Implementation of Automated Water Pump for Irrigation Using IoT

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ABSTRACT

Water is the most essential factor for living. In this most competitive and commercial world the accessibility towards the available resources has also increased. As India is a developing country and the need for agricultural perspective has also increased. Most of the people in rural area mostly rely on agriculture for livelihood and this is carried out by the process of irrigation. So the main objective of this paper is to control the unnecessary wastage of water and to make efficient use of available water. This project basically aims at providing the feasible way to farmers to supply water to the crops where it will examine the requirement of water by using humidity sensor, temperature sensor and moisture sensor. Hence it provides automated mechanism which will analyze and decide whether to turn the water pump ON or OFF. The PIC microcontroller which is programmed is placed in the land in such a way that it will collect input signals of the moisture and temperature conditions of the land which keeps on changing via moisture and temperature sensors. The water pump is turned on whenever there is a need of water in the field. The data from the humidity sensor and temperature sensor is updated continuously on the web page and IoT based system. ZigBee modules are used for both transmitter and receiver side for communication.

Keywords: IoT, PIC microcontroller, ZigBee module, Moisture sensor, Temperature sensor, Humidity sensor

1. INTRODUCTION

Nowadays our country is suffering from the problem of water scarcity. Hence, we cannot totally be dependent on monsoons as the source of water. So to utilize the available water in optimized way there is a requirement for an irrigation system which will provide water for agriculture purpose for all soil types without wastage of water. So to obtain the presence of humidity in soil, the sensors are kept at the base of the plants and trees. The information from the humidity, temperature and moisture sensors is then transmitted to the web page by using the GPRS technology. Hence we can view the date and access it.

In present days, wireless sensor network contributes a significant application in supervising the agricultural production and also reducing, torment of people doing farming. As we know that irrigation is the process of supplying water to the soil. The water that is required may vary from one type of soil to another and it also depends on different soil parameters like pH, Temperature, Humidity, Moisture of soil and type of the crops [1].

In this proposed system ZigBee modules are used to transmit and receive the data without any physical medium. Recently there are many smart irrigation system developed with the purpose of operating it manually and automated. So the existing system basically rely on computer based, real time based and low and high technological principles. This project is less expensive and affordable [2].

The desired project will help the farmers in the real time monitoring of crops and also to utilize water in very efficient way for the purpose of irrigation by examining the soil temperature, humidity and moisture. The system also has the feature of providing the water to the crops from any remote places. For the future enhancement the implementation can be done for detecting the mineral deficiency where we can capture and analyze the crop images. Moreover, the domain of agriculture can be altered from the canonical manual, stable to smart, intelligent and dynamic which will extinguish higher production with less human involvement and also by using automation of farm and garden related activities.

A PIC microcontroller is provided with wireless transceivers with great quality for automation in fields. This is due to their natural resources, less consumption of power, size, affordability, efficiency and scalability. The development professionals and Research are making an attempt to grasp the opportunity and to seek attention towards the trending style.

2. METHODOLOGY
Internet of Things (IoT) technology is used to send continuous information about the water supply. The information from the humidity sensor, moisture sensor and temperature sensor is stored in the database and the farmer can access the information from the web page or android application [3]. Figure 1 shows the block diagram for transmitting side. Which consists 3 sensors they are temperature sensor, humidity sensor and moisture sensor respectively. It also consists of ZigBee TX module which sends the data to the to ZigBee RX module. All the sensors, ZigBee TX module and relay drivers are connected to the PIC16F877A micro controller.

![Block diagram of transmitting side](image)

**Figure 1** Block diagram of transmitting side

The transmitting side is provided with 5V DC power supply for microcontroller, sensors, LCD and ZigBee TX. Relay is provided with 12V power supply. Temperature sensor measures the temperature conditions of the land and sends the measurement to PIC microcontroller. Similarly the moisture sensor is deployed into the field which measures the moisture level in the soil and the humidity sensor measures the water content in the atmosphere. Data collected from all three sensors is sent to the PIC microcontroller which is programmed according to the conditions. If the values are satisfy the land condition then need not turn on the pump. If its not satisfied particular range of values then the pump is automatically turned on. As the conditions are satisfied the pump will automatically turn off. The relay manages the operation of the pump. The measurements obtained from the sensors as well as the pump state is displayed in LCD. The data is sent to receiver side every 5 seconds via the ZigBee TX.

**Figure 2** Transmitting side

The transmitting side is provided with 5V DC power supply for microcontroller, sensors, LCD and ZigBee TX. Relay is provided with 12V power supply. Temperature sensor measures the temperature conditions of the land and sends the measurement to PIC microcontroller. Similarly the moisture sensor is deployed into the field which measures the moisture level in the soil and the humidity sensor measures the water content in the atmosphere. Data collected from all three sensors is sent to the PIC microcontroller which is programmed according to the conditions. If the values are satisfy the land condition then need not turn on the pump. If its not satisfied particular range of values then the pump is automatically turned on. As the conditions are satisfied the pump will automatically turn off. The relay manages the operation of the pump. The measurements obtained from the sensors as well as the pump state is displayed in LCD. The data is sent to receiver side every 5 seconds via the ZigBee TX.

Figure 3 shows the block diagram for receiver side. The receiver side is used to dump the data in the web page. In this also we consider PIC16F877A micro-controller. The micro-controller sends the data to server received from ZigBee receiving module. Server then dumps the data to the web page.
3. RESULT
Sensors are firstly deployed into the field. Moisture of the field is measured by moisture sensor, temperature is measured by temperature sensor and humidity is measured by humidity sensor. These sensor values are recorded in the server. Depending on the measured data from sensors pump will be automatically turned on or off and these data are displayed on the web page for the farmer. The farmer can also access the older data from the web page. The farmer can even manually turn the pump on or off using the app.

4. CONCLUSION
Thus the IoT and ZigBee Irrigation system has been developed by integrated features of all the hardware components used. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content), temperature sensor sense the temperature and humidity sensor sense humidity level of the field. If the moisture level goes below the desired and limited level or temperature goes above the desired point or in both the cases, the respective sensor sends the signal to the controller board which triggers the Water Pump to turn ON and supply the water to respective field. When the desired moisture or temperature level is reached, the system halts on its own and the water Pump is turned OFF or the farmer can turn on or off the pump at any time using an android app. Using the automation and web interface farmer can control and monitor the system. This system avoid the water wastage and provide the required amount of water to the field.

References

