

Farmer Friendly Solar Based Electric Fence For Deterring Cattles

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Abstract: Agriculture provides all the people's food needs as well as a variety of raw materials for industry. However, there is a significant loss of crops due to animal intrusion in agricultural lands. Wild animals will wreak havoc on crops. As a result, it's critical to keep an eye out for animals in the region. Then various devices should be activated to repel the dangerous animals. Operational amplifier circuits are put in place primarily for the purpose of detecting animal intrusion into the farm. The completed protection system is responsible for providing early warning of potential wild animal intrusion and harm. In comparison to older methods of crop and property protection, the Solar Electric Fence system is a newer option. Animal damage can be minimized by the use of an electrical fence. The project depicts an arrangement that could be used to prevent animals from damaging our fields, farmhouses, gardens, and other structures. In comparison to manpower, these fencing systems are more user friendly. When cattle jump the fence, they are given a brief (1/5000th of a second) and secure shock, which teaches them to stay away from the fields. Since the current in fencing is discontinuous and there is a certain time interval between two bursts, the shock is secure. It reduces the current flow for a longer period of time. Since there is a gap between two pulses of current, the

current flow is not sustained for long periods of time, and the animal is not shocked for long periods of time. When viewed in a different light, this type of fencing plan is more productive. When any animal endeavours to cross the fencing it gives them a shock and ensures them to stay off from the fields. Since, the current passing through the fencing is in an intermittent structure, the stock is not harmful to anybody. Since there is a pause between two beats of the current, it remains disconnected from the current stream for a long time, causing the creatures to be stunned later. The paralyzed is secured since the electrical current in fencing is sporadic as there's certain timeframe between two pulses.

Keywords: Microcontroller, Fence energizer, Photovoltaic, Light dependent resistor, Transmitter

1. Introduction

The sun arranged photovoltaic advancement is now being beneficially taken for electrical fencing reason. The solar energy fencing structure provides the most basic protections by effectively controlling and scrutinizing animal trespass. The daylight-activated energized electric fencing engages animal control by inducing a brief and secure daze that instructs them not to cross the barrier.

Normally, people do not consider electric

fencing because they are concerned about the possibility that it will cause harm or butcher a human or other living creature. However, if the electrical fencing is properly installed, it provides protection to both animals and humans. A closed and full circuit is required for current movement within the fencing. It is possible when the current is in a closed circuit or when the charged fence wire is grounded. The circuit is either open or split under normal circumstances. In any event, any attempt by an animal or a person to touch the fence grounds the fence and closes the circuit. An electrical heartbeat can travel through the animal and back to the energizer, providing the animal with the stable daze. An electrical obstruction by an enormous contains a various transmitters of uncovered wire, maintained on bounding and related with a fence energizer which during this way is expounded with a power source. When an animal comes into contact with the fence's electrically charged wires, it has an unconditional reaction. Individual new to electric fencing routinely are jittery about the likelihood that it will hurt, forever hurt, or murder which comes in touch of the fence. Be that as it may is not the case every time. This stream can occur when a charged fence wire becomes grounded with reiterating pulses of power made by the energizer sent through the charged wires of the fence, an electric boundary limits as an ineffective or open circuit under the normal working conditions. When an animal comes into contact with charged wire, the fence is grounded, resulting in a short circuit. An electrical heartbeat also passes through the animal, returning to the energizer an passing to the animals paralyzed state. Although the electric stager is unpleasant, it is not harmful. Solar electrical fencing is more cost effective periphery device than older barbed wire fencing for defending your home. When an animal or individual comes into the contact with the electrical fence, they are shocked with a sharp, fast, painful, yet safe electric shock. There is no physical damage caused by the shock. Despite the fact that the fence is not turned "ON", the more existence of

the fence serves as a powerful barrier after a period of conditioning.

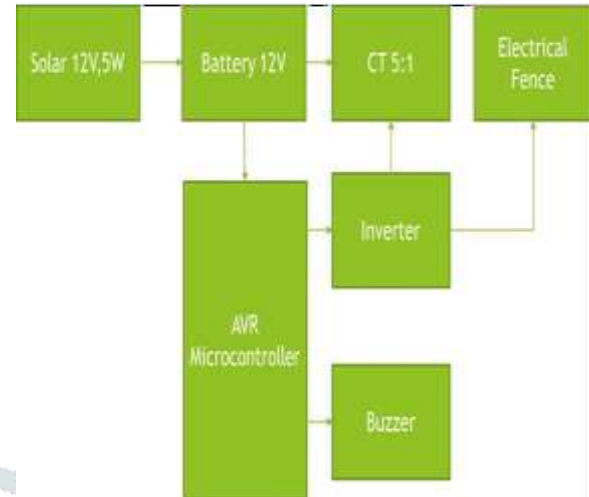


Fig. 01 Block diagram of Solar Fencing System

2. Components Description

A) Solar Panel

The solar panel merely serves as a battery charger. The semiconductor of the PN intersection are used to make the solar oriented cell. It has the ability to convert light into electric energy. We will eventually be able to receive the power produced by using daylight hours gleaming at the solar based cell as basic energy. Solar panel are clean and environmentally friendly way to generate solar energy because the use renewable energy from the sun. The solar panel acts as a battery charger in it's own right The semiconductors of the PN junction makes up the solar cell. It has the potential to turn light into electric power. As a result, we can conclude that power produced by solar light shining on the solar cell can be used in the same way as commonplace power.



Fig. 02 Solar Panel

A) PIR Sensor

The movement of people, animal, and the other object is detected using a PIR-based movement predictor. Thief warning and normally enacted lighting framework are popular uses for them. They are commonly referred as “PIR”. Inverse inputs to a differential speaker may be wired as collection of sensor components. When exposed to brief flashes of light or field- wide brightening, the device is able to detect or reject false sign of development.



Fig. 03 PIR Sensor

A) AVR Microcontroller

A microcontroller is the advance model of microprocessor. It acts as major element used in designing of embedded system.

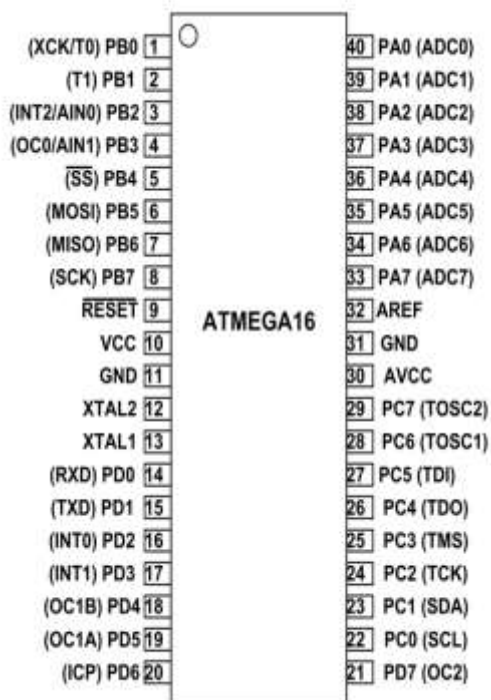


Fig. 04 ATMEGA16 Pin Diagram

AVR microcontroller is an electronic chip produced by Atmel, which has diverse superiority, over various kinds of microcontroller. AVR microcontrollers come in a variety of configurations, with some configured for floor mounting and other for hole mounting. It comes in the sizes ranging from 8 to 100 pins, with any microcontroller with 64 pins or more being surface mount only.

Programming the ATMEGA16 is similar to programming every other AVR controller. ATMEGA16 has sleep mode as well. To save energy, the modes can be activated at any time.

B) Fence Energizer

The electrical fence energizer transforms electrical strength, which is typically generated by an electrical application, batteries, or solar PV’s, into an electrically driven impulse with limited electricity relevant to safety limits. The electric fence energizer transforms electrical power from an electrical application, batteries, or solar PV’s into an electrical driven impulse with a minimal energy associated in accordance with safety limits.

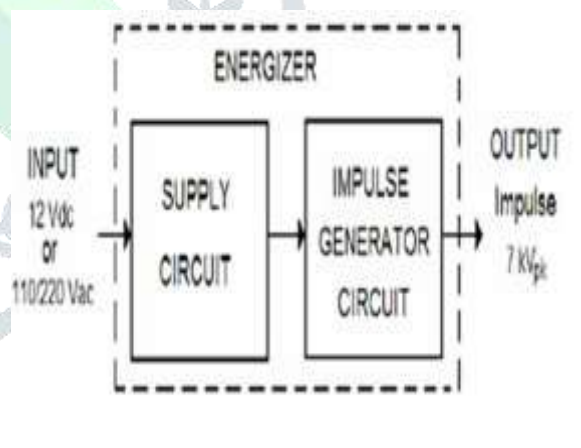


Fig. 05 Fence Energizer

C) LDR Sensor

A photo resistor, also known as a mild standardised resistor or a cadmium sulphide (CdS) mobile, is a resistor whose resistance decreases as the incident mild depth increase. A picture resistor is made from a semiconductor with a high resistance. Photons absorbed with the aid of the semiconductor provide electrons with enough energy to leap into the conduction band if light

falling on the system has a high enough frequency.

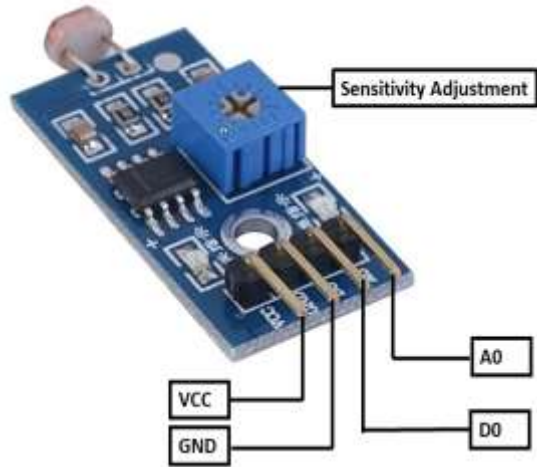


Fig. 06 LDR Sensor Module

D) MOSFET

The FET is capable of operating in both depletion and enhancement modes. This new generation of superior MOSFET’s has been designed to have lower on-state resistance, superior switching, and high avalanche energy electricity. It helps in signal switching and amplification. MOSFET are much more common than bipolar junction transistors. The insulated-gate field-impact transistor (IGFET) is another synonym. The MOS capacitor is the most important component of the MOSFET.

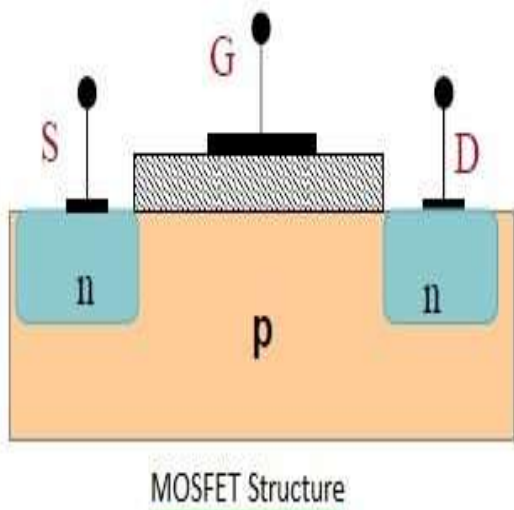


Fig. 06 MOSFET Structure

E) Alarm

When an array is cut, shorted or grounded, the smart fence voltage warning systems track

effective voltage on the fence in the smallest degree of time and generate an alarm.

F) Solar Fencing

Solar fence works on photon power with backup facility to run uninterruptedly throughout the day. Whole system is derived in two segments, one is the solar energy producing system unit or principle manipulate unit and the alternative one is the fence.

3. Methodology

- Photovoltaic energy from the sun is caught up with the help of sun based boards which are comprised of photovoltaic cell. These photograph voltaic (PV) cells are utilized to vary sun powered energy over to electrical energy.
- This energy is put away in batteries through the charge regulator during the day time to be used at whatever point required.
- The battery powers a MOSFET based inverter and step up transformer that converts a photovoltaic sun based boards immediate current (DC) yield to 50 Hz, 220 volt A.C.
- This A.C is then permitted to course through the fence that is introduced around the rancher field to give a slight electric stun to dairy cattle that attempts to enter into the field for nibble so as to secure the yield from harm.

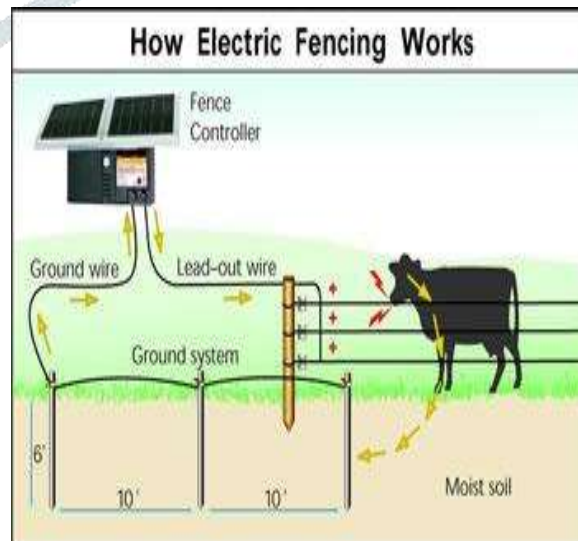


Fig. 07 Solar Fencing System

- An infrared sensor signals caution which is connected to an Alarm if any cattle try to cross fence. This electro luminescent substance has an energy gap of 0.25 to 0.4 electronvolt. Despite the fact that infrared rays disperse in all directions, they travel in a straight line in forward direction.
- As infrared rays are emitted by an LED, they move forward in straight line. Where an impediment blocks the path, the IR rays are cut, resulting in secondary wavelets that propagate in the opposite direction of the primary waves.
- If any object passes through the entrance and surrounding area, the microcontroller will receive the appropriate signal.
- The alarm will sound when it receives the signal, indicating that something is wrong with the farm.
- The voltage is regulated by MOSFET, which is connected to the threshold circuit. All tools are regulated by the microcontroller.

4. Results and discussions

The project depicts an arrangement that could be used to prevent animals from damaging our fields, farmhouses, gardens, and other structures. In comparison to manpower, these fencing systems are more user friendly.

When any animal endeavours to cross the fencing it gives them a shock and ensures them to stay off from the fields. Since, the current passing through the fencing is in an intermittent structure, the stock is not harmful to anybody. Since there is a pause between two beats of the current, it remains disconnected from the current stream for a long time, causing the creatures to be stunned later.

A) PV modules' DC output voltage

- Open-circuit voltage = 39 V
- Temperature coefficient of = $-0.30\% / ^\circ\text{C}$
- lowest temp history of Manali = $-12\ ^\circ\text{C}$

$$T(\text{min}) = -12\ ^\circ\text{C} - 25\ ^\circ\text{C} = -37\ ^\circ\text{C}$$

$$V_1 = V_{oc} \times \{1 + [(-37\ ^\circ\text{C}) \times (-0.30\% / ^\circ\text{C})]\}$$

$$= 39 \times 1.11 = 43.29\ \text{V}$$

B) The overall PV module output current

- Short-circuit current = 9.31 A
- Temperature coefficient of = $0.04\% / ^\circ\text{C}$
- Highest Temp history of Manali = $35\ ^\circ\text{C}$

$$T_{\text{max}} = 35\ ^\circ\text{C} - 25\ ^\circ\text{C} = 10\ ^\circ\text{C}$$

$$I_{\text{max}} = I_{sc} \times \{1 + [(10\ ^\circ\text{C}) \times (0.04\% / ^\circ\text{C})]\}$$

$$= 9.31\ \text{A} \times 1.004 = 9.35$$

Since this fencing relies upon renewable solar energy for electricity generation, it doesn't add any cost to our installation, in terms of power source which is conventionally a power plant. Electricity is generally generated by burning of fuels

(Fossils) by the power plants which release the gases like carbon dioxide which is not good for environment and air. So we need to shift it on renewable energy for safe environment. Hence, using the abundant, free of cost renewable energy is a great advantage.

5. Conclusion

Technology advancement is a never-ending process. As technology advances, we will imagine the future, where we will be able to occupy each space. The proposed unit, which is based on the ATmega16 microcontroller, is found to be more light weight, user-friendly, and straightforward to use. Our project, titled “Farmer friendly solar based electric fence for deterring cattle”, is built around the concept of renewable solar energy. It uses solar energy to power the fencing around our fields, preventing cattle from entering and spoiling our crops and fields.

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