Automatic Farming for Minimum Water Usage and Animal Protection Using Solar Fencing with GSM

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***Abstract*— Food is one of the basic need of human being, food comes from cultivation of crops, leafy vegetables, fruits, etc. in agriculture land. It is necessary to develop a system for better farming and crop cultivation. A system is to be proposed which will protect the farm field from animals / birds, as most of the crops / grains are destroyed by the animals / birds which enter the farm field. A Solar / electric fence is provided around the farm to protect the farm from animal / birds, so that they should not enter the farm. A short electric pulses are transmitted through the fence, any animal intends to enter / touch the fence may get a short shock, this shock is just to threaten the animal to be away from the fence. As birds enter the field and destroys the grains, an audio generator is used which emits definite frequency which tends animals / birds to stay away from the field and those frequencies are not audible to human being. For agriculture, water is needed for the growth of crops, somehow the farmer needs to monitor the crops for the water needed to be supplied, thus by designing an automatic water supplier to the crops by sensing the moisture content of the soil. If any of the harms / problems happens to the farm field a text message is sent to the farmer's mobile by the use of GSM, and alarm / buzzer is ranged to indicate any rare attempts in farm field. This research offers harmless and user friendly farm field for better agriculture.**

Keywords*— *Solar fence, electric pulse, audio generator, moisture sensor, GSM.

I. INTRODUCTION

The need of agriculture is important as food is the basic need of humans. Development in the field of agriculture is necessary in today's world. New technologies are invented day by day for various uses, methods and process are getting advanced, these new technology and advancement in process should be used or make in progress in the field of agriculture. Agriculture field is to be developed to overcome the loss in agriculture sector. Development is needed in agriculture sector to protect farmers from great loss to their crops caused due to many reasons. The farmers are facing a great loss in their agriculture land due to the interference caused by animal / birds. Due to the interference of animals / birds there is loss in crops as animals / birds enter the farm field and destroys the crops which are ready to be harvested. To prevent these loss to farmers a system is to be designed.

Solar energy is abundant source of energy as it is free energy source, so it is necessary to make most use of solar energy. The system to be designed uses solar energy, a fencing is provided around the farm this fencing transfers electric pulses, and so if any animal touches the fence may receive a short pulse it is just to threaten the animal. Thus animals does not enter the farm field. Doing this the loss in agriculture due to animals get reduced and farmers can cultivate crops without any fear.

II. LITERATURE SURVEY

Abhinav, "The Solar Fencing Unit and Alarm for Animal Entry Prevention"[1] has reported that the aim of this paper is to Design and implementation of an intelligent security system for farm protection from wild animals. An electric fence is used as a barrier to protect a farm from wild animals. An electric fence firstly used in Texas in 1888. Electricity from generator using an overshot wheel was used to charge the top two wires of a four-wire fence. Often solar-powered, the fences were used extensively in the Panhandle to prevent cattle wandering onto farmlands. It is important to keep the area near the fence cleared of any such vegetation. It should be ensured that the grounding has been done properly. Failure to do so might create the electric fence ineffective.

Venkat Iyer, "Sensor-based Breakage Detection for Electric Fences"[2] presents how breakage is detected, there exists a number of fault detection circuits for fence that are available commonly. However, there are certain limitations for them which inhibit their suitability to our problem. For example, a system is described which is best used for less rugged environments such as airports. The fault detection system uses a hand held device which points to the direction where the fault is located. Workers must then cross along the fence holding the fault detection device until they found the fault location. This is the currently used

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method by the department of wildlife conservation in Sri Lanka, this fault finding procedure sometimes may take days. In this likely event of an elephant breach, such a delay can be harmful. These devices usually uses high impedance voltage dividers where the device get grounded through the user. Fault detection system uses radio for communication, and are not viable because of effective low cost radios are not yet available commercially. The system describes uses a separate communication line parallel along with the fence, to detect faults. The system identifies the breaks in the communication line rather than in the wire itself. This solution is also not cost effective because it requires an extra wire dedicated for the fault detection.

EZEONU Stella Ogochukwu, "Ultrasonic Bird Repeller"[3] in this paper it is described about the ultrasound used for repelling birds from the farm area to reduce the loss in crops due to birds. Many attempts have been made to develop a bird deterrent systems with only a few achieved desired results. The ultrasonic frequency range 15-25 kHz is known to be disturbing for birds and a device operating at that range was developed. The devices were tested and the results obtained proved that the ultrasonic beam from the piezo speakers was able to drive birds away from areas. Further tests were conducted with the unit showed a wider reach of the waves on dull day than on sunny day. About 5-6 of device is expected to cover one hectare of field. The system is solar powered, to reduce the cost of fuel, it is eco- friendly.

Tasneem Khan Shifa, "Moisture Sensing Automatic Plant Watering"[4] presents Automated plant watering system evaluate and measure the existing plant and then supplies desired amount of water needed for that plant. It minimizes the excess water used as well as keeping plants healthy. The increasing demand of food requires the speedy improvement in food production technology. In a country like India, where the economy is mainly dependent on agriculture and the climatic conditions, still we are not able to make full use of agricultural resources. The main reason is the lack of rains & scarcity of land reservoir water. Very important reason of this is due to unplanned use of water to which a significant amount of water goes to waste. So, in modern irrigation system, plants can be easily monitored and can be taken care of by automatic plant irrigation system.

III. PROPOSED WORK

In this proposed system, solar panel is used to convert the solar energy to electrical energy, a battery is used this battery is charged by the solar energy and it stores the charge to operate during night hours. A peltier module is used to increase the efficiency of the solar panel. Microcontroller Atmega 328 IC Arduino UNO is used.

Arduino Uno is exact valued addition in the electronics it contains of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega 328 microcontroller.

A PIR Sensor is used to detect the motion of human being or animal, the movement's record is sent to the microcontroller.

Moisture sensor detects the soil moisture level, if the moisture content is less in the soil then a signal from microcontroller sent to the Pump on/off controller this controller gets active and signal sent to pump and the pump gets ON and the water is supplied to the crops.

An audio generator is used, this audio generator generates an audio frequency which is irritable for animals / birds. This frequency is not audible to humans as animals / birds are sensitive to some range of frequency, this frequency is emitted during a short period so that none of the animals / birds are attracted towards the farm field.

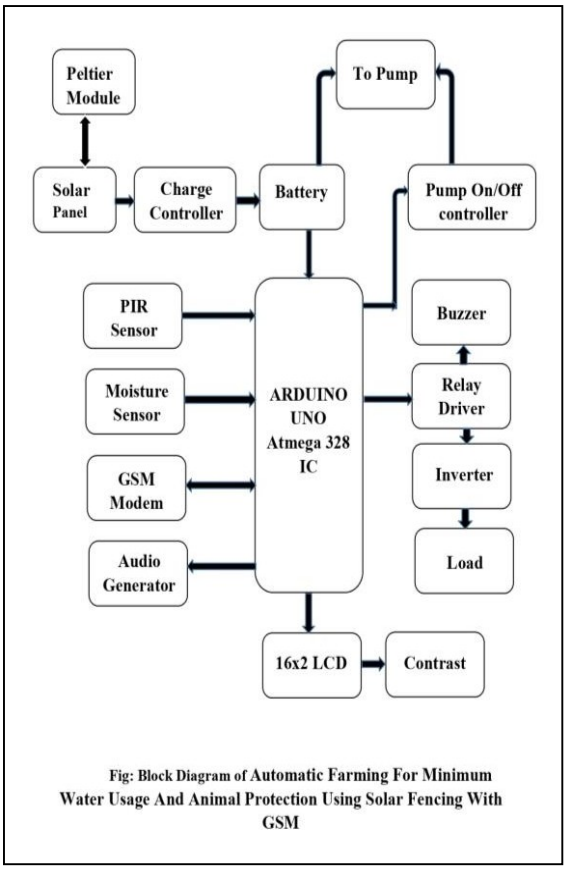

Fig III (1): Block Diagram

There is no harm to animals / birds by using this audio, it is just used to make them away from the field.

As the block diagram shown, the battery is also used to power the pump to supply water to the crops in the farm.

As solar energy is converted to electrical energy an electrical power of high voltage is supplied through the fence arranged around the field. If any animal / human tries to enter the field may have a short pulse shock which is not harmful it is used to threaten them to be away from the fence. If any unusual issues occurred in the field then an alert message / buzzer is rang to inform the farmer. This makes it more secure to the field.

This proposed system help the farmers to yield a better crops and can avoid the loss caused by animals / birds in the farm.

IV. HARDWARE SPECIFICATIONS

A. *Solar Panel*

Solar Panel is used to direct solar energy, solar panel used in this system is of 12V/300mA. The solar panel converts the solar energy to electric to transfer the electric pulse to fence. The use of solar energy is made as it reduce the cost of unnecessary electric supply and solar energy is an abundant resource.

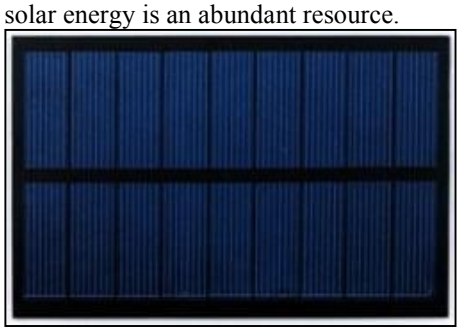

Fig A (1): Solar Panel

B. *Peltier Module*

Peltier Module is used to increase the efficiency of solar panel. As solar panel gets heated by the solar energy the cells in the solar panel may get damage due to excessive heat to reduce this peltier is connected to it. Peltier has two sides one is cold end and other is hot end, the cold end is connected to solar panel to increase the panel efficiency. The voltage in peltier hot end increase as the solar panel gets heated.

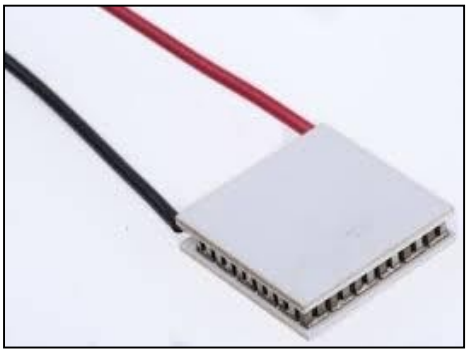

Fig B (1): Peltier Module

C. *Battery*

Battery is used to store the charge, so that during night hours when there is no sun light the system should work smoothly. The battery is charged by the solar energy and when battery gets fully charge the battery is disconnected and the energy is stored in battery. In this system a battery of 12V is used.

Fig C (1): Battery

D. *Arduino UNO*

An Arduino is a microcontroller development board. Use of Arduino is to read values of sensors and control devices such as motors and lights. This board permits to upload programs to the board which can then interact with the devices in real world. This board helps to make things which can respond to the world. For example, to read a moisture sensor attached to a potted plant and turn on the automatic watering system if it sense too dry soil moisture. It helps to interact with real world things. Mostly, if there is a bit that is in way controlled by electricity, the Arduino can interface with it in some way.if even it is not controlled by electricity, you can possibly still use device which are (like motors and electromagnets), to interface with it.

Fig D (1): Arduino UNO

E. *PIR Sensor*

PIR sensor detects the interaction coming towards the sensor, PIR sensor detects the heat in the body which comes near to the sensor. When any animal / human comes near to the sensor it detects the change in heat and informs the controller about the change occuring. Sensor detects the motion towards it and indicates about the occurrence. PIR sensor has two slots, each slot is made of

Fig E (1): PIR Sensor

special material which are sensitive to IR. When warm body like humans / animal passes by the sensor it creates a positive differential, when the body leaves it creates a negative differential. These pulse changes are detected.

F. *Moisture Sensor*

Moisture sensor works on the principle of voltage comparison. Amount of water content in soil, the conductivity of the probes varies accordingly. When the water content in soil is less then conductivity is also less, thus the comparator goes high and the water is supplied. If the water content in soil is high then conductivity is high and comparator goes low and water is not supplied as there is much water content in the soil.

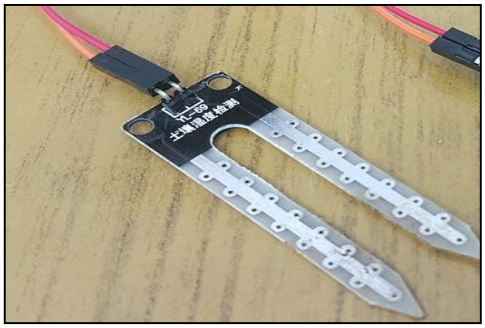

Fig F (1): Moisture Sensor

G. *Audio Generator*

Audio generator generates the frequency of 25-45 KHz. The audio generator used to repel birds / animals away from the protected area / farm, so that these animals / birds should not destroy the crops in the farm. The ultrasound emitted from device allows birds to stay away from the field, these frequencies are not audible to human being these are the frequency which are irritable to birds without causing any harm, it is just to keep birds away from field.

Fig G (1): Audio Generator

H. *GSM Modem*

Fig H (1): GSM Modem

GSM (Global System for Mobile) is a cellular technology used for communicating mobile voice and data services. GSM is a digital telephone system used for mobile communication. GSM used in this system is to alert user if any unusual attempts occur in the farm. When any attempts or problems occur it will send text message to user about the problem. GSM gives an ease to user for communication with devices.

I. *LCD*

LCD used is 16 by 2, LCD used to indicate the operation done by the system. A 16 pin contains LCD with D0-D7 the data lines used to transfer data to these lines to display on LCD. RS is the register select pin, RW is read / write pin when RW=0, write operation done else read operation, E is the enable pin. LCD used to display the messages in system.

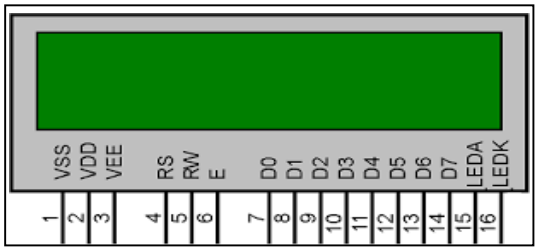

Fig I (1): LCD Display

J. *Buzzer*

Buzzer is used for alarming system. If any unusual attempts occur in the area the system detects and the buzzer rang alerting everyone regarding the attempt. The buzzer indicates any harm to the area to be protected. Buzzer helps user and other members to stay alert when it bells.

Fig J (1): Buzzer

K. *Relay Driver*

The relay takes advantage of the fact that when electricity flows through the coil, it convert into electromagnet. The electromagnetic coil draws a steel plate, which is attached to a switch. motion (ON and OFF) is controlled flowing through the coil, So the switch by the current respectively.

Fig K (1): Relay

A useful feature of a relay is it can be used to electrically separate different parts of a circuit. It will permit a low voltage circuit (e.g. 5VDC) to shift the power in a high voltage circuit (e.g. 100 VAC or more). The relay operates mechanically, it cannot be operated at high speed.

V. FLOWCHART

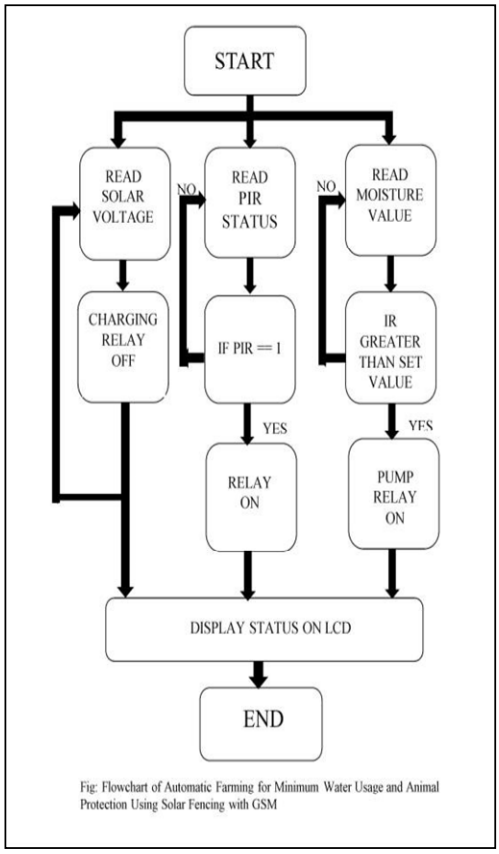

Fig: Flowchart of Automatic Farming for Minimum Water Usage and Animal Protection Using Solar Fencing with GSM

Fig V (1): Flowchart

First check the solar voltage, this solar voltage supplied to fencing and charge the battery when battery is fully charged with help of relay the charging is turned off. Read the status of PIR sensor and Moisture level, as the PIR sense any activity it turns on the relay fence is activated. The moisture sensor sense the level of moisture in the soil if the soil is too dry greater than the value then the pump is turned on to supply water. All the process indicated on LCD.

VI. SOFTWARE

Software used to design the system is PROTEUS PRO 7.6, for designing the system and circuit operation. The Proteus is circuit design software which includes a schematic, simulation and PCB (Printed Circuit Board) Layout tools. It helps to determine the circuit to be worked on and shows simulation according to the programming or operation to be performed.

For ARDUINO board the programing is done on Arduino Setup. The setup used to code the operation of circuit to be performed.

VII. APPLICATION

1. Yields to better production of crops.
2. Reduce the risk of crops getting damaged by animal / birds.
3. Supports economic growth of agriculture.
4. Increase in the production of crops.
5. Good security for current generation technology used in agriculture.

VIII. RESULT

The voltage level is indicated on LCD and the moisture level. When the PIR sensor senses the warm body then the fencing is activated, whenever any animal tries to enter the field will receive a short pulse which makes animals to stay away from the field. Whenever any unusual attempts occur the buzzer is ranged and a text message is sent to the farmer regarding the issues. This provides a safe and user friendly security system for farmers.

Fig VIII (1): Result (Fencing around farm)

IX. CONCLUSION

However in today's scenario agriculture / farming becoming a risk factor due to the climate changes or by the damage caused by animals / birds to the crops. Animals / birds are giving high risk to farmers for cultivating crops, as when the crops are ready for production these animals / birds enter the farm and eat or destroy the crops which leads to the great loss to the farmers.

So, this system will protect the farms from the animals / birds. The fencing around the farm area will provide protection to the field. It is a low cost system for the betterment of agriculture to increase the production of good crops.

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