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WSN Node Design for Protection of Poaching Forest Trees Using ATMEGA328

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Abstract: In this paper, we are going to see about the project against poaching. Now a days there are many incidents about smuggling of trees like sandal, sawn etc. These trees are very costly and meager. They are useful in medical science, cosmetics etc. To restrict their smuggling and to save forest from forest fire, deforestation around the globe some preventive measures have been developed. The proposed system makes use of electronic devices such as controllers and sensors. Tree cutting will be sensed by metal detector and this information will be displayed on LCD which is placed in the main server unit. Simultaneously buzzer will be activated and the data will be transmitted to the senior office using NRF receiver module. Communication between tree using NRF transmitter and receiver module. Trees are connected by using cluster networks interfacing, which are linked with the main sensor unit. This project is also an attempt to prevent forest mishaps using wireless sensor technology and eliminating manual power to the highest possible extent.

Keywords: WSNs, Electronic devices, Controller, Sensor, NRF transmitter and receiver.

I. INTRODUCTION

For many days the news in the newspapers about smuggling of the trees like sandal, sawn etc. These trees are very costly as well as available in the world. These are use in the medical science as well as cosmetics. Because of huge amount of money involved in selling of such tree woods lots of incidents are happening of cutting of trees and their smuggling. To restrict such smuggling and to save the forest around the globe some preventive measures need to be deployed. The developing of such as system which can be used to restrict this smuggling. The project is related prevention of trees and wildlife. Today's life should understand the value of trees. The atmosphere is present because of trees. The trees are giving valuable oxygen so the protection of trees is very important in today's life. So that the project is introduce on, 'WSN Based Forest Tree protection System' for that there will be two sections. They are Tree section and Control section. It consists of transmitter and receiver unit. Every tree will be equipped with one small electronics unit which consists of microcontroller, sensor and NRF module.

This project proposes a tree control section which is protecting trees from smuggling and uses the renewable energy. The system will be a low power design, so it will more effectively work with rechargeable batteries which can charge up by natural solar system i.e. solar panel. A solar energy harvesting system is used for recharging node's batteries to avoid frequent manual charge batteries.

In tropical years, poaching of treasured trees which are mostly has been hugely increased due to man's self-regarding wishes over-the-top include sandalwood, Teakwood, Pine and Rosewood. Trees have been much creativity carry out by different system of government, and in specific Govt. of India, to allay this problem. This holds enlistment of anti-poacher for deployment and training complete forest. Strict penalty for find guilty criminals and providing superior incentives for anti-poaching were as directed for destroying the risk. However, there is many of the actions have remained largely ineffective. There is hopeful solution for the preventive of forest trees is- 'The implementation of wireless sensor networks(WSNs)' which is robust, effective and practicable technology for monitoring and controlling. WSN is a most developing technology, widely used in many application which can be involved monitoring and controlling. In forest, it is already deployed for fire detection, rearing/poaching of wild animals.

II. EXISTING SYSTEM

To control against poaching there is another method hiring security person for monitoring the forest area for suspicious activity. This method is avoid poaching. But in this method, the physical limitations in human, it is hard to monitor the entire area continuously. This method is failure for the larger area protection against poaching.

By monitoring through CCTV connection in the forest area, is hard to implement due to limitation of power supply in forest area and very costly.

Forest department has found an innovative way now to protect the trees through steel armours. The thieves are very quickly, they cut down the trees and take away in a few minutes. After we put up the steel cover, some of the thieves once tired to cut the trees even after the steel mesh had been installed. Then also they didn't succeed and were arrested. But in some cases many of the thieves are cutting the trees and escaped during night time. So, thus method got failed.

In this, existing work on a microcontroller based anti-poaching system provide work on wireless sensor networks(WSNs) technology, which is accomplished of sensing theft by monitoring the signal produced by the cutting of trees using a 3 axis accelerometer. A low power MSP430 microcontroller is used along with RF module. WSN is widely cast-off technology in monitoring and controlling for the remote applications.

A. Drawback

- 1) Forest officer should walk through the forest all the time.
- 2) Maintaining database is such a crucial process.
- 3) The system cannot find tree logging it is cut down fully.

III. PROPOSED SYSTEM

We are developing the system which able to restrict the smuggling of tree in forest where human being not able to provide security. Such system we are developing in the forest where trees are costly and their protection is important fact.

The proposed system consists of two sub-section namely tree unit and main server unit. Sensor which is fitted in tree is tree unit and control section consisting main server unit. Tree unit consists of Temperature sensor, Tilt sensor, Metal detector sensor and NRF Transmitter and Receiver. Sensor is a device which is able to transform physical readings collected from environment into signals that can be measured by a system.

In our system, tilt sensor is used to detect the tilt level of tree. The tilt sensor triggers the microcontroller while its value exceeds its threshold value and the data transfer to receiver. Temperature sensor used to detect the fire on the tree. The communication between tree unit and main server unit taking place by using NRF module. The server will be receiver the NRF signal.

Every tree will be equipped with one small electronics unit which consists of microcontroller, NRF module. In the large area forest, each tree will be having sensor unit, that will communicate with their server unit. The communication between tree unit and server unit by NRF module.

Proposed2 system is smart technique to detect the theft of trees from the smuggling. Here, the microcontrollers controlled the whole system connected with three sensors namely Metal detector sensor, Tilt sensor and Temperature sensor, which sense the fire and cutting of trees. Wireless sensor which is used to send the received information from the three sensors to the forest guard and to the senior officer through the software application used, and the buzzer will be alert the officers near the tree unit and the main server unit.

The block diagram consists of two sections. One is transmitter block and another one is receiver block. Whenever the trees have been fired or cut down by the smugglers, it will be sensed by the wireless sensor network, it triggers the microcontroller to transmit the information through NRF transmitter and it will be received by the NRF receiver in the main server unit, which will be displayed in LCD. This will be send to forest guard and the senior officer through the software application.

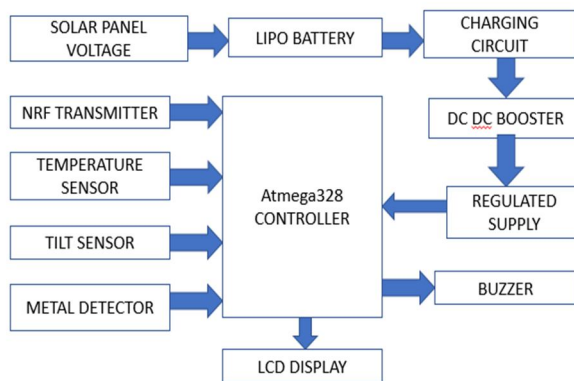


Fig 1.1 Block Diagram of Transmitter Section.

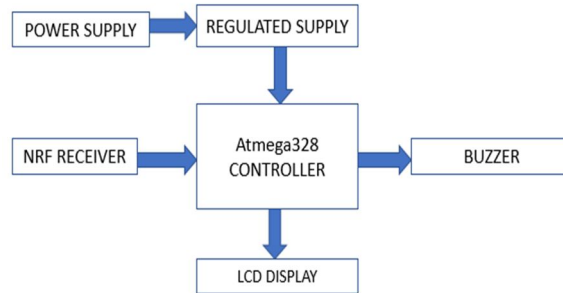


Fig 1.2 Block Diagram of Receiver Section.

A. Solar Panel

Solar panel to charge the battery through the renewable energy. Here, the solar panel used is 5W-8W.

- 1) 5 Year, 95% power output warranty
- 2) 10 Year, 90% power output warranty
- 3) 25 Year, 80% power output warranty
- 4) 1 Year limited product warranty.
- 5) 10000mA=1A
- 6) Watt=Amps X Volts
- 7) Volts=Watt/Amps
- 8) Amps=Watt/Volts



Fig 1.3 Solar Panel

B. Battery



Fig 1.4 Lipo Battery

- 1) 3.7V, 1000mAH (Lithium Polymer) Lipo Rechargeable Battery also known as Lipo or Lipoly batteries are thin, light and powerful.
- 2) Voltage: 3.7V.
- 3) Capacity: 10000mAH
- 4) ApproxSize: 48mm x 30mm x 4.2mm.

C. DC-DC Booster



Fig 1.5 DC-DC Booster

It boost the voltage which means increase the voltage for the circuit

- 1) Input voltage: 6-18V.
- 2) .Output voltage: 24V.
- 3) Switching frequency: 400khz.
- 4) Power output: 12W.

D. Regulated Supply

7805 is a three-terminal device with the three pins being 1. INPUT, 2. GROUND and 3. OUTPUT. The following images shows the pins on a typical 7805 IC in To-220 Package.

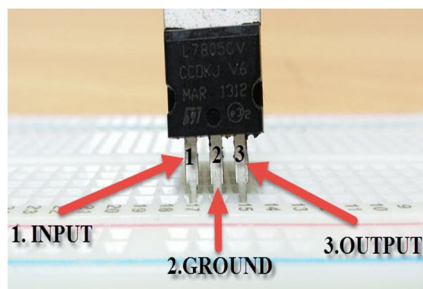


Fig 1.6 Regulator

Features

- 1) It can deliver up to 1.5A of current(with heat sink).
- 2) Has both internal current limiting and thermal shutdown features.
- 3) Requires very minimum external components to fully function.

E. ATMEGA328 Microcontroller

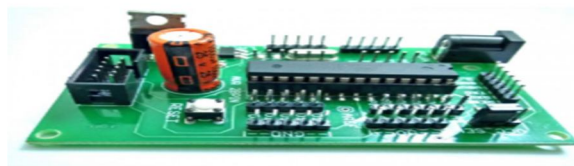


Fig 1.7 ATMEGA328 Microcontroller

The ATMEGA328 is a single-chip microcontroller created by Atmel in the mega AVR family. It has a modified Harvard architecture 8-bit RISC processor core.

- 1) 32 x 8 general working purpose registers.
- 2) 32K bytes of in system self programmable flash program memory.
- 3) 2K bytes of internal SRAM.
- 4) 1024 bytes EEPROM.
- 5) Available in 40 pin DIP, 44 lead QTFP, 44-pad QFN/MLF.
- 6) 32 programmable I/O lines.
- 7) 8 channel, 10 bit ADC.

The device operates between 1.8 and 5.5 volts.

F. NRF Trnsmitter AND Receiver

- 1) 2.4 -12V operation.
- 2) Low power and high noise immunity CMOS technology.
- 3) Low standby current of $<1\mu\text{A}$ at 5V supply.
- 4) Binary address setting.
- 5) Three times of received address checking.
- 6) Built-in oscillator with only a 5% resistor.
- 7) Valid transmission indicator.
- 8) Easy interface with a NRF or IR transmission medium.
- 9) Minimal external components.

G. Metal Detectoresensor



Fig 1.8 Metal Proximity Sensor

Capacitive proximity sensors are non-contact devices that can detect the presence or absence of virtually any object regardless of material. They utilize the electrical property of capacitance and the change of capacitance based on a change in the electrical field around the active face of the sensor.

H. Temperature Sensor

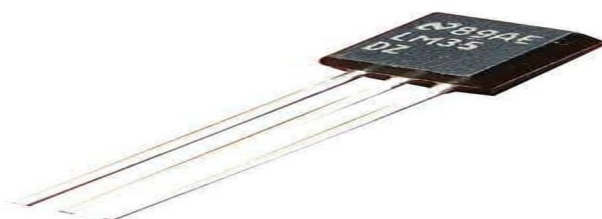


Fig 1.9 Temperature sensor

It senses the temperature level of the forest area and send the information regularly.

I. Tilt Sensor



Fig 1.10 Tilt Sensor

It senses the tilt condition of the trees and send the information to the main server unit through the NRF transmitter.

J. Buzzer

This is used to alert the forest guard during any malpractice like smuggling or trees gets fire, sensors will send the information at the same time the buzzer also alert both the sections.

K. LCD Display

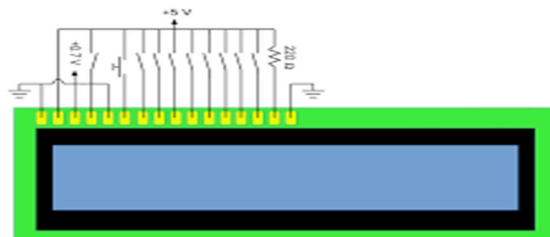


Fig 1.11 LCD Display

Reflective twisted nomadic liquid crystal display. It displays the information's that received by the NRF receiver.

IV. EXPERIMENTAL OUTPUT



Fig 1.12 Experimental Output.

V. CONCLUSION

This was carried out to avoid smuggling of precious trees in protected area in forests. There are many ways to protect trees but here a smart method of interacting some sensors around the trees with a microcontroller was carried out. The latest method of wireless devices was implemented which acts as a server for obtaining the tree status. That is to intimate the forest authorities about the tree's condition on 24X7 basis. This was possible because the embedded unit has NRF module. Idea was to treat each tree as a smart tree(with a microcontroller, sensors and NRF) and bringing many such tree's under network nodes. However the tree's condition is under continuous monitoring because of sensors. Hence it's a WSN a to protect the nature.

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