A Review on Solar Power Smart Automated Scarecrow

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ABSTRACT

The present invention provides an apparatus for scaring deer and other unwanted animals away from agricultural crop production areas using unnatural audible and visual stimuli. The invention generally comprises a substantially hollow housing having a removable top portion mounted atop a rigid support frame member. The exterior of the housing includes a plurality of light and sound emitting devices attached thereto, in addition rotatable mounted elongated arms having a hollow interior portion particulate contained therein for producing unnatural sounds upon rotation of such for scaring deer and other unwanted animals away. The interior portion of the housing includes an electronic controller in electrical connection with a power relay for energizing the aforementioned electrical components, along with a motor assembly for imparting rotational motion to the rotatable mounted elongated arms on the exterior of the housing. The apparatus is generally powered by a battery connected to a solar charging panel. In this system motion sensor also interfaced to detect the motion of living body present in sensor region. Whenever sensor detects any motion in farm of any living things then scarecrow starts rotating and produce sound and light flash. In addition to this system a wireless remote also attached so if whenever we want to make continuous rotation and sound then it can be controlled by remote.
Keyword : - ATmega328 AVR

1. INTRODUCTION

In this projects we are using a ATmega 328 AVR microcontroller to control all operation like central processing unit. Microcontroller is a brain of this project. Our main aim of this project to protect crops in agriculture field from deer and wild animals at day or night time. This animals enters to farm at any time and eats crops, so this makes loss for farmers. To avoid this we have implementing automated solar powered scarecrow with rotational and audio visible effect to scare the wild animals. In this system we using a PIR motion sensor to detect motion and presence of any living body near the sensor range. If any motion detected then motion sensor generate the output signal which receives by microcontroller. Microcontroller then activates relays of generating audio signal and light signal, and also activates the motor driver circuit to start gear motor which will rotate the dummy scarecrow. The system is powered by a 12 volt 8 Amp rechargeable battery connected to a 20 watt solar panel with solar charge controller. In addition to this system a wireless remote also attached so if whenever we want to make continuous rotation and sound then it can be controlled by remote and wireless solar powered RF motion detector is also implemented to cover more area because PIR motion sensor detects motion under 25 feet region. We are using 433MHz RF module to send signals wirelessly. RF Modules works under 100 Meter. RF module range can be increase depends on antenna height. Here we have using two wireless motion detectors one RF remote for activate and deactivate system.
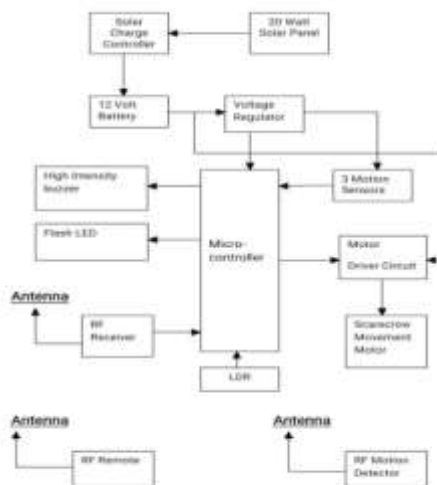
2. BLOCK DIAGRAM DESCRIPTION

Fig -1: Block diagram of system connection
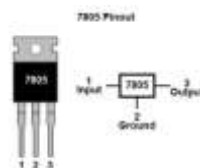
2.1 voltage regulators :-7805

Fig -2: 7805

All voltage sources cannot able to give fixed output due to fluctuations in the circuit. For getting constant and steady output, the voltage regulators are implemented. The integrated circuits which are used for the regulation of voltage are termed as voltage regulator ICs. Here, we can discuss about IC 7805.The voltage regulator IC 7805 is actually a member of 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is +5V DC regulated power supply. This regulator IC also adds a provision for a heat sink. The input voltage to this voltage regulator can be up to 35V, and this IC can give a constant 5V for any value of input less than or equal to 35V which is the threshold limit.

2.2 capacitors

Fig -3: Capacitor

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store electrical energy temporarily in an electric field.

2.3 crystal oscillator

Fig -4: Crystal oscillator

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency. This frequency is often used to keep track of time, as in quartz wristwatches, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators, but other piezoelectric materials including polycrystalline ceramics are used in similar circuits.

2.4 433MHz RF Tx/Rx Module

Fig -5: 433Mz RF Tx/Rx Module

In generally, the wireless systems designer has two overriding constraints: it must operate over a certain distance and transfer a certain amount of information within a data rate. The RF modules are very small in dimension and have a wide operating voltage range i.e. 3V to 12V.Basically the RF modules are 433 MHz RF transmitter and receiver modules. The transmitter draws no power when transmitting logic zero while fully suppressing the carrier frequency thus consume significantly low power in battery operation. When logic one is sent carrier is fully on to about 4.5mA with a 3volts power supply. The data is sent serially from the transmitter which is received by the tuned receiver. Transmitter and the receiver are duly interfaced to two microcontrollers for data transfer.

2.5 Relay

Fig -6: Relay

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their application. Most of the devices have the application of relays.

2.6 PIR Sensor

Fig -7: PIR Sensor

PIR stands for Passive Infrared Sensor. Any object in the world radiates IR rays and these rays are sensed by these sensor. The vehicle which passes by the street light is detected by PIR sensor. The PIR sensors are more complicated than many of the other sensors explained in these tutorials (like photocells, FSRs and tilt switches) because there are multiple variables that affect the sensors input and output. To begin explaining how a basic sensor works, we'll use this rather nice diagram
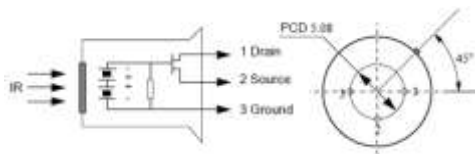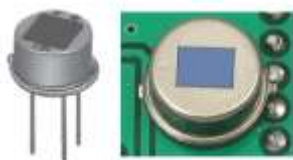
2.7 The PIR Sensor

Fig -8: PIR Sensor

This image shows the internal schematic. There is actually a JFET inside (a type of transistor) which is very low-noise and buffers the extremely high impedance of the sensors into something a low-cost chip (like the BIS0001) can sense.

2.8 Light Dependent Resistor

Fig -9 : LDR

LDR stands for Light Dependant Resistor. In this sensor resistance and light intensity are inversely proportional. When light intensity is more, resistance is low and vice versa. Here we are using LDR for to switch on the street light i.e., when light intensity falls on it, it turns on LDR and then the street light.

2.9 buzzer

Fig -10: Buzzer

The buzzer is the electrical device that makes a buzzing noise is used for signaling.

2.10 HT12D and HT12E IC

Fig -11: HT12D & HT12E IC

The HT 12E Encoder ICs are series of CMOS LSIs for Remote Control system applications. They are capable of Encoding 12 bit of information which consists of N address bits and 12-N data bits. Each address/data input is externally programmable if bonded out. The HT 12D ICs are series of CMOS LSIs for remote control system applications. This ICs are paired with each other. For proper operation a pair of encoder/decoder with the same number of address and data format should be selected. The Decoder receive the serial address and data from its corresponding decoder, transmitted by a carrier using an RF transmission medium and gives output to the output pins after processing the data.

2.11 DC Gear Motor

Fig -12: DC gear motor

The motors are used for the movement of the robotic vehicle, which are of DC gear motors operated at 12V DC power supply. 4 motors have been used to rotate the two wheels clockwise or anticlockwise. This provides motion to the robot. Motors are arranged in a fashion called H-Bridge. H-Bridge is an electronic circuit which enables a voltage to be applied across a load in either direction. It allows a circuit full control over a standard electric DC motor. That is, with an H-bridge, a microcontroller, logic chip, or remote control can electronically command the motor to go forward, reverse, left, right and stop.

3. OPERATION

All the circuit connections are shown in circuit diagram. The main system is powered by 12V/8Amp Rechargeable battery, which charges by 20 watt solar panel by using solar charge controller. Solar charge controller is for protection for battery as to avoid over charging and maintain constant charging voltage. Then the power from battery given to the whole system. The 12 volt given to Flasher LED, High intensity buzzer, motor driver module and relay. The ATmega 328 microcontroller is brain of whole system which control all operations for that we have programmed as per our requirements. The microcontroller needs 5 Volt regulated power supply, so for that reason we have used a 7805 positive voltage regulator which gives output as constant 5 Volt. Thee motion sensors are interfaced to microcontroller pins which is input, LDR is interfaced to analog pin of microcontroller A5, the relay for flasher LED is controlled by digital pin D8 and relay for buzzer is controlled by digital pin D7. The HT12D decoder IC is interfaced to D9,D10,D11,D12 digital pins of microcontroller as an input. The motor driver module is controlled by D5 and D6 digital pin of microcontroller. The wireless RF motion detector is powered by two 4 Volt 1.5 Amp battery which charges by 3 watt mini solar panel. Wireless detector has RF 433 MHz RF transmitter with HT12E encoder IC and PIR motion sensor.

4. CONCLUSION

An innovative system solar powered automated scarecrow is developed for agriculture field to protect crops from night animals and thief. The system has three motion sensor, LDR, RF remote and two wireless RF motion detectors which is implemented and working successfully. The motion sensor sensed motion only under 25 feet, so for we have implemented a wireless Motion detector using RF 433 MHz which has 100 meter range so we can cover more area by using multiple wireless motion detectors. The wireless RF motion detector is powered by mini solar panel and rechargeable battery.

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