International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 05 | May 2020 www.irjet.net p-ISSN: 2395-0072

Smart Drip Irrigation System using IoT with Artificial Lights

Aditya Tripathi[1], Ankit Kr. Maurya[2], Adarsh Pal[3], Mrs. Anamika Gupta[4]

[123]UG Final Year Students, Department of Electronics & Communication Engineering, RKGIT College, U.P. India
[4]Assistant Professor, Department of Electronics & Communication Engineering, RKGIT College, U.P. India

---

Abstract - *This paper explains the dangerous threat of the scarcity of water that is happening due to the irregular and non efficient use of the groundwater. Hence we must understand that we should make an efficient and smart way to irrigate a field. The system proposed here uses these data to analyze the requirement of water in the field. The proposed system uses ATmega328 microcontroller to analyze the data given by the sensor to command the supply of water and it also controls the amount of water that is to be used for irrigation in the field. The various sensors present in the field are soil moisture sensor and temperature sensor. Sensor used in the field doesn't get triggered when enough water is present in the field i.e. the moisture level is good but when the soil gets dry then the soil moisture sensor send the information to the microcontroller which commands the flow of water to start the pump to irrigate the field. So there is a mechanism of switching ON and OFF of the pump which provides the scheduled water supply in required area. The main aim of the system is to examine whether this automatic irrigation system which is known as smart drip irrigation system can reduce the wastage of water in the rural fields.*

Key Words: ATMEGA328, Artificial Lights, Soil Moisture Sensor YL69, ESP8266 Wi-Fi Module, Temperature Sensor LM35

1. INTRODUCTION

We know that in India, agriculture plays a vital role in the development. In our country the irrigation is primarily done by the help of the rainwater or the groundwater which is depleting the drinkable water. The irrigation depends on the soil type in that particular area where irrigation is to be done. We know that there are two things which are to be considered while irrigation i.e. moisture content present in the soil and the fertility of soil. Nowadays there are different irrigation mechanism and techniques available, that is used to reduce our dependency on the groundwater and rain for irrigation. These techniques are dependent upon the switching ON and OFF water pump to regulate the flow of water in the field and involve the use of the water reservoir and the moisture sensor which are placed on the root of plant. As we know that soil moisture sensor has two parts, first is electrical part and second is the sensor probe. The Sensor Probe is placed inside the soil and it handles the data to send it to the controller that commands the water flow to provide required water. The actual parameter values can be seen anytime by user in App.

2. LITERATURE REVIEW

In [1] October 2017 V. Vinoth Kumar and his team member proposed an irrigation system using IOT which receives various sensor data and other atmospheric parameters from the sensors. The data is sent from the various sensors like soil moisture sensor and temperature sensor in analog form. A predefined value of soil moisture is fixed in microcontroller and when the moisture content becomes less than this predefined value then system is triggered.

In [2] February 2017 Shrishti Rawal, explained how the agricultural practices can be made lot easier with the help of automation in the field rather than manual system. This give the greater amount of yield and a very less human attention is required after its implementation. Continuous monitoring and maintenance can be insured with the help of the proposed system. ATMEGA328 Microcontroller attached on ARDUINO UNO board acts as a controlling unit. This system enables the flow of water when the moisture of the soil is below the threshold value.

In [3] September 2017 Arif Gori and Manglesh told that ground water scarcity is a big problem in today's world. There is immediate need of adopting advanced irrigation systems which will be far better than our traditional methods. This will ensure continuous surveillance and conservation of water because this system monitors the need of the field for water. Hence this system can lead to a better agricultural practice.

In [4] March 2017 Dr. S. Joshi told about the system which uses microcontroller and moisture sensor to control the water flow in the field. The system involves the use of humidity sensor, temperature sensor, Wi-Fi module and various other sensors to make an automated irrigation system. The fluctuation of the moisture level in the ground is monitored and according to that the decision is taken by the microcontroller which commands the water flow. If [5] the sent value depicts that the moisture value is below a limit then the requirement of water is fulfilled by the flow of

water arrangement. The data can also be received from the web or application anytime. This helps to monitor the data and erase the resources needed in the field. The proper system hence provides the best use of water and technology. There can be many places where it can be implemented like lawns, parks, agricultural fields etc.

In [5] Oct 2018, Gaikwad Tararani and his team members explain a system based on the raspberry pi which works when AC supply is given to the system. It receives the sensed values of the various sensors. Then raspberry pi analyze the data and data is also saved in web server. Then server does the comparison of the threshold value and current value. And hence the required action is taken by raspberry pi.

In [6] March 2017 Apurva Tyagi and Nina Gupta tell about a system which is based on the switching action of motor to regulate the supply of water. The main aim is to reduce human intervention and improve the quantity of crop produced. This system is Arduino controlled and the sensed data is processed.

3. PROPOSED SYSTEM

The venture proposed is for those remote locations which have the water scarcity problems and proper sunlight is not available for plants to grow. Many times we see in our vicinity that large amount of human labor is required for the proper care of the crop to grow. The proposed system deals with this problem and tries to rectify it by the help of the automated system. Smart Drip Irrigation provides the basic functionality by irrigating the crops but using some advanced technology. We can take the proposed system to a whole new level of Automation.

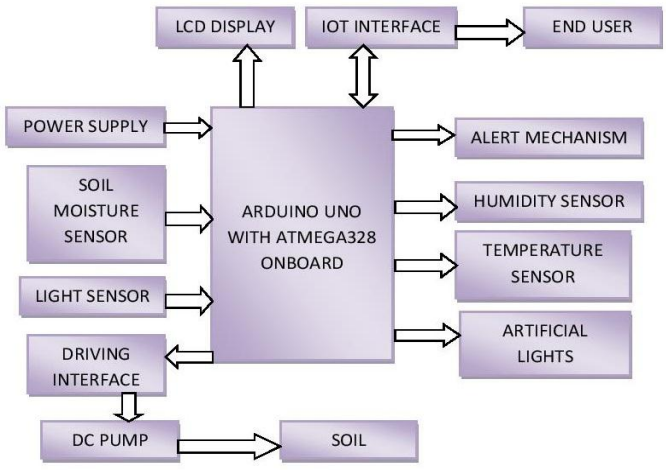

Fig-1: Block Diagram

3.1 Description of the Problem

Our economy has a great dependency on agriculture as it is the most practiced occupation in India. Agriculture provides livelihood to the large part of our economy. India is blessed with large agricultural resources but due to the harsh climatic conditions, farmers are unable to use them to the full. There are many areas in our country which do not receive the sufficient amount of rainwater and water reservoirs are not available for agricultural fields. Continued drawing out of groundwater from earth is leading to the problem of decreasing level of groundwater. In some areas these problems are leading to the scarcity of water and making them to the barren land. There is also a lack of planning in the use of the water present i.e. there is a large amount of water which gets waste during process of irrigation in the field. Today agricultural needs of water is dependent on the water that we get from groundwater and there is large amount of human efforts needed in the agricultural field to perform all the tasks like irrigation. It involves the large amount of planning for the process as well. The proposed system provides the efficient use of water in the field so it is also termed as Smart Irrigation System. Due to use of drop by drop water for irrigation this system is also known as Smart Drip Irrigation System. The importance of this system is that, in it, water is directly provided to the roots of the plant without the wastage of water. This system involves lower flow rate of water which is between 2-20 litres/hour. So, proper installation of the system is needed for it. The system will lead to the better use of the time and the water present. Technology used in this system provides the remote monitoring of the field data and enable the user to make the necessary changes as and when required.

3.2 Advantages

- The proposal irrigation system increase the quality of the crop and yield by the surveillance of the various atmospheric parameters like water level of the tank, moisture content of soil, air temperature and humidity of that particular area.
- Using the threshold value, it applies the algorithm for irrigation to decide when to start and when to stop the flow of water in the field.
- With the help of the level sensor, the proposed system monitor the water level in the tank and when it gets below the particular mark then it will not initiate the process of irrigation.

3.3 Algorithm

Reading Sensor Values

a. Start the modules to the ready state.
b. Read the sensor value.
c. Store that in the register.

Posting Values to Server

a. Establish the connection with server.
b. Instruct Wi-Fi module to drive data.
c. Send sensor value to the server.
d. Store a predefined value in the server database.
e. Take action based on the server response.

Take Action based on Server Response

a. YES- Request completion & continue reading.
b. NO -Continue reading the next sensor Data.

Table-1: Motor Operation on the basis of Moisture

RAIN	SOIL MOISTURE	MOTOR CONDITION
Low(No Rain)	Low (Dry)	ON
Low (No rain)	High (Wet)	OFF
High	Low (Dry)	OFF
High	High (Wet)	OFF

3.4 Flow Chart

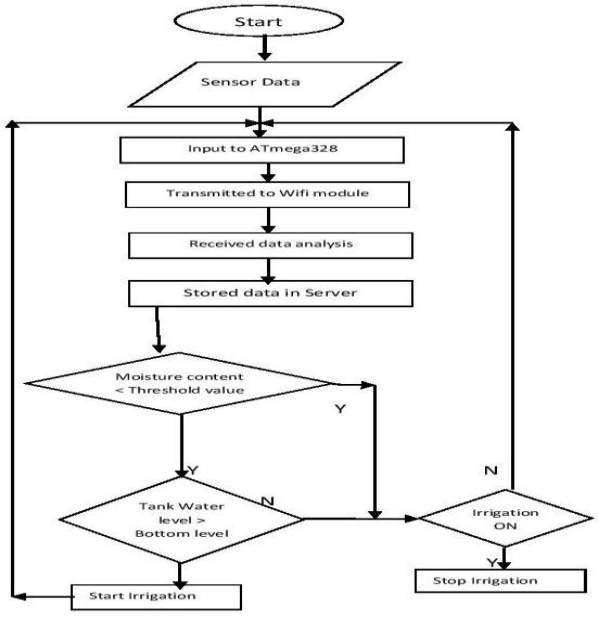

Fig-2: Flow Chart

3.5 Working of the System

The proposed model is the system in which automation and various advanced technologies like IOT are used. System when installed in a particular area then it uses the data acquired from the various sensors like soil moisture sensor, and temperature sensor. The acquired data which is taken in analog form is converted into equivalent electrical signal so that Microcontroller could use the value to command the other units to respond accordingly. When the moisture content gets lower than a threshold value then the system is switched ON. All the sensor values taken from the ground, is stored to sever so that user can take a look at it anytime. The data retrieval is possible through the web portal or the Android Application.

3.5.1 ATMEGA328

ATMEGA328 is a 1 KB Electrically Erasable Programmable Read Only Memory (EEPROM). This microcontroller has a property that even though the supply voltage provided to this microcontroller is detached, it can store all the data and can provide it when the supply voltage is provided again to it. This Microcontroller is attached in the platform provided by ARDUINO UNO. It collects the information provided by the different sensors in the system and commands the other components accordingly.

Fig-3: ATMEGA328

3.5.2 Soil Moisture Sensor YL69

Soil moisture sensor is also known as hygrometer. It is used to collect the moisture level of the soil so that it can provide the required data to the system for initiating the automatic watering system. This sensor has two parts, first one is the electrical part and the second one is the sensor probe which has two sensing probes to provide the analog signal of the moisture content in the soil.

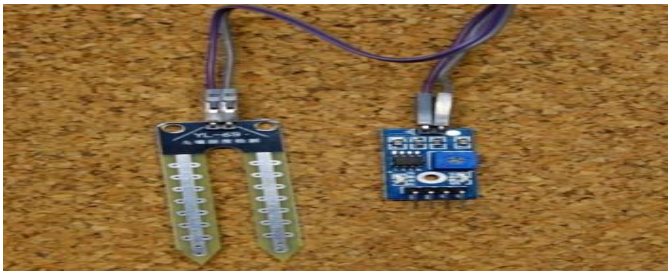

Fig-4: Soil Moisture Sensor

3.5.3 ESP8266 Wi-Fi Module

ESP8266 is a 32 bit RISC CPU which runs at 80 Mega Hertz. It has 64kb boot and instruction RAM. ESP 8266 is a wireless transceiver which is of low cost. It is used in the proposed system to wirelessly transmit and receive the data to/from the server. It is very useful in IOT improvements in case of end to end communication.

Fig-5: WI-FI Module

3.5.4 Temperature Sensor

Temperature sensor is a sensor which is used to find the temperature of its vicinity i.e. it can provide the temperature of the surrounding where it is kept. It is a device which detects the temperature of the environment and collects the information to convert it into electronic information for recording, monitoring and signalling temperature change.

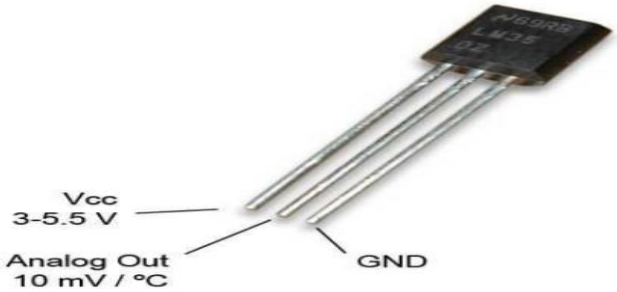

Fig-6: Temperature Sensor

3.5.5 DC Pump

DC motor has an impeller and it gets power through gear drive. As we know that, motor contains a shaft which has the rotor and the coil winding which is present around the rotor. Here permanent magnet plays the role of the stationary object. When the power is provided to the DC motor then the current flows through the coil and it produces magnetic flux. This flux repels the magnet present around it and there is 180 degree spin in the rotor section. Motor is used in the system to provide the water regulation. When the moisture value sensed, is lower than a predefined threshold value then the power supply to the Dc pump is set and pump starts to regulate the water in the concerned area. Continue monitoring of the moisture value allows the system to decide when to stop the flow of water in the field.

Fig-7: DC Pump

3.5.6 Relay

Relay is switch which works on electric supply. Relay open and closes the connection to provide the electrical control over the system. It has quality to detect the conditions which are undesirable for an assigned area and due to this it breaks the circuit to disconnect the area which is affected with such situation. Hence it is used to protect the system from any intolerable condition.

Fig-8: Relay

3.5.7 Artificial Lights for the Growth of Plants

Firstly the use of the artificial light for the growth of plants was done in 1868. Plant start the process of photosynthesis when they get enough amount of photons falling on them from the sunlight i.e. light provide the enough energy to the plants for the process of photosynthesis. Various areas are in such climatic conditions that they do not receive sufficient amount of sunlight and hence it is very difficult for plants to start the process of photosynthesis. According to the Inverse Square law, the intensity of light radiated from source, that incident on a surface is inversely proportional to square of the surface's distance from the source. For the best use of the light present, reflectors are used as they extract the maximum efficiency of the light. As we know that the wavelength of the light from the sun is from 400nm to 700nm so, it is required that we apply the same wavelength light to plants. According to studies it is found that some specific LEDs provide the same amount of energy as sunlight.

Fig-9: Artificial Lights for Plants

4. RESULT & DISCUSSION

The proposed system gives the output value regarding the reading given by the various sensors. Quality and quantity of the form fields can be improved with the help of the proposed system by analyzing the temperature, humidity, water level and soil moisture value without any intervention of human. By the help of IOT, system can be made more human friendly. ESP8266 is a Wi-Fi module which provides the real time information to the server and this information can be seen from any remote place on an Android app or web portal. When the system is applied to the multiple plants then each node includes soil moisture sensor, temperature sensor and various other sensors which provide the data to the microcontroller. And if there are multiple types of crops then different threshold values for the moisture is predefined for the particular crop.

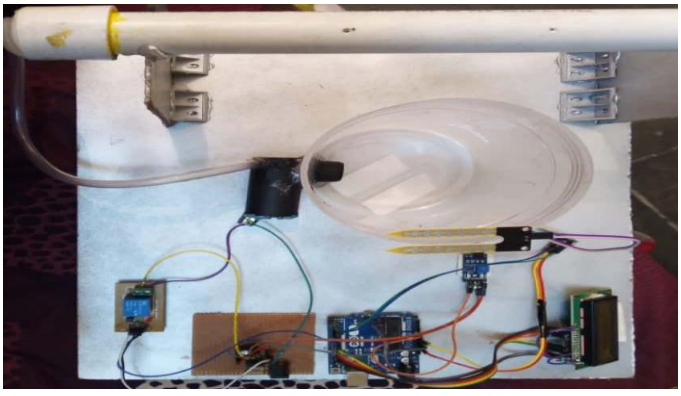

Fig-10: Snapshot of Working Model

Range of the Soil moisture readings ranges from **0-100%**. This range explains the moisture content in the soil in percentage. When the soil moisture content decreases and comes below **50** then the motor is triggered to start the water flow in the concerned area. Temperature sensor gives the reading in **°C.** And depending on these set of values, command is initiated to **ON** or **OFF** the water flow.

Table-2: Outcome of the Project

Sr. No.	Moisture Content (%)	Temperature (°C)	Motor Status
1.	65	37.8	OFF
2.	59	38.5	OFF
3.	50	40.2	OFF
4.	49	40.7	ON
5.	51	41.4	OFF

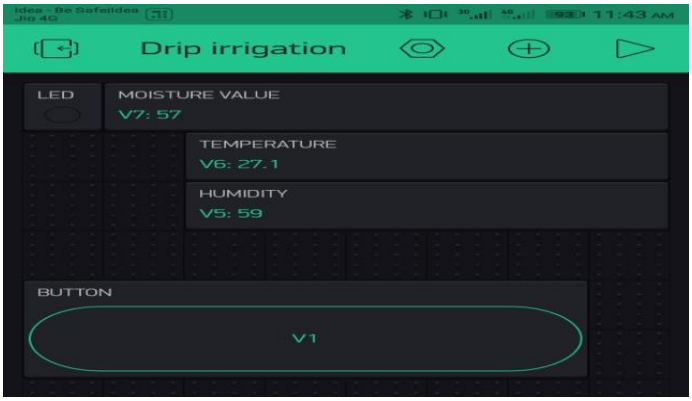

Fig-11: Screenshot of the Blynk App

5. CONCLUSION & FUTURE SCOPE

The proposed irrigation system is very beneficial for the farmers as it reduces the water wastage and no human interaction is required to operate it. This system provides quick and precise analysis of the various atmospheric parameters which enables the system to respond quickly. The smart irrigation system needs the schedule maintenance procedures for the long and efficient operation periods. The proposed system has a great potential of improvement and can provide a great assistance in the near future when applied to a larger scale. This system precisely controls the flow of water and detects all the parameters required for the better growth of the crop in a particular area. With few developments in the system, various other facilities like providing fertilizers at proper intervals and disease detection can be possible. With correct design and management of the system, it can provide such a performance on which farmers can rely on. With the use of internet of things, the system reaches to the amazing level of automation and control. IOT provides a wireless connection between all the components present in the system to sense the data and respond accordingly. The way IOT has evolved

in the recent times; we can expect that the proposed system can lead to a greater success with further improvements.

This paper proposes a Smart Drip Irrigation System which provides solution to various problems that a former deals while using the traditional system for irrigation. Soil moisture sensor and the temperature sensor collect the data and convert into the usable form to send it to the server where the data analysis is performed. Also, former receives all the information that we require about their field and they get the interface to interact with the system remotely to make changes. The system can also be developed to provide various other facilities like adding fertilizers and other chemical to the agricultural field by the addition of various other sensors and valves. The Smart Drip Irrigation System can also be implemented in commercial agricultural use. With use of other technologies like Artificial intelligence and Deep learning, we can detect various plant disease and pest in the crop with the help of Digital Image Processing. We commonly used passwords to protect our personal computer from an unauthorized access. Database can be developed to store and track the sensor values of the concerned area. In remote areas, network connection can be weak sometimes; in such situation we can have the control over the system through the service of SMS. Advanced Android apps can be created using IOT, to provide the better interface for the farmers which will enable them to analyze the area completely in a better and easy way.

ACKNOWLEDGEMENT

We take this opportunity to convey our profound regards to our project mentor "**Mrs. Anamika Gupta**" for her precious inputs, upliftment and sincerest involvement with her productive criticism over the duration of the completion of our project. We take our privilege to thank all those who were involved in the project directly or indirectly. We are grateful to all those who provided their constructive comments which proved to be a great improvement for our project.

REFERENCES

[1] V. Vinoth Kumar, R. Ramasamy, S. Janarthanan, M. Vasim Babu "IMPLEMENTATION OF IOT IN SMART IRRIGATION SYSTEM USING ARDUINO PROCESSOR", International Journal of Civil Engineering and Technology. October 2017.

[2] Srishti Rawal "IOT based Smart Irrigation System" International Journal of Computer applications (0975 – 8887) February 2017.

[3] Arif Gori, Manglesh Smart Irrigation System using IOT" International Journal of Advanced Research in Computer and Communication Engineering, September 2017.

[4] Dr.S.Jothi Muneeswari1 "Smart Irrigation System using Iot approach" International Journal of Engineering Research & Science (IJOER) march 2017.

[5] Gaikwad Tararani, Gandule Shital, Korabu Sofiya, Pawar Gouri "Smart Drip Irrigation System using IOT" International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 10 | Oct 2018.

[6] Apurva Tyagi and Nina Gupta "Smart Irrigation System" IJIRST –International Journal for Innovative Research in Science & Technology| Volume 3 | Issue 10 | March 2017.

BIOGRAPHIES

Aditya Tripathi
UG, Final Year Student
Dept. of ECE
RKGIT, Ghaziabad, India

Ankit Kr. Maurya
UG, Final Year Student
Dept. of ECE
RKGIT, Ghaziabad, India

Adarsh Pal
UG, Final Year Student
Dept. of ECE
RKGIT, Ghaziabad, India

Mrs. Anamika Gupta
Assistant Professor
Dept. of ECE
RKGIT, Ghaziabad, India