

Smart Agriculture System

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Abstract:- Automation of farm activities can transform agricultural domain from being manual and static to intelligent and dynamic leading to higher production with lesser human supervision. As water supply is becoming scarce in today's world, there is an urgency of adopting smart ways of irrigation. This paper aims at saving time and avoiding problems like constant vigilance. It also helps in conserving water by automatically providing water to the plants/field depending on the water requirements. This system can also prove to be helpful in agriculture, parks and lawns. The objective of this system is to detect the moisture content of the soil and depending on it sprinkle water. This entire information will be sent to the user's mobile phone. This paper proposes an automated irrigation system which monitors and maintains the desired soil moisture content via automatic watering. Microcontroller ATMEGA328P on arduino uno platform is used to implement the control unit. The setup uses soil moisture sensors which measure the exact moisture level in soil. This value enables the system to use appropriate quantity of water which avoids over/under irrigation. IOT is used to keep the farmers updated about the status of sprinklers. Information from the sensors is regularly updated on a webpage using GSM-GPRS SIM900A modem through which a farmer can check whether the water sprinklers are ON/OFF at any given time. Also, the sensor readings are transmitted to a Thing speak channel to generate graphs for analysis.

Keywords: automatic watering, ATMEGA328P, speak channel, GSM-GPRS, sprinklers.

1. Introduction

Agriculture is considered as the basis of life for us as it is the main source of food and other raw materials. It plays a vital role in the growth of country's economy. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming. In India most of the irrigation systems are manually operated ones. These outdated techniques are replaced with automated techniques. This paper focuses primarily on reducing the wastage of water and minimizing the manual labor on field for irrigation. Recent advances in soil water monitoring combined with the growing popularity of Wireless Sensor Networks make the commercial use of such systems applicable for agriculture and Gardening. The system designed is programmed to irrigate at regular time intervals for predefined periods of time. In this technique, soil moisture sensors are placed in the root zone of plant and near the module and gateway unit handles the sensor information and transmits data to the controller which in turn operates the control of the flow of water through the valves. To give proper attention to the land located far away from the human settlement, supervisory automatic control systems like multi-terminal control systems are used since in many processes, factors like soil, salinity, irrigation, temperature, light intensity, etc. need repeated tasks and have to work in abnormal environmental conditions of the soil and to overcome the flaws in the existing system here we are irrigating the land based on the soil humidity and at the same time the status of the irrigation is updated wirelessly to the based Android App. The proposed system will allow farmers to continuously monitor the moisture level in the field, controlling the supply remotely over the internet. When moisture goes below a certain level, sprinklers would be turned on automatically, thus achieving optimal irrigation using Internet of Things.

2. Literature review

Various researches have been carried out on how soil irrigation can be made more efficient. The researchers have used different ideas depending on the condition of the soil and quantity of water. Different technologies used and the design of the system was discussed by the researchers. This paper aims at reducing the wastage of water and the labor that is used to carry out irrigation manually. The proposed system aims at detecting the moisture content of the soil using sensors that are placed directly into the soil. These sensors sense the water level of the soil and if the water level is not adequate then the user will be notified through a message that will be sent to the application which would be installed on the user's mobile phone. The Arduino board, a microcontroller, controls the digital connection and interaction between objects in the proposed system, enabling the objects to sense and act. Also, with its powerful on-board processing, various sensors and other application specific devices can be integrated to it. In the system, sensors detect the water and moisture level and send readings to a fixed access point, such as a personal computer, which in turn can access irrigation modules installed in the field or the physical module in the water tank, wirelessly over the internet.

A wireless application of drip irrigation automation supported by soil moisture sensors. Irrigation by help of freshwater resources in agricultural areas has a crucial importance. Traditional instrumentation based on discrete and wired solutions, presents many difficulties on measuring and control systems especially over the large geographical areas. If different kinds of sensors (i.e. humidity, and etc.) are involved in such irrigation in future works, it can be said that an internet based remote control of irrigation automation will be possible. An automated irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of soil-moisture placed in the root zone of the plants. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to an android application.

3. Theoretical analysis

The proposed work describes the basic idea and theoretical framework for design and development of internet of things and machine learning based digital agricultural system. This work includes statistical review of existing issues faced by farmers in India. Based on this analysis, an embedded system platform that includes soil characterization module, environment monitoring module and drone delivery system is being developed.

This provided a base to design and integrate novel ideas of digitalizing agriculture on the pretext that it would mitigate farmers' suicides. Based on survey conducted, an IoT and machine learning based theoretical design of digital system is proposed in this paper to solve some of the farming related issues of farmers. The main aim is to provide a solution that is portable and ensure higher crop yield. This overcomes the problem of installation of permanent sensing modules. Section 2 shows the survey conducted and results inferred based on collected data. This survey is based on a sample size of 20 farmers.

Problem statement

To provide efficient decision support system using wireless sensor network which handle different activities of farm and gives useful information related to farm field to farmer. An automated irrigation system is needed to optimize water use for agricultural crops. The technique can be used for application of accurate amount of water.

4. Benefits to society

In traditional farming methods, it was a mainstay for the farmer to be out in the field, constantly monitoring the land and condition of crops. But with larger and larger farms, it has become more challenging for farmers to monitor everything everywhere. Smart farming systems reduce waste, improve productivity and enable management of a greater number of resources through remote sensing.

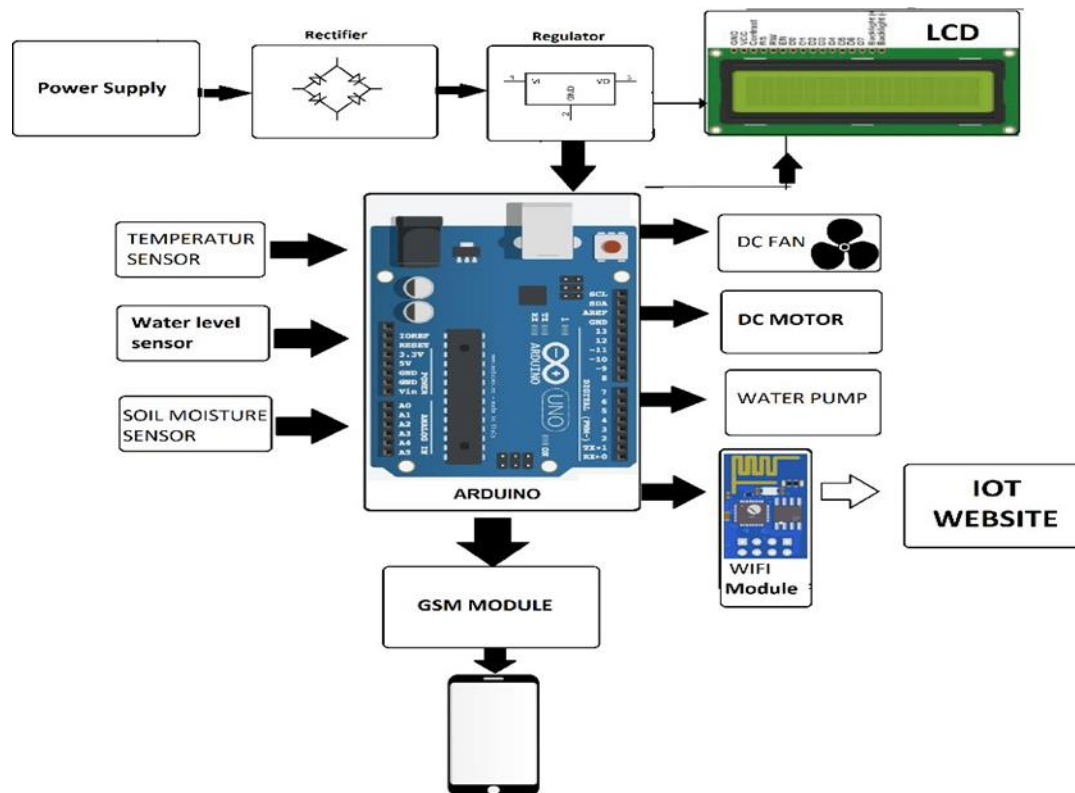
- Weather predictions and soil moisture sensors allow for water use only when and where needed.
- Farmers can visualize production levels, soil moisture, sunlight intensity and more in real time and remotely to accelerate decision making process.

- Automating processes in planting, treatment and harvesting can reduce resource consumption, human error and overall cost.
- Analyzing production quality and results in correlation to treatment can teach farmers to adjust processes to increase quality of the product.
- Accurately tracking production rates by field over time allows for detailed predicting of future crop yield and value of a farm.
- Sensors and machines can be used to detect reproduction and health events earlier in animals. Geofencing location tracking can also improve livestock monitoring.

5. Proposed solution

This system is a combination of hardware and software components. The hardware part consists of different sensors like soil moisture sensor, photocell sensor, etc whereas the software part consists of an android based application connected to the arduino board and other hardware components using Internet of Things (IoT). The android based application consists of signals and a database in which readings are displayed from sensors and are inserted using the hardware. The improvement in irrigation system using wireless network is a solution to achieve water conservation as well as improvement in irrigation process. This research tries to automate the process of irrigation on the farmland by monitoring the soil water level of the soil relative to the plant being cultivated and the adaptively sprinkling water to simulate the effect of rainfall.

Fig 1.0 Proposed system



In this paper, we are using a Mesh topology in which sensor nodes are placed in the farm area. Sensors in our proposed topology are mobile whereas the base station is stationary and it collects the data from sensor nodes and processes them. This work proposes that how to deploy the sensed data to the base station in Wireless Sensor Networks. For this purpose, firstly, set the farm area. pH sensor checks whether the soil is alkaline or acidic. Soil should have proper proportion of nutrients which is essential for the plant growth. Also, with help of pH we can

determine for what type of plant the soil is feasible. In this project, we have added a pH sensor to check the acidity of the soil and give constant updates to the android application about the same

Sprinkler Algorithm:

The moisture sensor gives the water content level in the soil and sends it to the arduino. It will process this data by comparing it with the threshold value if it is less than the predefined threshold value then start the irrigation.

Reading < Threshold value $\Rightarrow$ Start the irrigation System

Photocell Algorithm:

Light is very important for the plants. Plants convert light energy into their own building material. The photocell sensor measures the level of availability of the lights to the plants. Arduino compares the level of light with the predefined threshold value if it is less than the threshold value then we can provide artificial lights for the plants so that the plants can get appropriate level of light.

Reading < Threshold value $\Rightarrow$ Start the artificial light

6. Conclusion

A system to monitor moisture levels in the soil was designed and the project provided an opportunity to study the existing systems, along with their features and drawbacks. The proposed system can be used to switch on/off the water sprinkler according to soil moisture levels thereby automating the process of irrigation which is one of the most time consuming activities in farming. Agriculture is one of the most water-consuming activities. The system uses information from soil moisture sensors to irrigate soil which helps to prevent overirrigation or under irrigation of soil thereby avoiding crop damage. The farm owner can monitor the process online through a website. Through this project it can be concluded that there can be considerable development in farming with the use of IOT and automation. Thus, the system is a potential solution to the problems faced in the existing manual and cumbersome process of irrigation by enabling efficient utilization of water resources.

We have designed an automated Smart Agriculture system which reduces the time and resources that are required while performing it manually. This system uses the technology of Internet of Things. The system also measures moisture of soil and level of water in fields. This system works well in ideal conditions and further improvement can be made when the conditions are not ideal like proper illumination or lightning.

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