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Anti-Poaching of Trees in Forest-Based on IoT

S.Sanjay Kumar¹, V.Ravi², Ch.Rajendra Prasad³, P.Ramchandrarao⁴

^{1,2,3,4}Department of Electronics & Communication Engineering, SR University, Warangal, Telangana, India- 506371

¹sanjaykumar.s@sru.edu.in, ²ravi.v@sru.edu.in, ³rajendraprasad.ch@sru.edu.in,
⁴ramchanderrao.p@sru.edu.in

Abstract. Sandalwood, sagwan trees are smuggling by the thieves in the present days. These trees are rarely available and more cost also. There are many uses of sandalwood trees such as we can utilize in skincare products and Ayurvedic medicine. The primary goal of this paper is to design a framework or system which will be utilized to restrict the sneaking of sandalwood trees. A system can be developed using a gyro sensor (to detect the inclination of the tree which are being cut), thermistor sensor (NTC 10k), esp8266 device (Wi-Fi device) and GSM Module, to restrict smuggling and to track the trees much easy. These sensors data will consistently check with the Thingspeak cloud platform. The obtained data is stored in Thingspeak Server with using of the esp8266 module. Forest officials get alert when any event occurs so that appropriate operation will be taken.

Keywords: Internet of things, Global System For Mobile Communications, Negative Temperature Coefficient, radiofrequency transmitter module, short message service, Radio Frequency.

1. Introduction

The problem what is observed that, there is lot of time taken by forest guards to get notified of smuggling activity, by the time they get noticed, trees are smuggled and sold in the market and there is also no cost-efficient system or any appropriate medium to detect illegal logging and cutting of trees[1].

However, a system can be developed to solve tackle these issues. The Combination of Wireless communication system and embedded solutions offer us such Modules[2]. The Module is intended to operate in a particular area and this Module will consist of two Units:

- Tree Unit
- Base Station (Main Server Unit)

Each Tree unit is supposed to have one radio frequency transmitter Module of frequency 433Mhz, acts as a wireless communication channel to send data from the Tree section to the Base station. Moreover, each Tree unit has a gyro sensor, temperature sensor, Lm358, and 9v dc battery. The presence of the above said parts will send the present condition of the tree to the Base station, using RF Module. The data sent by Rf Tx Module is in the form 12 bits, in which four bits is used to send tree data.

The Base station has a radio frequency receiver, to receive data from the Tree unit and it also has GSM Module, Wi-Fi Module (esp8266), an Arduino Uno as a microcontroller. The data received is uploaded to Thingspeak, which is an IoT cloud platform. From Thingspeak one can monitor trees and also forest guard and officials receive SMS to phone from GSM Module when smuggling activity is



suspected [3]. To develop an industrial monitoring system and machine control through the Internet of Things (IoT). Surveillance is the most significant security system in the forest [4].

2. Literature Survey

A study conducted by the United Kingdom(UK)-Indonesian countries on illegal logging in the year 1998 suggested that about 35-40% of timber trading is illegal. This will result in a greater loss of \$365 million loss to countries. If we include and compare with legal harvesting plus exports suggests that near about 88% is illegal in some way. From Indonesia, most of the illegal wood production is being carried out in Malaysia. This is a major transit country.

Whereas in the Amazon rainforest, Brazil area holds 85% illegal trading which will violate government controls. At the core of illegal logging is widespread corruption often called 'Green Gold'. In the Brazilian state of Paraty the problem is deeply rooted. This investigation was carried out by Greenpeace. Like timber, for mahogany, there is no reliable legal way that exists till date and key players in its trade are still active in those regions.

India had an absolute area of 9000sqkm of sandalwood dispersion spread across 8 states.

- In the year 2005-2007, a total of 2666 sandalwood trees were illegal. While felled in Kerala while Karnataka reported quantity 35299 kg.
- Maharashtra reported a loss of 1404, number of sandalwood trees in illegal felling, while there was a total of 253 cases smuggling (20739 tones) in Tamilnadu.

3. Existing System

In [5] existing Anti-poaching framework they have used Zigbee technology.

- Zigbee technology will cover only a smaller area and due to the wireless technology, the speed is less when we compared to recent technologies like Wi-Fi.
- Practically the existing framework was not designed yet.

4. Proposed System

This article is intended to operate in a particular area and this Module will consist of two Units:

1. Tree Unit
2. Base Station (Main Server Unit)

Each Tree unit is supposed to have one radio frequency transmitter module of frequency 433 MHz, acts as a wireless communication channel to send data from the Tree section to the Base station. Moreover, each Tree unit has Adxl335, temperature sensor Lm358 (NTC 10k thermistor), and 9v dc battery. Adxl335 is used to sense the bent of a tree above a certain point, whereas 10k thermistor is used to sense the temperature in the forest [6-7]. The output from these two sensors is given to Lm358, which is a dual operation amplifier, Lm358 compares input voltages to reference voltages and sends signals to the receiver part with help of the RF TX Module. In the RF TX Module out of 12 bits, 8bits are used as address bit and 2 out of 4 remaining bits are used by Lm358 to send tree conditions. One can adjust or set reference voltages using presets. The presence of the above said parts will send the present condition of the tree to the Base station, using the RF module. Controlling the gadgets is very important in our daily life and this can be handled by using an emerging technology called IoT[6].

The Base station has a radio frequency receiver, to receive data from the Tree unit and it also has GSM

Module, Wi-Fi Module (esp8266), an Arduino Uno as a micro controller[8]. The data received is decoded by RF RX and passed to the microcontroller, from microcontroller data is uploaded to ThingSpeak, which is an IoT cloud platform and also SMS is sent to the phone via GSM on suspicious activity[9-10]. From ThingSpeak one can monitor trees and also, forest guard and officials get SMS from the GSM module when smuggling activity is suspected. The following block diagram represents the whole system as shown in figure 1. The following flow chart represents the working flow of the system as shown below figure 2.

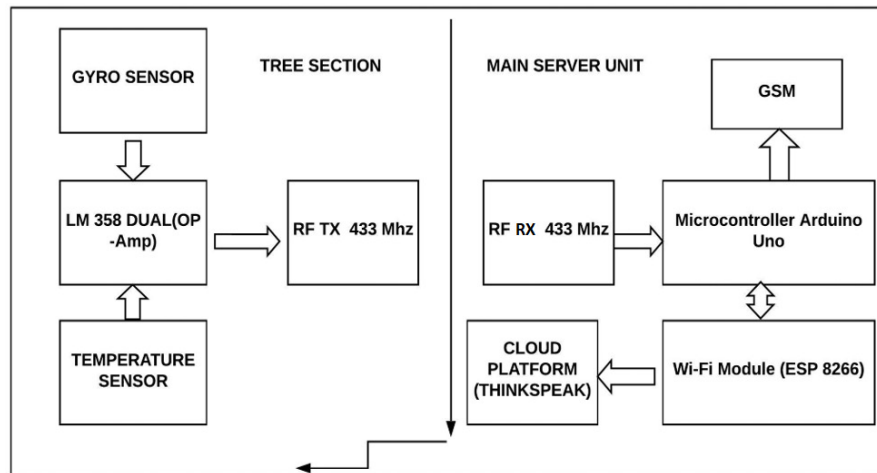


Figure 1. System Architecture

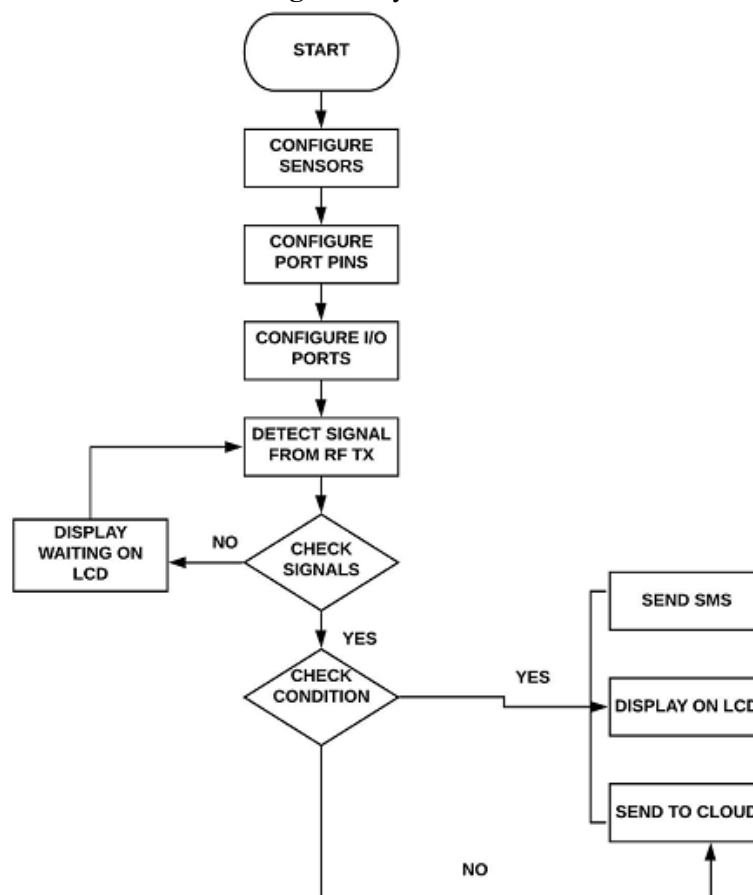


Figure 2. Working Flow of the system

The following figure 3 represents the Tree Unit of the system.

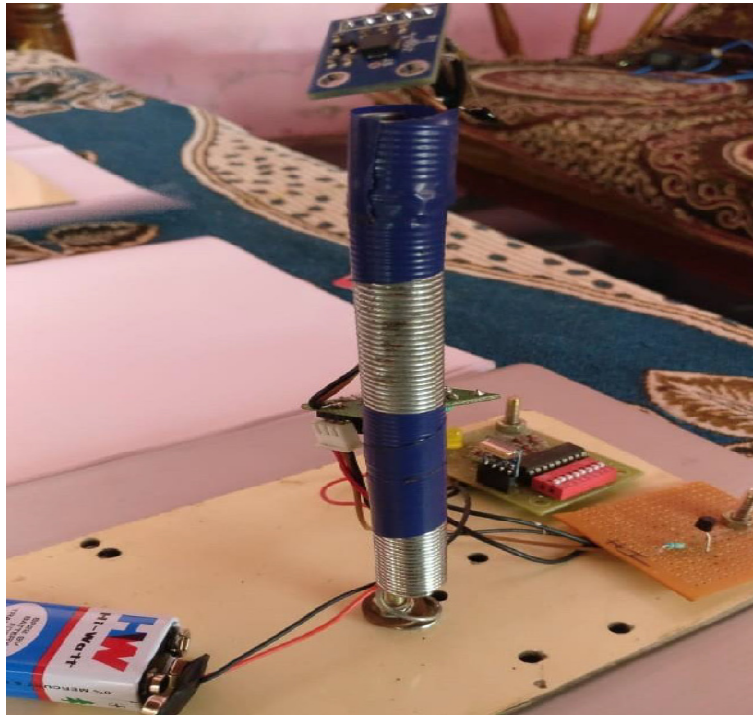


Figure 3. Tree Unit

The following figure 4 represents the Main Server Unit.

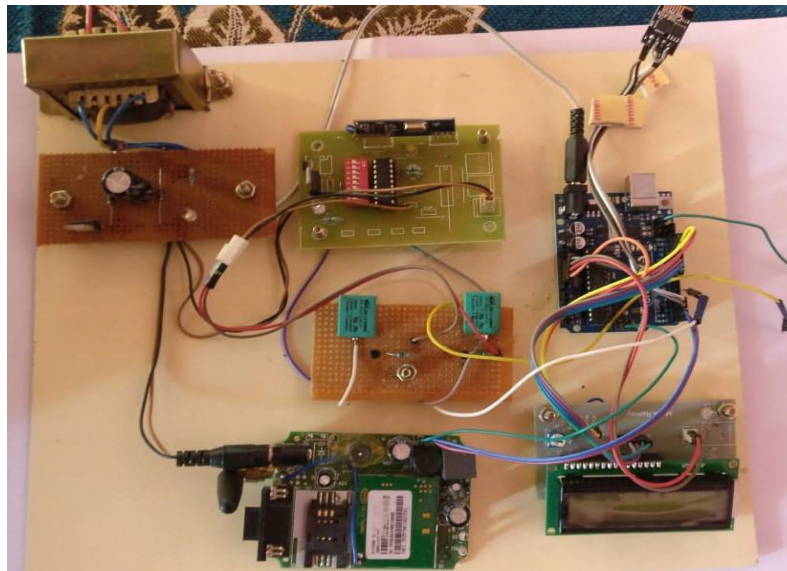


Figure 4. Main Server Unit

5. Result And Analysis

The analytical graphs uploaded to the cloud can be shown in the below figure 5 and figure 6. Figure 5 represents the Adxl 335 graph, whose values lie between 1 and 0. Value "1" indicates the inclination of the tree, whereas "0" indicates the tree is in normal position. Figure 6 represents

the temperature graph, Whose values lies between 1 and 0. Value “1” indicates the temperature of the tree above reference condition, where as "0" indicates the tree is in normal condition.

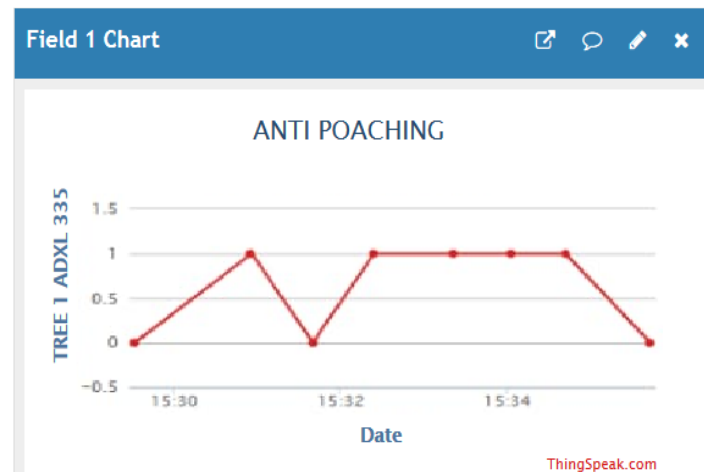


Figure 5. Adxl 335 Graph

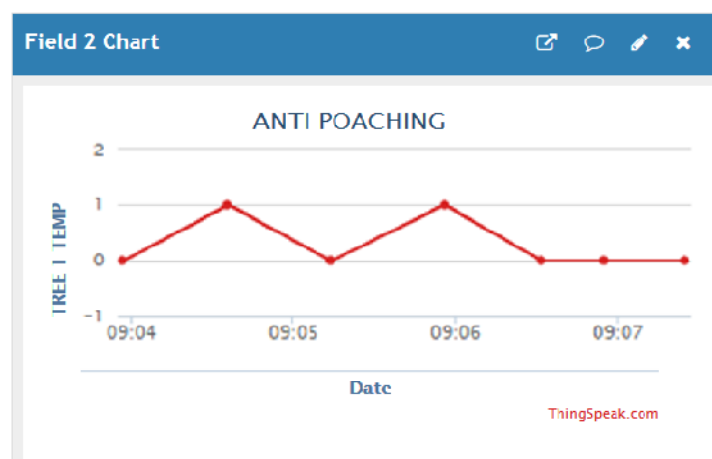


Figure 6. Temp Graph

The figure 7 shows SMS sent by the GSM Module when the condition is satisfied. There are two kinds of messages, one is describing the inclination of a tree, other is regarding temperature.

6. Conclusion

In this paper, it has proven to save the valuable trees in the forest or in private farming places such as teak farming, sandalwood farming and it reduces the human guard, always guarding the area for a long time. The system involves simple sensors like the ADXL 334, Temperature sensor. These sensors data is sent to the Arduino microcontroller from RF. The concept of IoT is implemented to make monitoring efficient. The regular updates can be provided to the users through the Wi-Fi module (ESP8266) which uploads input values to the cloud and the alerts can be sent to the users through GSM-SMS to the authenticated users when suspicious activity is notified. For designing one, there is a need to consider so many things just like adjusting preset, assigning address pins of RF Modules, in the receiver section address pin have to match with the transmitter section. The main motto of this

article is to provide cost-efficient and reliable monitoring of trees with help of RF design and IOT technology.

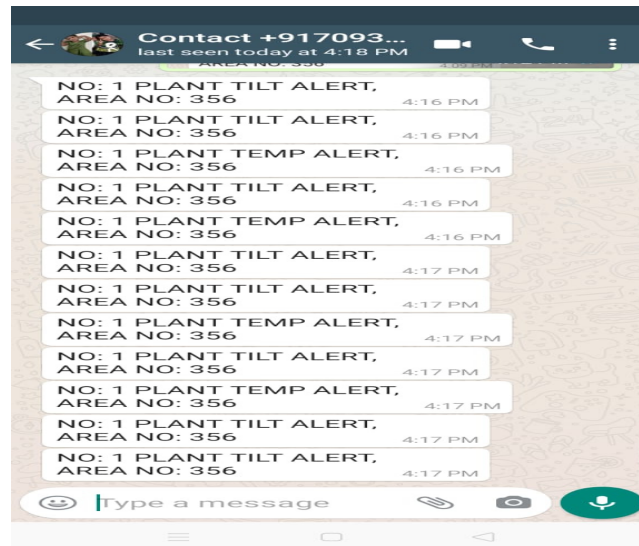


Figure 7. SMS Alert

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