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Innovative Protection of Valuable Trees from Smuggling Using RFID and Sensors

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ABSTRACT: this paper presents a model of preventing smuggling of valuable trees like sandal trees, red sandal trees in the forest area. In proposed system in order to detect cutting down of valuable trees immediately, we use vibration sensors and continuity sensors. Here vibration sensor is used to sense the vibration created during cutting down the tree and continuity sensor is used to check the continuity between neighboring trees. In existing system, RFID is used to identify the missing tags in the tree. But this illegal activity can be identified only after those trees are being smuggled. In India sandal wood is sold for Rs 39.51lakh per ton. But some smugglers cut these trees and trade illegally. This causes huge loss to government and also affects the ecosystem. In order to prevent this, this technology is used. The main feature of this project is to protect these trees from smuggling by using GSM module along with RFID. In addition to GSM we use ZigBee protocol. RFID is used to identify the tag of the tree. GSM sends alert using satellite communication. And due to bad weather condition, if GSM fails to send alert then ZigBee send alert to nearby police station that particular tree is being cutting down. So that immediate action is taken. This project can be applied even in dense forest area where manual monitoring is difficult and preventing cutting down of trees ecosystem can be protected.

KEYWORDS: vibration sensor, RFID, ZigBee.

I.INTRODUCTION

Forests constitute approximately 30 % of the global land area. They provide habitat for both humans and some species that share the valuable ecosystem's goods. Managing a forest has become an extremely hard task. Illegal logging represents one of the biggest challenges of forests sustainability. According to the UN Framework Convention on Climate Change (UNFCCC), there is more carbon stored in the forests than there is in the Earth's atmosphere—some 638 billion metric tons as of 2005. In addition, it is estimated that deforestation accounts between 1/6 and 1/4 of global carbon emissions. These percentages and figures are definitely reflecting how serious the phenomena of deforestation is, it also urges people around the world that have some knowledge and understanding of the consequences to think about solutions or ways to prevent illegal logging. Forestry departments in many countries such as Brazil and Malaysia thought of digitizing trees and hence transforming forest management to a high tech process using RFID tags. RFID (radio frequency identification) systems usually consist of a microchip, antenna, and it can store up to 2 kilobytes of data. There are 3 types of RFID tags. They are active, semi active and passive. Active and semi active RFID tags are power sources by an internal battery to power their circuit. An active tag use the internal battery to broadcast the signal to reader, the broadcasted frequency in this case can reach 950 Hz and be read 30 meters away. If more batteries are added into the tag, the broadcasting will be boosted and the distance could reach 100 meters in the case of a semi active RFID tag, broadcasting relies on the reader, which means that the reader supplies its power for broadcasting. The other type is passive tags.

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In recent years, Poaching of Valuable Tress has been extremely increased due to man's selfish needs. Trees which are mostly affected include Sandal wood, Teak wood and Rosewood. There have been several initiatives undertaken by different Organizations, and in particular Government of India, to ease this problem. This includes employment, training and deployment of anti-poaching watchers across forests. Strict punishments for convicted offenders, as well as giving special punishment for anti-poaching were aimed at eradicating the hazard. However, many of the measures have remained largely useless. The most promising resolution is –“Protection of valuable trees from smuggling using RFID, ZIGBEE and sensors” which will be a robust, valuable and realistic technology for monitoring.

In order to prevent this smuggling, in this project we use various sensors like continuity sensor and vibration sensor. And we use GPS, GSM module and ZIGBEE protocol for communication purpose. RFID (Radio-Frequency Identification) is used. This RFID uses electromagnetic field to automatically identify and track tags attached to objects.

II.LITERATURE SURVEY

- 1) 200 teak trees cut, timber smuggled LUCKNOW
- 2) Endangered red sandalwood seized from smugglers in Berhampur
- 3) The town of Suifenhe in China is home to a timber factory that processes more than 5 billion pounds of wood per year, most of which comes from Russia By smuggling.
- 4) Punjab Newsline Network on Saturday, 18 December 2010.
- 5) The situation has gone quite worse as timber, lakhs of rupees is being criminally sold right under the nose of the concerned department.
- 6) The Times of India, Ahmedabad. Plan to curb inter-state smuggling of forest woods.

III.EXISTING SYSTEM:

User (Forest officer) should enter the tree's information into the database. RFID is fitted in each tree to serve as a unique id. Forest officer would be holding the tracking device, in which RFID reader is embedded. He is walking through the forest. Once within the reader coverage area, the reader will detect the tags. The reader would send an encoded radio frequency signal to the tag embedded in the tree, and thus power sourcing the tag by exciting the current in the antenna of the tag. The tag would respond by reflecting and modulating back its identification information including the unique number identifying the tree. The same information (the tag identifier) would be communicated to the workstation at the back

Office through 3G connectivity enabled at the handheld reader device. The system at the workstation should be able to allow the user to update the database, by adding new tagged trees, as well as deleting tags when trees are logged or died.

DEMERITS:

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

IV. 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. In this area we proposed a novel system.

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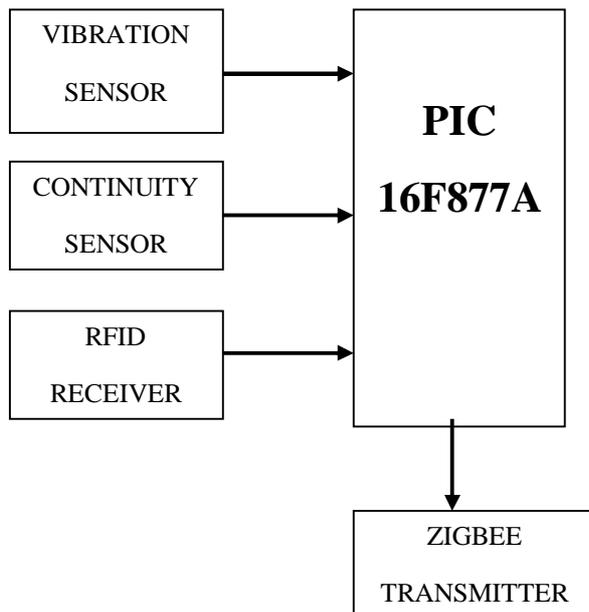
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Vol. 6, Issue 3, March 2017

The proposed system consists three sub-sections namely tree unit, sub-server and forest officer unit. Sensor which is fitted on tree is tree unit, control section consisting sub-server unit and finally the forest officer mobile phone or personal computer is the forest officer unit. Tree unit consists of vibration sensor, continuity checker and zigbee. 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, vibration sensor is used to detect the vibration level of tree. If any person tries to cut the particular tree, then the vibration level of tree will be high. The vibration sensor triggers the microcontroller while its value exceeds its threshold value. Continuity checker is used to link all the trees in a network. If the tree is cut down without any vibration then we are able to find out it with this continuity checker. The tree unit is fitted in many trees and continuously monitoring the status of sensor, and if any events (tree cut) occurs then one or all of these system detect this and then wirelessly sends this to sub-server unit. In our proposed system, zigbee is used to send information wirelessly.

V.BLOCK DIAGRAM

A) TREE UNIT:



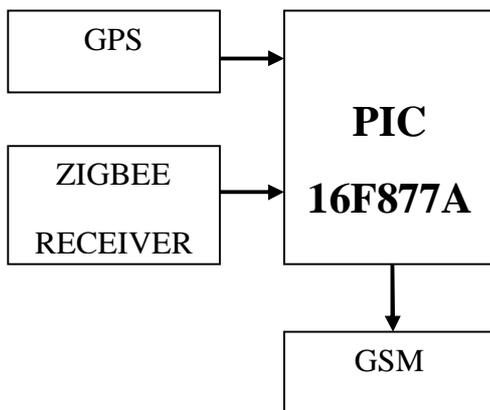
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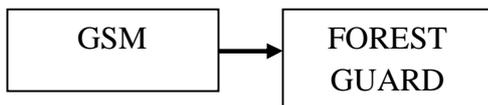
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Vol. 6, Issue 3, March 2017

B) SUB SERVER UNIT:



C) FOREST OFFICER UNIT:



VI. COMPONENTS USED:

a) VIBRATION SENSOR:

- 1.SW-18015P/20p series are spring type, no directional vibration sensor trigger switch, any angle can trigger
- 2.Switch is open circuit OFF-state , when it is static, when exterior force to contact and equivalent vibration, or movement speed achieve sufficient (partial) centrifugal force, conductive pick feet will produce instant conductivity is instant ON-state, when exterior force vanish, switch back to open circuit OFF-state.
- 3.Switch have the identification P at the bottom, for completely airtight;
- 4.In the normal, switch life can reach 2 lakhs cycles lifespan
- 5.This series Switches have trigger high sensitivity
- 6.Apply to security devices toys electronic scales products

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MECHANICAL CHARACTERISTICS:

Temperature range:	Storage: -40°C to 85°C Operating: 25°C to 85°C
Pull force of terminal:	500gf for 1 minute
Humidity:	95% RH, 40 for 96
Operating lifespan:	above 50000 hours

ELECTRICAL CHARACTERISTICS:

Voltage:	<12V
Current:	<50mA
Conductive time:	2ms
Closed resistance:	<30 ohm
Open resistance:	>10M ohm

b) RFID:

RFID is Radio Frequency Identification Device. It is a fast, affordable and automatic identification technology that uses radio frequency (RF) to transfer data between a RFID reader and a RFID tag. The RFID circuit is a only solid-state memory chip, but could also be planned where numerous electronic components together are used to form an integrated circuit design. In other words, RFJD is a means of capture data about an object without having a individual to read it. It holds a small amount of unique data – a serial number or other unique feature of the item .The data can be read from a remoteness – no contact or even line of sight required RFID technology uses RFJD tags, which is a small object, such as an paste sticker, that can be attached to or built-in into a product. RFID tags contain antennas to enable them to receive and respond to radio-frequency queries from an RFID transceiver.

c) ZIGBEE:

ZigBee is a standards-based protocols that provide the network communications required for wireless sensor network applications. 802.15.4 defines the physical and MAC layers, and ZigBee define the network and purpose layers. For sensor system applications, key design needs revolve around extended battery life, small footprint, and engage networking to bear communication between giant numbers of devices in an interoperable and multi application atmosphere.

ZigBee networks include the following device types:

- Coordinators
- Routers
- End devices

Coordinator

This device start and control the system. The coordinator stores information about the system, which includes acting as the Trust Center and being the storeroom for security keys.

Router

This router extend system area coverage, dynamically route around obstacle, and provide backup route in case of network jamming or device failure. They can connect to the coordinator and other routers, and also carry child devices.

End Devices

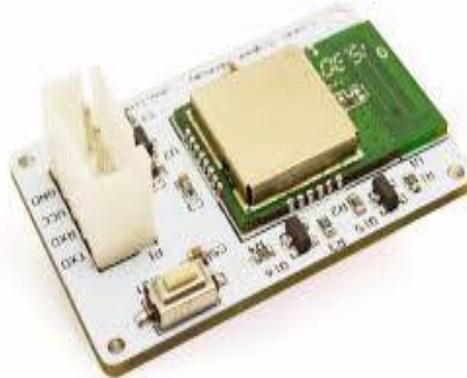
End devices can send out or receive a message, but could not perform any steering operations. They must be related to either the coordinator or a router, and this end devices does not support any child devices.

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Vol. 6, Issue 3, March 2017



d) GPS:

The Global Positioning System (GPS) is a space-based radio direction-finding system own by the United States government and work by the United States Air Force. It is a global navigation satellite system that provide place location and time in order to a GPS receiver any where on or near the world where there is an unhindered line of vision to 4 or more GPS satellites. The GPS system operates autonomously of any telephonic or internet greeting, though this technology can improve the usefulness of the GPS position information. The GPS system provide vital positioning capabilities to civil, military and commercial user around the globe.



e) GSM:

Global System for Mobile (GSM) is a pattern residential by the European Telecommunications Standards Institute to explain the protocol for 2ND generation 2G digital cellular system used by cell phones, 1st deploy in Finland. As of 2013 it has become the worldwide standard for mobile connections .

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2nd Generation network developed as a substitution for 1st generation 1G analog cellular network, and the GSM initially describe as a circuit switched arrangement optimized for full duplex say telephony. This prolonged over time to include data interactions, 1st by circuit switch convey, then by small data convey via General Packet Radio Services (GPRS) and Enhanced Data rates for GSM Evolution (EGPRS)

later, the 3rd GPP urbanized 3rd generation 3G UMTS values followed by 4th generation 4G standards, which does not form part of the ETSI Global System for Mobile standard.



f) PIC MICROCONTROLLER:

Microcontroller PIC16F877

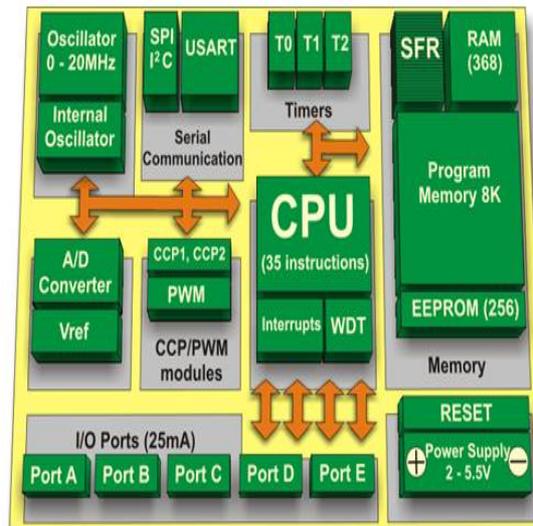
Peripheral Interface Controller is micro controller developed by Microchip. Peripheral Interface Controller microcontroller is easy and fast to execute program when we compare with other microcontrollers. The simplicity of programming and simple to interfacing with other peripherals Peripheral Interface Controller became victorious microcontroller. They are trustworthy and broken of PIC percentage is very fewer. And routine of the PIC is very speedy because of using architecture called RISC architecture. Power commencement is also very fewer when compared with other microcontrollers like 8051. When we see in the programmer point of view interfacing is very simple, also we can attach analog devices straight without any additional circuitry and employ them. Programming is also very trouble-free when compare to other microcontrollers.

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Vol. 6, Issue 3, March 2017



VII.WORKING

In this project we have three units. 1. Tree unit 2.Sub Server Unit 3.Forest officer unit.

In tree unit vibration sensor, continuity sensor, RFID receiver and ZigBee transmitter are connected to a microcontroller. In sub server unit GPS, GSM and ZigBee receiver are connected.

When the smuggler starts to cut the tree, the vibration created by it is sensed by the vibration sensor and RFID receiver receives the tag details of the tree and send signal to sub server via ZigBee transmitter.

Then this Sub server receives signal from tree unit and send alert to forest officer via GSM. And it also sends the location using GPS connected to sub server unit. There will be one Sub server per 50 trees.

There connected a continuity sensor to each tree. This sensor checks the connectivity between neighboring trees. If the smuggler removed this system or cut the tree, there lags the continuity between them. So this will send alert to sub server via ZigBee transmitter and this sub server will send alert to forest officer via GSM module.

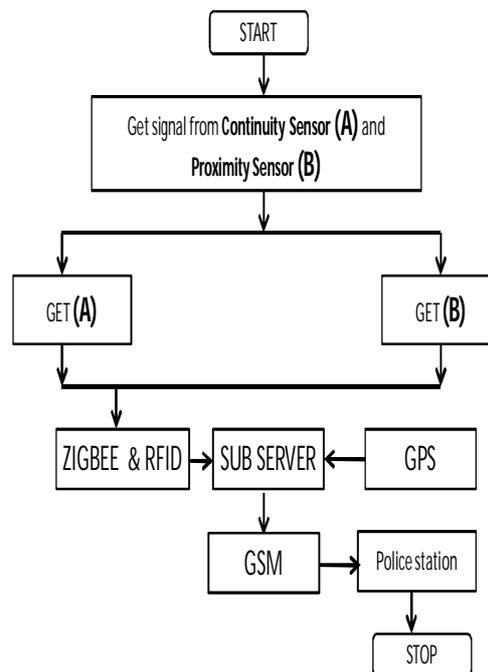
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Vol. 6, Issue 3, March 2017

FLOW CHART



VIII.CONCLUSION

The paper suggests protection of valuable trees from smuggling using RFID, ZigBee and various sensors. Smuggling can be easily prevented by continuous monitoring of the valuable trees in the forest automatically. The main goal of the system is to enhance forest management efficiency and decrease trees illegal logging cases. Continuity sensor and vibration sensor gives robust monitoring of the tree being cutting down. And immediate alert is given to forest guard patrol. So that they can take immediate actions. Thus from implementation of this system smuggling can be prevented and eco system is maintain balanced by preventing deforestation.

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