



Solar Based Virtual Fencing for Rural Agriculture

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ABSTRACT-

Animals can be kept out of homes, farms, cabins in the woods, and other structures by using virtual fences. These resemble the work of a cowboy or forest ranger in certain ways. Electric fences are already used in nations where labour is expensive, and they are steadily gaining popularity in India as well. These keep the animals under control by shocking them briefly, sharply, and safely, which teaches them to avoid the fence. Electric fences are therefore cost-effective and useful ways to increase field production through managed grazing. Because its output is discrete, virtual fencing is secure (not continuous). Two pulses are separated by a specific amount of time in order to prevent continuous stunning of people or animals. The brief "on" period also avoids heat buildup. A 12V rechargeable battery is used to power this fencing system. The battery is attached to a solar panel for daytime charging.

Solar-powered virtual fences work on the premise of transforming solar energy into electrical energy and shocking anyone who touches the fences with an electronic shock. Many locations, including farms, government properties, and forests, use electronic fences to deter theft and protect against animals. The solar energy is transformed into electrical energy, which takes the form of DC voltage that is not regulated. By utilizing an inverter, this uncontrolled DC voltage is transformed into a regulated DC voltage and then into an AC voltage. Additionally, a weak current serves to deliver a quick, powerful shock to deter animals and robberies from the region.

KEYWORDS- Renesas microcontroller, speaker, solar panel.

I. INTRODUCTION

Agriculture is a major contributor to the economies of many nations worldwide. Despite economic growth, agriculture remains the foundation of the economy. The primary engine of the economy is agriculture.

The gross domestic product benefits from it. Food needs are met by agriculture, which also provides a variety of industrial raw resources. But there will be a significant loss of harvests as a result of animal intrusion in agricultural regions. The crop will be completely ruined. Farmers will lose a significant amount of money.

It is crucial to keep livestock away from farms and agricultural fields in order to prevent these costly losses. In our suggested work, we will develop a method to stop animals from entering the farm in order to solve this issue.

The project's primary goal is to construct forbidding fencing around the farm in order to prevent animal-related losses. These forbidding fences shield the crop from harm, which inadvertently boosts agricultural yield. The developed system won't injure or be harmful to humans, animals, or both. The goal of the project is to develop an embedded system-based intelligent security system for farm protection. Animals have access to crops.

LITERATURE SURVEY

Design, Deployment, and Performance Evaluation of a Solar Fencing System for Demand Side Management in Smart Grid, a study by M. Usman Salman[1] A solar tracker is a device that holds solar panels and follows the sun's path across the sky to make sure that the panels receive the most sunlight possible at all times. According to Solar Fencing Unit and Alarm for Animal Entry Prevention, this paper's goal is to design and put into place an intelligent security system for farm protection from wild animals. To keep wild animals away from a farm, a barrier made of electric wire was utilised. In Texas, an electric fence was initially utilised in 1888.

In paper by S. Muralidhara, N. Hegde, and R.PM [2], "Solar fencing," Comput. Electr. Eng. Solar tracking system is used nowadays. Solar tracking is one of the most appropriate technologies so as to increase the efficiency of solar panels. Rather than purchasing additional solar panels, they can help to harness solar energy in more efficient way even with respect to cost. One major disadvantage of an electric fence is that it might slow down emergency

services from reaching you. Even worse, you can end yourself receiving assistance too late. When shrubs or trees develop nearby, there is a chance that electric fences could provide a fire risk.

Additionally, it must confirm that the grounding was performed correctly. The electric fence can lose its effectiveness if this is not done. Animal lives will be lost in this situation, and people are also in grave risk. Farmers will find it to be prohibitively expensive.

In the article "State-of-the-art analysis and views for peer-to-peer energy trading" by Y. Zhou, J. Wu, C. Long, and W. Ming[3], Engineering. According to Solar Fencing Unit and Alarm for Animal Entry Prevention, this paper's goal is to design and put into place an intelligent security system for farm protection from wild animals. To keep wild animals away from a farm, a barrier made of electric wire was utilised. Solar tracking system fabrication employing a DC gear motor was presented by Parasnian and Saranya in Design and Fabrication of Solar Panel. A solar tracker is a device that holds solar panels and follows the sun's path across the sky to make sure that the panels receive the most sunlight possible throughout the day. The solar tracker will make an effort to find the best position for sun exposure. There is a quick explanation of solar trackers and solar panels. Hardware and software are the two primary divisions of the solar tracker.

According to a study by S. Rajendran, A. Muthu Kumar, and T. Hariprasath,[4] The agricultural and horticultural industries are expanding quickly in our nation. The goal of several research fields is to boost agricultural output using current technology. [2]-[3]. If any live beings breach the fence, the system will quickly notify the business owner via the appropriate channel. However, because of its age, the owner cannot respond as quickly as the trespassers do when they invade the land. Many of them have now created systems that can sound an alarm and transmit messages to the landowner. The GSM module has been attached [4]. Because the current system merely sends messages, it is now an antiquated method.

II. BLOCK DIAGRAM AND WORKING OF THE SYSTEM

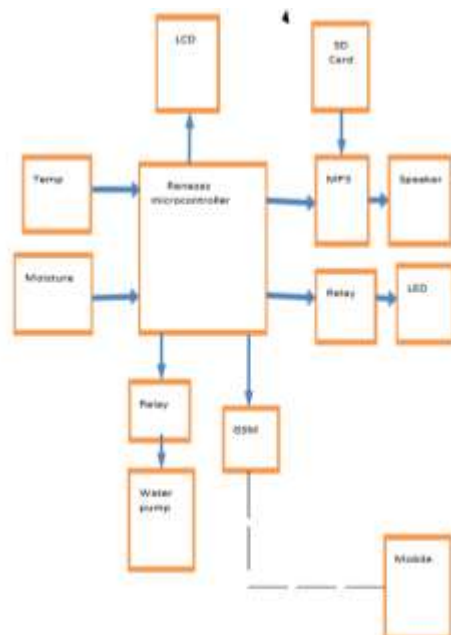
According to their functions and utilities, many embedded systems have radically different designs. The system in this project is mostly made up of a single microcontroller, and the structured modular design concept is used in its creation. The block diagram's central microcontroller serves as the project's central control element. A programme is contained within the microcontroller that helps the Based on the inputs provided by the GSM output, the microcontroller will respond. The major goal is to prevent against unauthorised people entering. Here, we've used an MP3 player, which will make obstruction-producing noises when birds enter the forms. When an IR obstacle detects an unauthorised entry, the recorded Mp3 material will be played. We use this to store the appropriate warning noises.

We are also using the virtual fence concept here; whatever mobile input the GSM connected to the controller will get, we can activate it and make it work by utilising a mobile device.

In order to conserve energy, we are replacing the battery with a solar panel as a backup power source. Additionally, internal operations will be shown on the LCD that is connected to the main controller unit. Additionally, GSM will be in charge of message transmission and receiving. The LED is switched by the relay unit, which controls when it turns on and off.

The battery and solar voltage will be maintained via the booster circuit. The controller's operations will be determined by the input from the mobile device.

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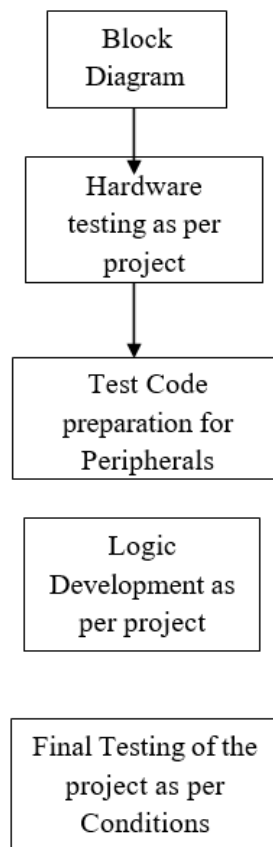
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Demo Points:

For the project, a prototype module will be created. According to the block diagram, each interface has its own PCB board. Jumper wires will be used to link each PCB to the others.

- LCD is utilised to display all current information for demo purposes.
- The messages will be transmitted and received using GSM.
- Data input from a mobile device is required by the controller.
- Relay functions as a switch that turns LEDs ON and OFF.
- To ensure the security of a farm or garden, both LED and MP3 are controlled by GSM Rx orders

Methodology



According to their functions and utilities, many embedded systems have designs that differ significantly from one another. The system in this project is mostly made up of a single microcontroller, and the structured modular design concept is used in its creation. The block diagram's central microcontroller serves as the project's central control element. A programme that aids the microcontroller in acting based on inputs provided by the output of the GSM is included within the microcontroller.

The major goal is to prevent illegal individuals from entering. Here, we've used an MP3 player, which will make obstruction-producing noises when birds enter the forms. When an IR obstacle detects an unauthorised entry, the recorded Mp3 material will be played. We use this to store the appropriate warning noises.

V. COMPONENTS USED FOR HARDWARE

1. Renesas Micro controller:

This project is implemented using the 16-bit R5F100LEA microcontroller from the Renesas RL78 family. The project's microcontroller, which governs the entire system, serves as its beating heart. It boasts 58 GPIOs, 3 UARTs, Simplified I2C, a 10 bit resolution ADC, 28 interrupt sources, support for ISP programming, 64 KB of Flash ROM, 4 KB of RAM, and 4 KB of Data Flash in addition to its other features.



Fig.1. Renesas microcontroller

2. Soil Moisture Sensor

The two exposed wires on the fork-shaped probe serve as a variable resistor (much like a potentiometer) whose resistance fluctuates in accordance with the amount of water in the soil.

The soil will have better conductivity and less resistance the more water it contains. Poor conductivity results from the soil's lower water content.



3. GSM

Global System for Mobile (GSM) is a cellular and open technology used for mobile communication. The European Telecommunications Standards Institute (ETSI) created the Global System for Mobile Communications (GSM) standard to outline the protocols for second-generation (digital cellular networks used by mobile devices such mobile phones and tablets. In Finland, it was initially used in December 1991.



Fig.3. GSM

4. IR SENSOR



Fig: IR sensor

4. RELAY

A set of input terminals for one or more control signals and a set of operational contact terminals make up an operated switch. The relay is the mechanism that activates or deactivates the contacts to activate the other electric control. When an allocated area experiences an unbearable or unpleasant situation, the circuit breaker is instructed to disconnect that region. thereby guards against harm to the system.



Fig: Relay

5. SOLAR PANELS

Devices that observe solar rays and transform them into heat or power. The PV (photo-voltaic) panel is another name for the solar panel. Utilizing solar energy, photovoltaic cells produce direct current power. Alternatively put. PV is used to transform solar energy, which is made up of "photons," tiny energy particles, into electricity, which may then be utilised to power electrical components.



Fig:6 solar panels

VI. RESULTS

The "FARMER FRIENDLY SOLAR ELECTRIC FENCE" project is made to be mounted on any surface. It is considerably simpler and more affordable than raising the wall's height. The idea is adaptable and may be used by farmers to strengthen the protection of their land from animals. It is also compatible with a variety of other security technology. This initiative aids with crop protection from animals and other creatures.

IR Sensor: A radiation-sensitive opto-electric component with spectrum sensitivity is an infrared sensor. An electrical device that monitors and detects infrared radiation in its environment is called an infrared (IR) sensor. The electromagnetic radiation that people experience as heat is found by infrared (IR) sensors.

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