IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 7, July 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 7, July 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1107061 |

Anti-Smuggling of Trees and Fire Detection System in Forest

Anusha S[1], Hemanth Kumar[2]

PG Student, Department of Master of Computer Applications, Jawaharlal Nehru New College of Engineering, Shivamogga, Karnataka, India[1]

Assistant Professor, Department of Master of Computer Applications, Jawaharlal Nehru New College of Engineering, Shivamogga, Karnataka, India[2]

ABSTRACT: This work seeks to develop a quick response mechanism to help prevent trees from being stolen by using a vibration sensor and LoRa(long-range) transceiver connected to an Arduino Nano ATmega328 microcontroller. When the trees are cut, the vibrations generated in the tree will be sensed and an alert will be sent wirelessly via the LoRa transmitter to the main control unit/control room. The sent information will be displayed on an LCD display and a buzzer will be turned on, thus alerting the security personnel to take the necessary action. Along with this, the suggested approach uses sensor output to identify fire. Information will be sent and displayed on an LCD display and a buzzer will be activated. It will intimate the owner with live-captured data and SMS to the owner

KEYWORDS: vibration sensor, LCD display, LoRa, GSM

I. INTRODUCTION

The cost and significance of sandalwood nicely known. Sandalwood used for many centuries for their exquisite fragrance and oil used in perfume-making. Their soft, warm, smooth scent also makes them a popular ingredient in cosmetics. All these qualities make sandalwood highly valuable, making it a target for illegal harvesters and smugglers. As such there is need to act immediately. protect sandalwood trees and other endangered tree species. Safety is limited by insufficient safeguards, cases of theft and illegal harvesting have become rampant, thus making it essential to develop an expert system detect such activities quickly and alert security personnel. Our proposed system is designed with the aid of embedded systems technology to provide a reliable security solution for sandalwood trees. Each tree on the land will be installed with a vibration sensor (SW-420 module), a fire sensor, and a microcontroller with a transmitter (LoRa transmitter). This will constitute the tree unit, which will be placed at the top of the tree. Additionally, a camera module will be connected which will monitor a group of trees.

Whenever the tree is axed or cut by equipment, vibrations are generated along the tree which will be sensed by the SW420 module or when the sensor detects fire. The sensor sends an output signal to the microcontroller to which it is connected, which then sends an alert via the LoRa transmitter wirelessly to the LoRa receiver in the control unit. Further, the tree identification number/code is sent via the GSM module connected to the controller, in the main control unit/control room. This immediately alerts the security personnel, who can quickly reach the destination of the theft occurrence and take necessary action against the intruders. Thus, it provides a robust and reliable security solution for sandalwood trees. It enables the quick response of the security personnel when the theft detection signal is triggered, and the owner can also view the live video from the location. Such an advanced system makes it much harder for tree cutters to break the system before cutting the tree, thus drastically reducing the chances of theft and illegal harvesting of sandalwood trees.

II. RELATED WORK

Suguvanam K R et al. [1] proposed system consists of three units with vibration, continuity checking and Zigbee sensors; a sub-server unit to process information from tree units; and a forest officer unit to monitor data. If the vibration sensors in the tree units detect an event, such as tree cutting, the data is wirelessly transmitted to the sub-server unit. Pruthviraj P Patil et al. [2] have developed a project with the title Anti-Smuggling Alarm Systems for

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 7, July 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1107061 |

Trees. In this work in Forest flex sensor is fixed to the trunk of the tree which detect the bending of a tree, whenever the tree gets axed, the tree will bend and the flex sensor will detect the tree bend and send this notification to the user with the exact location where the tree gets axed, And also, they have used the smoke sensor which detect the fire and send the notification to the user and PR sensor which detect the movement around the trees. The work in [3] have three main operations that are important in monitor the forests that developed in this detection of tree cutting, fire detection, and contaminated water detection by using the sensors like vibration, flame sensor and PH sensor respectively. A microcontroller is used along with GSM to communicate to the central server from a remote place. The sensed data from sensors is collected and sent to the authorized person via GSM. IoT is a widely used technology in forest monitoring applications. The work in [4] can predict the vehicle which is cast-off to transport the woods illegally. The working and cost of this scheme are simple and low, yet the accuracy is high. This system measures the load of the vehicle which crosses that particular area. It consists of an Arduino used to process data from the load cell. The output of the Arduino is in two forms. When the load cell detects the weight of the vehicle, the system compares the values with those already coded in the Arduino. Depending on the output, this system sends an alert message to the forest officer about illegal activities, such as tree cutting, using a GSM module and to a Liquid Crystal Display (LCD). In [5] whenever there is movement in the forest (e.g., tree cutting or fire) a sensor sends a message to microcontroller, which displays it on an LCD. This message is then sent to the forest official's registered mobile via GSM. A metal sensor is placed at each tree and a temperature sensor (LM 35) & PIR sensor (180° coverage) are at 1 tree. A wireless camera is monitoring the area, to indicate if it's animal or human movement. Tree trafficking remains a significant issue, despite advancements in technology. To combat the tree trafficking issue, researchers in [6] a method was developed to prevent tree the forest trafficking using Arduino, flex sensor humidity, mems sensor, and power supply. The system communicates with tree units via GSM, reshaping real-time data and ensuring data security and privacy. This innovative approach aims to protect trees in vast regions like forests while reducing the burden on local communities. The smuggling of trees very expensive obtainable trees like sandals and Sagwan has been a global issue for years. To prevent this, preventive systems are needed to monitor and protect forests. Work in [7] have proposed a system consisting of two modules: a Tree Unit and a Main station. Each tree has a tiny electronic separation with Renesas controller, sensors, and solar radiation. The units are collected and store in data and send to a ground station by using Global System for Mobile communication modules. The main control unit graphical user interface is managed by an owner who provides security measures. Forest reserves are designated by governments to support rainwater, decrease wind erosion, stalk logging, and halt desert infringement. Forests are crucial for life, nutrition, drug and protection against soil loss, overflow, and radiation. Work in [8] proposes six essential monitoring operations for forests: tree-cutting detection and also Integrated systems for detecting flame, people, moisture, and temperature. The proposed IoT-based forest security system collects sensor data from tree sites and sends normal text and site information to concerned security personnel, employees, or forest officers. Smuggling is caused by a high demand for trees. A system using nRF technology is proposed in [9] to protect nature by saving valuable trees like teak and sandalwood. A vibration sensor detects smugglers' attempts to cut trees, and the controller sends an alert via nRF transmitter to the forest guard's monitoring unit. The forest guard can access the information via an IoT link provided by web developers, allowing them to take responsible steps. Nowadays, the thefting of trees has been increasing rapidly. Rights to produce and sell oil from dissolving sandalwood are granted by the government. So, authors in [10] have advanced a system to avoid poaching of trees which would in turn stop Deforestation and uphold environmental stability, which would help to solve one of the issues of Global warming. Each tree contains one electronic division which consists of Renaissance Semiconductor for Advanced Solutions microcontroller, LM, ADXL, GPS, Flex sensor and also GMS.

III. METHODOLOGY

To address the above-mentioned challenges, the proposed work is to develop an innovative solution that combines sensor technology, wireless communication, and visual surveillance to create a quick response mechanism for the detection and prevention of tree theft. Tree units are equipped with SW-420 vibration sensors, fire sensors, an ATmega328 microcontroller, and a LoRa transmitter. This system will collect real-time data from the sensors, detecting suspicious activities such as unauthorized vibrations near the trees. The fire sensors will monitor environmental conditions to ensure the health of the trees. The collected data will be transmitted wirelessly to the main control units, allowing for immediate analysis and response.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 7, July 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1107061 |

a. Component used:

Machine vibration levels are measured using a vibration sensor as shown in Fig.1 shows for screening and analysis. Industrial vibration sensors useful for maintenance teams for condition monitoring, providing them with information on the strength and frequency of vibration signals

Fig.1: Vibration Sensor

A SIM card is used to link a GSM module to the GSM network for operation. The module receives a special identification number from the SIM card, is identify the device on the network the above Fig.2 shows. The GSM module may then send and receive data by interacting with the network via a series of protocols.

Fig.2: GSM

LCD display monitors utilize liquid crystal display technology, allowing light to pass through or be blocked. These thin, lightweight, and energy-efficient screens are popular because they are thin, lightweight design. Using this technology, we can do better viewing of images on the screen is as shown in Fig.

Fig.3: LCD

The Arduino Nano is a compact microcontroller board based on the ATmega328P microcontroller, offering 14 digital, 8 analog, and 6 PWM output pins. In Fig. 4, it's compatible with the Arduino IDE and is popular for its ease of use, low cost, and versatility.

Fig.4: Arduino Nano

The ESP32-CAM is a very small camera module using the ESP32-S chip In addition to multiple GPIOs (General Purpose Input/Output) for connecting the OV2640 camera and peripherals, it also features a microSD card slot to help store images captured by the camera and files provided to customers is as shown in Fig.5.

Fig.5: ESP32-CAM

A LoRa transmitter and receiver enable long-distance wireless communication in low-power, low-bandwidth applications using Long Range modulation is as shown in Fig.6

Fig.6: Lora

.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 7, July 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1107061 |

IV.DESIGN AND IMPLEMENTATION

Each tree in the land will be installed with a vibration sensor (SW-420 module), ana a fire sensor, and an ATmega328 microcontroller with a transmitter (LORA transmitter). This constitutes the tree unit, which will be placed at the top of the tree. Additionally, a camera will be connected to the sub unit. Whenever the tree is axed or cut by equipment, vibrations are generated along the tree which will be sensed by the SW-420 module or when the sensor detects fire. The sensor sends an output signal to the microcontroller to which it is connected, which then sends an alert via the LORA transmitter wirelessly to the LORA receiver in the main control unit. The received signal activates the ATmega328 microcontroller connected to it. along with an appropriate message, is sent via the GSM module. The received information activates the ATmega328 controller in the control room, which displays the information on an LCD display and activates a buzzer. The owner can also view the live video of the location. This immediately alerts the security personnel, who can quickly reach the destination of the theft occurrence

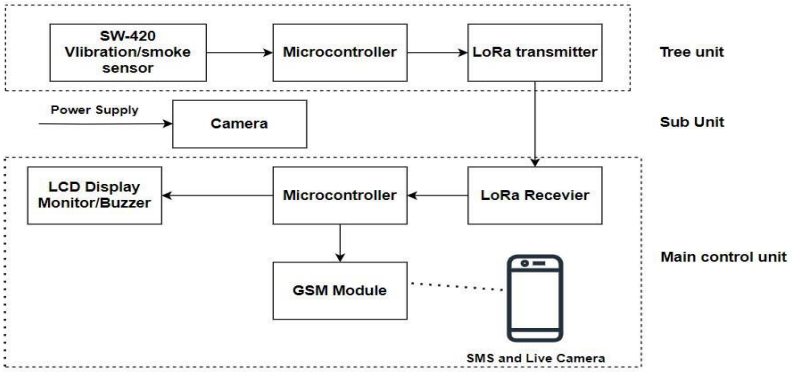

Fig.7: Block Diagram of the system

V.EXPERIMENTAL RESULTS

Screen in Fig.8 shown the message when fire is detected. In Fig.9 When vibrations are noticed, they are showed on an LCD monitor. In Fig.10 when a theft or fire is detected and attached to a tree, it is displayed as a normal message and we can take immediate action.in Fig.11 shown a live stream from a camera showing what is happening around the forest.

Fig.8: Output of fire detection

Fig.9: Output of theft detection

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 7, July 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1107061 |

Fig. 10:SMS

Fig.11: Live Stream

VI. CONCLUSION

The Anti-smuggling Of Trees and Fire Detection Systems offer real-time when someone is cutting the tress. The system detects the vibration using the vibration sensor and send a message to the owner and the buzzer get activated, displays a warning message on the screen. and we have used fire sensor. when a fire is detected the fire sensor initiates the alert mechanism and then it will activate the buzzer and display on the screen and send immediately a message to the owner. We have placed a camera to see the live stream and we can take immediate action. With the help of sensors. We are capable of providing security for trees from getting smuggled and catching fire by the thieves.

REFERENCES

1. Suguvanam K R, Senthil Kumar R, Partha Sarathy S, Karthick K and Raj Kumar S, "Innovative Protection of Valuable Trees from Smuggling Using RFID and Sensors", IJIRSET, Vol. 6, Issue 3, March 2017.
2. Pruthviraj P Patil, Sahana H N and Manoj Kumar S, "Anti-Smuggling Alarm systems for Trees in Forest", International Journal of Engineering Research & Technology (IJERT), Vol. 7, Issue 09, 2019.
3. Srushti Punyarthi, Sagun Raul and Mayur Kadam, "Smuggling Control in Forest Using Raspberry-Pi", International Journal of Engineering Research & Technology (IJERT), Vol.9, Issue 05, 2022.
4. Jakkula Karthik, Thangella Anil Kumar and Andmaddi Jagruthi, "Gsm Based Illegal Tree Cutting Prevention and Monitoring", International Journal of creative research thoughts, Vol. 10, Issue 6, June 2022.
5. M.Yuvaraj, K. Arunselvam, C. Dinesh and T. Harish, "Deforestation Theft Monitoring System Using Load Sensor", International Journal of Aquatic Science ISSN: 2008-8019 Vol. 12, Issue 03, 2021.
6. Pushpalatha R and, Darshini M.S, "Real Time Forest Anti-Smuggling Monitoring System based on IOT using GSM", International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE) Vol. 8, Issue 2, Feb. 2019.
7. Jyothi Latha, Harshitha L, Padmapria B and Chaluvaraju, "Anti-Smuggling System for Trees in Forest using GSM Technology", International Journal of Innovative Science and Research Technology Vol. 2, Issue 5, 2017.
8. Raed Abdulla, Waleed Al-Gumaei and Chandrasekharan Nataraj, "Smart Tree Care System with Internet of Things", Research Journal of Applied Sciences, Engineering and Technology, vol.15, Issue 9,2018.
9. Prem Ananth.R, Surya.M, Vikasini K R and Seetha.A, "Anti-Smuggling System for Trees In Forest Using Vibration Sensor And Nrf", International Journal of Emerging Technology and Innovative Engineering, Vol. 5, Issue 7, July 2019.
10. Hema M S, Nandini S, Priyanka H M, Vidhya Shree H M and Shilpashri V N, "Antismuggling System for Trees In Forest", Journal of Emerging Technologies and Innovative Research (JETIR), Vol.6, Issue 5, May 2019.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.379

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details