

A SURVEY ON VARIOUS METHODOLOGIES USED FOR CONSERVATION OF FOREST TREES

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Abstract - Smuggling of environmentally and economically important species of trees in forest areas such as Teakwood, Sandalwood, Pine and Rosewood has been dramatically increased. There have been several initiatives undertaken by different stakeholders and in particular by the Govt. of India, to mitigate these problems. These include the recruitment, training and deployment of anti-poaching watchers and private or government security guards across forests. Strict punishments for convicted offenders, as well as giving special incentives for anti-poaching activities were aimed for eradicating the menace. However, the punitive measures have remained largely ineffective. The most effective solution is “the implementation of a real time, wireless sensor network (WSN) and data logging system” which will be an advanced and a cheap modern technology to make monitoring more robust, effective and feasible.

Index terms - WSN [Wireless Sensor Networks], Sandalwood trees, Zigbee, Arduino.

I. INTRODUCTION

Forest resource has become an important strategic resource, playing a crucial role in economic development and improvement of people's livelihood and mitigating climatic changes. Sandalwood trees are known for their fragrance and medicinal value due to which they are grown in farmlands by farmers and in forests by the forest department. These trees are expensive and less available in the market. In recent years there has been an increase in the number of sandalwood robberies as there is no appropriate solution available for protecting sandalwood trees, thus, making them endangered. Smuggling of precious trees in forests such as sandalwood and forest fire is serious threat to forest resources causing significant economic loss and ecological imbalance of an environment all over the world. To avoid smuggling of these valuable trees and to save the forests around the globe some preventive systems need to be developed.

II. LITERATURE SURVEY AND SUMMARY

This paper[1] proposes a microcontroller based anti-poaching system employing WSN technology, and MEMS accelerometer. WSN is widely used technology in remote monitoring applications. The micro-controller that is used over here is PIC16F877A. MEMS accelerometer senses the tilt of the tree. Sound sensor combines a microphone and some processing circuitry. It detects sound from silence and outputs digital trigger signal. Fire sensor is used to detect the rise in temperature. Smoke sensor detects the lubricant gases in the surrounding environment. GPS gives the latitude, longitude and altitude values. For the purpose of serial communication UART is used. Internet of Things is used to transfer data without requiring human to human or computer interaction and objects, animals or people are provided with unique identifiers.

This paper[2] makes use of routing technique which sends signals to the base station about poaching activity using sensor nodes. Sensor nodes communicate over a short distance through a wireless medium and collaborate to accomplish a common task. They make use of WSN which consists of nodes integrated with sensors, communication module, powering unit interfaced with and controlled by a low power microprocessor. MSP430F5528 microcontroller uses the SPI interface to communicate with CC2500 communication module and ADXL362 accelerometer. The voltage regulator down converts the supply voltage from the solar rechargeable batteries to 3.3 V for operating the sensor node. There are 2 modes of operation in ADXL362: Measurement mode and Wakeup mode. Measurement mode is the usual operating mode of the ADXL362. Wake-up mode is ideal for simple discovery of the presence or absence of motion at extremely low power consumption. The farm will be divided into two fields: Ordinary field and Area field. Area field will be selected based on the received signal strength (RSSI) of the sensor node. The area based routing protocol will measure the received signal strength of sensor node and forward the signal if RSSI is within the required range.

The main objective here[3] is to build a protection system using Bluetooth 4.0 and GSM to alert the concerned authorities in case of sandalwood robbery. IEEE standard for Bluetooth is 802.15.1. Technology called frequency-hopping spread spectrum is used in Bluetooth, where it makes use of 79 channels to transfer the packets. Version 4.0 of Bluetooth is called smart Bluetooth because it includes basic Bluetooth, low energy and high speed protocols. The protection mechanism proposed in this paper can be implemented using either cluster or distributed architecture. Cluster architecture is a master slave architecture in which each tree is treated as slave node. Whereas distributed architecture is collection of clusters in which for a particular master node, other master node acts as slave. This protection model consists of two parts; protection circuit which serves the function of slave node and mobile application which is installed in every master node and monitors all the slave nodes.

This paper[4] proposed a system where the Yunyang country located at the viscera of Three-Gorges Reservoir is considered to be the study area & uses a high resolution optical satellite of GF-1 to identify the forest cover change by automatic extraction algorithm. Relief is an admitted feature selection algorithm. An improved relief is applied to update weight value of features for tentative feature matrix and then separable degree and redundancy and analyzed between features based on JM distance and correlation to filter irrelevant and redundant features in turn for reduction of features dimension. They study about the homogeneity, hue, NDVI, brightness, saturation, variance, contrast, dissimilarity, entropy and relativity depending on modeling, training and filtering.

The suggested system over here[5] consists of tree unit and main server unit. Each tree has a micro controller, Flex sensor, Accelerometer, temperature sensor, Zigbee and GSM module. The cutting down of tree is sensed by flex sensor and accelerometer. Tree unit gives the information about cutting down of trees when it catches fire and consists of three sensors accelerometer sensor, flex sensor and temperature sensor. There are several tree units and tree unit 1 is responsible to host the information from the multiple tree units. Each tree unit consists of zigbee module and controller is accountable for data transmission from primary stage to final stage. Main server unit is responsible for user interface and displaying the data that was transmitted from stage 1. Once the base station is modified, the authorized person takes action accordingly.

In this paper[6], a low power MSP430 microcontroller along with RF modules is being used. WSN is widely cast-off technology in monitoring and controlling the remote applications. The design that is discussed over here has a portable wireless sensor node which is the part of a Wireless Sensor Networks. It will be attached on trunk of each tree, and is used to identify robbery and also sends signals to Central Base Station. The system is designed to consume low power, and it works better with rechargeable batteries which can charge using natural solar system. A solar panel taken in the system is used for recharging node's batteries. The cluster of a node is around 5-10 trees. This can be formed into a cluster with a master node having extra properties and to communicate with central base station. The location of central base station is at the entrance of the forest which will communicate with node through RF network. The designed network will follow Star topology.

This paper[7] discusses the application of machine learning to prevent smuggling of trees. Inception-V3 model is the pretrained convolutional neural network used in the proposed system for training the system. System applies previous learning experiences to perform present or future classifications. The Application uses Infrared cameras to capture images of objects near the tree, captured images are processed to obtain high resolution images from low resolution images. The processed images are next sent to pretrained inception model for classification of objects in the image. On the basis of resemblance of classified images with bottlenecks probability of finding an intruder is calculated. Hence on detecting any abnormal value of probability, an intimation in the form of message is sent to the concerned authority.

III. GAPS FOUND IN THE LITERATURE

The base station is notified only after the tree is cut down in this approach[1]. The future scope is implementation of multi-node network and incorporation of microphone, motion detector sensor & temperature sensor to make systems more effective to acquire data.

Maximum consumption of power takes place while transmitting and receiving of data[2]. While forming a cluster large amount of data needs to be exchanged initially which results in unnecessary usage of power. Future work over here is to code and implementation of the proposed protocol, field testing of the sensor nodes under different environmental conditions and monitoring the power consumption for the designed protocol strategy.

In this paper[3], the protection circuit consists of a thin conducting wire which runs from one end to another end to cover the entire length of tree trunk. When the tree is being cut, the conducting wire also gets cut which in turn leads to disconnection of the protection circuit. Due to which contact between slave node and master node is lost. So the future work is to use the iron guards to cover the tree trunks.

Improved relief can perform well for large samples of certain surface target, limited in discriminating redundant features. It is noticed that the texture, hue and NDVI have their composition is less than 70% which does not meet the accuracy requirement and the capacity of single feature interpretation is limited. [4]

The flex sensors that are used in this system are costlier[5]. In future with a bit modification of this system we can use it effectively to protect valuable trees. The future effort is implementation of Multi-node network and incorporation of microphone, motion detector sensor & temperature sensor to make systems more effective to acquire data such as animals or human interference, fire detection etc. [6]

Obtaining pertinent data for training is a difficult task[7]. Processing huge data to convert it into a form essential for training is cumbersome. Insufficient or Irrelevant training data reduces the accuracy of the system.

IV. CONCLUSION

The above reviews give out different methods and strategies used for serving the purpose of forest conservation. Although various models are represented for the conservation of forests based on ecological aspects, they are inefficient for the instances where forest resources are deteriorated by human involvement like smuggling or poaching. Probability of detection of intrusion by harnessing existing sensor based wireless techniques does not provide competent results. Hence emphasizing the use of rugged sensors is vital for increasing the performance of the system.

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