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Automatic Plant Irrigation System With Real Time Notification

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Abstract: ***Agriculture is a primary occupation in India since ages. But now, due to migration of people from rural to urban areas agriculture has started degrading. In order to overcome this challenge and to increase the productivity in farming, an Automatic plant irrigation system with real time notification is developed. This system includes various features like reading values from the soil, capturing sunlight to generate solar energy in order to drive the motor pump and to notify the farmers with a real time notification by SMS on their mobile phone. Farmers need not to have Android phone or 4G connections; the system can even work with phones which only support 2G connections. A sensor node is being deployed in a small region of the farm, for large farm areas we can deploy multiple sensors and then interfacing all the sensor to one switch and this switch will be connected to microcontroller. The parameters can be controlled with the help of any remote service and the operations are performed by interfacing sensor with the microcontroller. The sensor sends data to microcontroller in analog form. Based on that microcontroller takes decision either to switch on the water pump or not. For sending SMS we are using GSM module 400C, this module is also connected to microcontroller and sends SMS whenever water pump starts or gets switch off. We can also control the timing interval of the whole system by increasing or decreasing delay time, so that it does not continuously pumps water when it is not necessary. This system may be crafted into a product and it can be handed over for the wellbeing of farmer's across the globe.***

Index Terms: GSM, IoT, Soil Moisture, Solar Energy, SMS.

I. INTRODUCTION

One of our driving motivations is to provide solutions for farmers to manage their crops more efficiently by making use of various technologies. The prime objective is to make the life of farmers much easy and user-friendly by providing them a smart automated irrigation system that will not just help them to reduce their efforts but also will ensure the proper use of water which is being given to the crops to harness them. As the world is transforming into new technologies and standards, it has become a necessary goal to bring new trends in agriculture. Many researches have been done in the field of agriculture till 2019.

Most of the research work signifies the use of wireless sensor network and their collected data from different sensors which are deployed at various locations [7]. The collected data provides the vital information about the various environmental factors like humidity and temperature. Monitoring these environmental factors is not a total solution to increase the yield of crops. There are other numbers of factors that brings down the yield of crops to a great extent. Hence, automation must be implemented in agriculture to get rid of these problems. In order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors that affects the productivity at each and every stage. Complete automation in agriculture is still not achieved due to various issues [7]. Though it is implemented in research level, it is not yet given as a product to the farmers to make them earn benefits from the resources. Hence, this work deals about developing an optimal plant growth system using IoT for the farmers. The motivation behind this work was the lack of good farming facilities and technology around the world. There is an extreme shortage of a smart irrigation system in India, which also includes the lack of technology that is being involved in the irrigation system. Traditional farming system does not involve smart technology which makes the life of farmer very- very challenging in the fields.

II. LITERATURE SURVEY

Moisture of soil is one of the deciding components in the atmospheric cycle of irrigation. This moisture helps to predict the future of the crops [7]. Irrigation also needs a vital improvement in various circumstances of hot and humid regions [6]. Unfortunately, often less than half of the water given to the crops only is being utilized and the rest get lost through runoff, which may also lead to soil-erosion [7][8].

Efficient use of water for crops requires the understanding of smart irrigation methods [5]. The rapid growth in population has drastically increased the demand for the development of irrigated land throughout the world [3]. Irrigation also needs improvement.

New irrigation systems and designs are continuously in development and examination as an effort to obtain high practically attainable efficiency of water application as well as increase in crop production in the field of farming [6].

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III. PROBLEM STATEMENT

The motivation behind this work was the lack of good farming facilities and technology around the world, especially in developing and under-developed countries like India. There is an extreme shortage of a smart irrigation system in India, which also includes the lack of technology that is being involved in the irrigation system. Traditional farming system does not involve smart technology which makes the life of farmer very-very challenging in the fields.

Sunlight is a great source of energy which can be utilized in an efficient way to provide energy to the irrigation pump in order to cultivate the crops in villages thus providing a continuous flow of energy to the whole system [5].

The automatic plant irrigation system not only ease the farmer's life but also makes sustainable use of the resources by providing a very smart and cheap energy source (Solar energy) to give power to the overall system in order to automate the system[1].

IV. METHODOLOGY

The problem can be solved by making a plant irrigation system which not only ease the farmer's life but also makes sustainable use of the resources by providing a very smart and cheap energy source (Solar energy) to give power to the overall system in order to automate the system [2]. The system is made with a real time notification system using the GSM service which alerts the farmer each and every time about the status of the motor pump.

The problem of overusing and wastage of water can be minimized with the help of the system which pumps the water out from the reservoir only when the field gets dry.Various technologies have been used to solve the problem using automatic plant irrigation system in a step by step manner:

- Reading and analyzing moisture content
- GSM module
- Solar driven energy

A. Reading and analyzing moisture content

Reading the value of the moisture is the first task which can be done with the help of a soil moisture sensor. The soil moisture sensor records the moisture value from the soil and gives the same to the Arduino which finally gives the decision in terms of turning the motor on/off according to the status of the soil i.e. wet or dry taken from the sensor.

B. GSM Module

This module is about the notification which is given to the farmer/user on his mobile device. Each and every time the motor pump goes on/off the farmer will receive a text message regarding the status of the pump. The GSM module helps to connect the famer remotely with the irrigation system very swiftly without any manual intervention.

C. Solar Energy

Providing sufficient energy to automate this system is a challenging task especially when it has to be used by the farmers of the small villages where providing continuous energy can be challenge. Solar energy [1] here provides a continuous, renewable and environment friendly way of providing the energy which not only provides a continuous flow but also make the system more environment friendly and user- friendly.

V. PROPOSED WORK

The proposed system for the work is depicted by the block diagram shown in Fig. 1. The main entity of the system is the one which is responsible for making changes in the system. The entity that handles the interactions between the system and the farmer is the main dashboard which includes the functionalities that can be implemented by the user.

The admin acts as a main entity has authorization to view and make any changes in the process so that it can work efficiently on different types of soil and crops. Because every crop needs different amount of watering, so admin can update or change water level.

The system can be operated in two different modes i.e. either it can be operated by a non-renewable source of energy (battery) or with a renewable source of energy (solar energy). Solar panel in daytime will provide a continuous flow of heat and energy which helps to charge the system and helps to drive the whole system without any human intervention. During night time, the system will be operated using battery power.

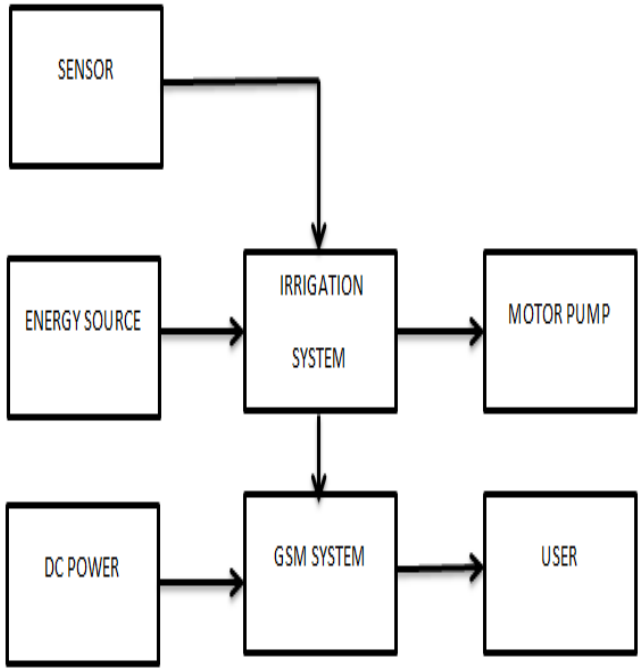

Fig. 1. Block diagram of smart irrigation system

VI. RESULTS AND DISCUSSIONS

The proposed real time system is shown in the Fig. 2. The required energy for the proposed system has taken from the natural energy source such as sunlight using solar panel. The real time notification about the motor running status sent to the farmer with the help of GSM as shown in Fig. 3. The motor automatically gets turned OFF and ON based on the moisture level of the soil.

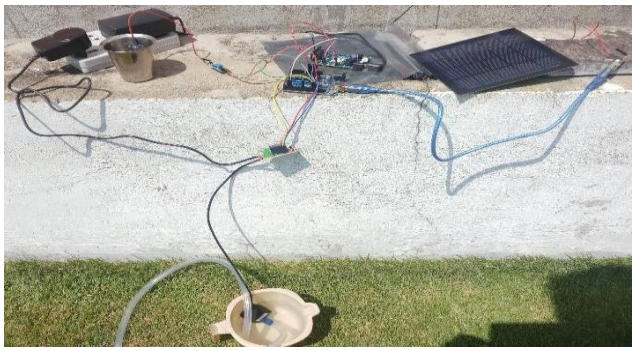

Fig. 2. Demo of the system in the presence of sunlight

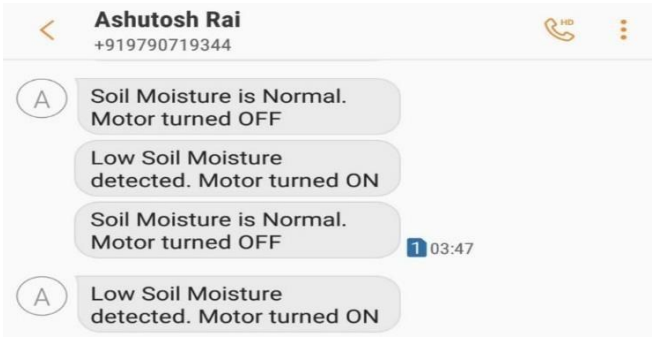

Fig. 3. Real time SMS notification to the user

The SMS will be sent to the user each and every time when the motor turns ON or OFF. With the help of real time notification through SMS, alerts the farmer about the current condition of the field i.e. whether the moisture of the soil is normal or not. These SMS use the GMS technology and hence it can be received on even the cheapest and simplest devices.

VII. CONCLUSION AND FUTURE WORK

Automating the irrigation system with the help of a renewable source of energy will bring revolution in the field of irrigation [10]. The solar panel not only save electricity bill for the farmers but also act as saver from greenhouse effect, since most of the sources which is used to generate electricity in India is come from coal (about 70%) which cause high amount of greenhouse gas emission. The system is suitable for various types of irrigation method which the farmer usually practices in his field. The farmers can also control the level of soil moisture detection i.e. farmers can change the sensitivity of soil moisture by rotating clockwise or anti-clockwise potentiometer which is inbuilt in soil moisture sensor.

This work can be expanded to another level of improvement which will include automatic weather prediction system that can help to predict the future weather condition in order to decide the actions in advance which will ultimately make the system much more reliable, efficient and environment friendly in the future. We can also integrate sun-tracking system so that solar panel which we are using to power the system will always be facing towards the sun. This work mainly focused more on utilization of the solar power in a more advanced way i.e. removing all the constraints from the use of solar panel which can help to improve the quality of the life of the farmers specially in village areas [9][11].

Another future scope of this work is to develop a very easy and friendly mobile app which can help the farmers to control and monitor the whole system with the help of a touch from anywhere anytime.

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