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Agriculture Automation and Crop Monitoring using Android

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***Abstract*—** The objective of the paper is to present a conceptual model of a micro controller based equipment which will monitor the crop. Analyzing the climatic data allows us to provide real-time information about the state of crop both in quality and quantity, with the possibility of early warning on alarm situations so that timely interventions can be planned and undertaken. In the proposed system we are using different sensors to monitor the temperature, humidity and irrigation process. Temperature sensor is used in monitoring the crop's soil temperature and humidity sensor, monitoring humidity level of soil. So we are integrating all the major factors that influence crop yielding to get a better overall monitoring capability to reduce manual labor involved in agriculture. This simply increases the cost effectiveness, water efficiency, convenience and the ability for the farmers to be absent from fields occasionally. If any abnormality is found, irrigation process will stop automatically

***Keywords*—** irrigation, android, crop monitoring

I. INTRODUCTION

There is always an increase in need for food because of the increase in population and on the other hand people involved in agriculture get reduced over time. This is because of human's dependency on technologies. There was a time when people used to walk several kilometers but now-a-days we use transport systems but in agriculture even a small part of work involves more human efforts. The involvement of computers and technologies in the field of agriculture is very minimal. Agriculture is more labour dependent rather than technology. Younger generation will never prefer to stare at the crops when it is being watered (lengthy and time consuming), they would see it as a boring task so implementing technology helps in influencing more people towards agriculture.

Irrigation is an artificial way of watering plants mainly in the tropical regions. Irrigated agriculture has been playing a vital role for the growth in crop production some crops like rice fields needs lots of water, so efficient supply of water is necessary. Due to unplanned use of water the ground water level is decreasing day by day. Lack of rains and scarcity of land water also results in decrements in volume of water on earth. Under irrigation may lead to increase in soil salinity and over irrigation may lead to crop shortfall.
An automatic irrigation system will save you plenty of time that you in the past would have spent watering. The watering will take place at the times that best suits your landscape and the climate where you live. You can go on holiday knowing that your crops will be maintained and flourishing when you return. With an automatic irrigation system there is no money or water wasted, for everything is timed, programmed and these systems all have sensors, so every drop of water is used only when it is needed. You can save between 30 and 50 percent of the water that you would normally use with other more conventional watering methods

When crops are watered with smaller amounts of water over a longer period of time, they grow faster, for it is the ideal condition for growth. You will enjoy greener and more luscious crops. The water is applied at a time of your choice and not only when you are available to open and close the tap.

Plants can be classified as hardy and non-hardy based on their ability to withstand cold temperatures. Winter injury can occur to non-hardy plants if temperatures are too low or if no seasonal low temperatures occur late in the spring or early in the fall. Winter injury may also occur because of drying out. Plant's roots need moist soil during the winter. When the soil is frozen the movement of water into plant is prevented

After measuring these factors a farmer can start sowing of seeds and continue with the irrigation process. In this paper we are giving the brief outline about conditions such as soil moisture and temperature in order to check the productivity of crops. We are measuring the conditions such as temperature and height. After measuring fertility, we are proposing a system of automatic irrigation through microprocessor to measure the moisture and temperature of soil. Sensor is used to determine the soil moisture and if there is inadequate water content then the system supplies water.

Maturity of a plant is influenced by the atmospheric temperature. It is determined by using a temperature sensor. Temperature helps to identify the perfect region for production of a particular crop, estimate the growth stages of crops, and predicts maturity and cutting dates of crops

and also to predict the perfect timing for using fertilizer and pesticides.

To design and develop low cost sensor node for real time monitoring of crop height and irrigation process. A person can examine the irrigation processes without physically visiting them. The overall functionalities which were developed are also integrated in an android application providing more convenient usage.

II. Related Work

Suhinthan Maheswararajah, et al.[1] proposed a system that increase the performance of wireless sensor network's real time application by optimal management of orphaned nodes in a sensor network deployed in automated irrigation system.The existence of a large number of orphaned nodes adversely affects the performance of wireless sensor network applications such as real time sensor-based automated irrigation control systems. Virupakshagowda C. Patil, [2] developed a system to study the water productivity of different types of crops cultivated in the desert region.The primary aim was to access the water productivity of the annual and the biennial crops. Sabrine Khriji et. al. [3] proposed a system of automated irrigation system that reduces the wastage of water and at same time cost effective by analyzing the need through various sensors.The main purpose of the paper is to provide a complete solution for the farmers through wireless sensors. DataVandana Tomar [4] proposed a system that analyzes the site-specific infield fertilizer treatments, its application rate discrepancies and crop yield assessment using rice equivalent productivity in terms of their economic potential. K.Prathyusha et. al. [5] used drip irrigation the humidity and temperature of plants are precisely monitored and controlled. Drip irrigation maintains water level constant. In this paper the design of a Micro controller based drip irrigation mechanism is proposed. Irrigation system controls valves by using automated controller to turn ON & OFF. This allows the farmer to apply the right amount of water at the right time. R.suresh et. al. [6] proposed the humidity and temperature of plants are precisely controlled. Variable atmospheric conditions varies in large farm house, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually, this system is implemented through GSM and the report is sent to android mobiles and the keil software generates the result. Jonathan et. al. [7] explained here monitors the moisture needs of crops through buried sensors and automatically pumps water for irrigation when the need arises. Through the use of a micro controller and sensors, water storage and delivery to the farm are automatically carried out. This system is simple and suits the needs of the farmers. Laxmi Shabadi[8] proposed a system which minimizes the manual intervention by the farmer. In recent times, the farmers have been using manually controlled irrigation technique. The ON/OFF process sometimes consumes more water and sometimes the water supply to the land is delayed due to which the crops dry out. Therefore in this paper we use an Android application which helps the farmer to ON/OFF the motor without his physical presence in the field. Manish Giri [9] developed Automatic micro controller based drip irrigation system irrigation will take place only when there will be intense requirement of water. Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers and solenoids. The purpose of this paper is to provide more facility in agriculture field by using wireless sensor network along with linear programming. The linear programming help us to distribute available water to the crops if and only if there is immense need of water to the crop in order to get maximum profit with minimum cost. Chaitali R.[10] proposed a system in which moisture of agricultural soil is measured by real-time method and to minimize this manual involvement by the farmer, which is why we are using a micro-controller AVR ATMEGA-16L,RF module. The sensor senses the amount of moisture present in the soil and presents an output in the form of analog voltage ranging between 1.7V (fully saturated condition) to 4.5V (completely dried condition) respectively. Venkata Naga [11] proposed Micro Controller Based Automatic Plant Irrigation System explained the entire system as controlled using 8051 micro controller which is programmed as giving the interrupt signal to the sprinkler. Temperature sensor and humidity sensor are connected to internal ports of micro controller via comparator. Whenever there is a change in temperature and humidity of the surroundings these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller and thus the sprinkler is activated.

III. Proposed Algorithm

Since agriculture forms the backbone of our country, we need lot of innovations to improve it. Lack of information is the major challenge in this regard. Agriculture is carried out mainly in rural areas where people have less access to certain ideas and tips. The system involves the combination of sensor technologies and programmed into a micro controller. A pipe to the field is connected with a motor pump that draws water from a water source and supplies to the field. This motor is in turn connected with a micro controller that makes the water supply to be automated. Herein we use a PIC16F877 micro controller since it has high number of ports in comparison with other micro controllers. We use a LM 35 temperature sensor due to its shielded architecture and hence will not subject to oxidation

and its operating temperature is convenient for irrigating environment. This temperature sensor is placed in the field and accounts for the farmer to know the atmospheric temperature of the field. To automate the water supply the amount of water content in the soil needs to be known since an optimal yield of the crop is dependent on the soil moisture. Timely recharge of the moisture is necessary and this is accomplished by a soil moisture sensor. It is placed in the soil near the roots and determines the amount of moisture in the soil. When the soil moisture reduces below a preset value the soil moisture sensor senses the action and signals to the micro controller and the micro controller triggers the motor connected to a water source. This makes irrigating process to be automated.The power supply needed by the controlling system is +5V. Monitoring the crops and providing information greatly helps the farmers. We place IR sensors at particular intervals to monitor growth. The duration is noted and this duration is then analyzed to find the growth of crop to be normal or abnormal. Here the placement of sensors should be taken care.

Growth rate of crops varies from one another. Generally, Herbaceous plants grows faster than woody plants. After receiving information ,the farmer can act accordingly. For example if the growth rate is slow fertilizers can be used so that the yielding process is achieved in expected time. If not then the farmer has to settle for a less profit or even face severe loss.

The crops should be cultivated at the right time to get better profit on investment , which can be achieved by using our crop monitoring system.

World is witnessing an enormous increase in the use of android based mobile users. Android technology is evolving so there is always a room for development in future. As the users increases, facilities are also increasing. The app provides varies functionality likes starting the system, stopping the system, changing the system from automatic to manual mode and vice versa. This app can be used to control the system remotely without actually being present.

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Android Application

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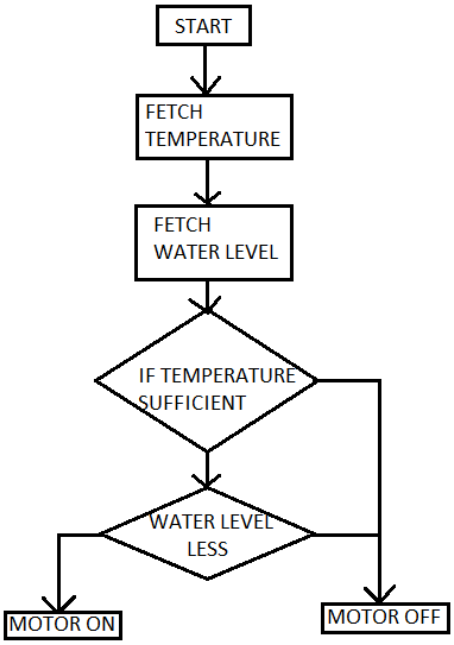


Fig. 1 Flowchart for Automated Irrigation

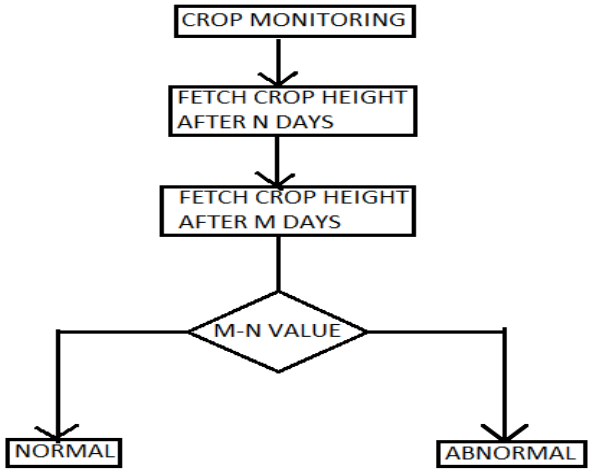
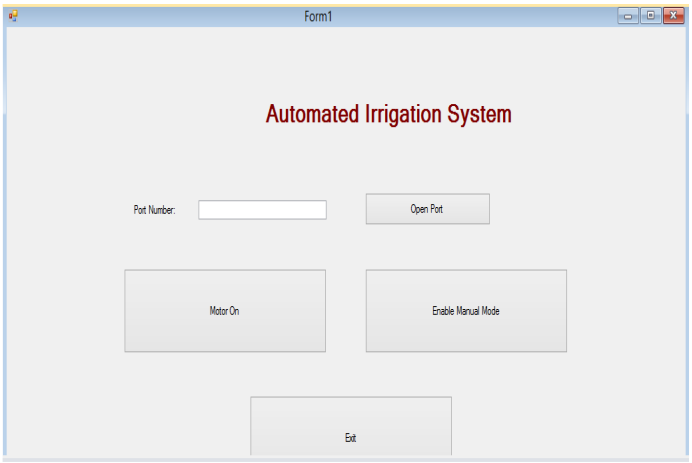


Fig. 2 Flowchart for Crop monitoring

IV. Experimental Results



The application screen has the options to enable manual mode or to switch over to automatic mode.

The user initially sets the mode in either manual or automatic mode. In case of automatic mode the system gets the input from the sensors and based on the criteria, for instance when the temperature is greater than 35 degree Celsius and the water level being low the system turns on the motor and starts pumping water to the field. If the specified mode is manual then the user can either switch on or off the motor by clicking the motor on and motor off buttons. The inputs from the IR sensors are sensed in periodic interval and the distance between two sensors with a particular time is taken and analyzed to find the normal growth of a crop.

V. Conclusions

Our aim is to increase the people involved in agriculture, providing an android app will do a lot. This will not only draw younger generation towards agriculture but also assists rural farmers because of its simplicity. It enables reuse and replacement of components. The app consumes very minimal memory and is available for free.In India, technologies used in agriculture are limited. Implementing technology in agriculture helps improve the yield and so increases the productivity. These systems include remote features facilitating farmers

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