IOT BASED ANTI-POACHING ALARM SYSTEM FOR TREES IN FOREST USING WIRELESS SENSOR NETWORKS

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Abstract: Nowadays there are many incidents about smuggling of trees like Sandal, Sagwan etc. These trees are very costly and meagre. They are used in the medical sciences, cosmetics. To restrict their smuggling and to save forests around the globe some preventive measures needs to be deployed. We have developed a system which can be used to restrict smuggling. The design system uses three sensors tilt sensor(to detect the inclination of tree when its being cut),temperature sensor(to detect forest fires),sound sensor(for effective detection of illegal logging i.e. even the sounds generated while axing the tree are also sensed).Data generated from these sensors is continuously monitored with the aid of Blynk server over the Wi-Fi module. Forest officials are notified when any event occurs so that appropriate action can be taken.

Keywords: Tilt Sensor, Temperature Sensor, Arduino Uno, Wifi Module

I. INTRODUCTION

Poaching isn’t related to India only, China, Australia and African countries are also struggling with same issue. Indian sandalwood costs 12000 to 13000 INR per kg [1] whereas in international market Red Sanders costs INR 10 crore per ton. The Indian sandalwood tree has become rare in recent years, in an attempt to control its possible loss the Indian government is trying to limit the exportation of sandalwood [2]. For an individual, maximum permissible purchase limit is not to exceed 3.8kg as per Govt. If the tree is already government controlled, then its removal is prohibited whether on private or temple grounds until the tree is thirty years old.Smuggling of sandalwood has created socio economic and law and order problems in areas bordering in India. The main objective of this project is to develop a system which can be used to restrict smuggling of sandalwood trees.

II. PROBLEM STATEMENT

Currently there is no system or any medium to detect illegal logging and cutting of trees. A mean by which, the forest officials know what’s happening with trees should be installed. Such system would help in detecting and alerting so that proper actions could be taken. Putting this problem in mind, we are designing a system which help us to achieve our goal i.e. TO PROTECT NATURE.

III. LITERATURE SURVEY

1. Endangered red sandalwood seized from smugglers in Berhampur [3].
2. The Times of India, Ahmadabad. Plan to curb interstate smuggling of forest woods. 3.200 teak trees cut, timber smuggled in Lucknow [4].
3. The Times of India, Ahmadabad. Plan to curb interstate smuggling of forest woods.
4. Punjab News line Network (18th December 2010) - The situation has gone quite worse as timber and lakhs or Rupees are criminally being sold right under the nose of department.

IV. EXISTING SYSTEM

According to a journal published in IJARCET [5] Anti-Smuggling of trees was designed using flex sensors and ZigBee.

Disadvantages:
- Wireless Communication in this system used ZigBee Module which is very slow and has lesser range than Wi-Fi Module which is used in Proposed System.
- Flex Sensors are merely sensors but tilt sensors are inclinometers(which are used to measure slope or elevation and readouts apart from just signals).
- The existing system is not practically implemented.

V. PROPOSED SYSTEM

The main idea is to design a portable wireless sensor node which will be a part of a Wireless Sensor Network. This system will consist of two modules one involving sensors and controller module which will be at tree spot and another one is Android phone. The Blynk application will continuously receive sensor data. This is an IOT based project where the sensor data is continuously uploaded to cloud(Blynk server) over a Wi-Fi module. In case of tilt sensor and the buzzer turns on when tree bends and for temperature sensor water pump is turned on in case of forest fire through relay switch.
VI. SYSTEM ARCHITECTURE

A. Block Diagram

![Block Diagram of Anti-Poaching Alarm System]

Fig 7.1 Architecture of Anti-Poaching Alarm System

Module 1-Arduino: The Microcontroller
Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack.
A program written with the IDE for Arduino is called a "sketch". Sketches are saved on the development computer as files with the file extension .ino.
A minimal Arduino C/C++ sketch, consists of only two functions:
- setup(): This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.
- loop(): After setup() is called, this function is called repeatedly by a program loop in the main program. It controls the board until it is powered off or is reset.

Module 2-Tilt Sensor
Tilt sensors are used to measure angle within a limited range of motion. Tilt sensors are called as inclinometers because the sensors just produce a signal but inclinometers produce both readout and a signal. These devices produce an electrical signal that varies with an angular movement.

Module 3-Temperature Sensor
It is a device which is designed specifically to measure the hotness or coldness of an object or in an environment. Temperature sensor used in our project is LM35. It’s a precision IC temperature sensor with its output proportional to the temperature (in °C). With LM35, the temperature can be measured more accurately than with a thermometer. The operating temperature range is from -55°C to 150°C.

Module 3-Sound Sensor
The Sound Sensor is a board that combines a microphone and some processing circuit. It not only provides an audio output but also a binary indication of the presence of sound and an analog representation of sound’s amplitude.

Module 4-Relay Switch
High voltage electronic devices can be controlled using relays. A Relay is a switch which is electrically operated by an electromagnet. The electromagnet gets activated with a low voltage, for example 5 volts from a microcontroller and it pulls a contact to make or break a high voltage circuit. One of the most advantages is you can do with an Arduino is controlling higher voltage (120-240V) devices like fans, lights, heaters, and other household appliances.

Module 5-Blynk Application
Blynk was designed for the Internet of Things. It can control hardware remotely, display sensor data and can store data. It has 3 components:
- Blynk App – It allows us to create amazing interfaces for projects using various widgets provided.
- Blynk Server – It is responsible for all the communications between the smartphone and hardware. We can use our Blynk Cloud or run our private Blynk server locally. Its open-source, could easily handle thousands of devices.
- Blynk Libraries - for all the popular hardware platforms - enables communication with the server and process all the incoming and out coming commands.

B. Flowchart

VII. SYSTEM DESIGN

Start

Yes

Switch on Relay and run output devices

No

Send data to cloud through Wi-Fi Module

Blynk Server

Blynk App for status checking

Stop

Send data from sensors

Condition for temperature or tilt

C. Interfacing Tilt Sensor with Arduino
Working:
When the device gets powered and is in its normal upright position, then the rolling ball settles at the bottom of the sensor to form an electrical conduction between the two end terminals of the sensor. If the circuit gets tilted so that the rolling ball doesn’t settles at the bottom of the sensor with the electrical conduction path, then the circuit becomes open. The circuit becomes short circuit and the LED gets sufficient current.

Sequence Diagram:
D. Interfacing Temperature Sensor with Arduino

Working:
As long as the ions and electrons are moving current flows between the electrodes and the circuit, the circuit functions properly. If fire breaks out smoke particles get into the sensor and clog up the ionization chamber.

Sequence Diagram:

Fig 8.2: Sequence Diagram for Temperature Sensor

E. Interfacing Sound Sensor with Arduino

This module allows you to know when sound has exceeded a set point you selected. Sound is detected through a microphone and fed into an LM393 op amp. The sound level set point is adjusted through an on board potentiometer. When the sound level exceeds the set point, an LED on the module gets illuminated and the output is sent low.

VIII. IMPLEMENTATION

1. All the sensors and the controller will be set up at the tree. When tree logging occurs, the sound generated due to axing the tree is sensed by the sound sensor. Arduino through the relay switch activates the buzzer notifying the security personnel. Also if the tree bends beyond threshold angle, the buzzer is activated.

2. In case of forest fires, when the temperature of the surroundings increases its sensed by the temperature sensor, through the relay switch the water pump is turned on. When the temperature goes down below the set value, the water pump stops functioning.

3. The data generated by all the sensors is continuously transmitted to the cloud which in our project is the Blynk Server. It in turn sends all of the data to Blynk Application, by which at the work place forest officials know the status of the trees and their environment.
IX. REFERENCES