Irrigation Monitoring and Controller System Using Internet of Things

Ms. Pratiksha D. Gadge **Prof. U.W. Kaware** **Prof. V.R. Pandit**

Abstract **- Farmers usually work on large portions of land to grow different types of crops. It is not always possible for one person to be able to keep track of the entire farmland all the time. Sometimes it may happen that some portion of soil is not wet while another portion might excessive wet. In either of the cases, the crops can get damaged and farmer may suffer losses. So in order to solve this problem, we propose an "Internet of Things (IoT) based Irrigation Monitoring and Control System". This is a very useful paper wherein, the user can monitor and control the supply of water from a remote location. This system makes use of a concept called Internet of Things (IoT). So for our paper, we connect our system to the internet using a Wi-Fi module. We use an Arduino Uno board to send the control signals and to connect to our desired website. On the website, two things are displayed: a) Motor status b) Moisture level. The system keeps checking the moisture content of the soil using of a moisture sensor, and send the updates about the "Moisture level" on the website. Then the user can check the current moisture level from a remote location and accordingly it controls the water supply. For this, the user only has to toggle the "Motor status" from 'ON-OFF' or vice versa; and the "water pump" will be 'turned ON' or 'turned OFF' accordingly. Thus the 'soil-moisture' gets monitored and the 'water supply' can be controlled by checking the motor status. So the user doesn't have to worry about his crops or plants getting damaged due to 'water-logging' or 'drought'.**

I. INTRODUCTION

In India agriculture plays an important role for development of country. In our country, agriculture depends on the monsoons which has insufficient source of water. In Irrigation system, depending upon the soil type, water is provided to plant. In agriculture, two things are very important, first to get information of about the fertility of soil and second to measure moisture content in soil . Nowadays, there are different techniques available which are used to reduce the dependency of rain. And mostly this technique is driven by electrical power and on/off scheduling. In this technique, water level indicator placed in water reservoir and soil moisture sensors are placed at root zone of plant near the module and gateway unit handles the sensor information and transmit data to the controller which in turns on the control the flow of water through the valves.

1.1 Need of irrigation monitoring & controller system

For drastically increasing demand and decrease in supply of food necessities, it's important to rapid improvement in production of food technology. Agriculture is one and only the source to provide food. This is the important factor in human societies to growing and dynamic demand in food production. Agriculture plays an important role in the economy and development, like India. Due to lack of water and scarcity of land water result the decreasing volume of water on earth, the farmer use irrigation.

1.2 Potential of IoT

The Internet of Things (IoT) holds the potential for major effects across a wide variety of market sectors. There are a number of important horizontal policy issues that affect the IoT across markets and use cases.

The IoT will rely significantly upon maximizing continuity of connectivity. With the world rapidly becoming wireless, establishing an appropriate spectrum policy is essential to ensure that the IoT will be successful.

1.3 Area of Utility

As we know IoT has tremendous applications in almost every sector. But here we mentioned below-

- The primary focus of this paper is to help the farmers and reduce their work.
- This module can be implemented in perennial plant irrigation land and gardening land.

1.4 Hardware Involved

Every system needs some hardware without the system cannot be implemented. The hardware required for this system are mentioned below-

- Rectifier
- Regulator
- LCD screen
- Power supply
- Wi-Fi module
- Water pump
- Soil Moisture Sensor
- Arduino Uno

1.5 Software Involved

Without software some hardware does not work. Hence here we mentioned that software's as follows-

- Arduino Compiler
- MC Programming Language: C
- IoT Gecko

II. PROPOSED SYSTEM

2.1 Algorithm

Every system needs its specific steps which have to be follows. So it states the steps that the proposed system undergoes.

- Step 1: Start the process.
- Step 2: Initialize power is supplied to GSM
- Step 3: Check the moisture level i.e. less than or more than reference value.
- Step 4: If the level will be more than a fixed criteria, no need to irrigation
- Step 5: If Moisture level is less than a fixed criteria, start irrigation.
- Step 6: Initialization of pump and rain gun.
- Step 7: After the process completed, it moves to original state.
- Step 8: Stop the process

2.2 Block diagram

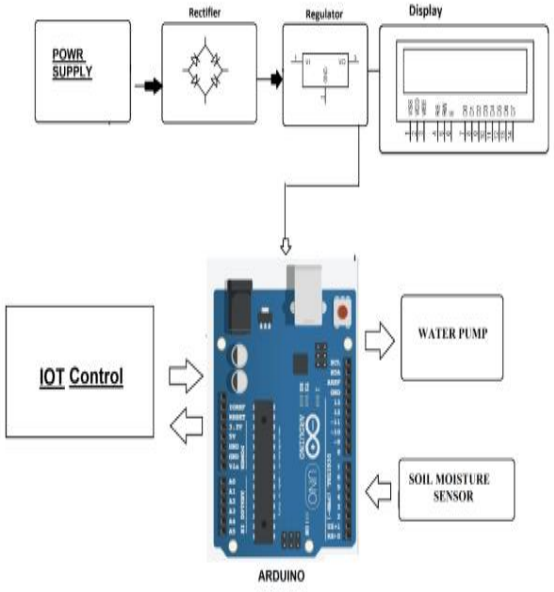

Fig. 1: Block Diagram of Irrigation Monitoring and Controller system using Internet of Things.

- **Block diagram description**

Fig. 1 shows the system block diagram of IoT based irrigation monitoring and controller system. The working of the system is as follows-

- The Wi-Fi module has to connect the internet by using mobile hotspot, Wi-Fi router which is generally known as an internet service provider.
- At first Wi-Fi module checks status of water level indicator, if water is present then it proceeds otherwise it terminates.
- If water is present, then it checks status of soil moisture sensor 1,
- If Region 1 is wet, motor will be off.
- If Region 1 is dry, valve 1 will open and motor will be on for 10 seconds.
- If Region 1 is humid, valve 1 will open and motor will be on for 5 seconds.
- During this, valve 2 will remain closed.
- Once again module checks status of water level indicator, if water is present then it proceeds otherwise it terminates.
- If water is present, then it checks status of soil moisture sensor 2.
- If Region 2 is wet, motor will be off.
- If Region 2 is dry, valve 2 will open and motor will be on for 10 seconds.
- If Region 2 is humid, valve 2 will open and motor will be on for 5 seconds.
- During this, valve 1 will remain closed.
- System is usually OFF state.
- It is possible to get STATUS of the field.
- It is possible to make System ON whenever. Once System is ON, it will check the status and supply the water one time only. Then again System is OFF.
- It is possible to make System OFF. But usually System is always will OFF condition.

III. COMPONENT AND DATASHEET

3.1 Introduction to Arduino Boards

Arduino is an architecture that combines Atmel microcontroller family with standard hardware into a board with inbuilt boot loader for plug and play embedded programming. Arduino Software comes with an IDE that helps writing, debugging and burning program into Arduino. The IDE also comes with a Serial Communication window through which can easily get the serial data from the board.

- **Arduino Uno**

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz, quartz crystal, a USB connection, a power jack. They operate at 5 volts. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips (NXP) and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

Fig. 2.1 Arduino Uno

3.2 ESP8266 WI-FI Module

ESP8266 is a complete self-contained Wi-Fi network solution that can carry software applications, or through another application processor uninstall all Wi-Fi networking capabilities. Built-in cache memory will help improve system performance and reduce memory requirements. Another situation is when wireless Internet access assumes the task of Wi-Fi adapter; we can add it to any microcontroller-based design. The ESP8266 is highly integrated chip, including antenna switch balun, power management converter. So with minimal external circuitry, we includes front-end module, including the entire solution designed to minimize the space occupied by PCB.

3.3 Soil Moisture Sensor

The sensor which is used to read the amount of moisture present in the soil known as Soil Moisture Sensor. It is ideal for monitoring an urban garden and is a must have tool for a connected garden. This sensor uses the two probes to pass current through the soil, and then it reads that resistance to get the moisture level. More water makes the soil conduct electricity more easily i.e. less resistance, while dry soil conducts electricity poorly i.e. more resistance. It will be helpful to remind you to water your indoor plants or to monitor the soil moisture in your garden.

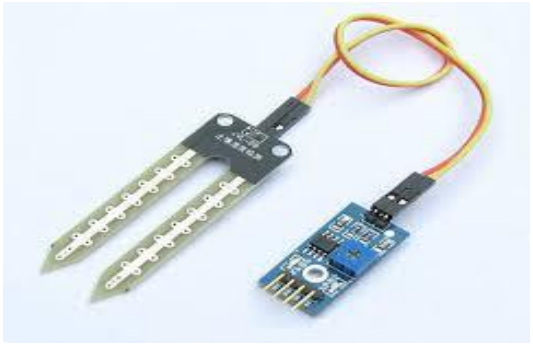

Fig. 3.3 Soil Moisture Sensor YL-69 YL-38

3.4 Solenoid Valve

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off. Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, low control power and compact design. A 2-way valve, for example, has 2 ports; if the valve is open, then the two ports are connected and fluid may flow between the ports; if the valve is closed, then ports are isolated. If the valve is open when the solenoid is not energized, then the valve is termed normally open (N.O.). Similarly, if the valve is closed when the solenoid is not energized, then the valve is termed normally closed (N.C.).

3.5 Submersible Water Pump

A submersible pump is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitations, a problem associated with a high elevation difference between pump and the fluid surface. Small DC Submersible water pumps push fluid to the surface as opposed to jet pumps having to pull fluids. Submersibles are more efficient than jet pumps. It is usually operated between 3V to 12V.

IV. APPLICATION

There are some applications of this system mentioned below-

- Water management depends upon crop types.
- Pest management and control works.
- This system will provide precision agriculture.
- Food production and safety etc.,

V. CONCLUSION

The farm field is being monitored and controlled by MyMQTT android app by user. The ESP8266 is the device at farm which receives the messages and manipulates it and will perform the function mentioned in message. After it will send the messages to user network and in turn it will be published to the user.

This system can also be useful for people having small gardens, while it may not be possible for a person to be continuously present at his/her garden and ensure proper water supply even from a distance. This system is proposed to supports aggressive water management for the farm. It is time saving, led to removal of human error in adjusting available soil moisture levels and to minimize the net profits in accordance to factors like sales, quality and growth of product.

REFERENCES

[1] Review Paper Based On Automatic Irrigation System Based On Rf Module, by Ms. Deweshvree Rane PG Scholar - VLSI, Sevagram, Wardha, India. Published by IJAICT Volume 1, Issue 9, January 2015,

[2] Sensor Based Automated Irrigation System With Iot: A Technical Review by Karan Kanasura, Vishal Zaveri, Babu Madhav Institute of Technology, Uka Tasadia University, Bardoli, Gujarat, India : ISSN:0975-9646 International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 9, September 2016