S0LAR POWERED AUTOMATED IRRIGATION SYSTEM

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ABSTRACT

This paper throws light on development procedure of an embedded system for solar based Off-Grid irrigation system. Solar power is absolutely perfect for use with irrigation systems. Using Solar Panel, the sun energy will be converted to electrical power which will be stored in batteries. When the sun is rising and shining, the solar panel will absorb the energy of the sun which will charge the batteries. For generation of maximum energy, it is important to maintain solar panels face always perpendicular to the sun. For this purpose Light Detecting Resistors (LDR's) are placed on the solar panel which helps in tracking maximum intensity of sunlight This tracking movement of the panel is achieved by mounting the solar panel on a stepper motor. This stepped motor rotates the mounted panel as per signal received from the programmed Arduino controller.

Soil moisture sensor is placed inside soil to sense the moisture conditions of the soil. Based on moisture sensor values, the water pump is switched on and off automatically. When moisture level of the soil is reaches below a certain value, the soil moisture sensor sends the signal to Arduino to start the pump by using stored solar energy. At the same time, using GSM technique Arduino sends a message on farmers mobile about status of the pump. The arduino completes the above job as it receives signals from the soil moisture sensors, and these signals functions as per program stored in ROM of the Arduino. The LDR's values, soil moisture values, condition of the pump i.e., on/off are displayed on a 16x2 LCD which is interfaced to the Arduino.

Keyword: - *Solar panel, Light Dependent Resistors (LDR's), Soil moisture sensor, Arduino.*

1. INTRODUCTION

In India, agriculture plays a very important role in the development of country as our economy is mainly based on it. India ranks second in worldwide farm output. The most important factor for the agriculture is timely and ample supply of water. But due to uncertain rainfall and water scarcity in land reservoirs, we are not able to make proper use of agricultural resources. Also unplanned used of water results in to wasting of water on large proportion. With the increase in agricultural activity and competitive demand from different sectors, it has become important to economize on the use of water. We can optimize use of water by adopting sensor base irrigation system.

There are different irrigation systems that are used nowadays to reduce dependency on rain. Due to the lack of electricity and mismanagement in the manual control irrigation system many times crops become dry or flooded with water. So to avoid this problem sensor base irrigation system is used. In manual system, farmers usually control the electric motors observing the soil, crop and weather conditions by visiting the sites which is time consuming and the simple analysis by observation of condition of soil may or may not be correct. Also, what amount of water is to given for optimal growth and to prevent overuse of water in the irrigation cannot be determined. Soil moisture sensor base irrigation system ensures proper moisture level in the soil for growing plants in all season. In this system, sensor is sensing the moisture content of soil continuously and accordingly switches the pump motor on or off. If the soil moisture sensor detects the condition of soil whether the soil is wet or dry. If the soil is dry the motor will pump the water till the field is wet which is continuously monitored by theArduino. The main advantage of soil

moisture sensor is to ensure accurate measurements and farmer doesn't have to visit his farm to operate the pump. At same time, using GSM technique Arduino sends a message on farmers mobile about pump status.
For operation of sensor base irrigation system, pump motor requires energy for pumping. In day to day life there is increasing demand for energy but there is continuous reduction in existing sources of fossils and fuels.

2. PROBLEM DEFINITION

Nowadays, even though irrigation systems are used in agricultural field to reduce dependency of rain, most of them are either regulated manually or having time based automation. In these types of system water is applied to field on the basis of fixed intervals which required high manpower for monitoring and also it reduces the field efficiency. In addition, this fixed interval operation leads to over irrigation than the actual plant requirement and under irrigation when plants required more water in their peak periods. Retardation of crop growth rate, late flowering and reduction of the yield are the major events caused due to water deficiency. Moreover, over irrigation in the root zones leads to ill health of the root zones and vegetation, additional cost for farmer, wasting of water and time wastage. Also salinity of the soil can be increased by continuous supply of excess water. For operation of irrigation system, electricity is required. So use of solar energy for power generation is essential to tackle current energy crisis. One of the major weaknesses of the fixed panel solar system is that due to rotation of the sun, it is not able to extract maximum energy from the sun.

2.1 CONCEPT

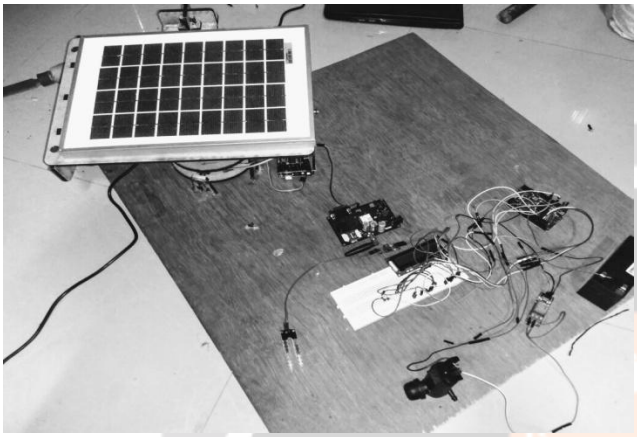
In the proposed system a single axis solar tracking system is used for the irrigation along with GSM. Four LDR's are placed on solar panels helps to track maximum intensity of sunlight and thus helps to collect more electricity. Produced electricity is stored in DC battery which is used to pump the water for irrigation system. The analog values from LDR sensors and soil moisture sensor are converted in to digital values by using ADC Converter. The digital values then provided to Arduinoas an input. Arduino is interfaced with DC Pump, LCD, and GSM Module. When moisture content of soil reaches below a predefined value, pump will start automatically and farmers can get the information on his mobile through GSM module.

3. WORKING

The basic idea of developing solar tracking system in this project is to get maximum sunlight from the sun throughout the day, by tracking the movement of the sun. The maximum energy is obtained from the solar panel if the rays of the falls perpendicular to the surface of the solar panel. By tracking the movement of the sun, maximum sunlight is obtained; further this energy will be stored in a 12 V DC battery. The solar cell panel will be mounted on a rotating structure. This structurewill have DC motors that will help the structure to rotate.
Here we are going to implement the LDR for detection of the sunlight. The LDR will detect the sunlight and send the data to the Arduino. We are going to use four LDRs in the project. One at each direction from East to West.
As long as the sunlight is in the perimeter of the LDR the solar panel will remain in the same direction. Once the sunlight is out of the perimeter of the LDR, it will stop sending data to the Arduino. But at the same time the sunlight will be in the perimeter of the next LDR, as we have installed the LDRs in such a pattern. Now the next LDR will start sending the data to the Arduino. Upon getting the data from the next LDR the Arduino will send a command to the DC motor. After receiving the command from the Arduino now the DC motor will get started and the panel will move to the corresponding direction of the next LDR. Again similar procedure will continue for remaining LDRS. This is how we are going to track the sunlight and adjust the solar panel in a position where it will receive maximum sunlight.Now moving to the second part of the project, the energy generated through the solar panel will be sent to a DC battery. The battery will store the energy for further applications. Now we are connecting a water pump to the battery so that the motor should run on the power generated by the solar panel. In this system the water supply will be an automated one that means the pump will supply the water only when the land needs it.
In order to achieve this task we are making use of soil moisture sensor and a GSM module. The soil moisture sensors will be placed inside the field, and it will be connected to the Arduino. The moisture sensor will be continuously sensing the moisture content of the soil and sending it to the Arduino, where moisture content value will be compared with predefine level. Now whenever the moisture level becomes less than the predefined level, Arduino will send a command to activate the water pump. Same time Arduino will activate GSM module, which will send a feedback message to user, stating that the "Pump on". After the motor gets started and starts supplying

water to the field; simultaneously the moisture sensor will be sensing the moisture content and sending the data to the Arduino. Since the field is getting water supply now the moisture level of the field will start increasing, this increase in the moisture content will again will be compared with a predefined moisture level. When it will reach the predefined moisture level, pump will automatically off. Again GSM module will send feedback message stating that "Pump off". This water pump also works manually by pressing the key.
This is how the system will become an automated system also we are using maximum power from the sunlight.

3.1 ILLUSTRATIONS OR PICTURES:



3.2 FIGURE:

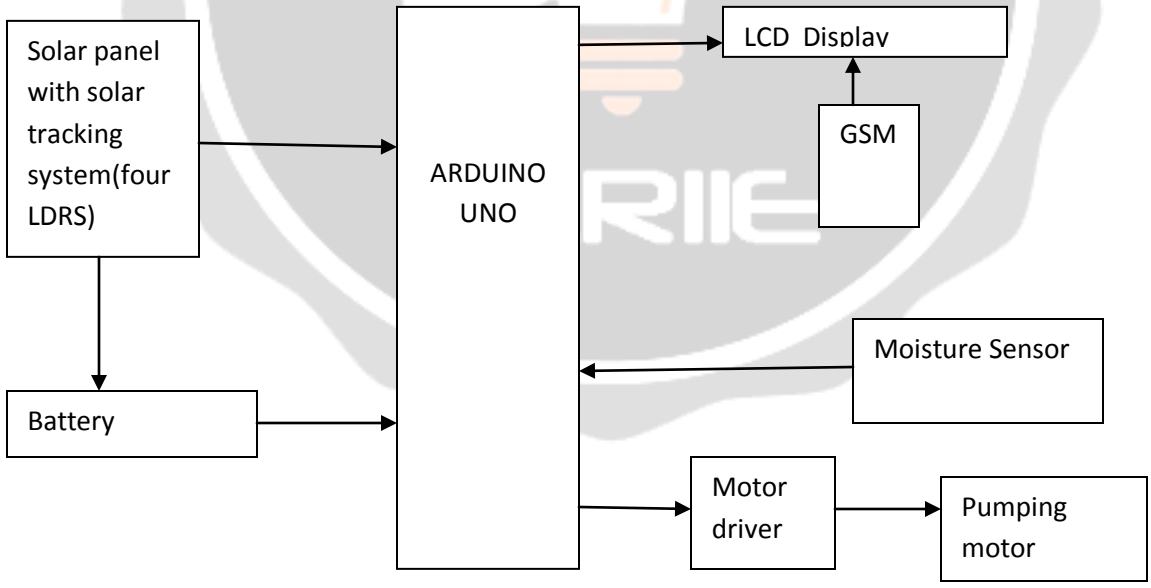


Fig: Block Diagram of Solar Powered Sensor Base Irrigation System

4. CONCLUSIONS

In this paper, a solar powered sensor base automated irrigation model is proposed. We designed this model considering low cost, reliability, alternate source of electric power and automatic control. As the proposed model is automatically controlled, it will help the farmers to properly irrigate their fields. The model always ensures the sufficient level of water in the soil. Thus, this system avoids over irrigation, under irrigation, top soil erosion and reduce the wastage of water. Solar power provides sufficient amount of power to drive the system. To overcome the necessity of electricity and ease the irrigation system for our farmers, the propose model can be a suitable alternative**.**

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