

## Preventive System for Forests

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### ABSTRACT

A very long before, when earth was forming its inner core and environment, it obviously had a very good plan of each area, part of nature should fit in cycle together so it would behave and work like a well-kept machine like today's embedded systems are working continuously. But from past few years we have been reading in the newspapers about cutting and smuggling of the trees like sandal, Teak etc. These trees are very costly as well as important in the world. These are used in the medical sciences 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. In India also in the forests of Karnataka and Tamilnadu some notorious Smugglers are doing the smuggling of such trees for so many years. The sandalwood trees of India have become endangered in past few years, and in an attempt to save it from outside sources, the Indian government is trying to set a limit the exportation of sandalwood. It has been already government controlled but not properly maintained, and removal is not allowed whether on personal or public grounds until the tree is 30 years old. This has not stopped many poachers from cutting trees down as soon as authorities are not watching. Smuggling of sandalwood has created socio economic and law and order problems in areas bordering the state of Tamil Nadu and other regions in India. The purpose of this project is to save valuable trees which have high demand in market like teak, Sandalwood, etc.

**Keywords:-** Zigbee Module, GSM, GUI.

### I. INTRODUCTION

For many days we are reading in the newspapers about smuggling of the trees. These trees are very costly. These are mostly useful in the medical sciences as well as cosmetics. Because of huge amount of money involved in selling of such tree woods and lots of incidents are happening of cutting of tree and their smuggling. This problem isn't related to India only, in China, Australia and African countries are also struggling with same issues. Putting cost in mind, Indian sandalwood costs 12000 to 13000 INR per kg whereas in international market Red Sanders command a high price of INR 10 core per ton. The Indian sandalwood tree has become endangered in recent years, and in an attempt to curb its possible extinction the Indian government is trying to limit the exportation of sandalwood. For an individual, maximum permissible purchase limit is not to exceed 3.8kg as per Govt. The tree is already government controlled, and removal is prohibited whether on private or temple grounds until the tree is thirty years old. But even though some corner of newspaper shows us the same title. The problem what observed is there is no system or any medium to detect illegal logging and cutting of trees. A mean by which, at your workplace, you will know what's happening with my trees should be installed. Such system will help you to detect and will alert you so that you can take actions. Putting this problem in

mind, a system is designed which help us to achieve our goal i.e. TO PROTECT NATURE.

The suggested system will consist of three different modules as follows:

- 1) Tree Unit
- 2) Area unit
- 3) Main Server Unit.

Every tree will be equipped with one small electronics unit which consists of Micro-controller, flex sensor and Zigbee module. There will be one sub server unit for particular area of forest. The data of different tree units can be collected by this unit. The sub server unit will send the data to main server using GSM modem. At main server GUI using VB will be created to alert about threads with exact tree location. This data can be used by concern forest authorities to take preventive action. The whole process will take maximum of few seconds or a minute. This will surely reduce smuggling and illegal logging to a greater extent.

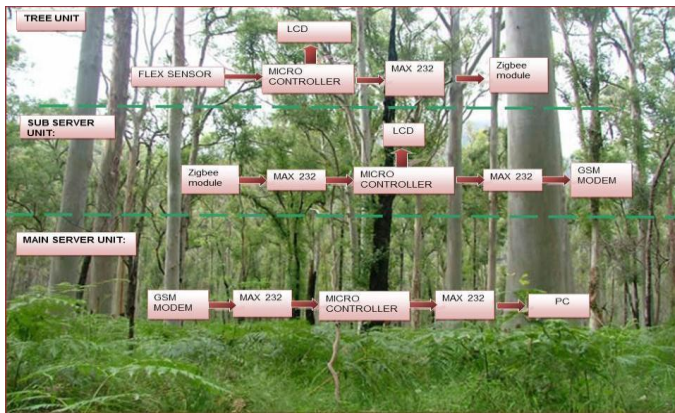


Fig: Block Diagram

The system is divided into 3 distinct units. Each tree will consist of a unit which will be mounted on each tree. This tree unit consists of different components which help to understand the sub-server unit. Every time when a person tries to cut the tree, it will sense by a flex sensor. The flex sensor is a unique component that changes resistance when bent. This kind of sensor is also used as a pressure or force sensor. So at the time of cutting, a certain amount of force and pressure will be sensed by the flex sensor. A micro-controller is used to establish the processing of data obtained from flex sensors. An LCD display will give the readings in terms of voltage generated by flex sensors. Furthermore, MAX 232 connects to a ZigBee module. This wireless device operates over 2.4 GHz frequencies which does not require a license. The covering area of this wireless device is max 1.5 to 2 km. A GSM module will transmit data to the main unit. The receiver at the main unit will process the data with a microprocessor and the output will come on a PC.

## II. LITERATURE REVIEW

Indonesian company Korindo transporting timber in March 2004, and it was being imported to France, UK, Belgium and other parts of Indonesia but Greenpeace had taken action against it. Korindo was famous for illegal cutting of timber from the rainforests of Indonesia. In May 2003, an Indonesian Government came to know from the investigation that Korindo was doing smuggling of timber with the help of notorious barons. Tanjung Puting National Park has a conservation area more than 4,000 square km and this park also has a global importance. United Nations has declared it as a world biosphere reserve and it forms a largest protected area of forest in South-East Asia.<sup>[2]</sup>

Smuggling and illegal logging causes enormous damage to forests, economies of producer countries and local communities. It's a very serious and comprehensive problem. Despite the economic importance of trade in timber and forest products, most of the international countries have no legal means to stop or halt such activities because technically it's very hard to identify illegally smuggled timber and other trees. Therefore,

some normative acts against illegal trading of timber and other trees, is missing. Scientific methods to pinpoint the geographic origin of timber are currently under development. Possible actions should meet with WTO regulation of non-discrimination to restrict imports. They must be arranged in bilateral agreements.<sup>[2]</sup>

Study conducted by UK-Indonesian countries on illegal logging in 1998 suggested that about 40-45% of timber trading was illegal. This had caused more than \$365 million loss to countries. If we include and compare with legal harvesting plus exports suggest 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 key transit country.

Whereas in Brazil, Amazon area holds 80% illegal trading this violates government controls. At the core of illegal logging is widespread corruption often called as 'Green Gold'. In Brazilian state of Para this problem is deeply rooted. This investigation was carried out by Greenpeace. As like timber, for mahogany there is no reliable legal way exists till date and key players in its trade are still active in those regions.<sup>[2]</sup>

## III. METHODOLOGY

All three units are wirelessly connected. Wireless communication among units is carried out by SIM300 GSM module. Detection of hammering on trees is sensed by flex sensors which will sense this hammering and it will cause to change its resistance. This change in resistance will be converted into voltage. This voltage is fed to a microcontroller as a signal at one of its ports. This detected signal will then be sent wirelessly to the sub-server unit using a ZigBee transmitter. At the receiving point of the sub-server unit there is another ZigBee receiver, which receives the signal. This will then be sent to the microcontroller for acknowledgment. Once this signal is acknowledged by the microcontroller it will further send to the main unit. At the last stage this signal can be set as an alarm or can be made to display on monitors depending on the user. The communication between the sub-server unit and the main unit is carried out by SIM300 GSM module. The very basic requirement of any system is power. If the system's power consumption is less then it will be considered as efficient (in terms of power only). For this case, individual units of the system require only 9 volts battery. At the main unit which should be at the control station, we can use several ways to take output. Here this output is shown as a message. This will take a maximum of a few seconds; once a message is being detected then required can be taken.

### A. Tree Unit

This small circuit will be kept hidden from smugglers and illegal loggers. The basic working of this unit is to just detect the hammering signal and inform to the sub-server unit. A flex sensor will do this for the tree unit.

**B. Sub server unit**

Signal detected by tree unit is received here in sub server unit by ZigBee receiver section. This part of sub server unit is synchronized with microcontroller in such a way that without delay it will send this information to GSM module. Here GSM module will carry out further communication wirelessly.

**C. Main unit**

The main unit is just like a control station where we will receive a message and further action can be carried out.

**IV. MATERIAL USED**

Project includes both hardware and software. This will help us to have a clear view.

**D. Hardware Requirements**

Micro-controller can be 8051 family, Zig Bee Modules, GSM module and Flex sensor.

1) **Flex sensor:** The impedance buffer in the above is a single sided operational amplifier, used with these sensors because the low bias current of the op-amp reduces error due to sources as voltage divider. The Flex sensor changes resistance between 10k Ω (straight) and 40k Ω (bent), so whenever tree

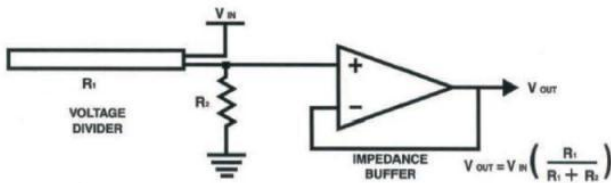


Fig: - Basic Flex Sensor Circuit

undergoes a certain amount of changes such as unbearable pressure or force which may harm tree so this will turn in change of resistance value of flex sensor. A amount of bending due to application of extra force or pressure on tree changes the resistance from its ideal value i.e. 10k Ω to up to maximum 40k Ω. This changes the value of resistance which will generate a certain amount of voltage. The amount of voltage generated by change in value of resistance is given by formula shown in above figure.

**E. Software requirement**

Embedded C for PIC/ARM7 Microcontrollers, ALP for 8051 Micro Controller and Visual Basic for GUI at main server.

**V. WORKING**

Every tree will be equipped with one small electronics unit which consists of Micro Controller, Flex Sensor and ZigBee module. There will be one sub server unit for particular area of jungle. The data of different tree units can be collected by this unit. The sub server unit will send the data to main server using GSM modem. At main server GUI using VB will be created to display the location of forest.



Fig: - Working Process

**V. SUMMERY**

The purpose of this is to save valuable trees which have high demand in market like Sagwaan, Sandalwood etc. These trees are very costly as well as less available in the world. These are use in the medical sciences 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. Here we have developed a system which prevents the smuggling of valuable trees and save the money of nation. This system consists of three different units Tree Unit, Sub-Server Unit, and Main Unit along with Flex sensor. The Flex Sensor detects the smuggling activity at the tree unit, and then this signal is passing to the sub server unit. The sub-server unit is located for particular area oh forest, as it receives the EVENT DETECTED signal from tree unit and passes it towards the main unit which is located at forest office, this data received at main unit is use by the forest officers to take preventive action and this whole process is done within one minute.

**VI. RESULT**

Three distinct units are placed in proper places for performing experimental test. fully setup of system is established. Stroke has been given and it is being detected by tree unit. Further processing of signal is done by sub server unit. For understanding purpose LCD display we have attached. At control station where main unit is fixed, detected

signal is successfully received by GSM module. For displaying purpose GUI is maintained which will display a message or alarm indicating that particular tree is undergoing non-bearable pressure.

Output display will look like this :-

MESSAGE	Tree No.	Time/Date
EVENT DETECTED	+919234234324	10:45/24-7-2014
EVENT DETECTED	+919234564738	10:34/24-7-2014

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## VII. FUTURE SCOPE

If we use GPS (Global Positioning System) along with current system then it could become improved version of this project, and provide actual location of the smuggling area by providing its GUI along with latitude and longitude Fire detection in forest could also be possible if we used temperature sensors along with this device, this can also avoid wastage of valuable trees. In future we can use this system anywhere in the corporate field for monitoring multiple numbers of units. The system developed here is dedicated model specially design for preventing the smuggling and illegal logging in forest. Such kind of system can be employ in any area of forest which is highly affected by smuggling and illegal cutting. No need to travel complete forest to guard it. We can see complete picture of forest on server unit. Exact location of tree cutting can be found easily.

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