SANDALWOOD TREE PROTECTION USING IOT

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ABSTRACT

The rise in sandalwood thefts in recent years has endangered the species, as there is currently no effective solution available to protect these valuable trees, which are renowned for their fragrance and medicinal properties, giving them a significant commercial advantage over other trees.

Using IOT (NodeMCU nodes), this article suggests a protective strategy. The majority of issues sandalwood owners have with safeguarding their trees from unauthorized felling have been addressed by a methodology that has been developed. In the event of a robbery, the implementation takesadvantage of the NodeMCU nodes' (IOT) features and chooses the most effective method of communication with the owner. The suggested system is made to alert the owner or relevant authorities through text message if criminals attempt to destroy sandalwood trees or disable the security system, allowing them to respond appropriately. Since the suggested model can be implemented utilizing cluster architecture and distributed computing, its longevity, which lasts up to it, is one of its appealing qualities.

Keywords: Sandalwood tree, Node MCU esp 8266,GPS, firebase web server.

I INTRODUCTION

Nowadays seeing news articles on the smuggling of expensive trees lately. These treeshave significant applications in the fields of medicine and cosmetics. However, the large sums of money involved in their sale have resulted in a surge in incidents of tree cutting and smuggling. This problem is not only in India only, but also in the same problems being faced by Australia, China, and Africa. When the price is taken into account, Indian sandalwood is priced at approximately12,000 to 13,000 INR per kilogram, while the international market places a high value on Red Sanders at around 10 crore INR / ton. Unfortunately, Indian sandalwood trees have recently become threatened with extinction, leadingthe government to impose export restrictions in an effort to save them. Despite this, there are still some reports in newspapers about sandalwood smuggling and trade. The issue is that there is no method or system in place to identify illicit tree-cutting and logging. In order to stay informed aboutthe status of your trees, it is advisable to set up a system that can monitor their condition in your workplace. A system has been designed to tackle the problem by detecting and notifying us of potential issues, enabling us to take prompt action. The purpose of this system is to aid us in reaching our desired outcome to protect nature. One of the most priceless trees in the world since the dawn of time is the sandalwood tree.

II OBJECTIVES

The main reason for decreasing the number of sandalwood trees is to theft, smuggling, and cutting of trees. To alert the thefts, cutting, and smuggling of trees, we used wireless communication to inform the message to the nearby forest range office. With this network, it reduces the thefts, smuggling, and cutting of trees.

III LITERATURE SURVEY

The team looked for and reviewed various patents, research papers, documents, newspapers, and magazine articles from diverse scenes for this project's literature review.

S.P. Manikanta Srinivasa Rao. T P.A. Lovina has proposed a “password-based circuit breaker” [1] which helps in controlling the electrical line with the help of a password. The project provides a solution for the accidents that are caused during the maintenanceof the electrical lines. The authors have proposed a system where the supply for the electrical line will be provided/cut off based on the password. This is implemented with three outputs with three different passwords. To ensure the safety of electricalworkers, a password-based electric lineman safety system has been developed to regulate a circuit breaker through the use of a password, where each output is connected to a relay that can open or close the power supply to the electrical line.

An "IoT BASED ANTI-POACHING ALARM SYSTEM FOR TREES IN FORESTS" has been proposed by Mrs. P. Madhavi, Sk. Razeena, Sk. Nowshad, Sushmita, and M. Sweety. [2] Our project's major goal is to set up a system that would make it more difficult to steal sandalwood trees or any other valuable trees that might harm the forest system. A temperature sensor (for detecting forest fires) and a MEMS accelerometer (for measuring the tilt of the tree being chopped) are two of the three different sensors that will be used in this project.

A "Vehicle tracking system using GPS technology" has been proposed by Kismat Pradhan, Yogesh Limboo, Anu Rai, Avinash Sharma, and Shirshak Gurung. [3] One of the most crucial methods most frequently employed in the modern world is vehicle tracking. The majority of modern vehicle tracking systems use GPS technology, so this paper surveys various GPS-based vehicle tracking techniques. These methods typically entail installing a tracking device inside a vehicle to allow the user or owner to track its location. Through the Internet or specialized software, one may browse and find vehicle information on the maps. The study includes a survey of several GPS-based vehicles tracking techniques that allow for the viewing and location of vehicle data on maps using specialized software.

"Vibration detection instrument based on the Internet of Things" has been proposed by Urvashi Jindal, Vaibhav Gupta, and Dr. Sujata Dash [4]. The purpose of this project is to develop an SMS alert system that activates whenever abnormal vibrations are discovered through the measurement of movements passing through a structure. It also aims to carry out a lab experiment that involves detecting vibrations caused by the application of various force levels that change the sensor's initial values. The acceleration data are shown on the website, where analysis may be done as needed. A warning signal is created when the magnitude rises to a point where it can cause destruction.

"Prevention of Theft of Sandalwood trees usingIOT and Arduino" is the idea put out by Ketaki Vinod Patil and Chakka Sai Abhishek [5]. The authors of the paper "Prevention of Theft of Sandalwood Trees using IOT and Arduino" suggestan efficient way to safeguard sandalwood trees,which are highly prized in our culture, by using embedded technologies and the built-in structureand script code of the Arduino. The project's sensors are connected to a wireless module using Arduino to continually sync sandalwood tree safety information with cloud storage, which can be easily seen by forest authorities, who can also enable or disable the sensors. The signals are controlled by the accelerometer, which relies on sensingvibrations.

Using tools like the Raspberry Pi and GPS antenna, devices proposed by Dinesh Suresh Bhadane, Pritam Bharati, Sanjeev A.Shukla, Monali D.Wani, and Kishor K.Ambekar to track and monitor public transportation vehicles that connect cutting-edge technology to provide security features to protect priceless sandalwood trees in the environment. In order to monitor transport trucks from their origin to their destination, this article suggests a system that uses a Raspberry Pi processor board to collect and analyze data. In particular, the system uses a GPS receiver module to continuously receive latitude and longitude values corresponding to the vehicle's current location. Passengers then input different location values between the source and destination

locations, which are then saved in the Raspberry Pi database for comparison.

A GSM-based system for home automation was invented by Rozita Teymourzadeh and Salah Addin Ahmed. The Short Message Service (SMS) maynow be used to access the system thanks to the GSM protocol. The user received input from the system on any desired object's present condition.[7]

Salma and Dr. Radcliffe [9] created a system that utilized the Novel Network Protocol in order to increase the appeal and reach of home automation. It provided the ability to control commercial gadgets through mobile or laptop. Instead of a microcontroller, an extra network device was employed for remote access.

IV METHODOLOGY

- The system is equipped with IOT point-to-point communication between the nodes uses the IOT to communication.
- In the above diagram there are two nodes there means one is the user node and another one is the tree node.
- User node consists of LCD, buzzer,Nodemcu 8266, and power supply.
- Tree node consists of vibration sensor,circuit breaker, Nodemcu 8266, and GPS.
- The user node is located in the forest officer's office or in the user side he/she can seethe longitude and latitude of the trees and the present location of the tree.

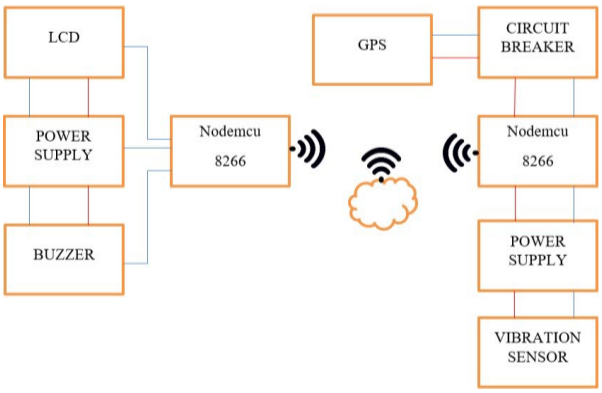

Figure 1. Block diagrams of the proposed project

- In the tree node means this is attached to the tree there are vibration sensors and circuit breakers are there in that two components at least one will be triggered it will inform the user node with the live longitude and latitude.
- When the smuggler will cut the tree and relocate the tree it will continuously send the live longitude and latitude of the tree to the user node in the user node there areLCD and buzzer when the tree is in constant position buzzer will be in low. when the tree is cut by any person then the circuit will break or vibrate the tree will cut the tree any one of them is on then it will start to update the live longitude and latitude then in the LCD it will "try to cut the tree check".
- Nodemcu 8266 will be the device it will be used to make a Wi-Fi connection between the user node and the tree node.
- For connection between the tree node and user node we use the server's name will firebase it is the server base station it will take the information from the tree node and send the data to the user node we can see the live longitude and latitude of the tree in the Firebase tool and in LCD also.

V SYSTEM IMPLEMENTATION

There are two nodes are there one is the main node andanother one is the tree node the working of both nodes isexplained below.

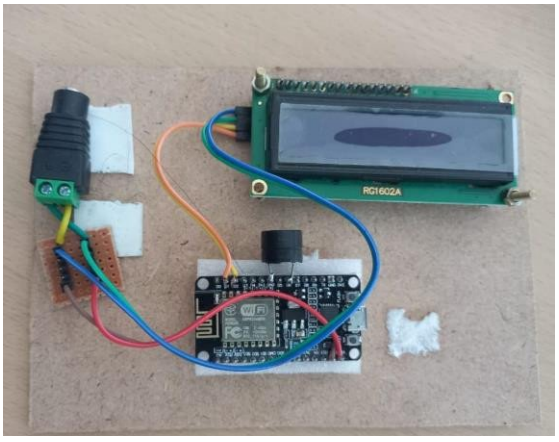

Figure 2: User node

In the user node, we contain Node MCU, LCD, buzzer, and power supply.
Node MCU ESP8266 is a 32-bit pin microcontroller it is connected to LCD, buzzer, and power supply and also The project's brain is the Node MCU.

In Node MCU D1 and D2 will connect to LCD, GND, and D6 are connected to the buzzer, and Vin and GND are connected to the power supply. It needs
+5V power supply to this Node MCU, at the constant condition in LCD shows the live longitude and latitude of the tree. To turn on the buzzer there is a two conditions are there:
1)set 0 means reset condition (low signal is transmitted 0 Volt).
2)set 1 means set condition (high signal transmitted +5 Volt).
Node MCU is connected to the web server via Wi-Fi, and data will be transferred from the tree node to the user node.

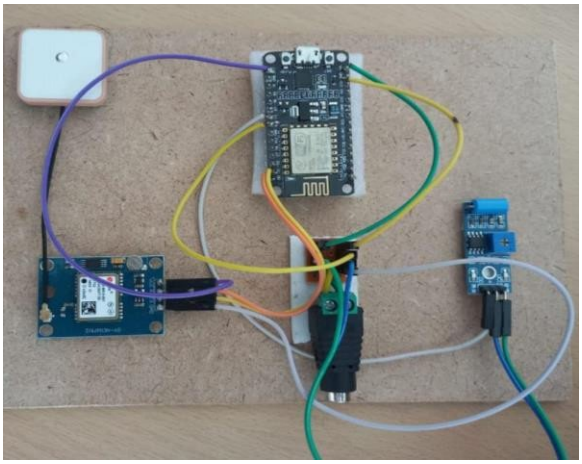

Figure 3: Tree node

The user nodes contain Node MCU, GPS,vibration sensor, circuit breaker, and power supply. In the Node MCU D1, D2, and 3.3V pins areconnected to GPS, Vin, and GND are connected to thepower supply (+5V), and the D6 pin is connected to the circuitbreaker. Another pin of GPS is connected to a power supply. In the Vibration sensor digital output isconnected to D5 of the Node MCU and GND, and Vccis connected to the circuit breaker.
The D1 pin of Node MCU is the serial clock line (SCL) pin, the D2 pin is the serial data (SDA) pin, the D6 pin is the master in slave out (MISO), the D5 pin is the serial clock signal (SCLK), D5 and D6 pin are transmit the receive signals. In the tree node vibration sensor and circuit breaker is there if one parameter is triggered it will transfer the data to the user node.
We used the webserver firebase which is connected to both Node MCUs of the tree node and user node via wi-fi.

V HARDWARE REQUIREMENTS

- Node MCU esp 8266
- GPS
- LCD
- Vibration sensor
- Circuit breaker
- Buzzer
- Power supply

VI SOFTWARE REQUIREMENTS

- Firebase server
- Arduino IDE

VII RESULTS AND DISCUSSION

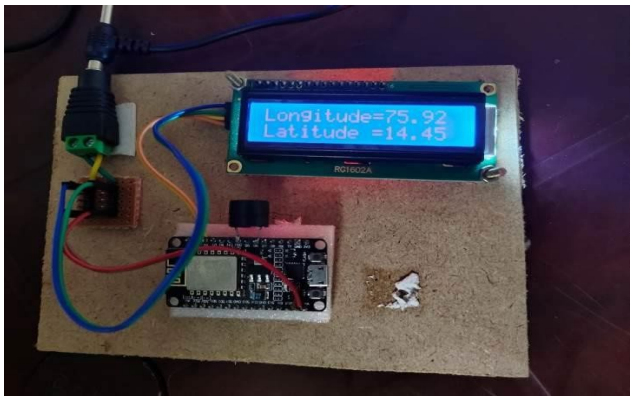

Figure 4: User node output

By using this model can save the trees as shown above figure user node output in the LCD display it will beshown the live longitude and latitude of the trees.

As explained in the system implementation in the previous section the tree node is placed in the trees and when the tree will be replaced or any illegal cutting of a tree is happening then the vibrationsensor or circuit breaker will break. Then the data will transfer to the user node via the Firebase server

and with the help of GPS the tree's location will easilybe tracked by the user.

In the user node live longitude and latitude willshow and the buzzer also turns on will show the location of the trees continuously in the Firebase software tool. When the tree is constant means not moving then set 0 is displayed in the software tool incase the tree is moving or the circuit breaker will break the circuit then set turned to 1 from set 0.

This model is not for only the protection of trees, it is also used for the protection of valuable things and to detect vehicles. We can see the output in both the hardware kit and software tool also.

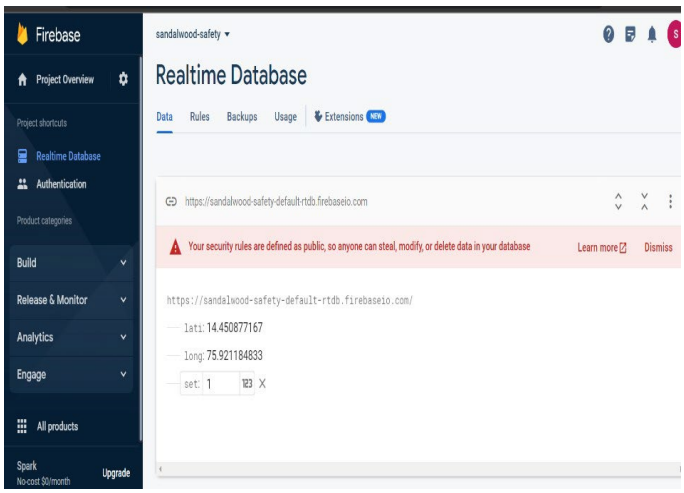

Figure 5: firebase output

VIII CONCLUSION

In conclusion, sandalwood tree protection using IoT technology offers numerous advantages, including real-time monitoring, improved efficiency, reduced costs, and increased yield. Despite some potential challenges, such as high upfront costs, technical expertise requirements, andsecurity risks, IoT-based sandalwood treeprotection has various applications, including forest conservation, agricultural production, and research and development. By implementing IoT-basedsandalwood tree protection, growers can optimize their yields, improve the quality of their crops, and preserve biodiversity while ensuring sustainable management of the sandalwood tree population.

IX FUTURE WORK

The future scope of sandalwood tree protection using IoT is promising. With the rapid advancement of IoT technology, in future can expect to see more efficient and cost-effective systems that can offer improved data analysis and better decision-making capabilities. Also, use athermal vision camera in place of NodeMCU with that camera easily find the smuggler and wecan also reduce the illegal cutting of trees.

X ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- **Real-time monitoring:** IoT-based sandalwood tree protection allows for real-time monitoring of the tree's health and other parameters such as soil moisture, temperature, and humidity. This enables early detection of any problems, allowingfor timely intervention.
- **Improved efficiency**: The use of IoT devices ensures that data is collected and analyzed automatically, which leads to better decision-making and reduces the need for manual labor.
- **Reduced costs:** With real-time monitoring and automated data collection, sandalwood tree protection using IoT can reduce labor costs associated with manual monitoring and data collection.
- **Less human work:** With this model, we can reduce the work of humans. Humans cansee the status of the trees anywhere.

DISADVANTAGES

- **High upfront costs**: The installation of IoT devices and the associated infrastructure can be expensive, which may deter some growers from adopting this technology.
- **Technical expertise required:** Setting up and managing IoT systems requires technical expertise, which may be achallenge for some growers.

- **Security risks:** IoT systems are vulnerable to cyber-attacks, which could compromise the data and potentially harm the sandalwood trees.

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