IoT based Smart Irrigation System using Raspberry Pi

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Abstract— The agriculture filed is changed from manual monitoring and control to Automation with the help of advanced technology results increased productivity and small number of human involvement. In this paper an automatic irrigation system uses automatic watering system to monitor and maintain the appropriate soil moisture content. The control unit is implemented using the Rasbperri Pi microcontroller and remotely controlled through mobile phone. To measure the correct moisture value of the soil the soil moisture sensor is utilized in this work. The over or under irrigation is avoided because, proper amount of water is used based on the values measured by the sensor. The Internet of Things Technology used to store the information and update the farmers about the moisture levels. This framework is for the most part used to distinguish soil moisture in the field. Henceforth the humidity level is verified by IoT technology. In this way, the client can be increment or reduce humidity level are can be controlled by IoT gadget with the assistance of solenoid valve and furthermore water pump stream are can be recognized by water locator. Consequently the model makes the irrigation framework less demanding, productive and financially savvy

Keywords—IoT; Raspberry Pi; solenoid valve

I. INTRODUCTION

Agricultural production contributes significantly to the country's economy. Agriculture is a source of income for more than 70% of the Indian population. In order to compensate for agriculture's declining contribution to the Gross Domestic Product (GDP), we must create new benefits through effective and efficient water use. Because storm rainfalls are unpredictable and ambiguous, water framework is a critical feature in agriculture. Agribusiness has shown to be a remarkable test, even in the face of water scarcity. There is a strong desire to learn more about how to improve the efficiency of water framework systems. [1]. There are a number of different combinations of typical water framework systems that have been used in the past. When designing a stream water system, water resources such as tanks and supplies are strategically placed at breathtaking heights. When it comes to the tank or supply, the weaken begins to stream after the channel. This type of water structure is commonly seen in flat locations. [2]. In contrast, a pull water framework is one in which the fields are higher than the available water, which is the most common situation. Pumps are used to move water from wells, tanks, channels, and conduits into the earth, causing it to flood. Ground water is being pumped out of the ground to flood the land in today's globe. Other traditional procedures that have been used in the past include well water frameworks, tank water frameworks, and cistern water frameworks ,ranching water framework, wrinkle water framework, and bowl base water framework. To improve traditional procedures, various structures have been created employing cutting-edge technologies that aid to reduce cutting wastes, avoid unnecessary and uncommon crop irrigation, and therefore increase item yield. Various cutting-edge water framework systems have evolved to this point. Spill water framework is one such approach for conserving both water and manure. Since ancient times, rough stream water framework has been used. Water and fertilizer are sent directly to the plant establishment in this technique as water dabs on a regular basis. Based on the type of collect, the structure for water application will differ. Water consumption is reduced by 30% as compared to the conventional system. The pot water structure is an alternative solution that is better suited to places with minimal rainfall than the other options. The necks of the pitchers that are being used here have been fixed to the ground level. Pitchers have openings in them that allow water to reach the soil and maintain the soil moist for the plants to grow in. This strategy is particularly appealing in locations where there is no access to stream water supply. Unlike conventional precipitation, the alternative method makes use of a sprinkler system that is comparable to that of conventional precipitation.. In order to ensure that water is used uniformly across the entire earth's surface [3] the water supply from the pumps should be restricted.

These are a few techniques that have been applied in the past to strengthen the water framework system, minimize waste, and increase trim gainfulness. In this project, sensors are used to monitor changes in the field and to automate the water framework system. The system has been tested and has shown amazing results. Farmers benefit greatly from the IoT sensing network because they cannot be on their fields at all times. Farmers will be able to readily receive information regarding [4].

There are no issues with the distant transfer of measured data from sensor field to the implementer, its storage in a database, field control via an adaptive application, or water framework administration. Compared to other conventional and modern water infrastructure systems, the water utilization system is 90 percent more capable.

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II. BACKGROUD OF THIS WORK

Based on the Internet of Things, Dr. M. Newlin and his team created a Smart Watering System (IoT). Despite the fact that it is quite basic, this framework does not bring anything new to the table in terms of functionality or features. It carries out its functions with the help of an Arduino-based system that includes sensors for moisture, temperature, and stickiness. It is only half-automated because the client is responsible for monitoring the water level in the framework. This framework makes use of a GSM module [5] for communication purposes. Rajalakshmi.P and colleagues disseminated an IOT-based Crop-Field Monitoring and Irrigation Automation system. Several sensors, such as temperature, wetness, moisture, and light, are combined in this study to create a smart irrigation framework. This approach is presented in this paper. The data is transported to a web server where it is processed and broken down, and it is then saved in JSON format on the server. The light sensor detects light and delivers a signal to the plant, which allows it to function more efficiently. They intend to utilize clever computations in order to improve the framework. With a 92 percent advantage over the competition, it claims to be the best. [6]

Using a model of an Automated Plant Watering System, Drashti Divani and her colleagues developed a prototype. In this activity, the dampness sensor is used for irrigation because it detects the type of water present in the dirt and, if necessary, notifies the client via the PC to which it is connected via notices when this type of water is present. The dampness sensor is also used for irrigation in other activities. Whenever the difference between the amount of dampness and the amount of limitation esteem is determined, the framework begins the water direct in understanding while also shutting down the pump at the same time. Given that it is not feasible to utilize this system on a farm, it has a limited range due to the fact that it requires a PC to connect to an Arduino board over an Ethernet cable to function properly. [7] Construction of the structure makes use of an Arduino board, dampness sensors, and a water pump, amongst other components.

Nikhil Agrawal and his associates used the Raspberry Pi and the Arduino to develop a Smart Drip Irrigation System for their garden. A master and slave arrangement will be used in this strategy, in which the raspberry pi will control a number of arduino devices using the Zigbee protocol. The Raspberry Pi will continue to scan through the email when it receives a message with the subject line "Turn on the pump for Y minutes." The hand-off of the water pump will be activated for the number of minutes specified in the parameter Y by using this command. When the water tank level is achieved, an email is sent to the client by the ultrasonic sensor[8].

Subhashree Ghosh and colleagues developed Smart Irrigation: A Smart Drip Irrigation System Using Cloud, Android, and Data Mining. This provides a system in which the dirt is filtered for wetness and necessary action is taken, such as starting and stopping the pump. The framework is distinctive in comparison to others because it use Bayes hypothesis to predict future estimates through data mining. This allows the client to understand the example of water directing method in various seasons and to act as needed for water storage. Because this framework was designed for a web client, it cannot be used to develop a portable application.

III. PROPOSED SYSTEM

The block diagram of the work is shown in figure 1. The plant moisture level is measured with the help of moisture sensor. The measured value is inputted to the Raspberry Pi Microcontroller. Here the threshold level is fixed depending on the type of plant. Once the value goes below the threshold level the water pump gets ON and water is distributed to the plant based on the water level. The measured moisture levels are updated in the IoT cloud and information is transferred to the user mobile device.

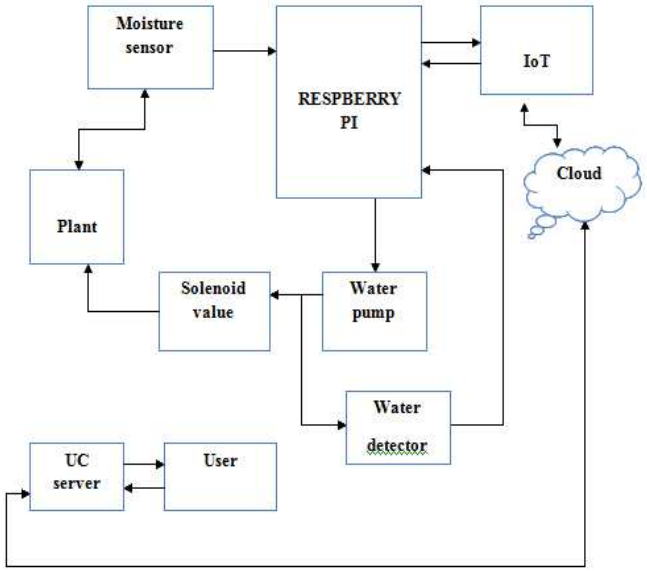

Fig.1. Block Diagram Representation of Proposed System

In this system, humidity sensor is utilized to detect the water level in the dirt and sends the perusing to the raspberry Pi. At that point raspberry sends those readings to the IoT; it is put away to the cloud. Those readings are given to the PC and it is given to the client portable. At the point when the water level surpassing the limit esteem, the client demand to the IoT and after that IoT offered warning to controller. The controller sends the flag to water pump and afterward solenoid valve is utilized to kill the engine. Here water indicator is utilized to identify the proceed with water stream in the water pump to the plant. On the off chance that the water not goes to the water pump, it will be shows to the controller and OFF the motor. The LM 393 soil moisture sensor is used in this work. The monitoring using IoT is accomplished with the aid of Thing Speak server. The module is tested in two fileds and the chart is indicated in figure 3.

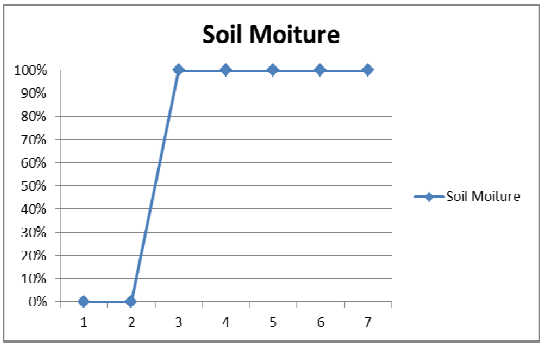

Fig.2. Field chart 1 for soil moisture sensor data

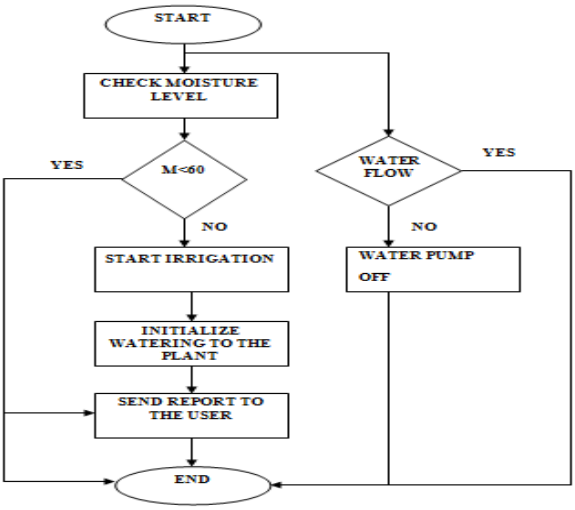

Fig.3. Flow Chart

We will be able to control the moisture content of the dirt on developed property as a result of this project. The hand-off controlled the water pumping engine, which turned on or off in response to the presence or absence of soil moisture. This conserves water while allowing the water level to be obtained in a preferred area of the plant, so increasing the efficiency of the goods. As a result, there is a negligible amount of water wasted. In addition, the system allows for the delivery of water to the plant when it is necessary based on the type of plant and the amount of moisture in the soil. It may be necessary to restrict the activities of important agrarian areas in order to complete the assignment. A large number of components of the framework can be customized, and programming can be used to calibrate the system to meet the needs of the plant. The result is a flexible structure that encourages creativity. We can tell if the dirt is wet or dry based on the results of this sensor. The water indicator transmits the need for the water to be streamed to the plant.

Fig.3.Complete Connection Setup

IV. CONCLUSION

This proposed process is designed to operate a water pump in an automatic manner and the soil moisture sensor detecting sufficient water in a plant or in fields. With the aid of a Raspberry Pi and IoT the information is frequently stored and updated. The proposed controller eliminates the need for the manual operation that farmers previously used to turn on and off the irrigation system. A temperature sensor-based fan speed control system is also planned for use with the framework. It has been designed to incorporate the best features of all of the equipment components that have been used. In future automatic fertilizer injection system is utilized along with this module.

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