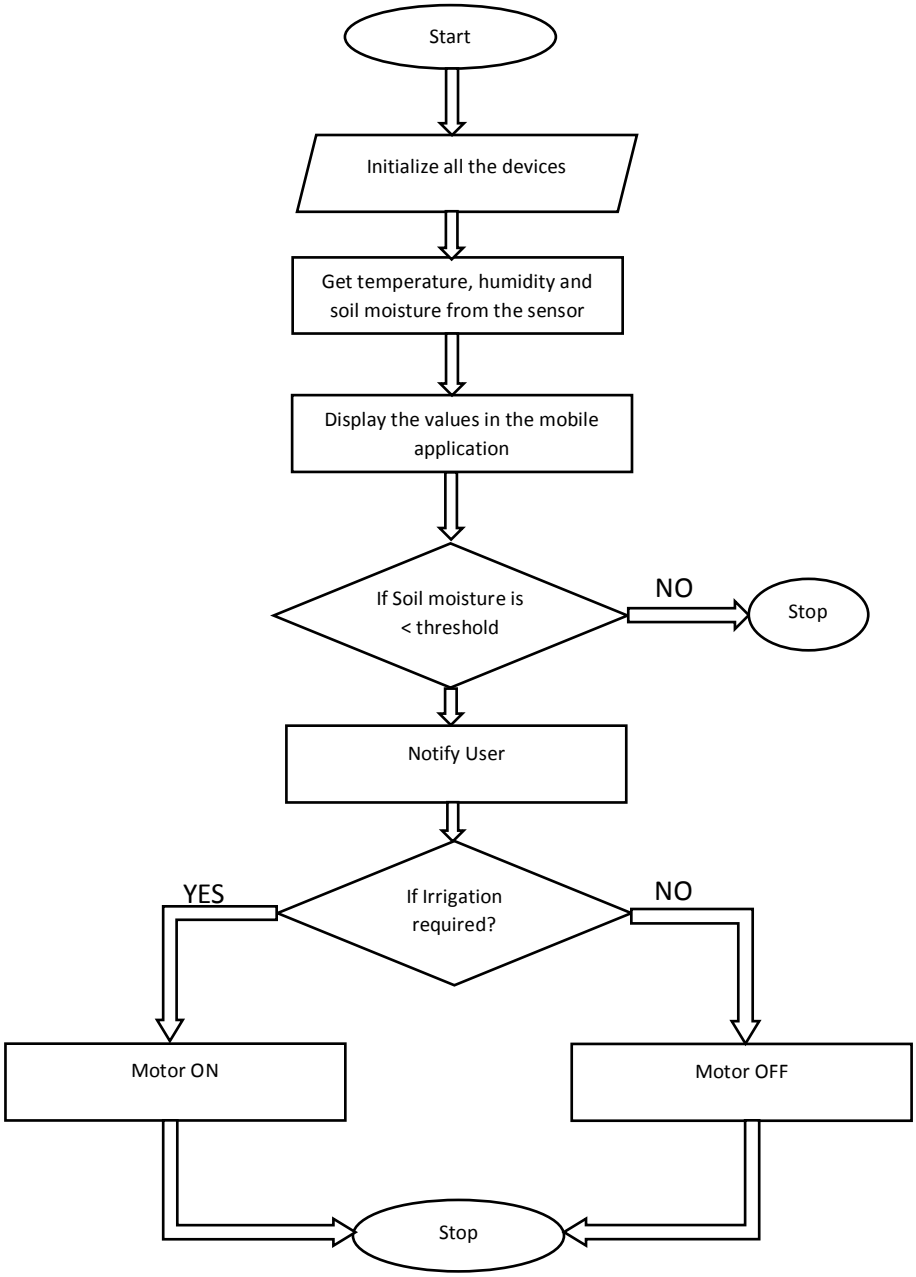

Figure 2: Flow chart for the Proposed Model

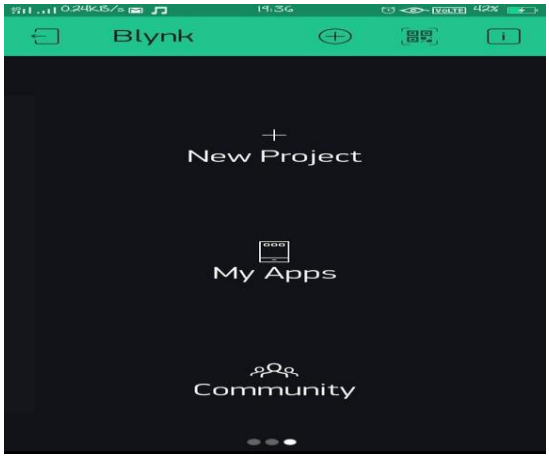

Figure 3: Blynk App designed for proposed model

The user can then access the application to view the agricultural parameters in real time and also will be able to control irrigation remotely. If the threshold is not met, then the farmer will have a choice to allow the flow of water, as per requirement, thereby increasing the efficiency and decreasing the workload on the farmer.

The optimization of irrigation to the farm field are done based on the set threshold values thorough the Blynk App, where one can monitor and control the flow of water to their farm field from remote places. For the experiment purpose considered the chilly crop. The Figure 4 shows the result for the experiment carried out.

IV. RESULT

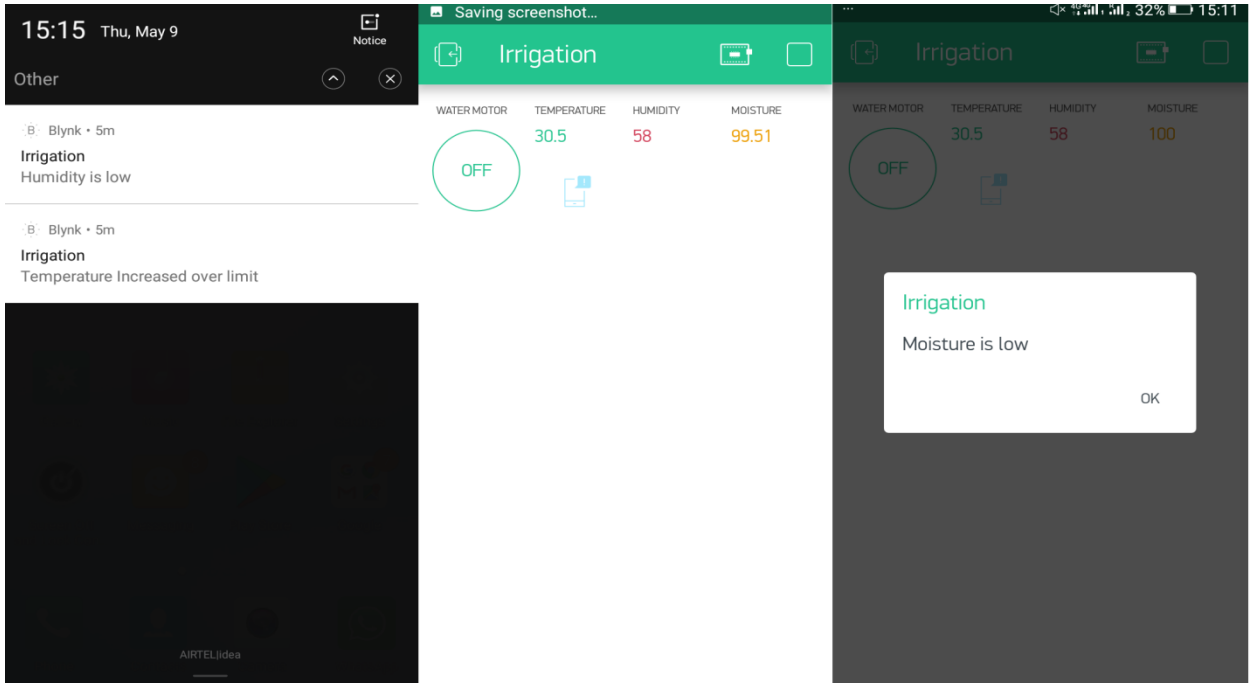

Figure 4: Snapshot of Blynk App showing the field parameters data values and irrigation status

V. CONCLUSION

The proposed system provides an attractive user interface with the most efficient way of controlling the irrigation system. It gives the idea to monitor the soil moisture content and temperature in a farming area and the user can control watering system using the android application in the mobile phone. The application was built using the blynk software which provided an easy way in designing the application. So, the overall implementation cost is cheap and it is affordable for a common person. Considering the present situation, we have chosen Android platform so that most of the people can get benefits. The design consists of Android application by which user can interact and send a control signal to the output of the valve which will control sensors and also monitor the environment. This system of irrigation is also helpful in the region where there is a scarcity of water and improves their sustainability. It can also be adjusted according to the need of varieties of the crop to be irrigated.

ACKNOWLEDGEMENT

We are grateful to Maharaja Institute of Technology, Mysore for continuous encouragement to continue this research work. We would like to thank our family members, Staffs of department ECE and friends for their continuous support to present the paper.

REFERENCES

[1]. Prakashgoud Patil, B.L.Desai. "Intelligent Irrigation Control System By Employing Wireless Sensor Networks" in International Journal of Computer Applications (2013)

[2]. Pavankumar Naik , Arun Kumbi, Kirthishree Katti, Nagaraj Telkar "Automation of irrigation system using IOT" in International Journal of Engineering and Manufacturing Science (2018).

[3]. Prachi Patil, Akshay Narkhedi , Ajita Chalki, Harshali Kalaskar, Manita Rajput "Real Time Automation Of Agricultural Environment" in Department of electronics and Telecommunication, International Conference (2014).

[4]. Rajeshwari Madly, Santhosh Hebbar, Vishwabath Heddoori, G V Prasad. "Intelligent Irrigation Control System Using Wireless Sensors And Android Application" in International Journal of Computer and Information Engineering (2016).

[5]. A. Algeeb, A. Albagul, A. Asseni, O. Khalifa, O.S Jomah. "Design And Fabrication Of An Intelligent Irrigation Control System".

[6]. Arpit Mittal, Niladri Nandan Sarma , A.Sriram, Trisha Roy and Shriya Adhikari"Advanced Agricultural System using GSM Technology" in International Conference on Communication and Signal Processing (2018).

[7]. Pavithra G. "Intelligent Monitoring Device For Agricultural Greenhouse Using Iot"in Department of Computer Science and Engineering (2018).

[8]. Ahmed Huseein Abbas, Maya Medhat Mohammed, Gehad Mostafa Ahmed, Eman Adel Ahmed,Rania Ahmed, Abdel Azeem Abul Seoud. "Smart Watering System For Gardens Using Wireless Sensor Networks" in Department of Communications and Electronics (2014).

[9]. Femila Roseline J , Sree kala J. C, Kasa Ishwarya " Automated Irrigation using a wireless sensor network and GSM module" in Department of Electrical and Electronics Engineering (2017).

[10]. Rashid Hussain , J L Sahgal , Anshulgangwar, Md. Riyaj " Control of irrigation automatically by using wireless sensor networks" in International Journal of Soft Computing and Engineering (2013).

[11]. Shining Li, Jin Cui, Zhigang Li "Wireless Sensor Network for Precise Agriculture Monitoring"inFourth International Conference on Intelligent Computation Technology and Automation(2011).

[12]. Carlos Kamienski, Juha-Pekka Soininen,Markus Paumberger,Stenio Fernandes, Attilio Toscano "An Iot Based Smart Water Managemet Platforms For Precision Irrigation In Agriculture" In Global Internet Of Things Summit(2018).

[13]. Ibrahim Mat, Mohamed Rawidean Mohd Kassim, Ahmed Nizar Harun "Precision Agriculture Application Using Wireless Moisture Sensor Network" In 12th International Conference(2015).

Balakrishna K received his BE and M.Tech Degree from the VTU University, Karnataka, India in 2011 and 2013, and currently submitted his Thesis to get Ph.D. degree at the University of Mysore, Karnataka, India. He has published about 11 research papers in reputed journals and conferences. His research interests his Image processing, Wireless Sensor Network, Communication systems. He has 4 years of Research and Teaching experience.

Aishwarya B T, Chaithra D, Anjitha H S and Venkataramana K are currently pursuing their UG in Electronics and Communication in Maharaja Institute of Technology, Mysore under VTU university. Their research interests his Image processing, Wireless Sensor Network, Communication systems.