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JNANASANGAMA BELAGAVI-590 018, KARNATAKA

PROJECT WORK PHASE-II REPORT

ON

"IOT approach for Anti-Plundering : Halting the erasure of Endangered trees"

Submitted in the partial fulfilment of requirements for the award of Degree

B.E. in Computer Science and Engineering

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ABSTRACT

Poaching of the most important trees in the forest, such as sandalwood, poses a serious threat to forest resources, causing serious damage and ultimately serious damage to the environment worldwide. We present a microcontroller-based anti-poaching system using WSN technology that can detect poaching by monitoring the vibrations produced by tree/branch cutting using a 3-axis MEMS accelerometer.

Microcontrollers are used to transfer data with mobile devices. WSN is a widely used tool in remote monitoring. Embedded system architecture, hardware-software design are used. GPS enabled monitoring is implemented to provide real time location using geo-location co-ordinates.

KEYWORDS: Internet of Things, Blynk Application, Microcontrollers, Data Collection, WSN technology.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays, the demand for web development applications is quite high. So IoT is a big technology with which we can create many useful Internet applications. Nowadays sandalwood, sagwan tree etc. are available on the internet. There is a lot of information about illegal wood such as: They are used in medicine and cosmetology. Some measures need to be taken to stop smuggling and save the world's forests. We have created a system that can be used to stop smuggling. This design uses three sensors: tilt sensor, temperature sensor and sound sensor. The buzzer is activated for the tilt sensor and sound sensor, and the water pump is activated for the temperature sensor. The use of real-time, wireless sensor networks and data systems will be modern and affordable technologies and will make monitoring more efficient, effective and feasible. Wireless sensor networks are one of the newest technologies and are widely used in many industrial applications such as surveillance, monitoring, security and control applications, especially remote monitoring applications. Detecting wood smuggling We have created a framework that can be used to prevent wood smuggling, thus preventing deforestation and preserving environmental stability, solving one of the problems of global warming.

Hunting problem is not only in India, China, Australia and African countries also face the same problem. Indian sandalwood sells for 12,000 to 13,000 Indian rupees per kilogram. The price of red sand in the market is INR 100 million per tonne. These are often useful for cosmetic research. Large-scale logging and their smuggling occurred due to the large amounts of money involved in transporting the timber. Indian sandalwood has become rare in recent times, and the Indian government has tried to limit sandalwood exports to control the shortage. The main aim of this project is to create a framework that can be used to stop poaching of sandalwood.

According to official regulations, the maximum purchase limit for individuals does not exceed 3.8 kilograms. If the tree is currently under government control, it will not be allowed to escape either privately or in a protected area until it is 30 years old. Sandalwood piracy is creating financial and legal problems in the region in India. It's hard to imagine a world without trees, but so far there are only two real forests in the world. Today the weak forces of life are slowly being attacked, but this attack will not be launched by businessmen and international partners, but by ordinary people who seem to have lost all connection with nature. The removal/stealing of the most important trees, such as sandalwood, from the forest poses a real risk to the timber heritage, causing serious damage and ultimately greatly affecting the international situation.

This paper proposes a new microcontroller-based anti-poaching framework using WSN, suitable for detecting poaching by analysing vibrations generated by cutting trees or branches. Vibration data was collected and simulated by testing different types of wood. Three sensors are used in the project plan: a tilt sensor (used to determine the tendency of trees to fall), a temperature sensor (used to distinguish forest fires) and a sound sensor (used for e.g. criminal action and even good fire control)) wood can also be checked). Continue reviewing the data generated by these sensors as directed by the Blynk app. As for the sensor, the output device is activated by a relay. The buzzer is activated for the tilt sensor and the sound sensor, and the water flush is activated for the temperature sensor. The generated data is stored on the Blynk Server via the Wi-Fi module.

Poachers use increasingly aggressive tactics; park experts believe this is the result of a decline, such as the decline in methamphetamine use in that country. Enraged by the crowd, residents of the neighbourhood called themselves 'Midnight Pain'. In 2014, a giant tree was felled by bagmen in the middle of the night only to lift a 500-pound ball at least 60 feet or more, and the problem was resolved by destroying the entire tree due to a major casualty incident. A crushing defeat. These knots produce beautiful results and eventually appear in the inventory of the craftsman who transforms the perfect knot into furniture and other beautiful things. Stealing knots from these unsuspecting trees will scare them away and potentially leave them vulnerable to dangerous predators.

Creatures and chaos also make the tree difficult to implement. The short-term struggle of nature and the increase in money are small indicators that man is in conflict with nature. Poaching has reduced the spread of trees by animals in rainforests, which has negatively affected the air quality in these forests. Without animals, these remote areas would store less carbon in the long term. Poaching has reduced the spread of trees by animals in rainforests, which has negatively affected the air quality in these forests. Without animals, these remote areas would store less carbon in the long term.

Poaching or poaching of environmentally and commercially important trees (such as sandalwood, teak, pine and rosewood) from forest areas has increased significantly in recent years. Many measures were taken by different stakeholders, especially the government. India will solve these problems. These include the recruitment, training, and deployment of dissidents and/or government personnel. Security personnel walking in the forest. Heavy penalties for those convicted of crimes and special incentives to prevent violent crimes are aimed at eliminating this crime.

The current system involves appointing a supervisor to monitor the entire system for suspicious transactions, but the fact that it is difficult to monitor the entire area simultaneously due to human limitations shows that there is no trust and there is no need to do so. Hiring guardians. Another existing system is the use and storage of CCTV cameras. RF-ID tags are also now available to protect trees. This is the same as tagging "animals to identify a particular tree". However, this type of technology does not provide instant messaging, meaning it does not provide information about the activities taking place at that moment, it only notices when the tree moves away from its old job.

The main purpose of our project is to design and build a wireless sensor model that is part of a wireless sensor network. It will be installed on the trunk of every tree, able to detect thieves and automatically initiate a voice alert sent via wireless media to a remote location (if available).In the face of environmental competition and the brutal plunder of the world's resources, new solutions are urgently needed to protect endangered ecosystems. “Fighting Looting: Stop Logging of Endangered Trees” is a grassroots initiative that combines technology with environmental awareness to combat illegal logging. its core.

The essence of our Fighter defence lies in its solid equipment. Powered by a reliable 12-volt battery supply, the system integrates key components such as Node MCU ESP8266, Arduino UNO, LED buzzers, ultrasonic theft detection module, MPU-6050 accelerometer, LCD display and DHT11 temperature and humidity. . Each element plays an important role in strengthening protection against unauthorized tree protection. The-node MCU ESP8266 acts as the central communications hub connecting various sensors and devices to ensure seamless data exchange. The ultrasonic anti-theft module serves as the first line of defence along with the MPU-6050 accelerometer. It monitors and detects any activity or movement around the selected tree and triggers an alarm if unauthorized detection is detected. The DHT11 sensor adds an additional layer to ensuring the health of protected trees by providing real-time environmental information.

The Arduino UNO microcontroller manages data transmission and effectively communicates over the protected area by controlling output devices such as LED buzzers and LCD display. The LED buzzer emits a loud alarm that deters potential intruders and alerts neighbours to ongoing threats. We built an Android app experience to give users real-time monitoring and control. The app uses Blynk to provide a user-friendly interface to tree collectors. Users can remotely activate and deactivate alarms, receive instant notifications when security breaches occur, and access real-time information from the DHT11 sensor. The app also includes a tracking function that allows users to track the location of trees protected by GPS technology.

1.2 Internet of Things

IoT (Internet of Things) is a technology and analytics that uses communication, information, big data, and artificial intelligence to provide complete systems for products or services. These systems provide greater transparency, control and efficiency when applied to any business or system.

IoT systems have applications in many industries due to their versatility and ability to adapt to any environment. They enhance data collection, automation, operations, and more through intelligent tools and powerful support tools.

The IoT system enables users to achieve deep automation, analysis and system integration. They improve the services and accuracy of these sites. The Internet of Things leverages existing and emerging sensing, networking, and robotics technologies.

The Internet of Things benefits from recent advances in software, falling hardware costs, and modern approaches to technology. Its new and improved content creates a significant change in the delivery of goods, products and services and the social, economic and political impact of these changes.

Features of IOT

The most important features of IoT include intelligence, connectivity, sensors, collaboration and the use of small devices. Below is a brief review of these features

- Artificial Intelligence The Internet of Things essentially makes everything smart; This means it improves every aspect of life through data collection, smart algorithms and the power of the Internet. This might mean something as simple as stocking up on your fridge and cupboards to see when you're running low on milk and your favorite foods, then placing an order at your favorite store.
- Connectivity New network enabling technologies, especially IoT networks, mean that networks will not be dependent on a large service provider at all. Networks can exist on a smaller, cheaper scale while still being efficient. IoT creates a small network of devices.
- Sensors Without sensors, IoT will lose its uniqueness. They work as a tool to transform IoT from a network model of passive devices to an active machine that can integrate with the real world.

- Collaborative Work Today, most interactions with connected technologies occur through collaboration. The Internet of Things offers new concepts of active content, products or services.
- Small Devices As one might expect, devices are getting smaller, cheaper, and more powerful over time. IoT leverages unique small devices to ensure its precision, scalability, and versatility.

1.3 Architecture of IOT

IOT is a three layer architecture. The layers include:

1. Perception Layer
2. Network Layer
3. Application Layer

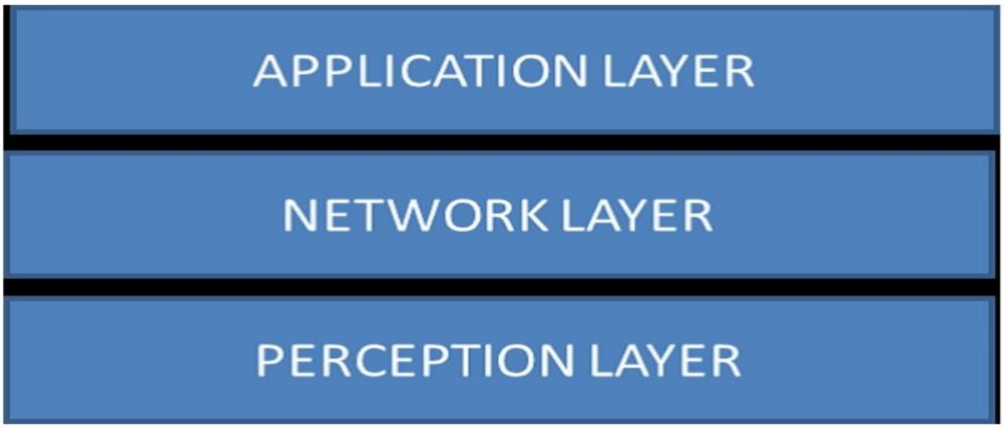


Table.1.3.1.Architecture of IOT

Perception Layer :

It is the first layer of IoT architecture.It is mainly used for identifying objects and collecting information. It is tied to the hardware device like a GPS, sensor, RFID tags, or sensor network and linked to any intelligent system. It also called physical layer as the information from the physical devices is changed into a digital signal that is suitable for network transmission. The primary work of this layer is to gather information from the sensing technology

Network Layer :

It is a second layer of the IOT architecture .Its main function is to conduct and obtain data or information. It is a network management center for IoT. It gains data or information from the perception layer that has been collected and transferred to different networks via wired or wireless network. It also transfers huge amount of data between dissimilar networks.

Application Layer :

It is a third layer of the IoT architecture. It ties the application to the network. The application layer uses the processed data sent by the network Layer. In fact, this layer constitutes the front end of the whole IoT architecture through which IoT potential will be exploited.

CHAPTER 2

LITERATURE SURVEY

2.1 Literature Survey Review

The Author A.Kulkarni et.al.[1] in their work, concentrate on the detrimental consequences of human activities, such as widespread tree-cutting and unrestrained hunting, which pose a serious threat to wildlife, have made wildlife prevention a crucial practice. Thus, we will present the initiative aimed at preventing trees and wildlife in forests. In order to prevent a disaster (forest) that could result in the loss of a significant amount of natural resources, this article presents the design of a system for detecting vibration to prevent the cutting down of trees, temperature to prevent forest fires, and animal pulses to prevent wildlife using wireless sensor networks. In this project, the temperature, pulse, and vibration are sensed by the sensor device and communicated to the forest office over zigbee networks. We simultaneously transmitted the GPS location data in order to save transmission costs. Wireless Sensor Networks (WSNs) are used here. Since many sensors in this network are typically located in remote areas, setup and maintenance must be simple and scalable. A wireless sensor network is one that is made up of a lot of tiny nodes. Sensor models work well when deployed across wide geographic areas or in dangerous circumstances.

The Author S.Veerasingam et.al.[2] in their work, In order to monitor temperature in real-time process dynamics, they place a strong emphasis on portable wireless data logging systems. In some applications, process variables (such as temperature, pressure, flow, and level) change over time. These fluctuations should be documented so that a control action can be initiated at a predetermined point. In order to address low-cost, low-power wireless sensor networks, this study provides an 8-bit embedded platform for a temperature sensor with a network interface that uses the 802.15.4 ZigBee protocol. ZigBee is a wireless technology designed as an open worldwide standard. When a central computer unit is positioned within range of the wireless temperature sensor, it receives and communicates changes in the local temperature. The data is received by the central base station, which simultaneously plots the variations and stores them in a file.

The Author M.Upadhye et.al.[3] in their work, they address Vibration analysis provides relevant information about abnormal working condition of machine parts. Vibration measurement is prerequisite for vibration analysis which is used for condition monitoring of machinery. Also, wireless vibration monitoring has many advantages over wired monitoring. This Paper presents, implementation of a reliable and low cost wireless vibration monitoring system. Vibration measurements been done using 3-Axis digital output MEMS Accelerometer sensor. This sensor can sense vibrations in the range 0.0156g to 8g where, 1g is 9.81m/s2. Accelerometer Sensor is interfaced with Arduino-derived microcontroller board having Atmel's AT- mega328p microcontroller. The implemented system uses ZigBee communication protocol i.e. standard IEEE 802.15.4, for wireless communication between Sensor Unit and Vibration Monitoring Unit. The wireless communication has been done using XBee RF modules. National Instruments's LabVIEW software has been used for development of graphical user interface, data-logging and alarm indication on the PC. Experimental results show continuous real-time monitoring of machine's vibrations on charts. These results, along with data-log file have been used for vibration analysis. This analysis is used to ensure safe working condition of machinery and used in predictive maintenance.

The Author H.Hamza et.al.[4] in their work, they point on the development of a system designed to combat tree theft, a prevalent issue in various regions. the proposed system integrates Texas Instruments technology and educational methodologies to create an innovative solution for monitoring and preventing unauthorized tree removal. By leveraging advanced technologies, the authors aim to address the challenges associated with tree theft, providing a practical and effective means of control. while the specific details of the paper are not outlined in the summary, it is likely that the authors discuss the implementation of the Trees Theft Control System, the technologies utilized, and the potential impact on preventing illegal activities related to tree removal. Papers presented at conferences often emphasize the practical application of technology in addressing real-world problems, and this paper is likely to contribute insights into the development of systems aimed at protecting trees from theft.

The Author N.Shilpa et.al.[5] in their work, they present a comprehensive exploration of an Internet of Things (IoT) solution to combat tree poaching. The authors focus on leveraging advanced technology to address the critical issue of illegal tree felling. The proposed system incorporates IoT devices to create a robust monitoring and alert mechanism for protected tree areas. Utilizing sensors and connectivity, the system enables real-time tracking of environmental conditions and detects unauthorized activities. The authors emphasize the integration of innovative technologies for proactive anti-poaching measures. The paper likely discusses the design and implementation of the IoT-based system, highlighting its effectiveness in preventing tree-related crimes. By providing insights into the application of IoT in conservation efforts, the paper contributes to the evolving field of environmental protection and sustainable resource management.

The Author A Sonwane et.al.[6] in their work, they offer a strategic approach to combatting poaching through the implementation of a wireless sensor node system. The focus of the paper lies in the design and development of an innovative solution that leverages wireless sensor nodes to address the pervasive issue of wildlife poaching. The authors emphasize the integration of advanced communication and signal processing techniques to create an efficient and proactive anti-poaching system. The wireless sensor nodes play a pivotal role in monitoring and securing critical areas, detecting and transmitting alerts in real-time when suspicious activities are identified. The paper likely details the technical aspects of the sensor node design, discussing its functionality, reliability, and practical application in anti- poaching efforts. By presenting this work at an international conference, the authors contribute to the broader discourse on utilizing technology for wildlife conservation, demonstrating the potential impact of wireless sensor nodes in safeguarding against illegal activities targeting wildlife.

The Author S. Ishitha et al. [7] presents an IoT-based Anti-poaching and Fire Alarm System (IAFS) for forests. It utilizes temperature, smoke, and Light Dependent Resistors (LDR) sensors connected to an Arduino board to collect data. This data is relayed to the cloud, which continuously monitors for any intrusion and sends alert notifications to forest officials via SMS. The system aims to remotely monitor forest cover and detect poaching activities, providing officials with a more efficient means of protecting forests.

The Author K.Hegde et.al.[8]presents IoT-Based Anti-poaching Technology to Save Wildlife. It explores various modern technologies developed to prevent poaching of endangered wildlife species globally. The study examines different technological components used in anti-poaching instruments and highlights projects and systems aimed at preventing wildlife loss and alerting authorities of potential dangers. Statistical information on poaching rates of endangered species worldwide is provided, and a new sensor-based system is proposed, considering the advantages and limitations of existing projects.

The Author EV Kameswararao et.al.[9]presents an IoT-Based Anti-Poaching System for Trees and Forest Protection. It addresses the theft of valuable trees like sandalwood, lumber, teak, rosewood, and pinewood, which poses a significant threat to forest resources and ecosystems globally. The study proposes an anti-poaching system utilizing IoT and WSN technologies, employing sensors such as a tilt detector (for detecting tree cutting), fire and smoke detectors (for detecting forest fires), and a sound detector (for detecting tree cutting sounds). These technologies aim to prevent illegal logging and protect forests by enabling remote monitoring.

The Author K. Edemacu et.al.[10]discusses "Poacher Detection in African Game Parks and Reserves with IoT: Machine Learning Approach." It addresses the extinction of wildlife due to poaching practices, particularly in Africa, and proposes an IoT framework to combat this issue. The framework integrates machine learning for image analysis and classification to improve poacher detection. The trial implementation demonstrates the potential of IoT to enhance surveillance in game parks and reserves and effectively control poaching problems.

The Author I.Heyl et.al[11]presents a review and testing of fault tolerance levels of an Anti-Poaching Cybersecurity System. It discusses the development of anti-poaching networks and systems utilizing advanced technologies like heat sensors, drones, and trip wires to prevent poaching. Radio-frequency identification (RFID) systems are also employed to track animal locations. However, these networks are vulnerable to cyber-attacks if not properly protected. The paper explores common attacks by cyber-criminals on anti-poaching networks and evaluates their effectiveness in identifying weaknesses within the system. The study utilizes empirical methods and quantitative research to assess the fault tolerance levels of the RFID elements within the anti-poaching system.

The Author K Rani Rudrama et.al[12]discusses the Design and Analysis of an Anti-Poaching Alert System for Red Sandalwood Safety. It addresses the common occurrence of smuggling valuable trees like red sandalwood, posing significant threats to forest resources and ecosystems. The work presents a Wireless Sensor Network (WSN)-based microcontroller system capable of detecting theft and protecting forests from natural disasters by monitoring vibrations, location, smoke, and temperature. Sensors such as a three-axis MEMS accelerometer for tilt monitoring, a sound sensor for detecting vibrations, and a temperature sensor for wildfire detection are employed. The system also integrates a GPS module for precise location tracking and utilizes a microcontroller connected to a PC for data uploading. Additionally, temperature and smoke sensors trigger a water pump to tackle fires promptly, effectively reducing damage.

The Author JK Paul et.al[13]presents a low-cost unmanned aerial vehicle (UAV) for anti-poaching. It addresses the persistent threat to forest animals posed by poaching activities. The research aims to provide a feasible perspective on anti-poaching by leveraging technological advancements in the Internet of Things and Deep Learning. The solution utilizes UAVs as aerial robots capable of performing multiple tasks, including continuous monitoring for poaching activities. Advanced technical tools such as Raspberry Pi, Computer Vision, and Encryption are employed to tackle poaching effectively.

The Author KV Acharya et.al[14]presents an Anti-poaching Secure System for Trees in Forests. It addresses the significant reduction in the number of trees in forests, creating an unfavorable environment for wildlife survival. The paper proposes a system for tracking and protecting trees from human and fire incidents. Flame sensors are utilized to monitor and detect fires, while PIR sensors detect motion in the nearby surroundings and alert forest officials. The Surf algorithm is employed to differentiate between animal and human movements. This system aids forest officials in protecting trees from forest fires and poaching activities.

The Author C Perera et.al[15]discusses "Internet of Things for Efficient Wildlife Conservation: Challenges and Opportunities." It focuses on the Danau Girang Field Centre (DGFC) in Sabah, Malaysia, which is accessible only via the river, presenting unique challenges for research activities. The region's high humidity and jungle terrains pose risks to electronic components, requiring consideration when addressing challenges. The paper describes a two full-day workshop aimed at exploring research challenges addressable by IoT technologies. During the workshop, two major areas of focus were identified.

The Author E Ronoh et.al.[16] presents the "Development of an Early Warning System for Human-Wildlife Conflict Using Deep Learning, IoT, and SMS." It addresses the significant challenge of human-wildlife conflict, particularly in regions like the United Republic of Tanzania. The proposed system utilizes deep learning, IoT, and SMS to support response teams in mitigating these conflicts. The system comprises three units: sensing, processing, and alerting. The sensing unit includes a GPS module, a passive infrared sensor, and a Raspberry Pi camera to detect and record animal presence. The processing unit uses a Raspberry microcomputer to perform image inferencing with the YOLO algorithm. The alerting unit sends SMS alerts to response teams when animals are detected near park borders. The system aims to detect, identify, and report wildlife using SMS alerts, with internet connectivity for data collection and cloud storage. An online visualization system using Google Maps facilitates wildlife tracking by park rangers. Overall, the system is cost-effective and accessible to low-income communities.

2.2 Literature review summary

In the pursuit of environmental conservation and protection of endangered trees, the "IoT Approach for Anti-Plundering: Halting the Erasure of Endangered Trees" represents a pioneering effort. The study employs Internet Of Things (IoT) technology to create a comprehensive system aimed at preventing unauthorized activities such as tree plundering. Utilizing a network of interconnected devices and sensors, the system provides real-time monitoring and alert mechanisms to safeguard endangered trees. The integration of IoT enables effective data collecting, enabling the system to detect and respond promptly to potential threats.

Existing journals available online contribute valuable insights to the field of IoT-based anti-plundering systems. By reviewing relevant literature, one can gain a more thorough comprehension of the technological advancements, challenges, and possible remedies related to maintaining endangered trees. Journals covering topics such as environmental monitoring, IoT applications in conservation, and sustainable development are likely to provide pertinent information. Furthermore, exploring case studies and research articles in reputable journals can enhance the understanding of successful implementations and guide future endeavors in the ongoing battle against the erasure of endangered trees.

2.3 Existing System

The existing system consists of Camera Surveillance, Satellite Monitoring, Drones, IoT based Anti-poaching alarm system.

Drawbacks:

- Setting up cameras in vulnerable areas to monitor and capture activities, but this may be limited by the camera’s field of view and the need for regular maintenance.
- Utilizing satellite imagery for large-scale monitoring, although this can be expensive and might not provide real-time data.
- Making use of unmanned aerial vehicles aerial surveillance, offering flexibility and real- time monitoring but with limitations in terms of battery life and coverage.
- Involves real time alarm system whenever poaching is about to be done but, this model doesn’t provide real time location of the tree.

2.4 Problem Statement

The persistent menace of poaching and illegal logging poses an imminent threat to the survival of rare and invaluable tree species. This destructive practice not only undermines biodiversity but also jeopardizes entire ecosystems, disrupting delicate environmental balances. The illicit trade in rare trees contributes to deforestation, exacerbating the global ecological crisis. Beyond ecological ramifications, the loss of these unique trees hampers scientific research and potential medical discoveries, as many of these species possess undiscovered medicinal properties. Urgent and concerted efforts are imperative to combat poaching and illegal logging, incorporating robust conservation measures, international cooperation, and public awareness campaigns to safeguard these vital components of our planet's biodiversity

2.5 Proposed System

The main idea presented in this Project is to create a portable wireless sensor model that will be a component of a wireless sensor network is the core idea behind this project. The proposed system will be composed of two modules: an Android phone module and a sensor and controller module that will be located at a tree site. We are proposing an application which will continuously receive sensor data. This is an IOT based project where we upload sensor data continuously to mobile. Accelerometer sensor is used to determine whether the tree is cut down or not similarly temperature sensor is used to determine whether the forest is on fire or not. Using built application, we can turn on alarm other devices in smuggling case. This system is like from anywhere we can monitor and control by using GSM Technology. Which will convey the message from monitor station to the control station vice versa using wireless technology. By using GPS, we can get a real time Location.

2.6 Objectives

- To create a wireless portable sensor device consisting of sensor modules and a controller module, which will be placed at the tree spot, and monitoring done through Android phone.
- To notify an alarm system using an accelerometer sensor, temperature sensor, LCD, LED, buzzer, and to activate the alarm during emergencies.
- To develop a system that monitors and is controlled using GSM technology, conveying messages between the monitoring system and the control system in both directions.
- To monitor and capture the activities by obtaining the real time to monitor location by using GPS.

CHAPTER 3

SYSTEM REQUIREMENTS AND SPECIFICATION

3.1 Software Requirements:

Operating System	Windows 10
Coding Language	Embedded C
Tools	Arduino IDE and Blynk App

3.2 Hardware Requirements:

Micro-Controllers	Arduino UNO, Node MCU ESP8266
Sensors	DHT11 Temperature and Humidity sensor, Accelerometer MPU6050, Ultrasonic sensor
Internet access	Yes
Battery	12volt battery
Board	PCB Board
Display	LCD
GPS chip	NEO-6M

CHAPTER 4

SYSTEM DESIGN

4.1 Methodology

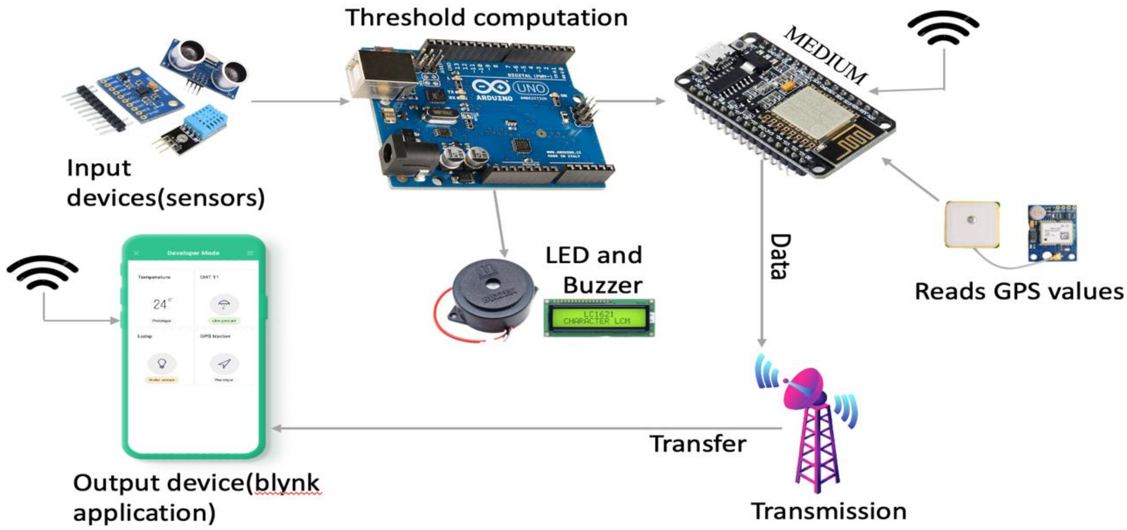


Fig 4.1.Methodology

Fig 4.1 describes the hardware setup involves the intricate interconnection on components to establish a robust monitoring infrastructure.

The "IOT approach for Anti-Plundering: Halting the erasure of Endangered trees " project aims to address the critical issue of illegal logging and protect endangered trees through an integrated system. The methodology encompasses a multifaceted approach, utilizing a combination of hardware components and advanced technologies. The central components include a 12V battery power supply, Node MCU ESP8266 for wireless connectivity, LED Buzzer, Ultrasonic theft detection, MPU 6050 accelerometer for motion sensing, Arduino UNO as the main controller, LCD for on-site display, and DHT11 Temperature and humidity sensor for environmental monitoring. The holistic nature of this system allows for comprehensive surveillance, ensuring the safety of endangered trees.

The hardware setup involves the intricate interconnection of components to establish a robust monitoring infrastructure. The Arduino UNO serves as the brain of the operation, orchestrating data collection and processing from the Ultrasonic sensor, MPU 6050 accelerometer, LCD, and DHT11 sensor. The Ultrasonic sensor is strategically employed for proximity-based theft detection, while the MPU 6050 accelerometer detects abnormal vibrations or movements that may indicate unauthorized activity. The DHT11 sensor monitors the environmental conditions around the tree, adding an additional layer of protection by triggering alerts for unfavorable changes in temperature or humidity. The Node MCU ESP8266 facilitates wireless communication, enabling real-time data transmission to the Android app.

To enhance on-site security, an LED and Buzzer system has been incorporated, serving as immediate visual and audible alerts in response to potential threats. The alert patterns are customized based on the severity of detected incidents, ensuring that the response is proportional to the perceived risk. The interconnectedness of these components forms a cohesive hardware framework designed to thwart illegal activities and protect endangered trees effectively.

The Android app, developed using the Blynk application, complements the hardware system by providing users with remote control and monitoring capabilities. Users can activate the LED and Buzzer remotely through the app, providing a deterrent effect and alerting nearby individuals to potential threats. Additionally, the app incorporates a tracking facility, allowing users to monitor the location of the protected trees in real-time. This adds a layer of transparency and accountability to the system, enabling efficient response to incidents.

Throughout the project, rigorous testing and calibration procedures are implemented to ensure the reliability and accuracy of the system. User training and comprehensive documentation accompany the deployment phase, empowering users to effectively operate and maintain the anti-plundering system. Continuous improvement remains a focal point, with regular feedback loops and updates to the system based on emerging technologies and user insights, ensuring the sustained effectiveness of the project in halting the erasure of endangered tress.

4.2 Architecture and Flowchart

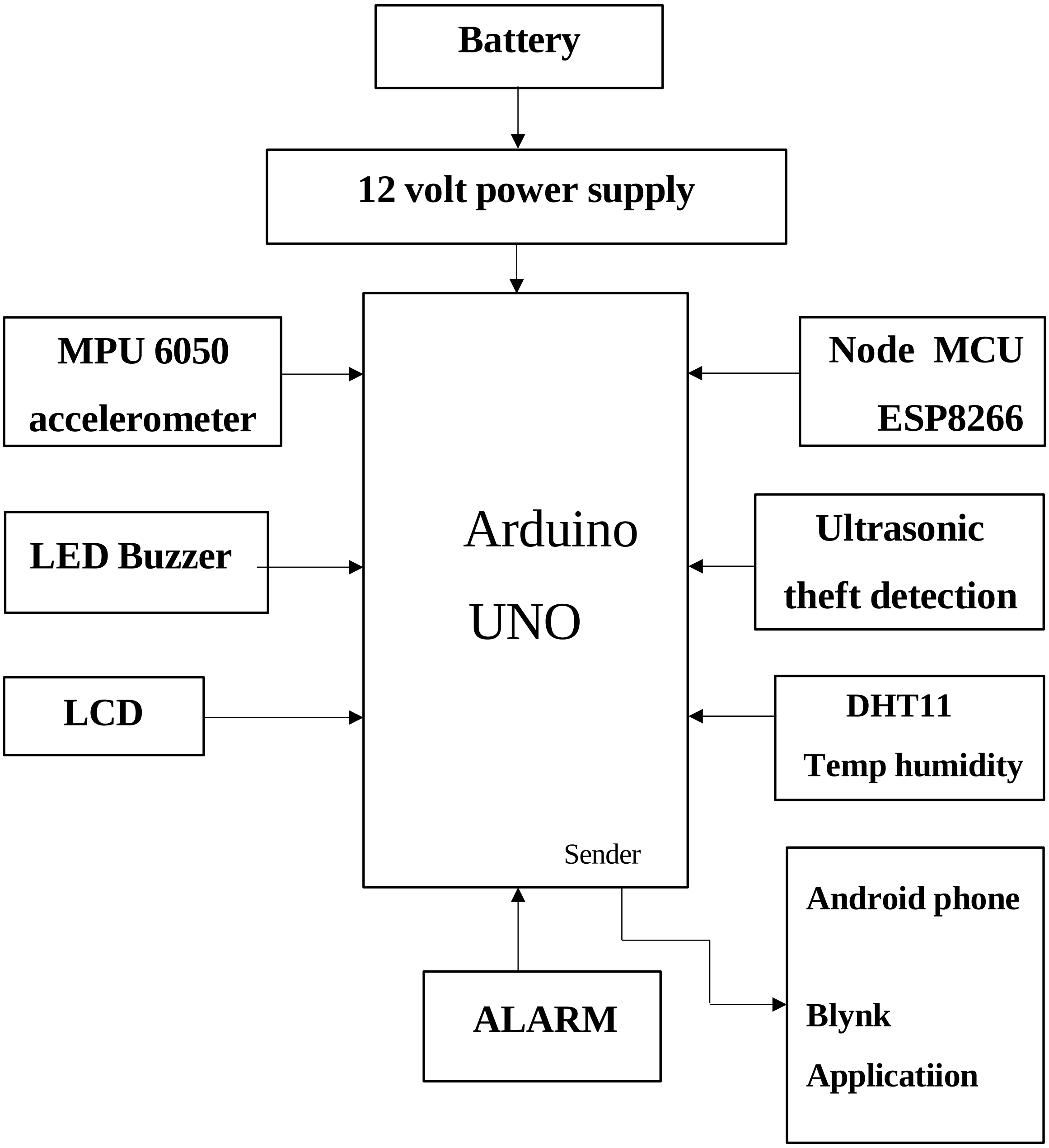


Fig 4.2.1. Anti Plundering tree Architecture

Fig 4.2.1 explains the architecture of Anti-Plundering system where the Arduino UNO serves as the brain of the operation, MPU 6050 accelerometer, LCD, and DHT11 sensor. The Ultrasonic sensor is strategically employed for proximity-based theft detection, while the MPU 6050 accelerometer detects abnormal vibrations or movements that may indicate unauthorized activity. The DHT11 sensor monitors the environmental conditions around the tree. The Node MCU ESP8266 facilitates wireless communication, enabling real-time data transmission to the Android app.To enhance on-site security, an LED and Buzzer system has been incorporated.

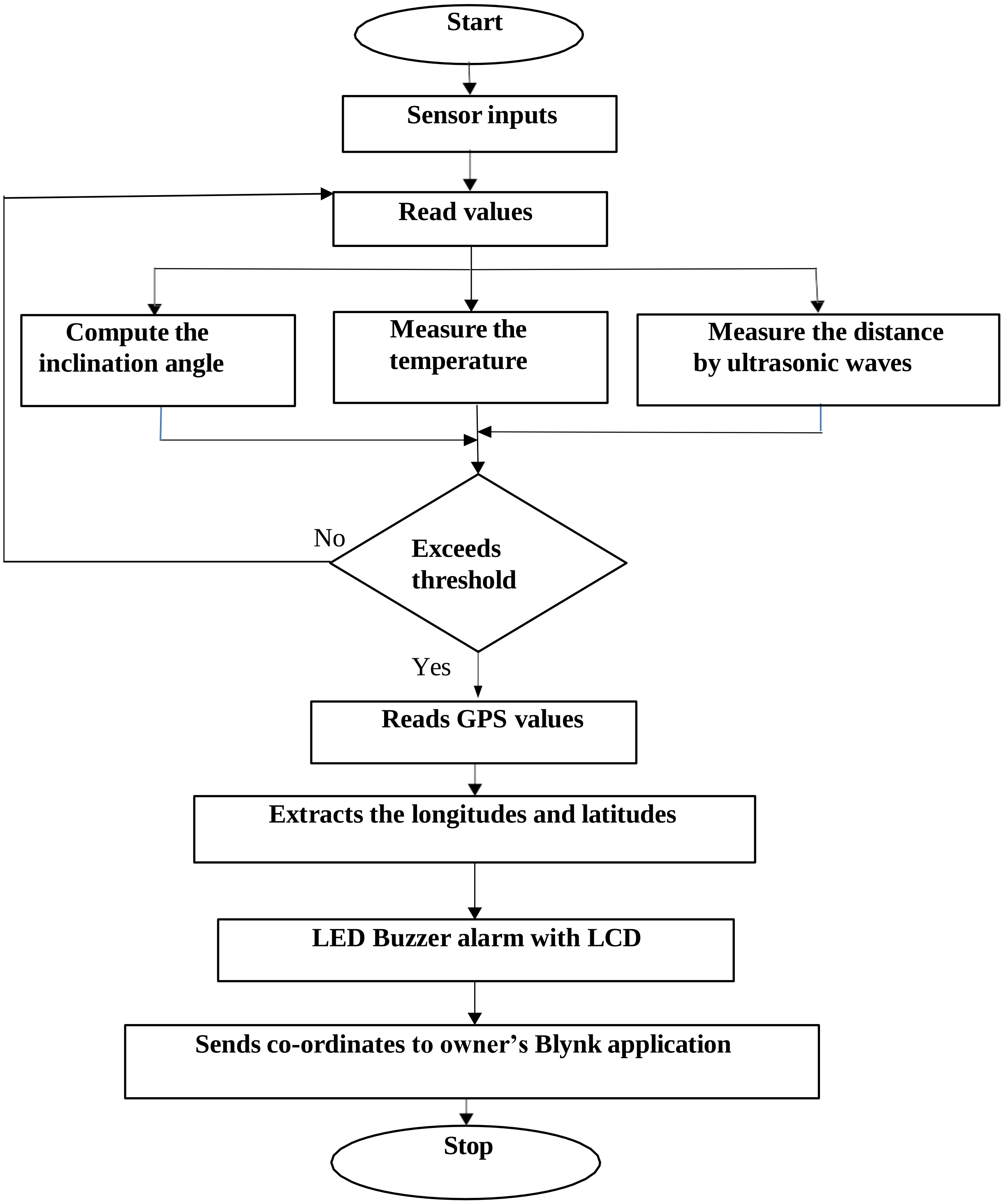


Fig.4.2.2. Flow chart of Anti plundering trees

In Fig 4.2.2, the flow chart illustrates the journey of data from input sensors to the Blynk Application. Sensors take input, read values, compute the inclination angle, measure the temperature, and gauge distance using ultrasonic waves. If any measurement exceeds the threshold, the model reads the GPS values, extracting longitudes and latitudes, then displays theft detection and triggers an alarm buzzer for alerts. The data sends alert messages and coordinates to the Blynk Application.

4.3 Circuit Diagram

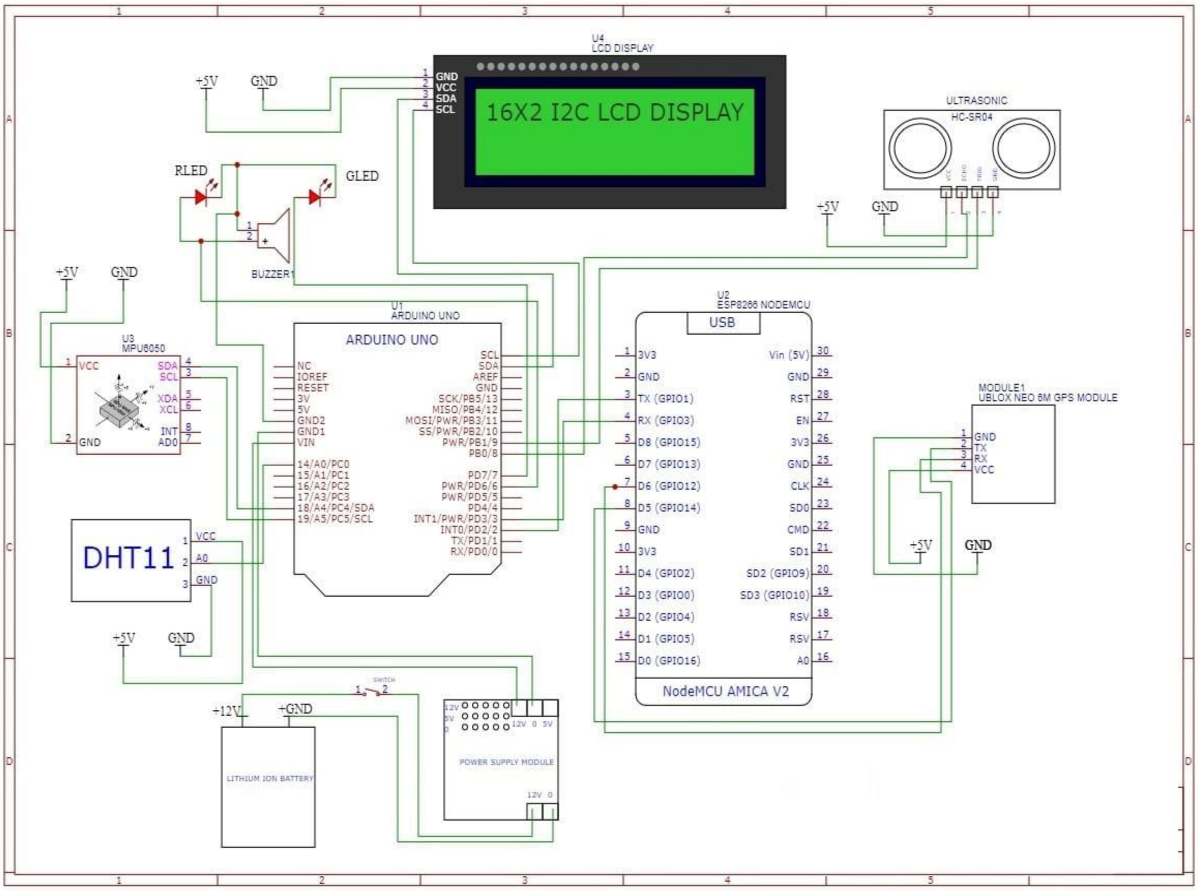


Fig.4.3. Circuit Diagram

The Fig 4.3 circuit diagram appears to be a complex system combining an Arduino Uno board, an LCD display, several sensors, and potentially other electronic modules . It seems like the model is designed to collect and display data from various environmental sensors. Here's a breakdown of the possible components and their connections:

- **Arduino Uno:** This is a microcontroller board at the center of the circuit. It's a popular platform for hobbyists and educators to build electronic projects due to its ease of use.
- **LCD Display (16x2):** The 16x2 LCD display is likely connected to the Arduino. It can show up to 16 characters per line and has 2 lines. This display helps visualize the sensor data collected by the Arduino.
- **Sensors:** The circuit seems to include several sensors. It's difficult to determine the exact types from the image, but some possibilities include:

  - o Ultrasonic Sensor (HC-SR04): This sensor uses sound waves to measure distance.
  - o DHT11 Temperature and Humidity Sensor: This sensor can measure both temperature and humidity.

- MPU6050 Accelerometer and Gyroscope: This sensor can measure acceleration and orientation.

4.4 Sequence Diagram

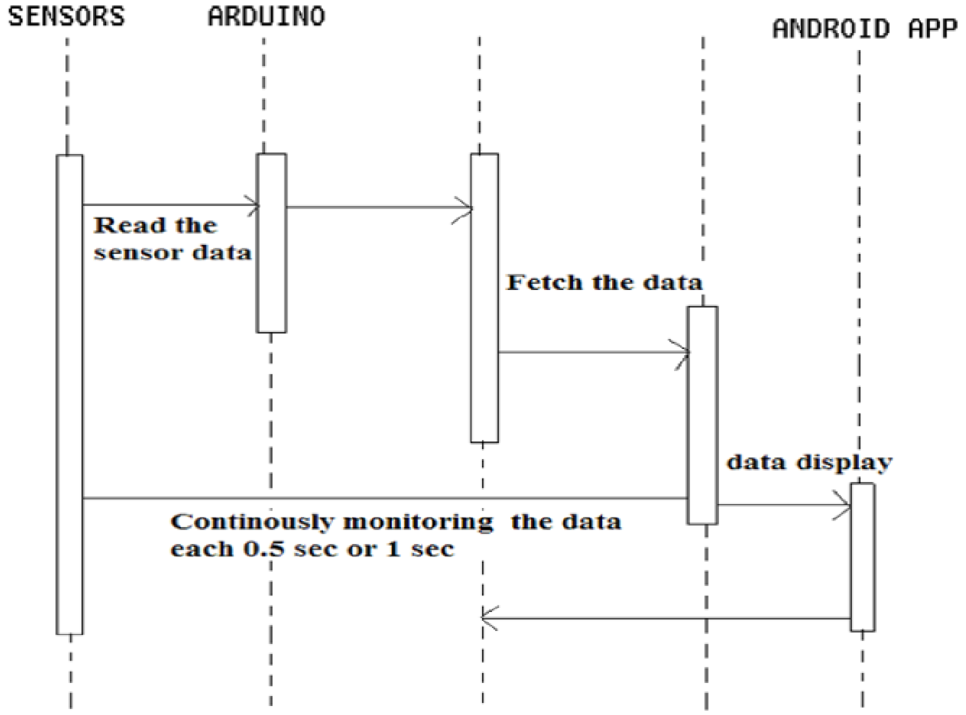


Fig 4.4.Sequence Diagram

Sequence diagram are an easy and intuitive way of describing the behaviour of a system by viewing the interaction between the system and the environment. A sequence diagram shows an interaction arranged in a time sequence. A sequence diagram has two dimensions: vertical dimension represents time, the horizontal dimension represents the objects existence during the interaction. Basic elements:

• Vertical rectangle: Represent the object is active (method is being performed).

• Vertical dashed line: Represent the life of the object.
• X: represent the life end of an object. (Being destroyed from memory)

• Horizontal line with arrows: Messages from one object to another.

CHAPTER 5

IMPLEMENTATION

5.1 Installation steps

How to get started with Arduino UNO?

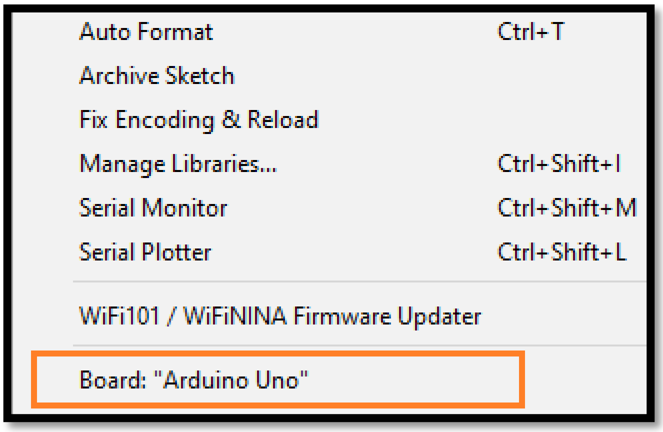
With the Arduino IDE, we can programme the Arduino UNO. The Integral Development programme, or Arduino IDE, is shared by all the boards.

Additionally, we have access to the Arduino Web Editor, which enables us to upload sketches and write code directly to any Arduino Board using a web browser (Google Chrome is suggested). It's a digital platform.

For the computer and board to be connected, a USB connection is required. The PWR pins will become green following the hookup. It's an LED with green power.

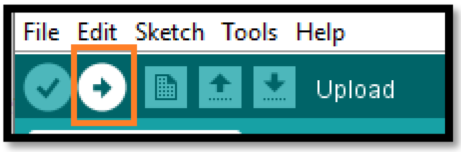
The steps to get started with Arduino UNO are listed below:

1. Install the drivers of the board.
2. As soon we connect the board to the computer, Windows from XP to 10 will automatically install the board drivers.
3. But, if you have expanded or downloaded the zip package, follow the below steps:
   1. Click on Start -> Control Panel -> System and Security.
   2. Click on System -> Device Manager -> Ports (COM &LPT) -> Arduino UNO (COMxx). If the COM &LPT is absent, look Other Devices -> Unknown Device.
   3. Right-click to Arduino UNO (COmxx) -> Update Driver Software -> Browse my computer for driver software.
   4. Select the file "inf" to navigate else, select "ArduinoUNO.inf" .
   5. Installation Finished.
      - Open the code or sketch written in the Arduino software.
      - Select the type of board. Click on 'Tools' and select Board, as shown below:



- Select the port. Click on the Tools -> Port (select the port). The port likely will be COM3 or higher. For example, COM6, etc. The COM1 and COM2 ports will not appear, because these two ports are reserved for the hardware serial ports.
- Now, upload and run the written code or sketch.

To upload and run, click on the button present on the top panel of the Arduino display, as shown below:



Within the few seconds after the compile and run of code or sketch, the RX and TX light present on the Arduino board will flash.

The 'Done Uploading' message will appear after the code is successfully uploaded. The message will be visible in the status bar.

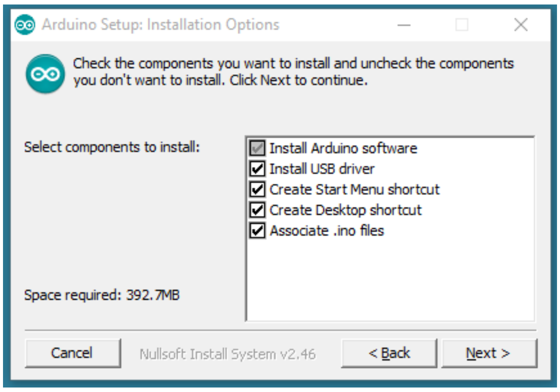
1. Microcontroller: Microcontroller is the central processing unit of Arduino Uno.
2. Digital Pins: There are 14 digital pins on Arduino Uno which can be connected to components like LED, LCD, etc.
3. Analog Pins: There are 6 analog pins on the Uno. These pins are generally used to connect sensors because all the sensors generally have analog values. Most of the input components are connected here.
4. Power Supply: The power supply pins are IOREF, GND, 3.3V, 5V, Vin are used to connecting sensors because all the sensors generally have analog values. Most of the input components are connected here.
5. Power Jack: Uno board can be powered both by external supply and via USB cable.

6. USB Port: This port function is to program the board or to upload the program. The program can be uploaded to the board with the help of Arduino IDE and USB cable.
7. Reset Button: This is used to restart the uploaded program.

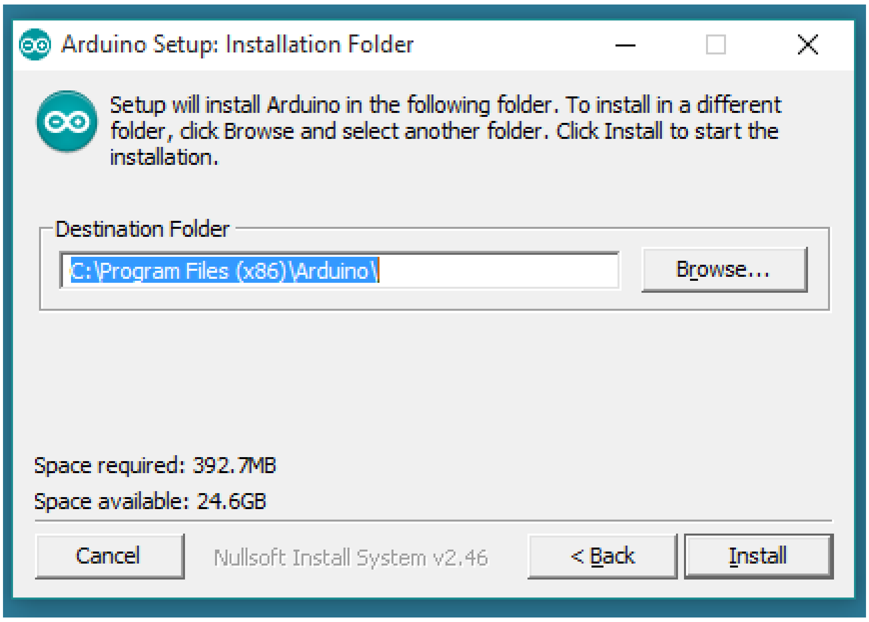
The Software Arduino IDE

- The Arduino software or the Arduino IDE can be downloaded either via Arduino official site or you can download the latest version here. There are two ways to install IDE. One is via automatic installer which is a .exe file another is via zip files. We suggest you install the Arduino IDE via the installer as it automatically installs all the required drivers to run. In zip files, you will have to install everything manually. After the download, please allow automatic driver installation and give administrative permissions if required.

- Choose which parts you want to install. (recommendation default selection)



- Select the folder in which you want to install



How to upload code to Arduino board from Software (IDE)

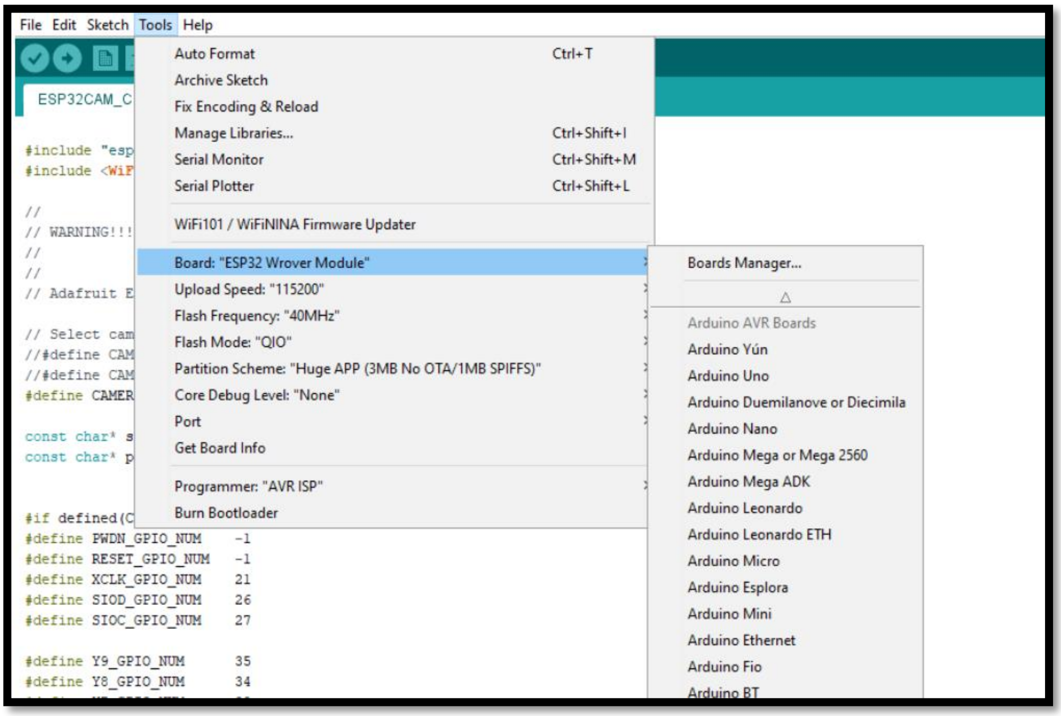
1. Connect your Arduino to the computer via USB cable. The end of the USB cable which is a USB type B 2.0 connects to your Arduino and the USB type A 2.0 connects to a USB port on your computer.

2. Choose Tools→Board→Arduino Uno to find your Arduino board in the menu. You can find all Arduino boards in this menu, such as the Arduino MEGA 2560 and Arduino Leonardo.

3. Select the proper serial port for your USB cable. You can easily find the serial port by going to Tools→Serial Port→ com port. X is a randomly assigned number. In a Windows PC, if you have just connected your Arduino, the COM port will normally be the highest number, such as com 3 or com 15 etc. if you are connecting many devices to your computer use then your next com port for that device will be higher.

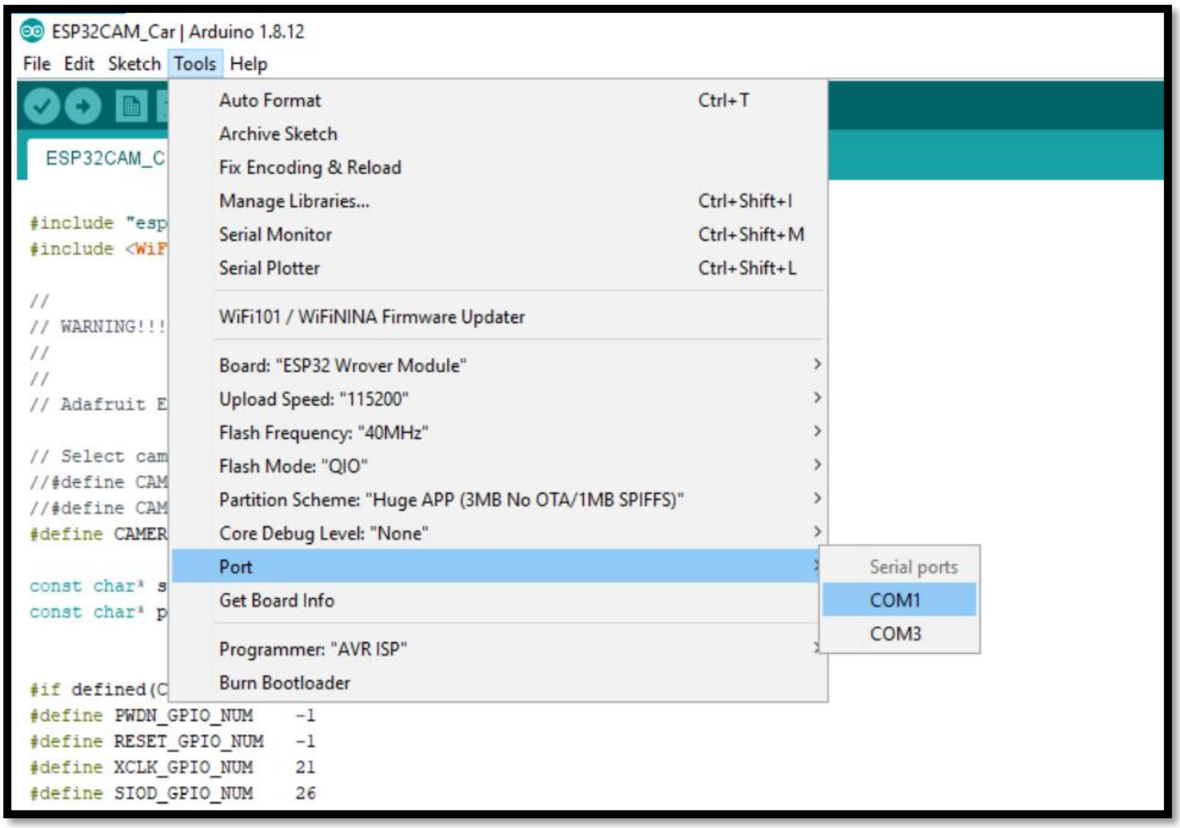
4. Click the Upload button. This button is located on the upper left side. You can also use the keyboard shortcut Ctrl+U for Windows or Cmd+U for Mac OS X.

Step 1: Make sure you have selected the right Arduino board



Step 2: Uninstall third-party firewall and antivirus apps

1. There is some third-party firewall software that blocks the serial connection, you may have to uninstall those third-party firewall apps. To do this, open the Run by pressing Windows + R key on your keyboard.
2. Enter appwiz.cpl in the text box to open the programs and features window.
3. Search for any third-party firewall or antivirus and uninstall them.
4. Choose the Uninstall option, click yes to confirm if the dialog box appears.
5. Step 3: Make sure you have selected to right COM port
6. You'll also need to have the right port to upload programs. Click Tools to open that menu.
7. Select Ports to open the submenu below.
8. Now select the correct COM port for your Arduino board. Usually.



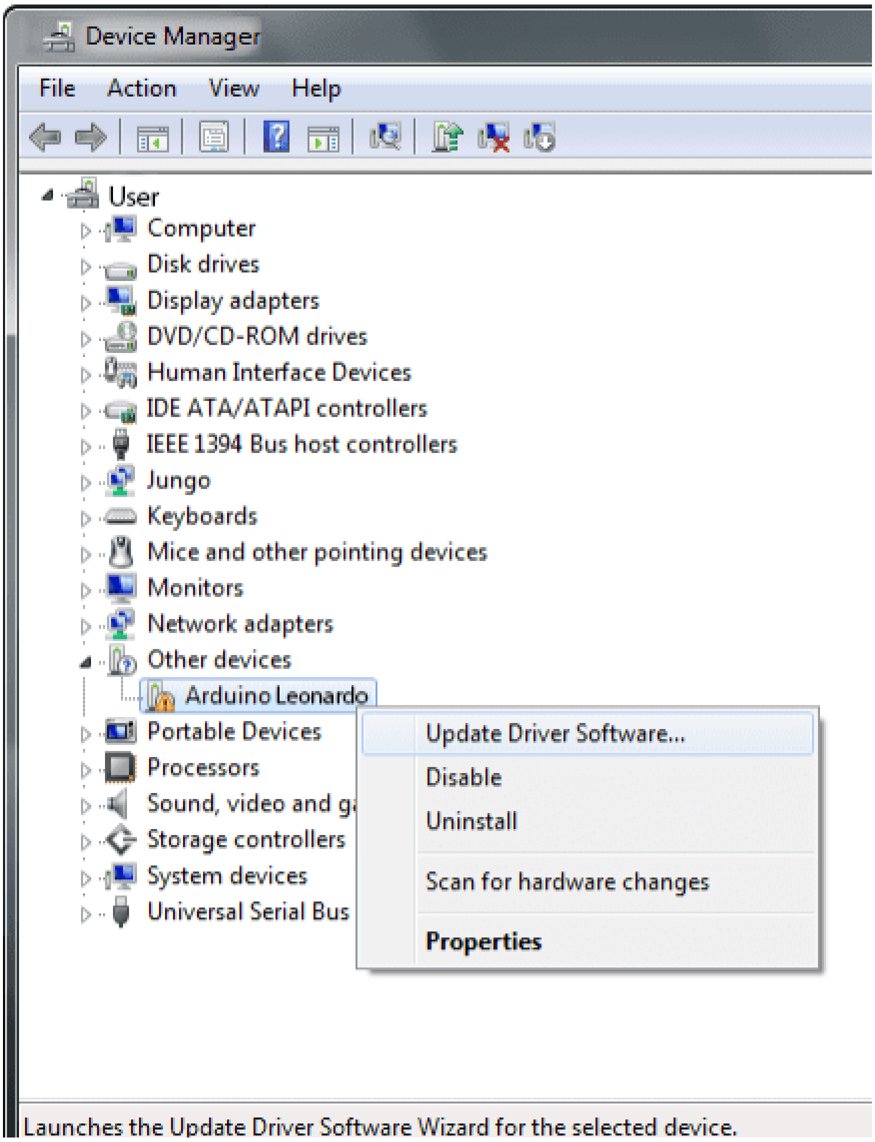
Step 4: Try connecting the board with another USB cable

- To successfully upload the code to an Arduino board, the USB cable must allow serial communication. For example, charging cables do not allow serial communication. So a charging cable cannot be used to upload the code to an Arduino board. Charging + data transfer cable is required to upload code.

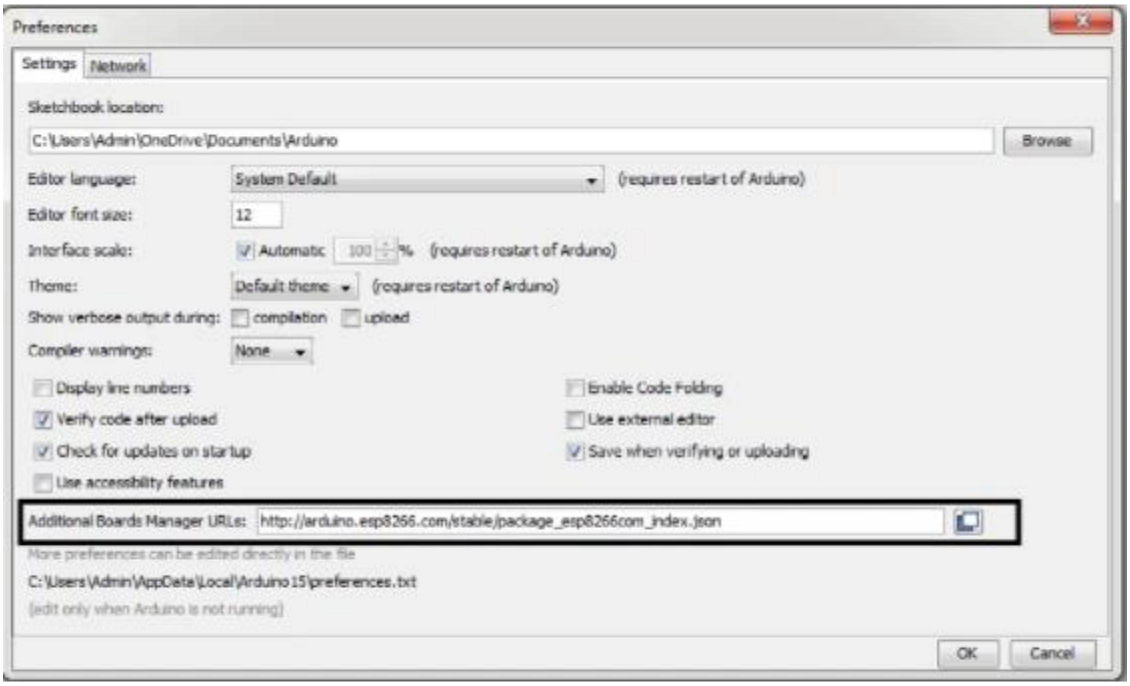
Step 5: Unplug all the pins from the board

- Some users have been told that unplugging all the pins from the Arduino board solves the issue of upload errors. There is no way to understand fully why that happens but a lot of people have reported the same solution. Especially with the HC-05 Bluetooth module. The code cannot be uploaded when the Tx and Rx pins are connected to the Arduino board. that One must unplug those pins in order to upload the code successfully.

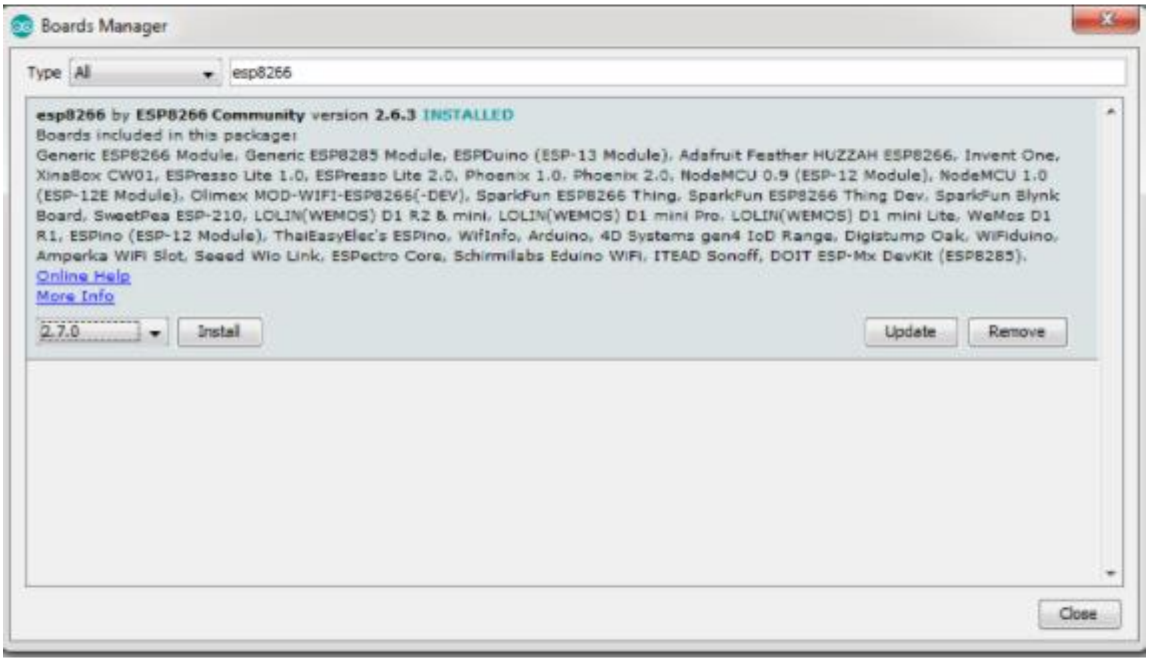
- Step 6: Install all the Arduino drivers
- Program upload errors can arise when there is a problem with the drivers. If a driver is not installed then problems may occur during the uploading of code.



- Open run by pressing windows + R key and type devmgmt.msc, and press the OK button.
- Click Other devices to expand that category.
- Under the other devices section, If there's an exclamation mark for your Arduino device, then right-click on it and select Update driver software.
- There will be a Browse my computer for driver option. Select it.
- Click the Browse button.
- Click the Next button to proceed.
- Click the Continue Anyway button.
- Step 7: Reset the Arduino board
- If nothing works, then finally try to reset the Arduino board. There is a red button situated right beside the USB port. When you press that switch, the yellow LED light on the board should blink. If the board is not resetting even after pressing the reset button a couple of times, then you might need to burn the bootloader to it. The Bootloader page on the official Arduino website gives further details for how users can do that.
- These are some of the solutions to various different kinds of uploading errors on Arduino Uno. Users who have fixed other Arduino errors with alternate solutions are welcome to specify what issue they had and what solution worked for them in the comments section below.
- How to upload programs on to ESP8266 from Arduino IDE
- Firstly, you need to download the Arduino IDE. If you already have installed then it is ok. Otherwise you can download the Arduino IDE from here.
- Now open the IDE and follow this path. File -> preferences -> Additional board manager URL.
- Now paste the URL in the dialog box : http://arduino.esp8266.com/stable/package_esp8266com_index.json



- Now follow this path. Tools -> Board -> Boards Manager
- Now in the search bar, type esp. There will be esp8266 listed in the boards below. Download and install the latest version for you Arduino IDE.



- After the installation is complete, open Tools -> Board-> Select the NodeMCU 1.0
- Now your board is installed and selected. There are various settings which can be changed right from the IDE now.
- You can now upload the code to NodeMCU right from the Arduino IDE.

5.2 Code

5.2.1 NodeMCU Code

```
#define BLYNK_TEMPLATE_ID "TMPLoZiLx5Lf"
#define BLYNK_DEVICE_NAME "ANTIPROACHING TREE"
#define BLYNK_AUTH_TOKEN "TKbZ6fPx-ZGcnP0Us0rCJxMIHswk66o2"
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <SoftwareSerial.h>

char auth[] = "TKbZ6fPx-ZGcnP0Us0rCJxMIHswk66o2";
char ssid[] = "PROJECT";
char pass[] = "DEMO2024";

String myString; // complete message from arduino, which consistors of snesors data
char rdata; // received charactors

int t,h,accelerometer_x,accelerometer_y,accelerometer_z,distance;

BlynkTimer timer;
void setup()
{
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  //timer.setInterval(1000L, sensorvalue);
}
void loop()
{
```

```
 if (Serial.available())
 {
Blynk.run();
 }
if (Serial.available())
{
  rdata = Serial.read();
  myString = myString+ rdata;
  if( rdata == '\n')
  {
 String l = getValue(myString, ',', 0);
 String m = getValue(myString, ',', 1);
 String n = getValue(myString, ',', 2);
 String o = getValue(myString, ',', 3);
 String p = getValue(myString, ',', 4);
 String q = getValue(myString, ',', 5);
 t= l.toInt();
h= m.toInt();
accelerometer_x= n.toInt();
accelerometer_y= o.toInt();
accelerometer_z= p.toInt();
distance= q.toInt();
    myString = "";
Serial.print("NT=");
Serial.print(t);
Serial.println();
Serial.print("NH=");
Serial.println(h);
Serial.println();
Serial.print("NAX=");
Serial.println(accelerometer_x);
```

```
Serial.println();
Serial.print("NAY=");
Serial.println(accelerometer_y);
Serial.println();
Serial.print("NAZ=");
Serial.println(accelerometer_z);
Serial.println();
Serial.print("NDIS=");
Serial.println(distance);
Serial.println();
Blynk.virtualWrite(V0, t );
Blynk.virtualWrite(V4, h);

//---------BLYNK STRING----------//
if(t>38)
{
  Blynk.virtualWrite(V3, "ALERT FIRE DETECTED...");
  }
else
{
  Blynk.virtualWrite(V3, "NO FIRE DETECTED");
  }

if(distance>10)
{
  Blynk.virtualWrite(V1, "ALERT THEFT DETECTED");
  delay(5000);
  }
else
{
  Blynk.virtualWrite(V1, "NO THEFT DETECTED");
```

```
  }
if(accelerometer_x>4000)
    {
      Blynk.virtualWrite(V2, "ALERT TREE IS CUTTING");
      delay(5000);
    }
else
{
  Blynk.virtualWrite(V2, "TREE IS SAFE");
  }

if(accelerometer_x<-4000)
   {
      Blynk.virtualWrite(V2, "ALERT TREE IS CUTTING");
      delay(5000);
    }
else
{
  Blynk.virtualWrite(V2, "TREE IS SAFE");
  }
if(accelerometer_y>4000)
   {
      Blynk.virtualWrite(V2, "ALERT TREE IS CUTTING");
      delay(5000);
    }
else
{
  Blynk.virtualWrite(V2, "TREE IS SAFE");
  }
```

```
if(accelerometer_y<-4000)
   {
      Blynk.virtualWrite(V2, "ALERT TREE IS CUTTING");
      delay(5000);
    }
else
{
  Blynk.virtualWrite(V2, "TREE IS SAFE");
  }
if(accelerometer_z<13000)
   {
      Blynk.virtualWrite(V2, "ALERT TREE IS CUTTING");
      delay(5000);
    }
else
{
  Blynk.virtualWrite(V2, "TREE IS SAFE");
  }

if(accelerometer_z<13000)
   {
      Blynk.virtualWrite(V2, "ALERT TREE IS CUTTING");
      delay(5000);
    }
else
{
  Blynk.virtualWrite(V2, "TREE IS SAFE");
  }
//---------EVENT LOG----------//
if(t>38)
{
```

```
  Blynk.logEvent("fire","Fire Detected");
  }

if(distance>10)
{
  Blynk.logEvent("open","Theft Detected");
  }

  }
}

}

String getValue(String data, char separator, int index)
{
    int found = 0;
    int strIndex[] = { 0, -1 };
    int maxIndex = data.length() - 1;

    for (int i = 0; i <= maxIndex && found <= index; i++) {
        if (data.charAt(i) == separator || i == maxIndex) {
            found++;
            strIndex[0] = strIndex[1] + 1;
            strIndex[1] = (i == maxIndex) ? i+1 : i;
        }
    }
    return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}
```

5.2.2 ARDUINO Code

```
#include <LiquidCrystal_I2C.h>
#include <SoftwareSerial.h>
#include <Wire.h>
#include <SPI.h>
#include "DHT.h"
#include "Wire.h"
#define DHT_A_TYPE DHT11
#define DHTP A0
DHT dht(DHTP, DHT_A_TYPE);
LiquidCrystal_I2C lcd(0x27, 16, 2);
SoftwareSerial espSerial(2,3); //tx,rx

const int MPU_ADDR = 0x68;
const int trigPin = 11;
const int echoPin = 10;
long duration;
int distance;

#define GLED 12
#define RLED 13
String cdata;
void setup()
{
  Serial.begin(115200);
```

```
  dht.begin();
  espSerial.begin(9600);
  Wire.begin();
  Wire.beginTransmission(MPU_ADDR);
  Wire.write(0x6B);
  Wire.write(0);
  Wire.endTransmission(true);
  pinMode(DHTP, INPUT);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(GLED, OUTPUT);
  pinMode(RLED, OUTPUT);
  lcd.begin();
  lcd.backlight();
  lcd.print("ANTI-PLUNDERING");
  lcd.setCursor(0, 1);
  lcd.print("BIET COLLEGE DVG");
  delay(4000);
  lcd.clear();
}
void loop()
{
  //--------TEMP---------------//
  int h = dht.readHumidity();
  int t = dht.readTemperature();
//  Serial.print("HUM: ");
```

```
//  Serial.println(h);
//  Serial.print("TEMP: ");
//  Serial.println(t);
  lcd.setCursor(0, 0);
  lcd.print("T:");
  lcd.setCursor(2, 0);
  lcd.print(t);
  lcd.setCursor(5, 0);
  lcd.print("H:");
  lcd.setCursor(7, 0);
  lcd.print(h);
//--------MPU---------------//
  Wire.beginTransmission(MPU_ADDR);
  Wire.write(0x3B);
  Wire.endTransmission(false);
  Wire.requestFrom(MPU_ADDR, 7*2, true);

  int accelerometer_x = Wire.read()<<8 | Wire.read();
  int accelerometer_y = Wire.read()<<8 | Wire.read();
  int accelerometer_z = Wire.read()<<8 | Wire.read();

//  Serial.print("aX = "); Serial.print(accelerometer_x);
//  Serial.print(" | aY = "); Serial.print(accelerometer_y);
//  Serial.print(" | aZ = "); Serial.print(accelerometer_z);
//  Serial.println();
```

```
lcd.setCursor(0, 1);
lcd.print("ST:");

if(accelerometer_x>4000)
  {
    lcd.setCursor(3, 1);
    lcd.print("Tree..Cutting");
    digitalWrite(RLED, HIGH);
    digitalWrite(GLED, LOW);
    delay(5000);
  }
else if(accelerometer_x<-4000)
 {
    lcd.setCursor(3, 1);
    lcd.print("Tree..Cutting");
    digitalWrite(RLED, HIGH);
    digitalWrite(GLED, LOW);
    delay(5000);
  }
 else if(accelerometer_y>4000)
 {
    lcd.setCursor(3, 1);
    lcd.print("Tree..Cutting");
    digitalWrite(RLED, HIGH);
    digitalWrite(GLED, LOW);
    delay(5000);
```

```
 }
else if(accelerometer_y<-4000)
{
  lcd.setCursor(3, 1);
  lcd.print("Tree..Cutting");
  digitalWrite(RLED, HIGH);
  digitalWrite(GLED, LOW);
  delay(5000);
 }
else if(accelerometer_z<13000)
{
  lcd.setCursor(3, 1);
  lcd.print("Tree..Cutting");
  digitalWrite(RLED, HIGH);
  digitalWrite(GLED, LOW);
  delay(5000);
 }
else if(accelerometer_z<13000)
{
  lcd.setCursor(3, 1);
  lcd.print("Tree..Cutting");
  digitalWrite(RLED, HIGH);
  digitalWrite(GLED, LOW);
  delay(5000);
 }
else
```

```
    {
     lcd.setCursor(3, 1);
     lcd.print("Tree..Safe....");
     digitalWrite(RLED, LOW);
     digitalWrite(GLED, HIGH);
     }

//--------ULTRASONIC---------------//

  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.034 / 2;

//  Serial.print("distance:");
//  Serial.println(distance);

  lcd.setCursor(10, 0);
  lcd.print("AT:");
if(distance > 10)
    {
     digitalWrite(RLED, HIGH);
     digitalWrite(GLED, LOW);
```

```
     lcd.setCursor(13, 0);
     lcd.print("OPN");
     delay(5000);
   }
 else
 {
   digitalWrite(RLED, LOW);
   digitalWrite(GLED, HIGH);
   lcd.setCursor(13, 0);
   lcd.print("CLS");

 }

 if(t > 38)
    {
   digitalWrite(RLED, HIGH);
   digitalWrite(GLED, LOW);
   }
 else
 {
   digitalWrite(RLED, LOW);
   digitalWrite(GLED, HIGH);
 }

if(espSerial.available())
  {
```

```
Serial.print("NT=");

Serial.print(t);

Serial.println();


 Serial.print("NH=");

 Serial.println(h);

 Serial.println();


 Serial.print("NAX=");

 Serial.println(accelerometer_x);

 Serial.println();


 Serial.print("NAY=");

 Serial.println(accelerometer_y);

 Serial.println();


 Serial.print("NAZ=");

 Serial.println(accelerometer_z);

 Serial.println();


 Serial.print("NDIS=");

 Serial.println(distance);

 Serial.println();

 cdata = cdata
t+","+h+","+accelerometer_x+","+accelerometer_y+","+accelerometer_z+","+distance;

 Serial.println(cdata);

 espSerial.println(cdata);
```

```
    delay(1000); // 100 milli seconds
    cdata = "";
  }

}
```

CHAPTER 6

SYSTEM TESTING

6.1 Test Cases according to Standard Format

The purpose of testing is to find bugs. The purpose of testing is to find possible flaws or flaws in the product's performance. Provides a method to evaluate the performance of parts, subass emblies, assemblies and/or end products. It is the process of testing the software to ensure that it meets customer needs and expectations and does not fall into the rejection trap. There are many different types of tests. Each type of testing focuses on specific tests.

TYPES OF TESTING

UNIT TESTING

Unit evaluation involves creating cases to ensure that internal processes are working properly and that the program's design strategies are valid. All branch decisions and internal policies m ust be verified. It is the testing of every software application. This is an evaluation model base d on knowledge of its structure and impact. Unit testing performs basic testing and evaluation of business processes, applications, and/or configurations. The testing unit ensures that each s pecific method of the business process is executed according to the specified data and has clea r instructions and desired results.

INTEGRATION TESTING

Combination testing is designed to test a combination of components to determine whether they work as planned. Evaluation is results oriented and is more about results on the screen or in the field. Combination testing indicates that the combination of ingredients is correct and consistent when the ingredients work satisfactorily (as the test results show). Combination testing is specifically designed to uncover problems caused by the combination of components.

FUNCTIONAL TESTING

Functional testing provides a demonstration of the functionality being tested as defined by the business and requirements, system documentation, and user manuals.
Functional testing is centered on the following items:

Validity: Valid material must be accepted.
Invalid input: Indicates that the invalid input group should be rejected.
Action: The defined action must be performed.
Output: Filename output class needs to be executed.

System/Process: The interface or process to be invoked.
Organization and preparation of job tests focusing on needs, important jobs or special situatio ns. In addition, details regarding business process analysis are regional information, the previo us process and continuous process should be taken into account during the review. Identify ad ditional tests and determine the validity of existing tests before testing is completed.

SYSTEM TEST

System testing ensures that all integrated software meets requirements. Tests settings to ensure results are known and predictable. An example of system testing is configuration-focused system integration testing. The system evaluation is based on the process and method of explaining the preliminary connection process and the integration point.

WHITE BOX TESTING

White box testing is a type of testing in which the software tester understands the inner workings, structure and language of the software or at least understands its purpose. It has a purpose. It is used to evaluate inaccessible areas at the black box level.

BLACK BOX TESTING

Black box testing is testing software without understanding the internal workings, structure or language of the model under test. Like most other types of testing, black box testing should be written with clear information such as instructions or required information. In such experiments, the software under test is treated as a black box. This testing provides response to input and output regardless of how the software operates.

UNIT TESTING

Unit testing is usually done as part of the integrated coding and testing phase of the software lifecycle, but it is not uncommon for coding and testing to occur in both phases.

6.2 TEST STRATEGY AND APPROACH

Field tests will be done manually and performance tests will be written in detail.

TEST OBJECTIVES

- All immigration processes need to work properly.
- The page must be viewed with a verified link.
- There should be no delay in entering the interface, messages and replies.

FEATURES TO BE TESTED

- Make sure the entry is correct
- Duplicate entry not allowed
- All links must direct the user to the correct page.

INTEGRATION TESTING

Software integration testing is the additional integration of two or more software integrations into a single platform to create a non-interfering system.

The role of integration testing is to identify hardware or software applications that can be affected without fail, such as content in a software system or even more so software applications at the enterprise level.

Test results: All previous tests passed successfully. There are no flaws.

ACCEPTANCE TESTING

User acceptance testing is an important phase of any project and requires active participation of end users. It also ensures that the system meets the requirements.

Test results: All previous tests passed successfully. There are no flaws.

6.3 Test Cases

TEST CASE	EXPECTED OUTPUT	ACTUAL OUTPUT	TEST STATUS
BOX THEFT	Theft Alarm with Blink Notification	Theft Alarm with Blink Notification	Pass
FIRE	Fire Alarm with Blynk Notification	Fire Alarm with Blynk Notification	Pass
LOW HUMIDITY	Humidity Alarm with Blynk Notification	Humidity Alarm with Blynk Notification	Pass
TREE TILT	Tilt Alarm with Blynk Notification	Tilt Alarm with Blynk Notification	Pass
GPS	Real Time Location access	Real Time Location access	Pass

Table 6.3 Test cases for Anti-Plundering.

CHAPTER 7

RESULTS AND DISCUSSIONS

Fig 7.1 Anti-Plundering Model

The above Fig 7.1 Shows the Anti Plundering model which must be mounted on to the trunk of the tree.

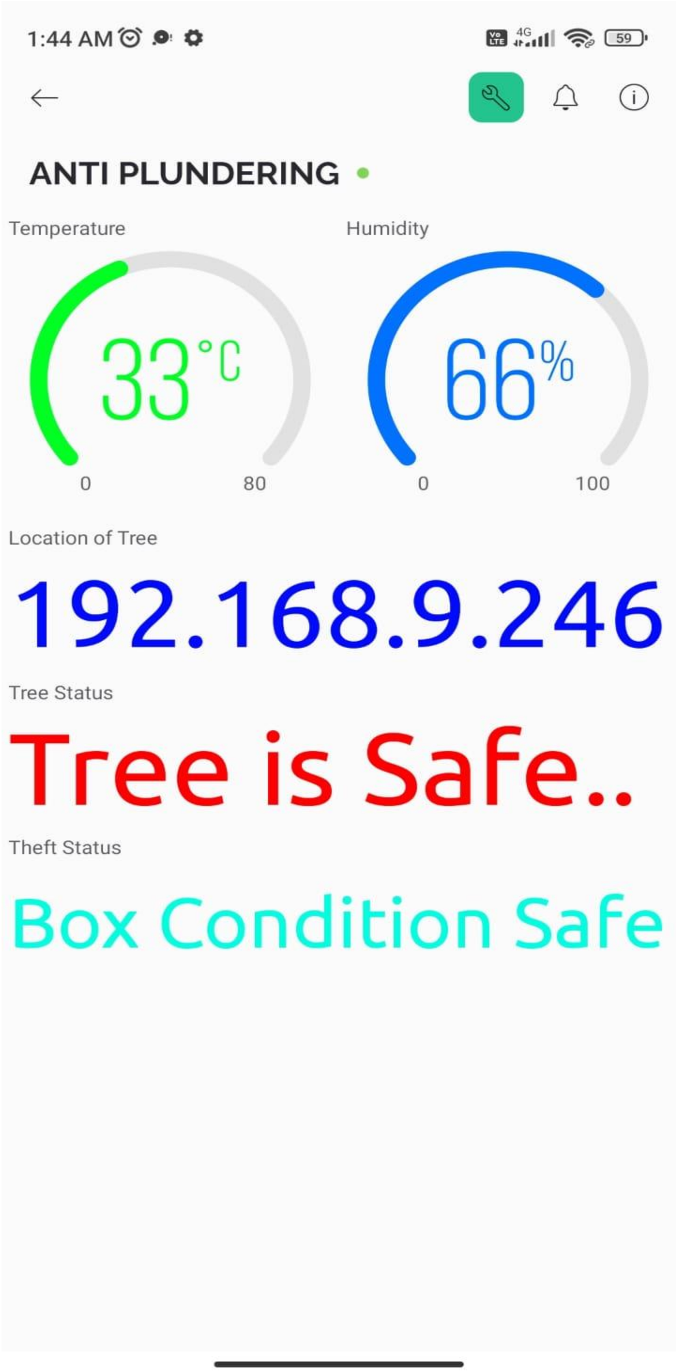


Fig 7.2. Live Data in Blynk application and LED

The above Fig 7.2 Shows the live app interface of the Blynk app displaying temperature, humidity, location and status of the tree, also including theft status of the model.

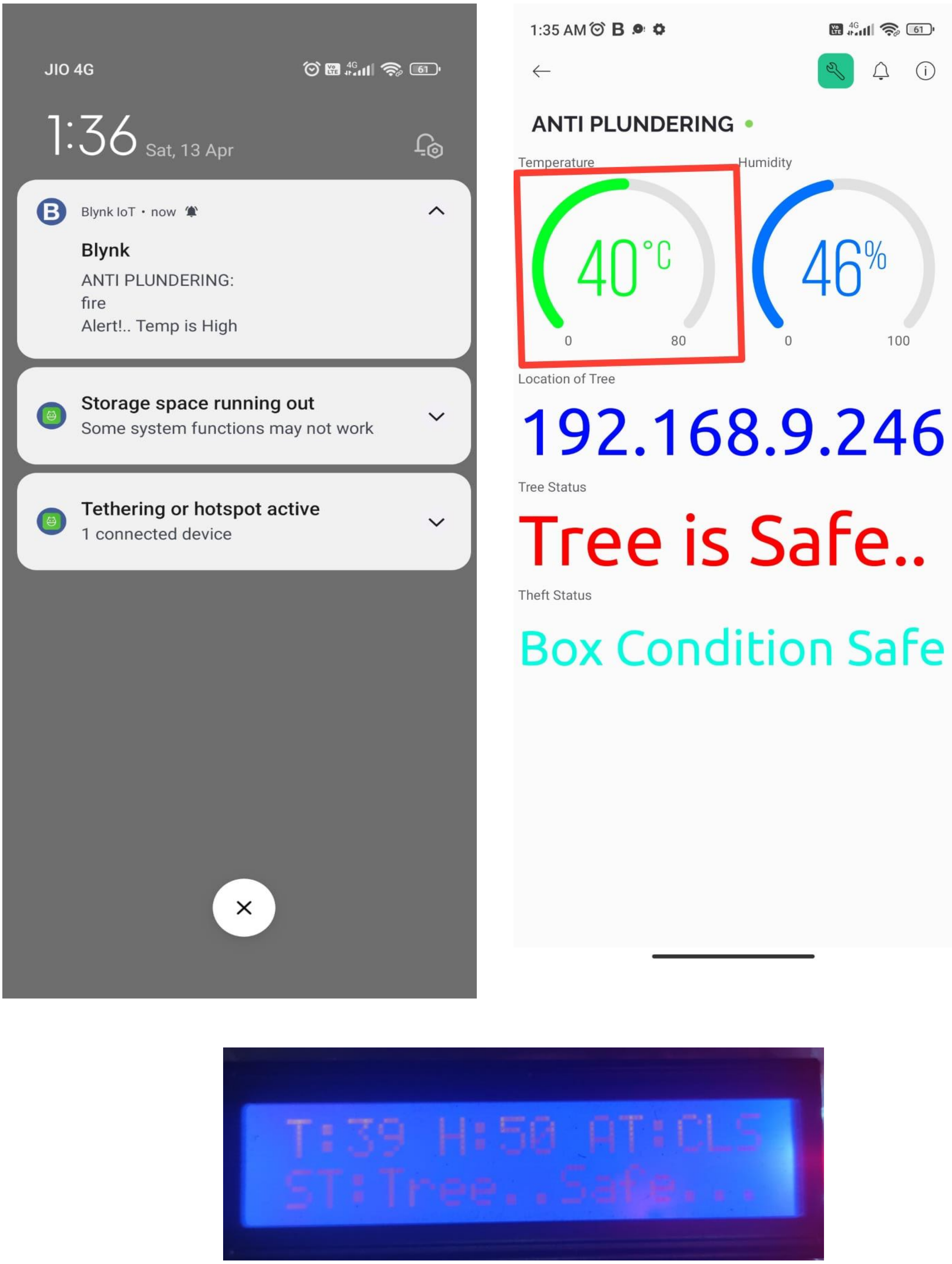


Fig 7.3 Fire Alert

The above Fig 7.3 Displays the notification and status of the tree in the blynk app also in the IoT model when the temperature around the tree is more than 38C.

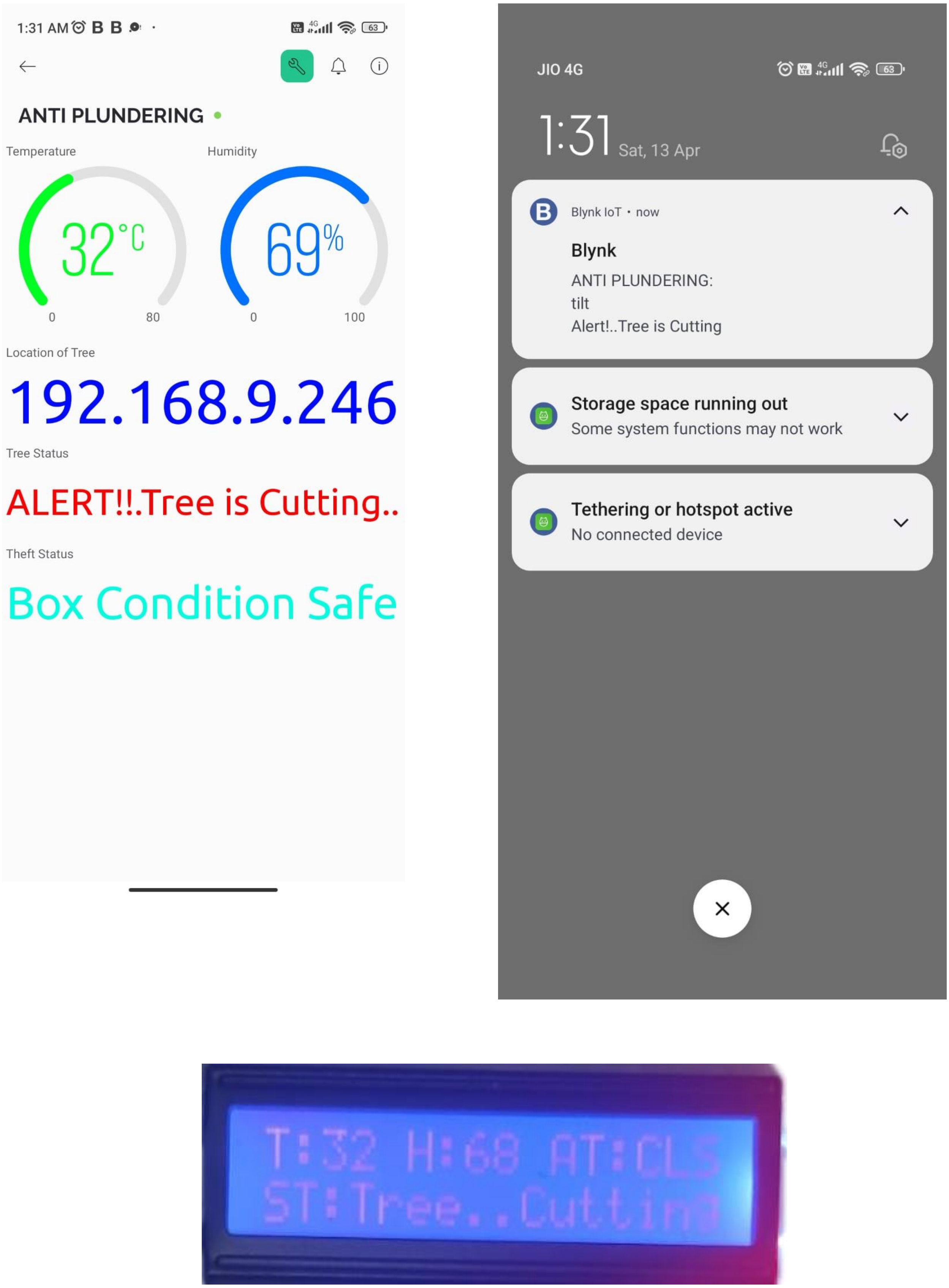


Fig 7.4 Tree Tilted Alert

The above Fig 7.4 Displays the notification and Shows the status of the blynk app and in the IoT model when the tree is being cut or tilted.

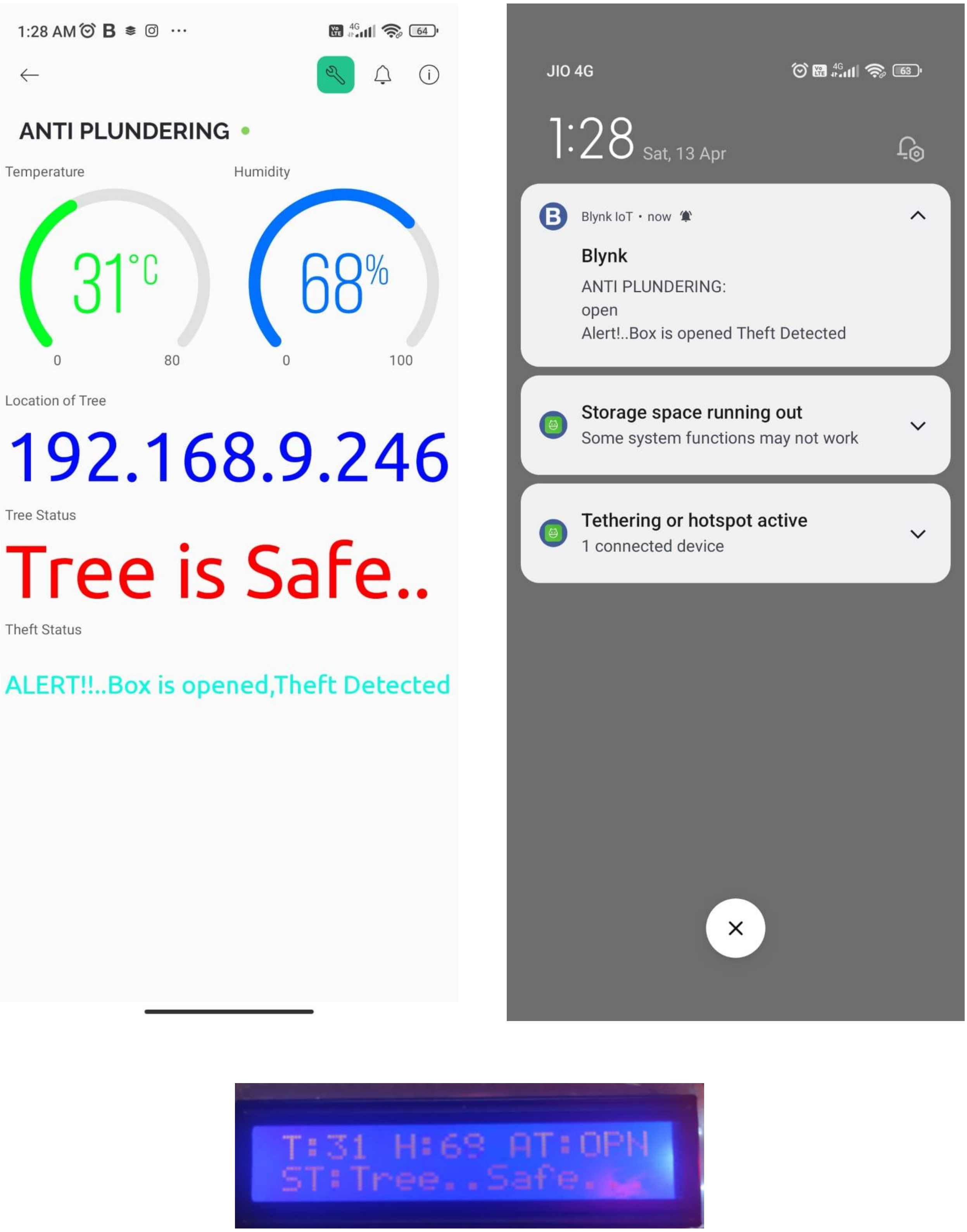


Fig 7.5 Box opened Alert

Fig 7.5 shows notification appeared in the blynk app when the model mounted on to the tree is being stolen. Here theft status is updated in real time.

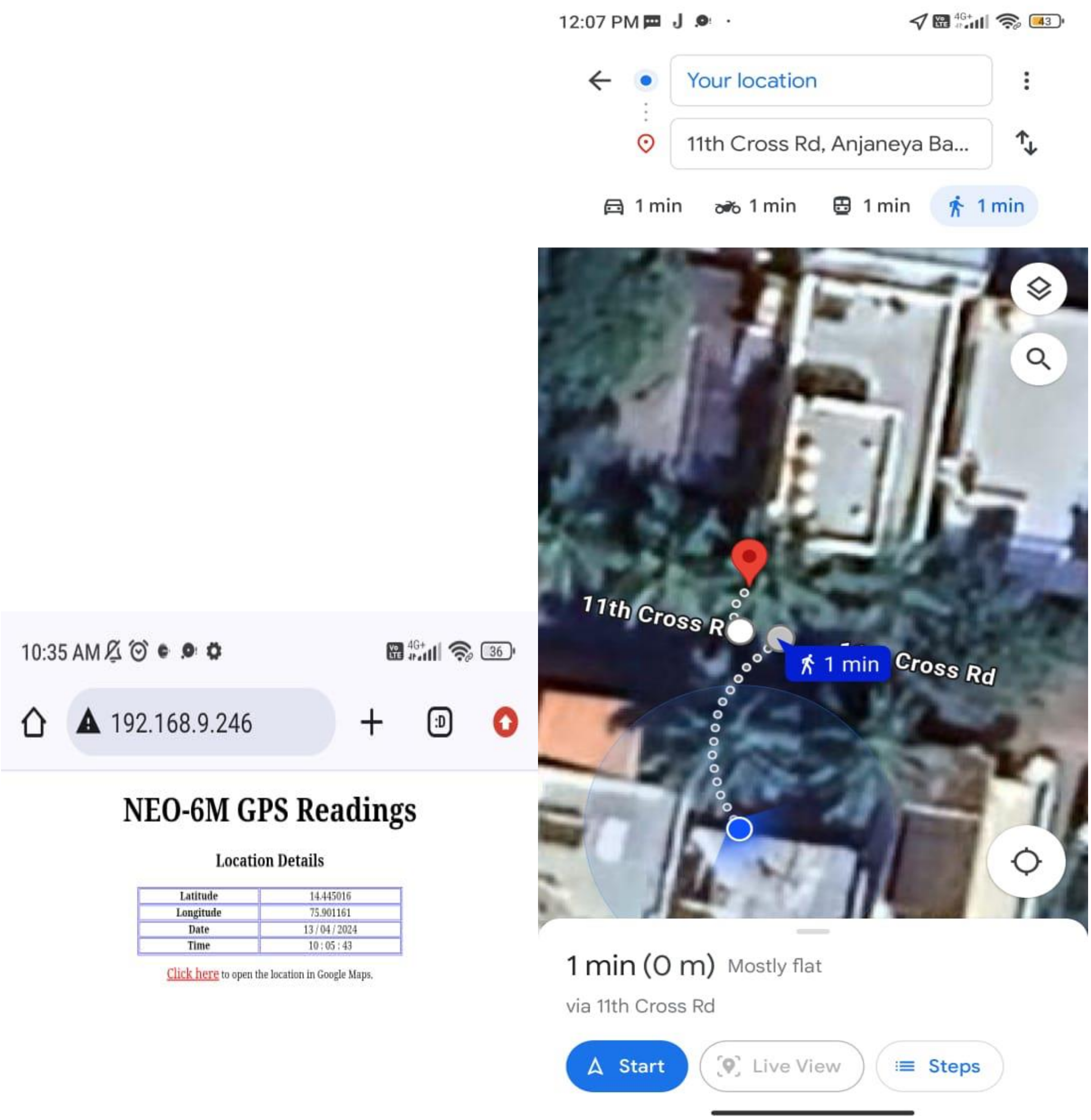


Fig 7.6 NEO-6M GPS Readings and Direction

The above Fig 7.6 shows the Neo-6M GPS readings and the map associated with those readings

CONCLUSION

We identified from the beginning that producing a complete result would be impossible within the given time frame. We viewed the project as a journey where we learnt many lessons and gained insights to the subject which we tried to share in this report and summarized in this chapter. We tried to look at the problem from many points of view which generated some new ideas that could be explored in future. We suggested formal approaches for modelling and analysing the system which are by no means complete but could become the initiation for further research. We also created a working system and algorithms which we claim to be useful and extensible. However, as we have seen in these chapter, all these achievements are only partially successful. Personally, we would consider this project a success if the ideas described in the report can be a useful reference for future work on the subject.

FUTURE SCOPE

Although the design was successful there are improvements that could be made in future adaptations of this project. The future scope of this work is:

- To develop our own mobile application instead of Blynk application due to its limitations.
- To implement automatic water sprinkler to the trees whenever the humidity level is very low or the temperature is very high.

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