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Solar powered automatic irrigation system using moisture sensor

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ABSTRACT

Solar energy is best way for the irrigation purpose to overcome energy crisis problem. The solar panel will extract energy from the sun and convert it into electrical energy which is stored in the battery. Automatic irrigation using solar power can be efficiently used for the proper management of irrigation. Proper irrigation increases fertility rate of the field and can get maximum production of crops by increasing yields and the quality of the crop. The motor may off automatically when there is a no water.

INTRODUCTION

Now a days, several irrigation systems in use. In those farmers usually switches ON/OFF the motor either manually or through mobile phones. If they control the motor through the mobile phone, he might not be able to know the moisture content of the soil in agricultural land. Farmer after switching ON the motor, the motor may run without water. This is a lack of controlling system of motor.

Solar based automatic irrigation using moisture sensor helps to maintain proper water supply at the equal interval of time which will rid of the problem of scarcity of water. For the fulfillment of water problem many technologies have made lots of methods and types of irrigation systems. For the problem of energy crisis and solar energy is best way hence, solar based irrigation system is used.

EXISTING SYSTEM

Existing systems are using GSM Module alone for automation in irrigation system. Existing system either beautomatic or manual. The user switches the motor ON and OFF by sending SMS to the registered SIM in the GSM. The GSM will send a signal to motor ON, and it will tend to run till the user sends an OFF message to registered SIM. In some systems, the controller turn OFF the motor after a period of time. This time will pre-defined by the user during installation of system. it is a challenge to maintain soil moisture for plants. Current watering system offered scheduling scheme as the solution, which might cause the soil to be too wet during the rainy seasons and too dry during the draught season. This prototype uses Arduino Uno R3 board or microcontroller which is easy to programming. It is programmed in such a way that it will sense the moisture level of the soil and supply the water if required. This type of system is often used for general plant care, as part of caring for small and medium orchard for small and medium enterprise (SME). Therefore, the microcontroller has coded the system to water the plants according to the reading from the moisture sensor which has been calibrated. On top of that, this system is extended using GSM technology, which enables the user to control the motor by sending and received the SMS (Short Message Service). So, by sending the SMS the user can look after his farm remotely. It gives access to the watering system using GSM technology is what the prototype offers.

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PROPOSED MODEL

The auto irrigation system is very significant in the agriculture field. In the field of agriculture, it is very important wetness in the soil. Excess or lack of water may damage the progress of plants which results in loss of farmers.

To overcome this problem, the proposed system is designed. This system keeps information about the level of moisture in the soil and keeps moisture to acceptable limits. The level of moisture can be measured using a sensor namely moisture sensor. According to the level of measured moisture, the motor is switched ON or OFF.

This system works on solar energy. Solar panels are designed with solar cells composed of semiconductor materials. The main function of Solar panels is to convert solar energy into DC electrical energy, which is used for the circuit. The number of cells required and their size depends on the rating of the load. The collection of solar cells can produce maximum electricity. But the solar panel must be place exactly at right angles to the sun rays.

BLOCK DIAGRAM OF PROPOSED MODEL

The block diagram of the proposed model is illustrated in fig 1. GSM plays a vital role in this system. GSM stands for Global System for Mobile communications. GSM is acts like an interface for farmer and microcontroller. The farmer sends SMS to the registered SIM of the GSM module in the system. In reply, GSM sends a SMS to the farmer. The SMS consists the information of

- Moisture level of the soil
- ON or OFF status of pump

The moisture level of the soil is measured by the moisture sensor. The Soil Moisture Sensor is used to measure the loss of moisture over time due to evaporation and plant uptake, evaluate optimum soil moisture contents for various species of plants, monitor soil moisture content to control irrigation in the agricultural field. If the farmer thinks the moisture content of soil, he will send SMS to the system. The controller will turn ON the pump for irrigation. The farmer can turn motor OFF by sending SMS. If the farmer has good water source, no problem. If not the pump will run, even though there is no availability of water for pumping.

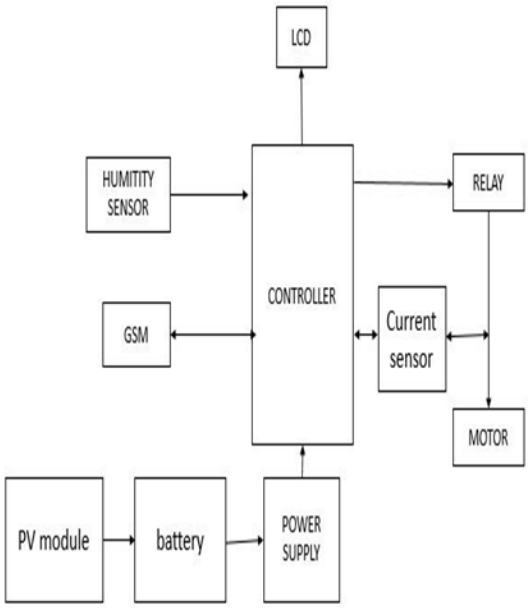

Fig 1. Block diagram of proposed model

This is a unwanted one and needs to be turned OFF For this, the current consumed by the pump is continuously measured. The current consumed under load condition will be lesser than no load condition. If the pump is ON without pumping, the current consumption will be high. By knowing high consumption of current, the pump will be turned OFF by controller also sending SMS to farmer

GSM module

GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz . This type of GSM can be used not only to access the Internet, but also for oral communication (provided that it is connected to a microphone and a small loud speaker) and for SMSs. It looks like a big package (0.94 inches x 0.94 inches x 0.12 inches) with L-shaped contacts on four sides so that they can be soldered both on the side and at the bottom. The module is managed by an AMR926EJ-S processor, which controls phone communication, data communication and serial communication. The processor is also in charge of a SIM card (3 or 1,8 V) which needs to be attached to the outer wall of the module. In addition, the GSM900 device integrates an analog interface, an A/D converter, an RTC, an SPI bus, an I²C, and a PWM module.

The module is supplied with continuous energy (between 3.4 and 4.5 V) and absorbs a maximum of 0.8 A during transmission. Higher Dry soil conducts electricity poorly, so when there is less water, then the soil will conduct less electricity that means there will be more resistance. Therefore, the moisture level will be lower.

Fig 2. SIM900 GSM Module

Moisture sensor

The moisture sensor allows to monitor the water content in the soil. This can be useful if we want to build an automatic watering system. We can also use it to just monitor our plants soil moisture.

The soil moisture sensor or the hygrometer is usually used to detect the humidity of the soil. So, it is perfect to build an automatic watering system or to monitor the soil moisture of our plants. The sensor consists of two pieces: the electronic board and the probe with two pads, that detects the water content.

One commonly known issue with soil moisture sensors is their short lifespan when exposed to a moist environment. To combat this, some of them have done the PCB coated in Gold Finishing. Another way to extend the lifespan of your sensor is to only power it when you take a reading or delay the sensor reading (for example take readings every 10 mins). If you wish to power the sensor with more than a digital pin on your microcontroller can provide, you could always use a transistor. The sensor gives us both analog and digital output, so it can be used in both analog and digital mode.

It has a built-in potentiometer for sensitivity adjustment of the digital output (D0), a power LED and a digital output LED.

The soil moisture sensor consists of two probe's pads which are used to measure the Volumetric content of water. The two probe's pads allow the current to pass through the soil and then it gets the resistance value to measure the moisture value. It can cause corrosion across the probe pads.

If there is water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be

Fig 3. Moisture Sensor 4.3 CURRENT SENSOR

MICRO SWITCH CS series solid state current sensors monitor either alternating (AC) or direct (DC) current. This series includes a wide assortment of devices ranging from digital output current detectors capable of sensing a few hundred milliamps to linear sensors capable of monitoring over one thousand amps. The entire family of CS current sensors provides a means of accurate low-cost current sensing. Current sensors monitor current flow. Digital sensors produce a digital output signal. Linear sensors produce an analog output signal. When these signals have reached a predetermined level, the control system logic is instructed to perform a function.

The digital signal with its logic level output may sound an alarm, start a motor, open a valve, or shut down a pump. The linear signal duplicates the waveform of the current being sensed and is ideal for use as a feedback element to control a motor or regulate the amount of work being done by a machine. Some CS current sensors utilize a through-hole design. This feature insures that there will not be any DC insertion loss in the conductor. In addition, the through hole design simplifies installation by eliminating the need for direct connection, which minimizes energy dissipation, and provides output isolation at no extra cost. MICRO SWITCH CS through-hole current sensors cannot be damaged by overcurrent. Current sensing is accomplished by measuring the magnetic field surrounding a current-carrying conductor.

The conductor is passed through the flux collector which concentrates the magnetic field at the sensing element. The magnetic field is directly proportional to the current passing through the conductor. Thus, there is a direct relationship between the output voltage of the current sensor and the level of input current. The waveform of this output voltage will track the waveform of the measured current. The through hole design electrically isolates the sensor and insures that it will not be damaged by overcurrent or high voltage transients.

Fig 4. Current Sensor

FLOW MODEL OF PROPOSED SYSTEM

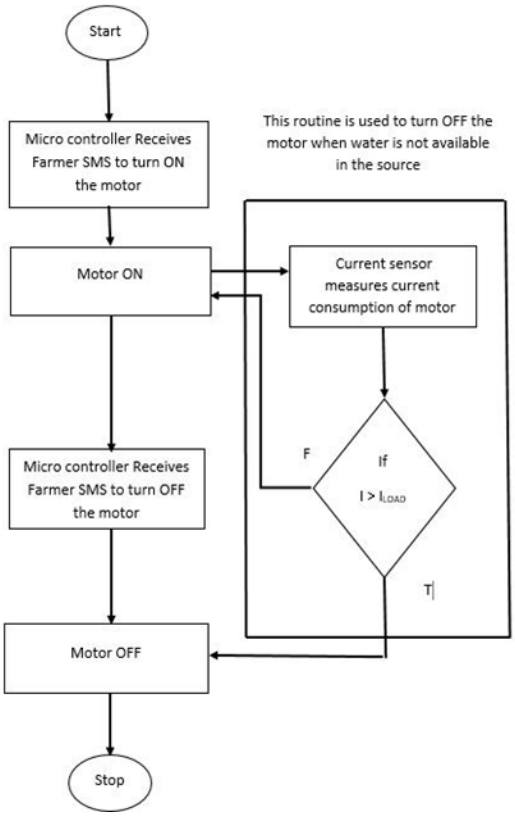

Fig 5. Flow Model of Proposed System

The processing of microcontroller is illustrated in the Fig 5. Flow model of proposed system. In this flow model T refers to when condition is true and F refers to when condition is false.

The farmer sends an message to turn the motor ON to the microcontroller through SIM via GSM. The microcontroller will turn ON the motor for irrigation. The current sensor plays a important role here. The current sensor continuously measures the current consumption of the motor. This will be useful to turn OFF the motor based on the water availability. The current consumption of the motor when pumping water will be less than the current consumption of motor when not pumping water. Based on this condition, the motor will be turned off by the microcontroller when it gets high value from the current sensor. If the water source is good enough for irrigation, then the motor will tend to run until the farmer. Sends an OFF message to SIM on GSM. Then the microcontroller will turn the motor OFF.

RESULT

The objective of the project is achieved. The PIC micro controller does the most of the work even though sensors are present. It controls the whole system. The micro controller and LCD display which shows us output is shown in the fig 6.PIC micro controller and LCD display.

Fig 6. PIC micro controller and LCD display

CONCLUSION

Hence by implementing the automatic irrigation system proper irrigation is done which maximizes the productivity of crops. The scarcity or deficiency of water in field is controlled and regular irrigation is done. This system generates its source of energy by its own. This system can be operated from remote areas. By implementing manual switching we use the pump to supply water for other purpose also. This system can be secured with passwords for the restriction of number of users. The pump is also can be used for filling the tank and used during cultivation of land

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