International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 03 | Mar-2018 www.irjet.net p-ISSN: 2395-0072

Automated Irrigation System Using IOT

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Abstract - *It's been nearly 60 Years(1960's) since the green revolution started but the farmers of our country are still dependent on the rain for farming. The techniques used for irrigation are also merely same. To adapt to the changing needs and demands, we have to modify the way we farm and use automation for our benefits. The proposed method will use the Soil Moisture Sensor and a Sensor to detect the Temperature and the humidity. The system will set a threshold value for the moisture of the crops. If the moisture falls below the threshold value, the crops will be irrigated and if the moisture level increases the threshold value, the water pump will be stopped. If the temperature and Humidity around the crops is high, it will let the farmer know when to use insecticides and pesticides.*

***Key Words*: Automation, Irrigation, Agriculture, IOT, Water Conservation**

1. INTRODUCTION

The primary sector is undoubtedly one of the most important sector of the Indian Economy. It accounts for 17-18% of the GDP and is also responsible in giving job to half of the working man force of India.

Farming has progressed significantly in the previous century. We create more food now than we have any time in the recent years. However, our present techniques are unsustainable, and as the number of people are increasing so quickly, current Agricultural techniques will require a complete makeover if we want to compete with the depleting resources.

Watering the land daily is vital for the growth of the plants. In simple words, watering the land efficiently by any means in known as irrigation. Lots of water is wasted during irrigation and therefore we must employ ways to use the irrigated water efficiently.

The water used in irrigation is by far the highest in terms of percent than any other purpose of water (Accounts for nearly 70%). About 60% of the irrigated water is wasted and doesn't reach the crops. Since the water is already scarce, we cannot afford to waste that much of water.

If the temperature and Humidity around the crops is high, it promotes the growth of unwanted substances like fungi and bacteria. It can also lead to rotting of the crops. Hence the temperature and humidity must be low in order to grow crops of good quality.

During Storms and Heavy rains, there is always a risk of flood which will not only lead to excessive watering of crops but also the damage to machinery and livestock.

In this technological era, where information plays an important role, Primary Sector is becoming a very information intensive industry. The farmers need to store the data from sensors in order to automate the tasks and become efficient.

With the ease access to technology and the sensors getting cheaper day by day, it has now become feasible for the agricultural sector to employ the sensors and automate their tasks. This will save a lot of manual labour and cost and also the farmers can pay attention to other farm activities like to their livestock.

Hence it is a better option to modernize the growth of crops and prevent all these problems.

2. LITERATURE SURVEY

A Remote Measurement and Control System for Greenhouse Based on GSM-SMS by Shen Jin, Song Jingling, Han Qiuyan

In this paper, the proposed framework presented a GSM-SMS remote estimation and control framework for greenhouse in view of PC-based database framework associated with central station. Central station is produced by utilizing a micro-controller, GSM module, sensors and actuators. In the proposed system, the main station gets and sends information through the GSM module. Various parameters such as Humidity and Temperature are measured using the sensors. The GSM-Module sends a message every time the temperature or humidity varies from the threshold value.

Smart irrigation System Using Wireless Sensor Network by A. Salam Al-Ammri, Sherin Ridah

In this paper, they proposed a method of irrigation using wireless network(Bluetooth). The soil moisture sensor was used to detect the amount of moisture in the soil, if it was below the threshold, the sensor sends a message using Bluetooth to the motor driver board. The pump is first given training by forming a neural network. Hence upon receiving the signal from the moisture sensor, the decision is made by using appropriate input values.

Solar Powered Smart Irrigation System S. Harishankar1, R. Sathish Kumar2, Sudharsan K.P, U. Vignesh and T.Viveknath

The proposed system is again a automated irrigation system which automatically turns on the water pump when needed. The Solar energy is the most abundant form of energy. In this system, they use solar panels to power up their system which helps the energy crisis we have. The system uses a soil moisture sensor which calculates the soil moisture content between its electrodes. The motor is turned on/off by the energy provided by the solar panels depending upon the threshold value.

Smart Drip Irrigation System using Raspberry pi and Arduino by Smita Singhal, Nikhil Agrawal

In this paper, the idea of automating the irrigation from remote places is focused. It wants the farmers to activate the water pump whenever they want without being physically present. The farmer simply has to send a mail on a specific Email id. The raspberry pi searches the email using a python program on the Email account. It then sends the message to the Arduino board to activate the pump. Hence irrigation is automated and is done without any human interaction.

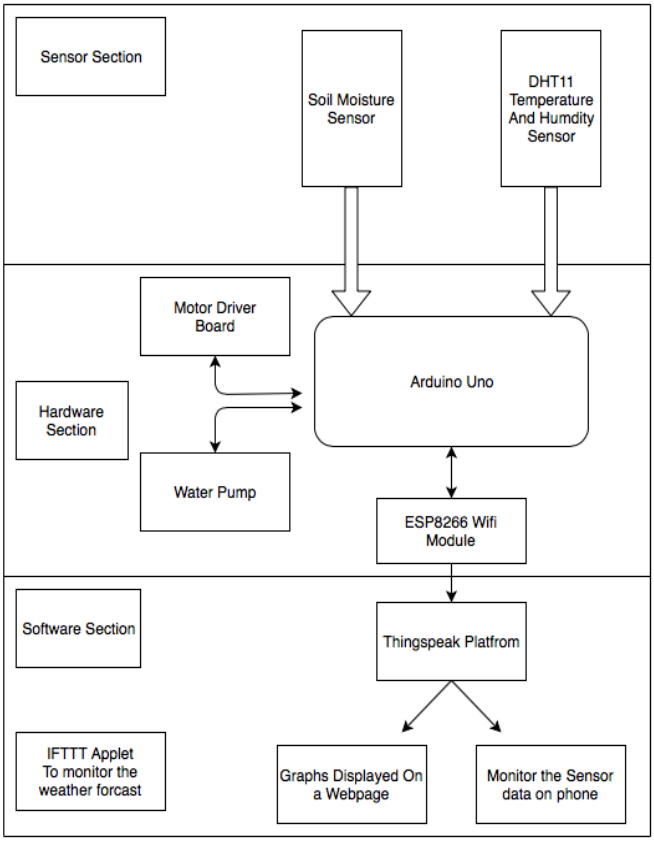

Figure 1: Architectural Design

3. PROPOSED SYTEM

The proposed method will use the Soil Moisture Sensor and a DHT11 Sensor to detect the Temperature and the humidity. A threshold value for the moisture of the crops will be set. If the moisture level falls below the marked value, the crops will be irrigated and if the moisture level crosses the threshold value, the water pump will be stopped. If the temperature and Humidity around the crops is high, it promotes the growth of unwanted substances like fungi and bacteria. It can also lead to rotting of the crops. Hence our temperature and Humidity sensor will warn the farmer when to use insecticides and Pesticides. During Storms and Heavy rains, there is always a risk of flood which will not only lead to excessive watering of crops but also the damage to machinery and livestock. In order to cope with all of this, our proposed method will alert the farmers using SMS well in advance by checking the weather forecast for the day/week. This will allow him to move the livestock and Machinery to a safe place. This system will be monitored online on the thingspeak platform and also on the Mobile phone using virtuino Application.

The system can be divided into the hardware and software. The hardware part includes the Arduino, motor driver board, water pump and the sensors. The software part includes the thingspeak host platform, Virtuino App, Webpage designed for monitoring the crops and the IFTTT applet designed to monitor the weather forecast and warn the farmers for any odd weather conditions.

3.1 Sensor Section

The Soil moisture sensor consists of two electrodes. These electrodes are put in soil and current is passes through them. The current passed through the soil between the two electrodes will determine the moisture content of soil. More the water content in soil, easier it will be to pass the current between the electrodes. Hence, this is how the moisture content is calculated of the soil.

Figure 2: Soil Moisture Sensor

To determine the temperature and humidity of Air, we use the DHT11 sensor. It consists of two components, a Humidity measuring component and a NTC temperature sensor also known as a thermistor. The humidity measuring component works on a similar principle as a

soil moisture measuring sensor. It all consists of two electrodes with the moisture holding substrate between them. Current is passed between the two electrodes. The amount of resistance offered by the substrate changes as the amount of moisture in air changes. These changes are measured and humidity is calculated.

For the temperature sensor, it consists of a thermistor. A thermistor is a device which changes its resistance with the change in temperature. Hence, by measuring the change in resistance we can calculate the temperature.

3.2 Hardware Section

The hardware consists of the Motor driver board, Water Pump, ESP8266 WIFI Module and the Arduino which powers them all. The sensors send all their data to the Arduino. If the moisture content of the soil is below the threshold value, Arduino sends the signal to motor driver board to turn on the water pump. Once the moisture content again reaches the threshold value, the pump is turned off. The ESP8266 WIFI module is also connected to the Arduino, it is responsible to store the data collected form the sensors on a host server such as thingspeak platform.

3.3 Software Section

The thingspeak platform stores the data collected form the sensors. The farmers can use an android app such as Virtuino to access the sensor data. With the app we can monitor the sensor data. We can also put warning alarms which will trigger whenever the water pump is turned on or also when moisture content falls below threshold. A webpage is also created where graphs will be generated depicting the soil moisture content at various times. For getting a warning message of the weather forecast, we can subscribe to an IFTTT Applet. It will send us a text message/ Email whenever the weather forecast is not suitable for the crops and the farmer can take appropriate actions.

4. METHODOLOGY

The soil moisture threshold value is set which depends upon the type of crop i.e it needs more water or less. This threshold value is checked every time by Arduino to power up the motor or not. The humidity and Temperature sensor also send their data to Arduino. The crops require optimum temperature and Humidity or else the quality of the crops is compromised. The Arduino is further connected to the motor drive board and ESP8266. The motor driver board turns on the water pump whenever the soil moisture content drops the threshold value. The ESP8266 is responsible to connect the hardware and the software part. The ESP 8266 module connect the Arduino to the thingspeak platform and sends the sensor data wirelessly. The thingspeak platform stores the data which can be analyzed by the farmers by looking at the graphs on the webpage. The thingspeak platform also shares their data to a virtuino App which lets the framers monitor the sensor data remotely. The IFTTT applet sends a text message/Email whenever the weather forecast varies the specified or normal conditions.

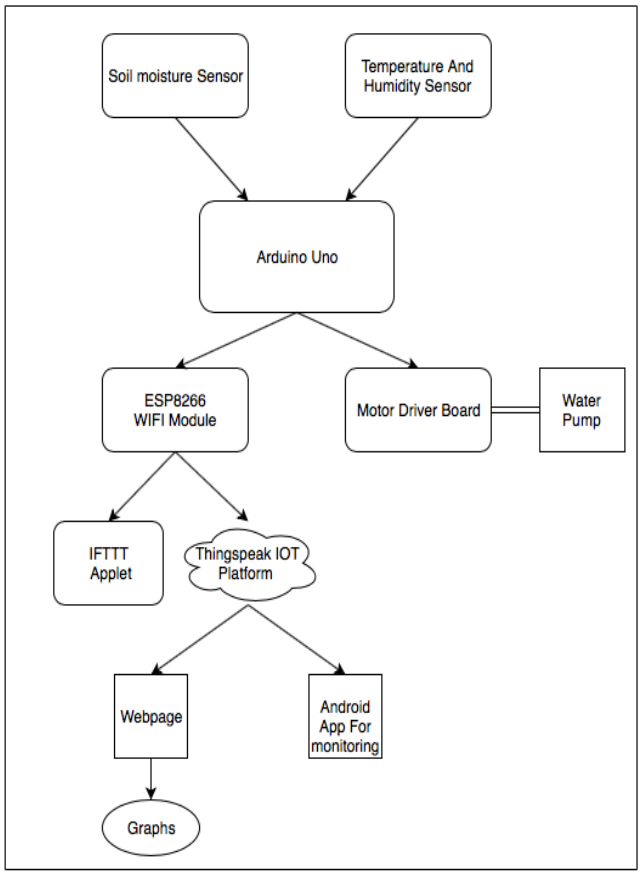

Figure 3: Flow Diagram of the system

5. CONCLUSION

The country which depends its most of the livelihood on agriculture, needs a Smart and efficient way to adapt to the changing needs and demands. This system provides the farmer this solution which is not only very efficient but is also very cost efficient. By Adapting to this system, We can save a lot of Water by irrigating only when needed. This will also let farmers save the quality of crops by over or less irrigating the crops. The temperature and Humidity sensors warns the farmers to use pesticides and infectants whenever their value is too high. The farmers can also analyze the Soil moisture graphs on the webpage and on mobile phones using virtuino App. The IFTTT Applet will warn the farmers of any mishap by monitoring the weather forecast. Thus, it is a potential solution to the problems faced by farmers.

6. ACKNOWLEDGEMENT

I would like to thank my Project Guide Prof. Shaik Naseera (Associate Professor, VIT, Vellore) for guiding and helping

me at every step of the project. Secondly, I would also like to thank my college, V.I.T, Vellore for giving me such a wonderful opportunity which enabled me to complete this project successfully.

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