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Solar Power Fencing System for Agriculture Protection using GSM

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ABSTRACT: India, with vast agricultural lands has different crops ranging from paddy to tomato. But few crops are destroyed due to animal menace and hence a protection is required to save the crops from animal. Solar Fencing Perimeter Protection is the modern day need to the growing security threat in denying, detecting while having the in built capability to serve as deterrent. In this project, we design and implement Fencing Perimeter Protection for agriculture. It is the modern day need to the growing security threat in denying, detecting while having the in built capability to serve as deterrent. It works on Solar Energy with backup facility to run uninterruptedly during the nights as well as cloudy days. when any object is sensed by PIR or IR sensor, Immediately controller sends the message to the authorized person through the GSM modem, and it is interfaced with the controller. At the same time buzzer and light will on. The authorized person can sent message through GSM to operate motor also. Solar Powered Fence is scientific Fence and works on Solar Energy with backup facility to run uninterruptedly during the nights as well as cloudy days..To control motor using GSM.

KEYWORDS: GSM modem, sensor, fence, agriculture.

I.INTRODUCTION

Agriculture in India is the broadest economic sector and plays a significant role in the overall socio-economic factor of India. The increasing news articles in television and newspaper on wild animals raiding agricultural crops during harvest season shows that these animals can destroy a farmer's livelihood. In such areas Electric fencing system can be employed in which the animals experience a high voltage low current shock for a very short time. Because of the small magnitude of current there is no threat to the animal's life at the same time the large magnitude voltage scares away the animals.

Usually, PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. A photoelectric sensor, or photo eye, is a device used to detect the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver. They are used extensively in industrial manufacturing. There are three different functional types: opposed (through beam), retro-reflective, and proximity-sensing (diffused).

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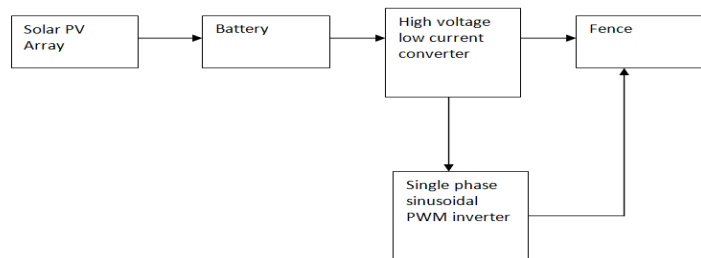
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II.SYSTEM DESCRIPTION

The block diagram of the solar fence set up is shown in Fig.2.1. The solar photovoltaic (PV) array converts light energy into electrical energy.



The current shock is given only when the authorized person is in another location at the time he can not come quickly for protection areas. In such cases, only the shock is given to the fence while human is entered in the land. The solar energy obtained is stored to a battery. The battery supply is fed voltage regulator IC7805 and in turn to a microcontroller. sensor which is capable of generating ON/OFF pulses to controller. This is fed to a buzzer, cathode fluorescent light and sent to message to authorized person through GSM modem.

A.MATHEMATICAL MODELING OF SOLAR PV PANEL

The solar PV panel is modelled mathematically using the equivalent basic structure consisting of a current source and a diode in parallel. For the purpose of simplicity and accuracy the single diode model (Fig 2.2) is adapted. The equivalent circuit consists of a series resistance and shunt resistance that accounts for losses in ohmic contacts and losses on the edge of the cell, because of leakage of current from one terminal to the other due to poor insulation respectively.

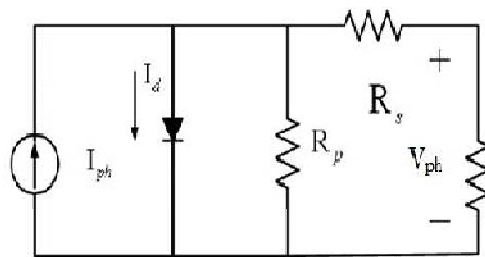


Fig 2.A.Equivalent circuit for solar cell.

From equivalent circuit the following equations are obtained:

$$I_{pv} = I_{ph} - I_r [\exp(V_D/V_T) - 1] - (V_D/R_p) \quad (1)$$

$$I_{ph} = G * I_{sc} \quad (2)$$

$$I_{sc} = I_{sch} [1 + K_d T] \quad (3)$$

$$I_o = I_r [\exp((V_D * V_{ta})/N_{ss}) - 1] \quad (4)$$

$$I_m = N_{pp} [I_{ph} - I_o]. \quad (5)$$

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III. TRANSMIT MESSAGE TO THE AUTHORIZED PERSON

A. GSM MODEM.

A **GSM modem** is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. For the purpose of this document, the term GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols.

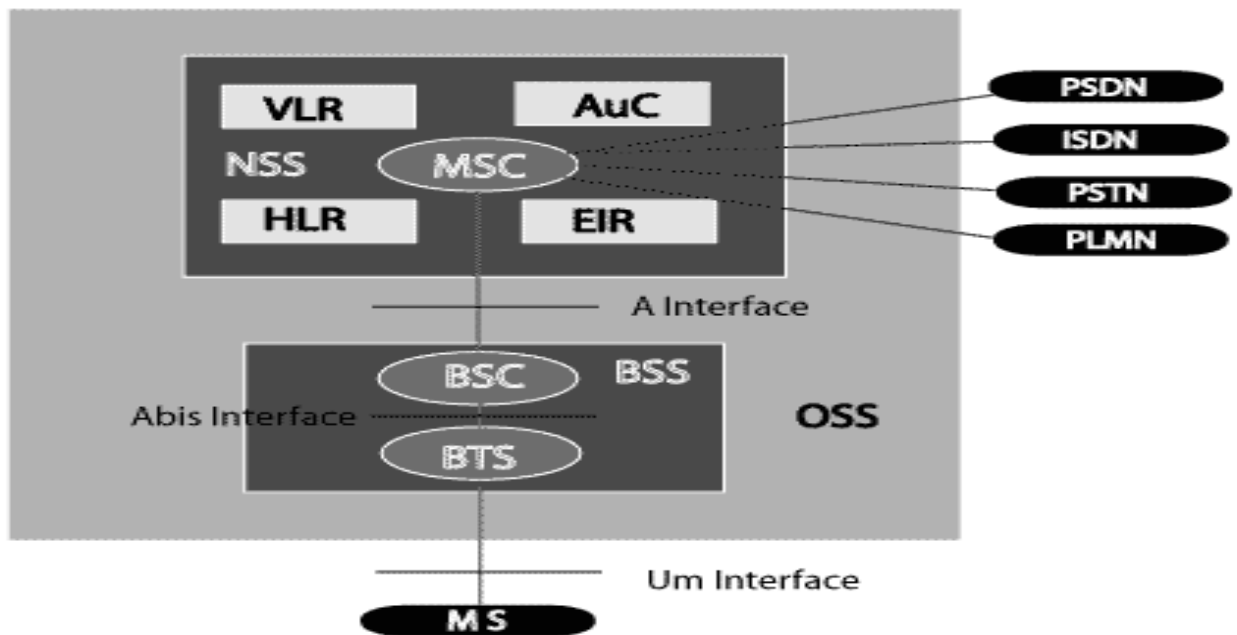


Fig:3. AGSM modem network

The MS and the BSS communicate across the Um interface, also known as the air interface or radio link. The BSS communicates with the Network Service Switching center across the A interface.

GSM network areas:

In a GSM network, the following areas are defined:

Cell: Cell is the basic service area: one BTS covers one cell. Each cell is given a Cell Global Identity (CGI), a number that uniquely identifies the cell.

Location Area: A group of cells form a Location Area. This is the area that is paged when a subscriber gets an incoming call. Each Location Area is assigned a Location Area Identity (LAI). Each Location Area is served by one or more BSCs.

MSC/VLR Service Area: The area covered by one MSC is called the MSC/VLR service area.

PLMN: The area covered by one network operator is called PLMN. A PLMN can contain one or more MSCs.

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B.GENERATE BUZZER SOUND AND GLOW LIGHT.

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke. Early devices were based on an electromechanical system identical to an electric bell without the metal gong.

Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzzer. Often these units were anchored to a wall or ceiling touse it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made

A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep. Electronic buzzers find many applications in modern days.

The line drivers used for TxD are called T1 and T2, while the line drivers for RxD are designated as R1 and R2. MAX-232requires four capacitors ranging from 1-22 microfarads.

A **relay** is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, butother operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computersto perform logical operations.

IV.BLOCK DIAGRAM

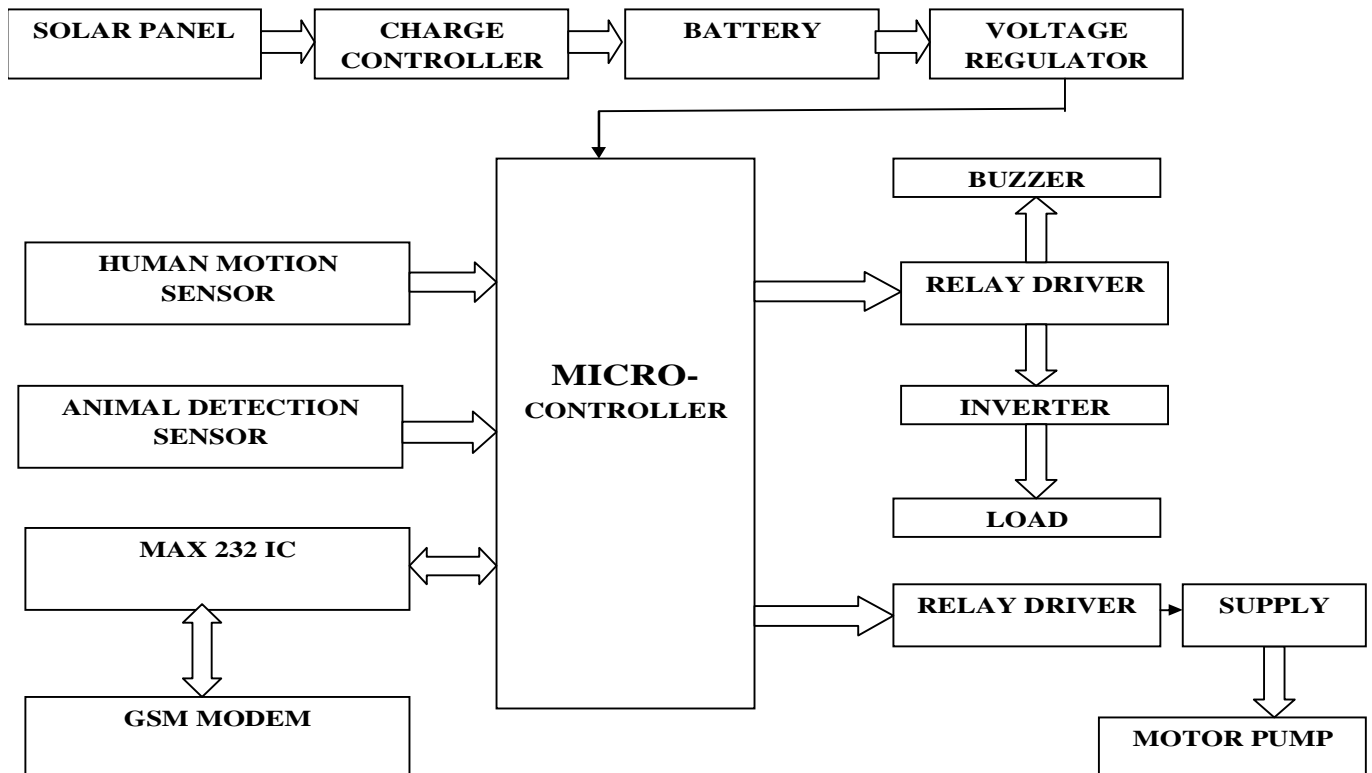


Figure 4.1 Block Diagram



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From the above block diagram it is clearly shows that,

A solar panel (also solar module, photovoltaic module or photovoltaic panel) is a packaged, connected assembly of photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. The efficiency of a panel determines the area of a panel given the same rated output an 8% efficient 230 watt panel will have twice the area of a 16% efficient 230 watt panel. A photovoltaic system typically includes an array of solar panels, an inverter, and sometimes a battery or and interconnection wiring.

Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar panels are rigid, but semi-flexible ones are available, based on thin-film cells.

In this project, control the fencing by using GSM technology. Initially the power is drawn from the solar panel and it is stored in the battery. From the battery, take the power for all the components.

The components including fence. Here the sensor is used to detect the object. A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. For example, a mercury-in-glass thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors are calibrated against known standards.

PIR SENSOR

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

PHOTO SENSOR

A photoelectric sensor, or photo eye, is a device used to detect the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver. They are used extensively in industrial manufacturing. There are three different functional types: opposed (through beam), retro-reflective, and proximity-sensing (diffused).

Also, the controls for the sensor are more accessible, since they may be bigger. When space is restricted or the environment too hostile even for remote sensors, fiber optics may be used. Fiber optics are passive mechanical sensing components. They may be used with either remote or self-contained sensors. They have no electrical circuitry and no moving parts, and can safely pipe light into and out of hostile environments

An opposed (through beam) arrangement consists of a receiver located within the line-of-sight of the transmitter. In this mode, an object is detected when the light beam is blocked from getting to the receiver from the transmitter.

A retro reflective arrangement places the transmitter and receiver at the same location and uses a reflector to bounce the light beam back from the transmitter to the receiver. An object is sensed when the beam is interrupted and fails to reach the receiver. A proximity-sensing (diffused) arrangement is one in which the transmitted radiation must reflect off the object in order to reach the receiver. In this mode, an object is detected when the receiver sees the transmitted source rather than when it fails to see it.

Some photo eyes have two different operational types, light operate and dark operate. Light operate photo eyes become operational when the receiver "receives" the transmitter signal. Dark operate photo eyes become operational

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when the receiver "does not receive" the transmitter signal. The detecting range of a photoelectric sensor is its "field of view", or the maximum distance the sensor can retrieve information from, minus the minimum distance. A minimum detectable object is the smallest object the sensor can detect. More accurate sensors can often have minimum detectable objects of minuscule size. Once the object is detected, the information pass to the controller. Immediately controller sends the message to the authorized person through the GSM modem, and it is interfaced with the controller. Once the authorized person receives the message, he is again reply to the modem and switch on the power supply to the fencing unit. The MAX-232 converts from RS-232 voltage levels to TTL voltage levels, and vice versa. One advantage of MAX-232 chip is that it uses +5v power source which is same as the source voltage for microcontroller, with no need for the dual power supplies that are common in many older systems.

Since the RS-232 is not compatible with microprocessor and microcontrollers we need a line driver (voltage converter) to convert the RS-232's signals to TTL voltage level that will be acceptable to microcontrollers' TxD and RxD pin data.

V. CONCLUSION AND FUTURE WORK

Thus we are concluded the solar fencing system was designed and fabricated successfully. The experiment shows that the proposed system is simple and efficient one. We are save cost in order to implement this project for security purpose as well as less time consume.

The authorized person get message from GSM, when any object is detected by PIR or IR sensor. It sends to the controller by Ic 7805 regulator. Though relay driver the buzzer will on and light will glow. By using this techniques, we can save small birds as well as the things which is placed inside the fencing areas. This is the solution to the protection of agriculture areas from robberies, interruption and creatures.

At the same time the user can sent message to the GSM in order to operate motor for pumping applications. In the existing system, the fencing is operated by passing continuous electric power supply . Due to continuous power flow in the fencing system, the living beings are affected. Disadvantage of existing system is the Electric power loss. There is need for government approval for giving current shock on the fence. Affect the human beings. Instead of electric power supply, using sensor and GSM Modem to reduce power level. Fence works on Solar Energy with backup facility to run uninterruptedly during the nights, as well as the cloudy days. Motor can be controlled by GSM. Advantage of our proposed system are Solar energy is used, Easy to control and maintain the fence, Less time consuming.

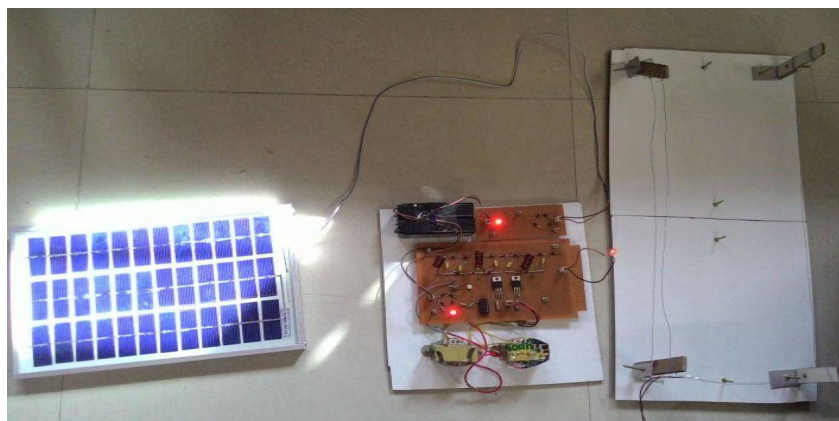


Fig.5. Hardware set of protecting system.

This is the view of our proposed system.

FUTURE WORK: Camera is interfaced with the fencing system.

Snapshot of the person and text messages are send to the authorized person who tried to get inside land.

Ultrasonic wave can be sent, to give pain to the intruder.



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