

**DESIGN AND DEVELOPMENT OF IDENTIFICATION, LOCATION TRACKING
SYSTEM, AND SOS GENERATION FOR HUMAN SAFETY USING RFID AND
LORA NETWORK**

A PROJECT WORK PHASE - II

Submitted in partial fulfilment of the requirements for the award of

Bachelor of Engineering

Degree in Electronics and Communication Engineering

by

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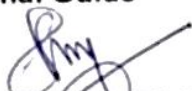
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of I.VISHNU VARDHAN REDDY (39130170) and G.OM SAI (39130155) who carried out the project entitled “**DESIGN AND DEVELOPMENT OF IDENTIFICATION ,LOCATION TRACKING SYSTEM AND SOS GENERATION FOR HUMAN SAFTEY USING RFID AND LORA NETWORK**” under our supervision from Jan 2023 to April 2023

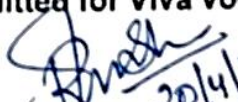
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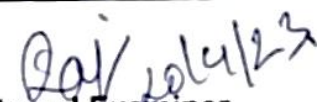

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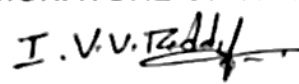
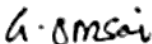
DECLARATION

We, **I.VISHNU VARDHAN REDDY(39130170)** and **G.OM SAI (39130155)** hereby declare that the Project Report entitled “ **DESIGN AND DEVELOPMENT OF IDENTIFICATION ,LOCATION TRACKING SYSTEM AND SOS GENERATION FOR HUMAN SAFTEY USING RFID AND LORA NETWORK**” done by us under the guidance of **Dr .G.JEGAN, M.E., Ph.D.,** Dept. of Electronics and Communication Engineering, SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNA , is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering in Electronics and Communication Engineering.

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ABSTRACT

The research is about creating a system for tracking Students through their ID cards. The objective of the research is to design and develop a location Tracking System to display the location of a person on Google Maps. This system uses LORA from STM as a microcontroller and it will be used as the main processing unit. Next, the Ublox NEO-6m GPS module is used to route the coordinates while the SIM 900A GSM module is used to connect with the user. The product was successfully run smoothly outdoors and as well as indoors due to the high-quality GPS module that extracts accurate coordinates this system can adapt to Military and Navy units since it can even transfer text and voice data through the wireless system The module proposed in the project has a wide range of covering a distance that can adapt to short and long-range communication

One of the emerging technologies in today's World having spread its usefulness in a wide variety of domains is near-field communication. From automation of student attendance monitoring to the ticketing system, it has been widely accepted across many countries. Its main feature lies in automation like automating cars for locking/unlocking car doors, switching in GPS, turning on radio/speakers, etc. A wide variety of GPS improvements are brought into gadgets. A lot of GPS tracking devices use mobile data from Sim cards with some additional gadgets using Wi-Fi to enable the communication of the data. But consider a situation where mobile data is expired or due to some environmental parameters, we lost the signal. This project proposes a methodology to improve the technique of sharing information on such conditions manually. We mainly took a theme of child safety and an insane person tacking system hence we decided to use NRFID stickers to store the information about the persons physically inside the RFID tags. These RFID tags and Stickers work with the wireless charging functionality of tesla that can be powered with the gadgets having RFID support. Hence there won't be any power failure factor to extract the information. This is a kind of manual operation that supports the existing technologies. This project can store information up to 32kb based on memory functions. They are free from environmental factors of moisture and can handle up to certain levels of heat

threshold. Hence this will provide us with an energy-efficient and safest way to

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transfer data.

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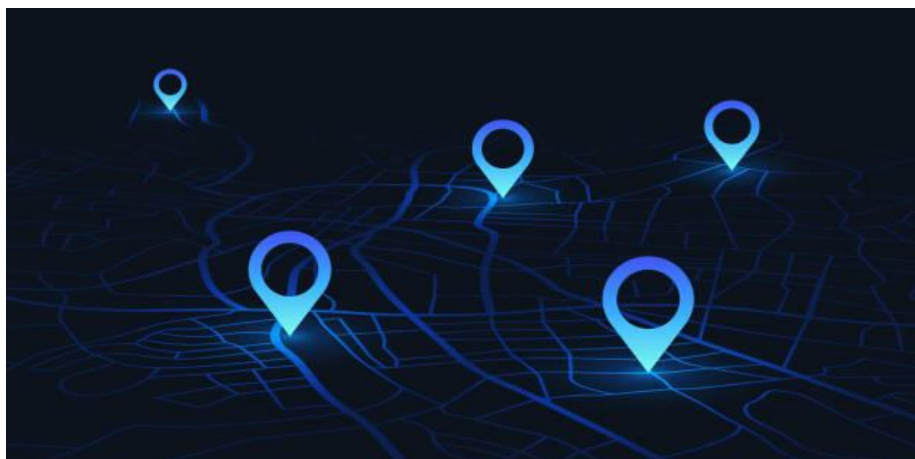
CHAPTER 1

INTRODUCTION OF LOCATION TRACKING

1.1 Location tracking system for human safety

Identification, location tracking systems, and SOS generation are critical components for ensuring human safety in various contexts, including outdoor adventure activities, search and rescue operations, and emergency response situations. These systems are designed to help individuals and emergency responders quickly and accurately locate and identify people who may be lost, injured, or in distress. The development of such systems involves a multidisciplinary approach, including hardware design, software development, and data analytics. Hardware components typically include GPS sensors, communication devices, and emergency beacons. The software development process involves creating user interfaces and algorithms that can accurately track and locate individuals and generate SOS signals in emergency situations.

In addition to the technical components, the design and development of identification, location tracking, and SOS generation systems must also consider ethical and legal issues, including data privacy and security. The system must be designed to protect the privacy and security of individuals using the system while still providing accurate and timely information to emergency responders. Overall, the design and development of identification, location tracking, and SOS generation systems require careful consideration of technical, ethical, and legal factors to ensure that these systems can effectively and safely contribute to



human safety.

Fig.1.1: Location tracking system

The purpose of this project is to design and construct a hand-held wireless GPS tracking device that can be tracked from the Internet. The project consists of three parts. The first part is a mobile device with an embedded GPS and wireless Internet connection to transmit its current location. The second part is a web server that will receive the data, parse it, and store it for access over the Internet. The third component is the user interface that will allow others to visually see where the hand-held GPS device is and has been. To view its location, one could use any device that can connect to the Internet such as a desktop computer, laptop, PDA, or cell phone. The data available through a browser includes a scalable map of the surrounding area, latitude, longitude, speed, and altitude of the hand-held device. The system is intended to be a general-purpose tracking device; however, the user interface will be tailored to the university shuttle system.

Therefore, precise technology is needed. Thus, for many years Google Map services have been applied in public construction fundamental facilities, roads, or outdoor large areas. Mobile devices are irreplaceable in daily life, currently, it is limited by their short battery lives, which encourages the need for frequent recharging. To address this issue, many mobile devices use 2Bluetooth Low Energy (BLE). It has many advantages including stable signal, ease of distribution, low cost, and extensive connectivity with the existing wireless device. BLE has remarkable potential as an enabling technology for indoor LBS applications.

To increase the application of finding systems and to enable smart mobiles to become key equipment of augmented humanity. It can effectively enhance convenience. It is based on short-distance wireless communication technology, which combines RFID, BLE beacon, and RFID technology, which is suitable for indoor buildings. This combines BLE, GPS, AND RFID technology to realize a seamless outdoor-indoor user localization for implementation on smartphones. In the suggested plan for user localization and guidance, the app is suitable for implementation in smartphones.

1.2 GSM/WIFI

GSM and Wi-Fi are two different wireless communication technologies used for different purposes.

GSM (Global System for Mobile Communications) is a cellular network technology used for mobile phone communication. It allows for voice and data transmission over the airwaves between mobile devices and cell towers. GSM operates in different frequency bands around the world, including 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz.

On the other hand, Wi-Fi (Wireless Fidelity) is a wireless networking technology that allows devices to connect to the internet or other networks wirelessly. It uses radio waves to transmit data between devices that are within range of a Wi-Fi network. Wi-Fi operates in the 2.4 GHz and 5 GHz frequency bands and typically has a shorter range than cellular networks.

While GSM is primarily used for mobile phone communication, Wi-Fi is used for connecting devices to the internet or other networks, such as home or office networks. Both technologies have their own advantages and disadvantages and are used for different purposes.



Fig.1.2: GSM/WIFI

1.3 GPS

GPS, which stands for Global Positioning System, is a network of satellites orbiting the Earth that provides location and time information to users on the ground. The GPS system was initially developed by the United States Department of Defense for military purposes, but it is now widely used in various civilian applications, including navigation, surveying, and tracking.

GPS satellites transmit radio signals that are received by GPS receivers on the ground. These receivers use the signals to determine their location and calculate their speed and direction of travel. The GPS system can provide accurate positioning information anywhere on Earth, 24 hours a day, in any weather condition.

The GPS system is made up of three segments: the space segment, the control segment, and the user segment. The space segment consists of a constellation of 24 GPS satellites in orbit around the Earth. The control segment includes a network of ground-based monitoring stations and control centers that track the GPS satellites and make adjustments to their orbits as necessary. The user segment includes GPS receivers that are used by individuals and organizations to determine their location.

GPS technology has revolutionized the way people navigate and explore the world. It has become an essential tool in various industries, including transportation, aviation, maritime, and outdoor recreation

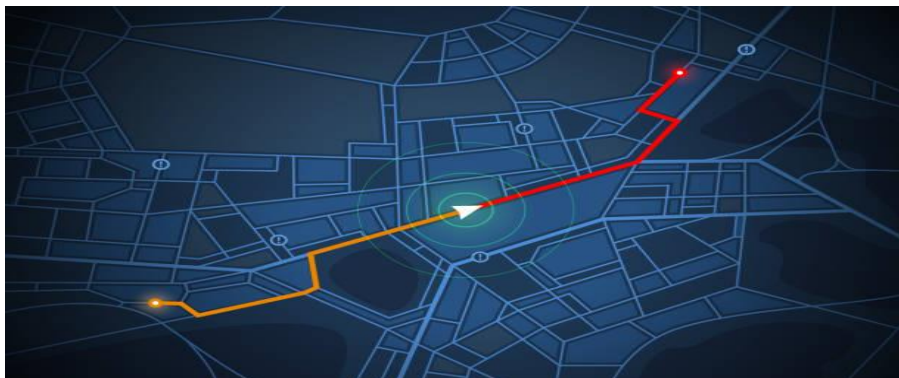


Fig.1.3: GPS

1.4 RFID TAGS

RFID stands for Radio Frequency Identification, which is a technology that uses radio waves to identify and track objects. An RFID system consists of a reader, antenna, and a tag or transponder. The tag contains a microchip and an antenna, which is used to transmit data to the reader when it is in range.

RFID or Near Field Communication is a simple technology allowing you to use your mobile phone for innovative purposes. An RFID tag can be linked to information such as a web page, social network, etc. RFID began to evolve in other areas such as payments, door control with secured locks, computer connections, and more. All these actions have a common point: you have to put your smartphone (or another RFID device) near the element with which you want to interconnect technology to make the link between the physical and the virtual world. By placing two devices close to each other, a virtual reaction is made. Bluetooth and WiFi aren't as easy to set up. Therefore, the main characteristic of RFID is that it is automatic, it doesn't require an application... It just works! In more technical terms, RFID defines the process by which two products communicate between them. The RFID is a by-product of the technology RFID at a shorter distance of action (10cm, in theory, 4 CMS in reality) which uses low speeds (kbps 106-414) and an installation with low friction (no discovery and no matching), what allows then two devices to communicate automatically when they are close one of the other one.

RFID technology is used in a variety of applications, such as inventory management, asset tracking, access control, and supply chain management. In inventory management, RFID tags are used to track the location and quantity of items in a warehouse or retail store. In asset tracking, RFID tags can be used to monitor the location and status of equipment or vehicles. One of the key advantages of RFID technology is that it can be read remotely, without requiring line of sight or direct contact. This makes it ideal for tracking objects in

environments where line of sight is obstructed, such as in a manufacturing plant or warehouse. However, there are also some concerns about privacy and security with RFID technology, as the tags can be read by anyone with a compatible reader.

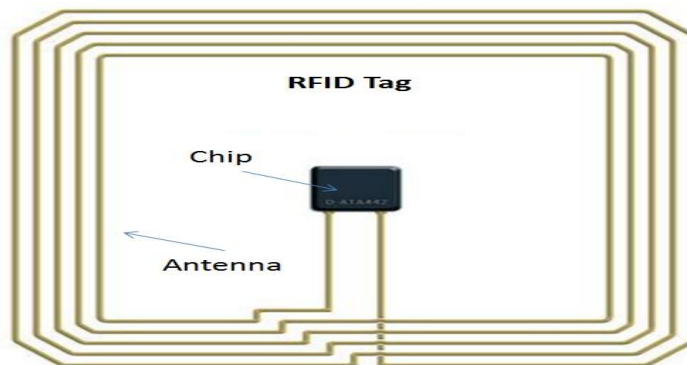


Fig.1.4: RFID TAGS

1.5 RFID reader/writer

An RFID reader chip can be considered as the main controller of the communication system, as it initiates the communication, powers up the RFID tag, and sends commands through the magnetic field to the passive tag. An RFID reader can also be called an RFID writer, because of its ability to write data into the RFID tag. Usually, combined with a microcontroller, the RFID reader chip powers up and exchanges information with one or more RFID tags. Supporting multiple RF protocols and features, an RFID reader chip can be used in three different modes: Read/Write, Peer to Peer (P2P), and Card Emulation.

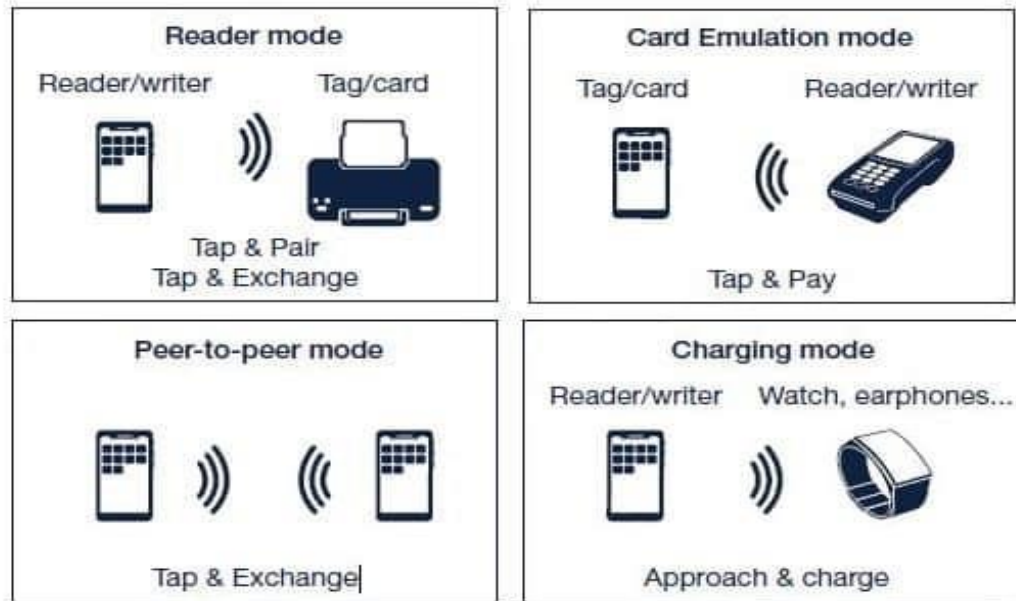


Fig.1.5: RFID READERS / WRITER

1.6 LORA

LoRa technology was developed by a company called Semtech and it is a new wireless protocol designed specifically for long-range, low-power communications. LoRa stands for Long Range Radio and is mainly targeted for M2M and IoT networks. This technology will enable public or multi-tenant networks to connect a number of applications running on the same network. LoRa Alliance was formed to standardize LPWAN (Low Power Wide Area Networks) for IoT and is a non-profit association which features membership from a number of key market shareholders such as CISCO, actility, MicroChip, IBM, STMicro, SEMTECH, Orange mobile and many more. This alliance is key to providing interoperability among multiple nationwide networks. Each LoRa gateway has the ability to handle up to millions of nodes. The signals can span a significant distance, which means that there is less infrastructure required, making constructing a network much cheaper and faster to implement. LoRa also features an adaptive data rate algorithm to help maximize the nodes battery life and network capacity.

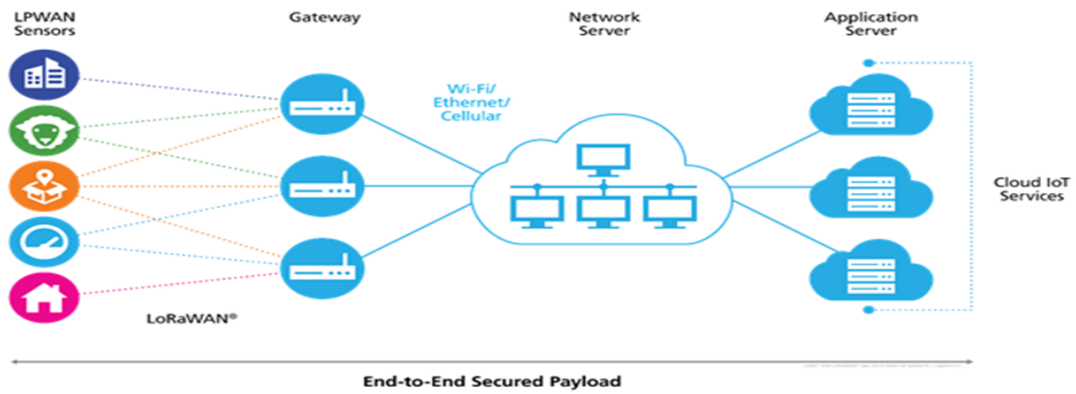


Fig.1.6: LORA

Specification	LoRa Feature
Range	2-5Km Urban (1.24-3.1 mi), 15Km suburban (9.3 mi)
Frequency	ISM 868/915 MHz
Standard	IEEE 802.15.4g
Modulation	Spread spectrum modulation type based on FM pulses which vary.
Capacity	One LoRa gateway takes thousands of nodes
Battery	Long battery life
LoRa Physical layer	Frequency, power, modulation and signalling between nodes and gateways

1.7 IOT

The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

Internet of Things (IoT) describes the capability of an electronic device to connect, communicate, and exchange data over the internet. Some common examples of IoT devices include at-home products like Amazon Echo and security cameras, as well as wearable devices like the Apple iWatch, and many IoT devices are controlled using a smartphone app. By the end of 2016, there were over 17 billion IoT devices in the hands of consumers worldwide, and that number is expected to increase dramatically in the next decade according to IHS projections (Figure 1). At Kickr, our team of expert engineers know exactly how to transform your product into a high-tech, internet-enabled device so you can take advantage of this growing market.

Most IoT devices include wireless communication technology like Wi-Fi, Bluetooth, and ZigBee to connect to send and receive data over the internet. For example, when you ask Siri a question on an iWatch, it uploads the audio recording of your voice and downloads its processed response to the watch, and all of this can be done over a wireless network! Kickr has experience in developing hardware and software solutions for virtually every wireless application, and your products developed with us will have the same performance as today's top IoT devices. We are also experienced with battery and wireless charging features to maximize your product's functionality.

Some types of IoT

- Internet of Things Introduction.
- Mobile/Cellular IoT Connectivity.
- Wi-Fi IoT Connectivity.
- Bootstrap IoT Connectivity for OEM.
- IoT Connectivity Management.
- Use Cases IoT.

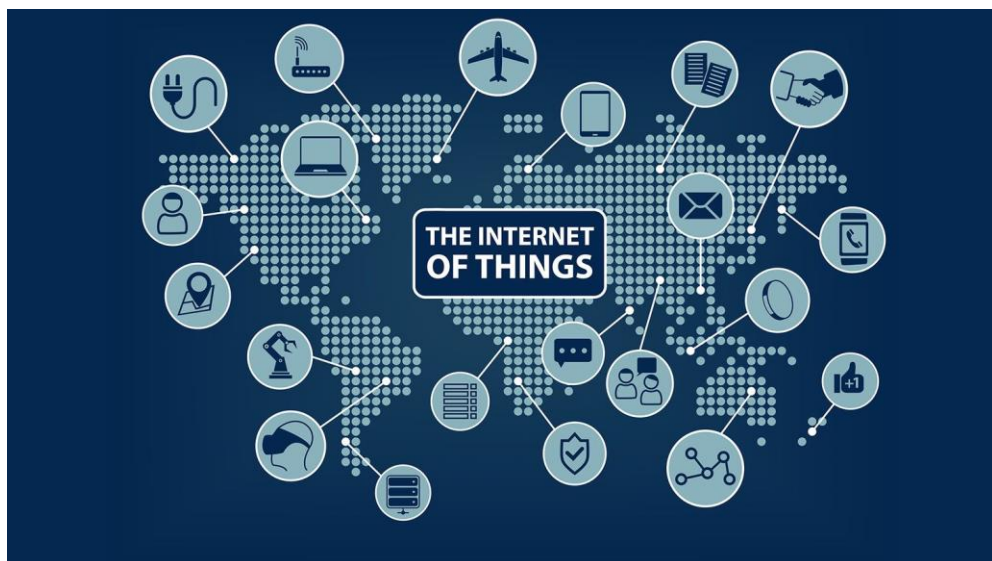


Fig.1.7:IOT

1.8 Applications

School Safety: The system can be implemented in schools to monitor the location of students and ensure their safety. The SOS feature can be used by students in case of emergencies such as bullying, accidents, or medical emergencies.

Hospital Security: The system can be used in hospitals to monitor the location of patients, visitors, and staff. The SOS feature can be used by patients and staff in case of emergencies such as medical emergencies or security threats.

Factory Safety: The system can be implemented in factories to monitor the location of workers and ensure their safety. The SOS feature can be used by workers in case of emergencies such as accidents or safety hazards.

Public Events: The system can be implemented in public events such as concerts, sports events, and festivals to monitor the location of attendees and ensure their safety. The SOS feature can be used by attendees in case of emergencies such as medical emergencies or security threats.

Law Enforcement: The system can be used by law enforcement agencies to track the location of suspects, monitor the movement of crowds during public events, and ensure the safety of officers. The SOS feature can be used by officers in case of emergencies such as injuries or threats.

Construction Sites: The system can be implemented in construction sites to monitor the location of workers and ensure their safety. The SOS feature can be used by workers in case of emergencies such as accidents or safety hazards.

Search and Rescue Operations: The system can be used in search and rescue operations to track the location of individuals and coordinate rescue efforts. The SOS feature can be used by individuals in distress to request assistance.

1.9 Limitations

Range Limitations: LoRa technology has a limited range compared to other wireless technologies. The range depends on factors such as the terrain, obstacles, and frequency used. Therefore, the range of the system will be limited, and this could lead to inaccurate location tracking or failure to generate an SOS signal.

Interference: LoRa uses unlicensed frequency bands, which means that other devices could be using the same frequency, leading to interference. Interference can disrupt the communication between the RFID tags and the gateway, leading to loss of data or inaccurate location tracking.

Cost: The cost of implementing an RFID and LoRa network can be high. The cost of the RFID tags, readers, and gateways can add up, making it expensive to deploy the system.

Power Consumption: RFID tags and LoRa gateways require power to function. The battery life of the RFID tags and gateways could be short, leading to frequent replacements or recharging.

Privacy Concerns: RFID tags can be used to track individuals without their knowledge, which raises privacy concerns. The system must be designed with privacy in mind to protect the user's data.

Maintenance: The system will require maintenance to ensure that it functions properly. The RFID tags, readers, and gateways must be regularly checked and repaired if necessary.

Reliability: The reliability of the system will depend on the quality of the components used and the design. A poorly designed system could lead to false alarms or failure to generate an SOS signal in an emergency.

CHAPTER 2

LITERATURE SURVEY

2.1 Inferences from Literature Survey

The following survey was made in the automation sector on integrating the applications with RFID-based appliances. Here the data between different IoT platform and Android computing was made through the papers to improve the standard of interacting BFC devices with existing IoT GPS gadgets

"Development of a real-time personnel tracking and monitoring system for underground coal mines using RFID and Zigbee network" by Ghose and Gupta, 2016.

The paper describes a real-time tracking and monitoring system for personnel in underground coal mines using RFID and Zigbee technology. The RFID-based tracking system tracks personnel location using passive RFID tags, while the Zigbee-based monitoring system monitors physiological parameters. A central server receives and processes the data, and a graphical user interface displays the information for mine managers in real-time. The system can improve safety and reduce accidents in underground coal mines.

Pros: Provides a real-time tracking and monitoring solution for personnel in underground coal mines, which can improve safety and reduce the risk of accidents.

Utilizes RFID and Zigbee technology, which are easy to implement and maintain.

Includes a graphical user interface that enables mine managers to monitor personnel location and health in real-time.

Cons:

The use of RFID tags may pose potential health risks to personnel due to exposure to electromagnetic radiation.

The system requires personnel to wear sensors, which may be uncomfortable or intrusive.

The system may be expensive to implement, as it requires the installation of RFID readers and Zigbee sensors throughout the mine.

"Development of an RFID-based employee tracking and monitoring system for construction sites" by Jang and Park, 2017

Jang and Park (2017) developed an RFID-based employee tracking system for construction sites to enhance worker safety, attendance, and efficiency. The system uses RFID tags and readers to monitor workers' movements and work hours, and the results of a case study showed that the system was accurate and effective in tracking workers. This system has the potential to be implemented in other industries as well.

Pros:

More accurate and efficient than traditional manual check-ins and check-outs.

Real-time monitoring can help in emergency situations.

Improves overall site efficiency and productivity.

Enhances safety and security of construction workers.

Cons:

Implementation and maintenance costs may be high.

Potential for privacy concerns regarding worker monitoring.

System may not be foolproof, and RFID tags may be lost or damaged.

"Design and implementation of a LoRa-based IoT system for real-time monitoring of patients in hospitals" by Bhattarai et al., 2021.

Bhattarai et al. (2021) proposed a LoRa-based IoT system for real-time monitoring of patients in hospitals. The system includes a patient node, gateway node, and cloud server. The patient node collects vital signs data and sends it wirelessly to the gateway node through the LoRa network. The gateway node sends the data to the cloud server, which analyzes and processes it, providing real-time alerts to healthcare professionals. The system was evaluated through experiments and showed to be accurate and reliable, making it a promising solution for improving healthcare.

Pros:

The system provides real-time monitoring of patient vital signs data, allowing healthcare professionals to make informed decisions and take timely actions.

The LoRa network infrastructure used in the system allows for long-range communication, making it suitable for hospital environments with large distances between patient rooms and monitoring stations.

The system is cost-effective compared to traditional monitoring systems, as it uses low-power, low-cost sensors and a wireless communication network.

The system provides accurate and reliable patient data with a lower error rate compared to traditional methods, improving the quality of healthcare.

Cons:

The system relies on wireless communication, which may be susceptible to interference and signal loss, potentially affecting the quality of patient data.

The system requires significant hardware and software development expertise, making it challenging to implement for smaller healthcare organizations.

"Design and implementation of a LoRa-based system for tracking and monitoring of elderly people" by Alavizadeh et al., 2020.

The paper "Design and implementation of a LoRa-based system for tracking and monitoring of elderly people" by Alavizadeh et al. proposes a system consisting of a wearable device and a gateway device using LoRa technology to track and monitor elderly people. The wearable device contains sensors and a LoRa module for transmitting data to the gateway device. The gateway device processes and analyzes the data using a cloud-based platform and can send notifications in the event of an emergency. The system was tested with elderly participants and showed promising results in tracking and monitoring movements and health.

Pros:

Long-range and low-power communication provided by LoRa technology is well-suited for IoT applications.

The system can track the elderly person's movements, monitor their health, and detect any abnormalities or emergencies.

The system can be configured to send notifications to caregivers or family members in the event of an emergency.

The wearable device contains various sensors to provide comprehensive monitoring of the elderly person's health.

The cloud-based platform provides real-time data analysis and processing.

Cons:

The system requires the use of a wearable device, which may not be comfortable or practical for all elderly people.

The system may require internet connectivity, which may not be available in all areas or may be subject to disruptions.

The system relies on the accuracy and reliability of the sensors in the wearable device.

The cost of the system may be prohibitive for some elderly people and their families.

"Design and Implementation of Smart Safety Helmet for Coal Miners using Zigbee and Arduino" by M. A. Rana et al., 2021.

The paper "Design and Implementation of Smart Safety Helmet for Coal Miners using Zigbee and Arduino" by M. A. Rana et al., 2021 presents a smart safety helmet equipped with various sensors that monitor environmental conditions in the coal mine and a microcontroller that sends alerts to miners when there is potential danger. The system uses Zigbee wireless technology and was implemented using an Arduino microcontroller and Zigbee modules. The system was tested in a simulated coal mine environment and was effective in detecting potential hazards in real-time. The paper presents a practical and cost-effective solution to improve safety in the coal mining industry.

Pros:

The smart safety helmet is equipped with sensors that can detect potential hazards and alert the miners in real-time.

The use of Zigbee wireless technology allows for communication between the sensors and the base station, improving the reliability of the system.

The system is cost-effective and easy to implement using Arduino microcontroller and Zigbee modules.

The system has the potential to save lives by detecting potential hazards before they become a serious threat.

Cons:

The system was tested in a simulated coal mine environment and may require further testing in real-world situations to ensure its effectiveness.

The sensors used in the system may need to be replaced or recalibrated periodically to maintain accuracy.

The system may require additional training for the miners to understand how to interpret and respond to the alerts and alarms.

The implementation of the system may require additional infrastructure and resources.

"A LoRa-based Automatic Alarm System for the Elderly and Patients" by L. Huang et al., 2019.

The paper proposes a LoRa-based automatic alarm system using sensor nodes to detect falls, temperature and humidity changes, and send an alarm message to the caregiver's phone. The system has low power consumption, long-range communication, and low false alarm rate. The system is designed to be easy to use and reliable, with low power consumption and long communication range. The authors have conducted experiments to evaluate the performance of the system, and the results show that the proposed system can successfully detect and transmit alarm messages with a low false alarm rate. It can improve the quality of life for elderly people and patients and can be integrated into existing smart home systems. Overall, the proposed LoRa-based automatic alarm system has the potential to improve the quality of life for elderly people and patients who require constant monitoring, and it can be easily integrated into existing smart home systems. The paper proposes a LoRa-based automatic alarm system for elderly people and patients that uses low-power, long-range communication technology. The system consists of multiple sensor nodes, a gateway node, and a caregiver's phone. The system detects unusual events and sends alarm messages to the

caregiver's phone via the LoRa network. The proposed system is reliable, easy to use, and has a low false alarm rate.

Pros:

The system is designed to be easy to use and reliable.

Low power consumption and long communication range.

Can improve the quality of life for elderly people and patients who require constant monitoring.

Can be easily integrated into existing smart home systems.

Cons:

The system requires installation of multiple sensor nodes.

The LoRa network infrastructure may not be available in all locations.

The system may not be effective in detecting all unusual events.

The cost of implementing the system may be a barrier for some users.

"Design and Implementation of an IoT-Based Fire Detection and Alerting System" by G. Das et al., 2021.

The proposed system consists of several components, including temperature sensors, smoke sensors, a Raspberry Pi 4 board, a Wi-Fi module, and a cloud server. The temperature and smoke sensors are used to detect the presence of fire, and the Raspberry Pi 4 board is used to process the sensor data and send alerts to the cloud server. The Wi-Fi module is used to connect the system to the internet, and the cloud server is used to store and process the data and send alerts to the user's mobile phone. The system uses a machine learning algorithm to analyze the sensor data and determine whether there is a fire or not. The algorithm is trained using a dataset of sensor readings collected from different environments, and it is capable of detecting fires with high accuracy. The authors also describe the implementation of a mobile application that can be used to receive alerts from the system. The application provides real-time notifications to the user's phone in case of a fire, along with the location of the fire and instructions on how to respond.

Pros:

Quick detection and alerting: The system uses sensors to detect fires quickly and send alerts to the cloud server and the user's mobile phone. This can help to prevent or minimize damage caused by fires.

Accurate fire detection: The system uses machine learning algorithms to analyze the sensor data and accurately determine the presence of fires.

Easy to install and use: The system is easy to install and does not require extensive technical knowledge. The mobile application is also user-friendly and provides clear instructions in case of a fire.

Scalability: The system can be easily scaled up or down, depending on the size of the building or the number of sensors required.

Cons:

Dependence on internet connectivity: The system relies on internet connectivity to send alerts to the cloud server and the user's mobile phone. If the internet connection is lost, the system may not work as expected.

False alarms: The system may sometimes trigger false alarms due to fluctuations in temperature or smoke caused by factors other than a fire. This can lead to unnecessary panic and disruption.

Maintenance: The sensors and the system may require regular maintenance to ensure they are functioning properly.

2.2 Objectives

According to recent statistics, the International Telecommunication Union (ITU) states that the number of mobile devices in the world reached 60.835 billion at the end of 2025. Furthermore, the number of distinct devices is still growing.

Thereby wireless technology continues to improve and wireless networks are even more extensively deployed in certain environments which in turn the feasibility of developing Location-Based Services (LBS) has become more attracted research interest for both academicians and industries. Moreover, indoor navigation systems have recently become a popular research field due to the lack of Global Positioning System (GPS) signals in indoor surroundings. Several indoor navigation systems have already been proposed in order to eliminate deficiencies however each of them has several technical and usability limitations. To overcome this, the research study demonstrates a Near Field Communication (RFID) based indoor navigation system which promotes users to navigate through buildings or complexes by enabling a specific location update by touching RFID tags that are

spread around and orient users to the destination. Further, this paper initially presents the system requirements and the viability of RFID internal specification with a prototype application that directs future research development. Keywords: GPS, RFID, Wireless Technology, Indoor Navigation, Mobile Phone.

1. To develop a system upgradation on the GPS tracking system with RFID tags
2. To develop a system that can support multiple OS platforms
3. To develop a robust technology that can even survive in all weather conditions
4. To develop a standalone system that works with wireless energy transmission
5. To upgrade the GPS tracking with the simplest form of information tracking
6. To approach a kind solution for human trafficking and a missing child

CHAPTER 3

SYSTEM ANALYSIS

3.1 Existing methodology of location tracking

With the aim of circumventing this lack of performance, an assortment of technologies has been tested and new designs generated for indoor navigation in the literature. Positioning systems enable the appropriate device to determine its position, and make the location information available for position-based services. Positioning system topology is an important issue for understanding and developing a positioning system. Four different system topologies are defined for wireless positioning systems: (a) remote positioning; (b) self-positioning; (c) indirect remote positioning and (d) indirect self-positioning. In the case of a remote positioning system, there is a signal transmitter and several fixed measuring units. The location of the transmitter is computed in a master station after the collection of all data from measuring units.

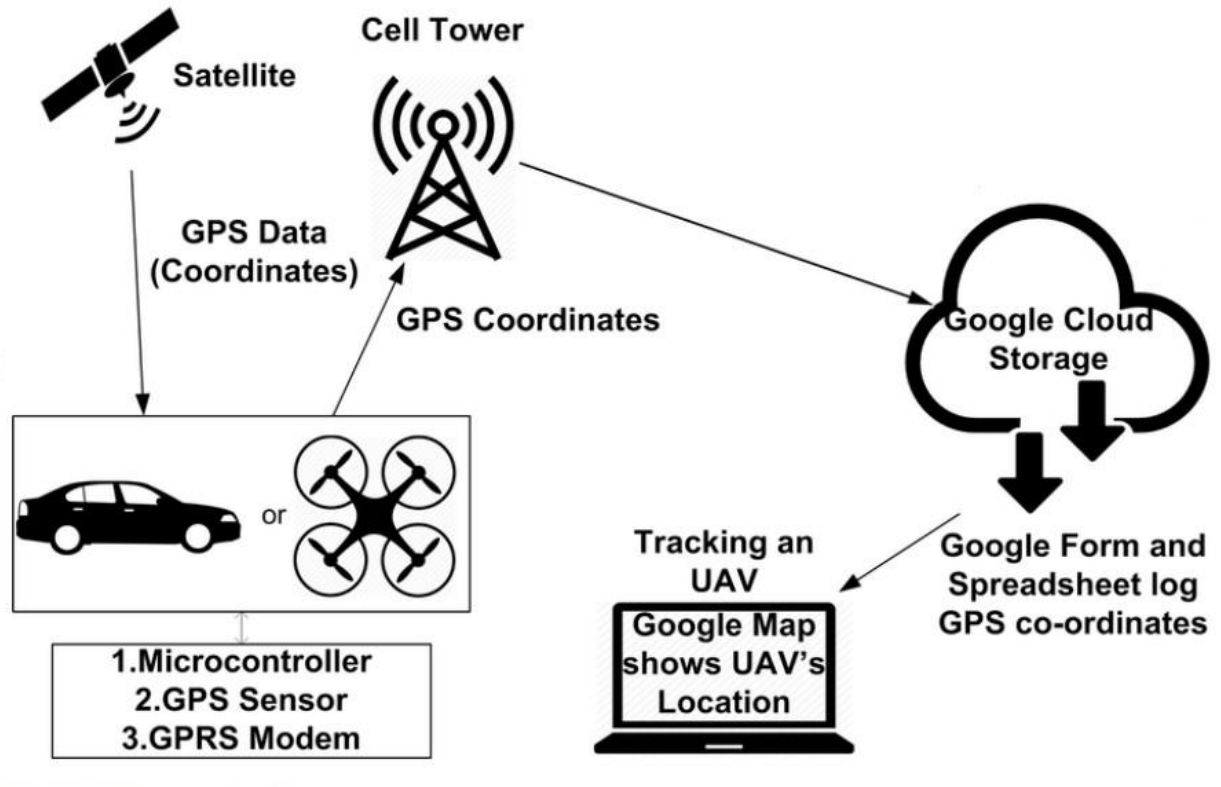


Fig. 3.1. – Existing GPS Tracking System

1. Separate GPRS or Wi-Fi systems must be enabled to track the information
2. Digital Cloud platform must be maintained
3. Data transmission requires the activity of MQTT brokers to bind the data
4. System works only on temperatures between 10 degrees to 60 degrees

In a self-positioning system, the measuring unit is mobile and it receives the signals of several transmitters placed in known places, and with the help of these signals, it can compute its location. In the case of indirect remote positioning, a self-positioning measuring unit sends the measurement results to the remote side via a wireless data link. A remote positioning unit can also send measurement results to a mobile unit, which is then named indirect self-positioning. According to another study, indoor positioning techniques can be divided into two categories: network-dependent systems and device-dependent (network-independent) systems. Network-dependent navigation systems are based on networking technologies such as IR, sensors, ultrasound, WLANs, UWB,

Bluetooth, and RFID technologies, whereas independent navigation systems provide autonomous user positions such as A-GPS as an indoor GPS system.

1. Pre-models have Live GPS tracking ability which requires an external power source
2. Separate GPRS or Wi-Fi systems must be enabled to track the information
3. Digital Cloud platform must be maintained
4. Data transmission requires the activity of MQTT brokers to bind the data
5. System works only on temperatures between 10 degrees to 60 degrees

To overcome these limitations, researchers have explored various indoor positioning techniques. These techniques can be network-dependent or device-dependent. Network-dependent techniques rely on networking technologies, such as IR, sensors, ultrasound, WLANs, UWB, Bluetooth, and RFID technologies. In contrast, device-dependent techniques provide autonomous user positions, such as A-GPS, which function similarly to an indoor GPS system. These techniques offer more flexibility in terms of power supply, network connectivity, and temperature range, and can be better suited for certain applications. These techniques offer more flexibility in terms of power supply, network connectivity, and temperature range, making them better suited for certain applications. However, they also have their limitations and trade-offs, and the choice of a particular technique depends on the specific application requirements and constraints.

3.2 SCHEMATIC VIEW OF GPS TRACKING SYSTEM

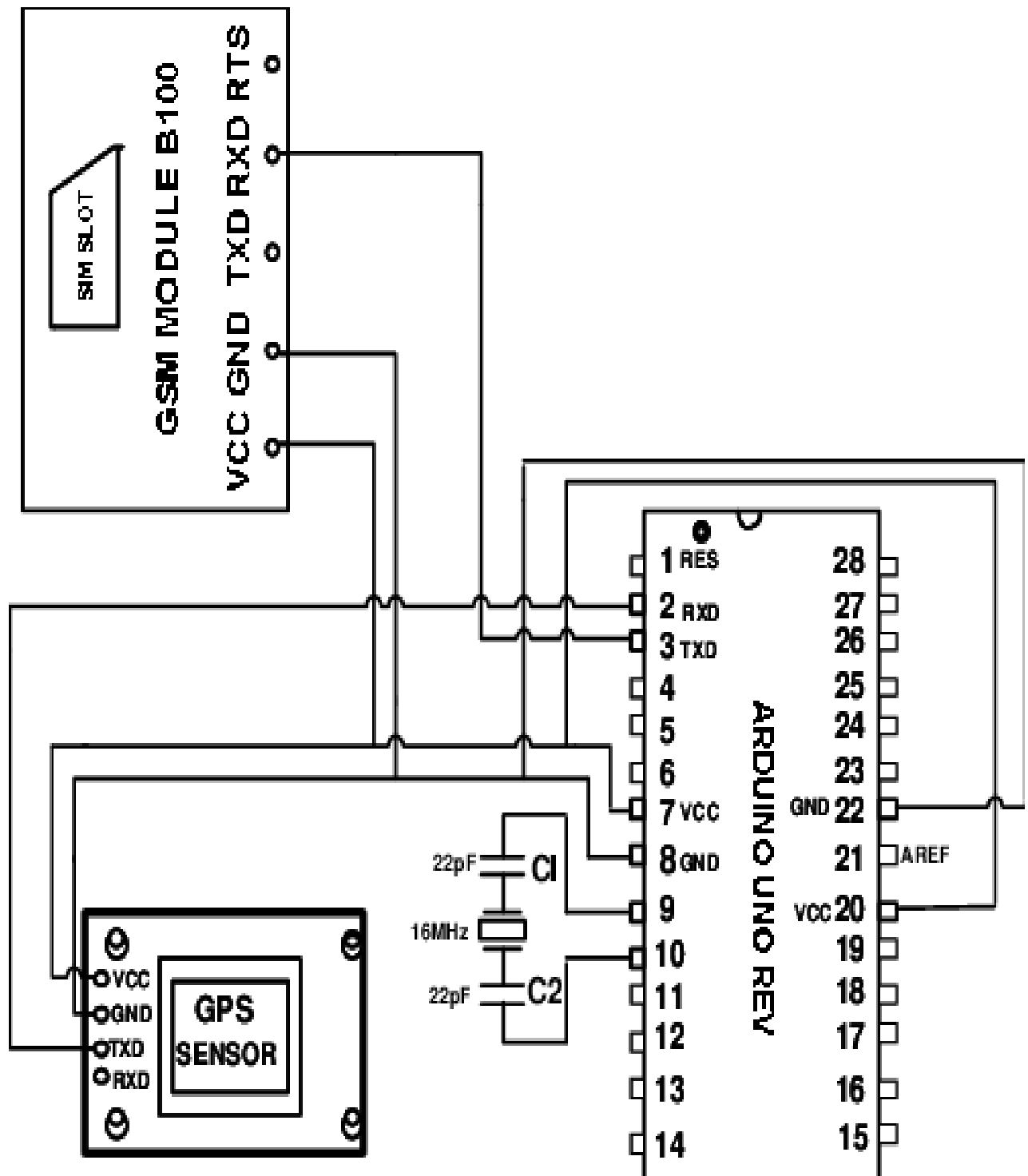


Fig.3.2: SCHEMATIC VIEW OF GPS TRACKING SYSTEM

Flow chart of the project



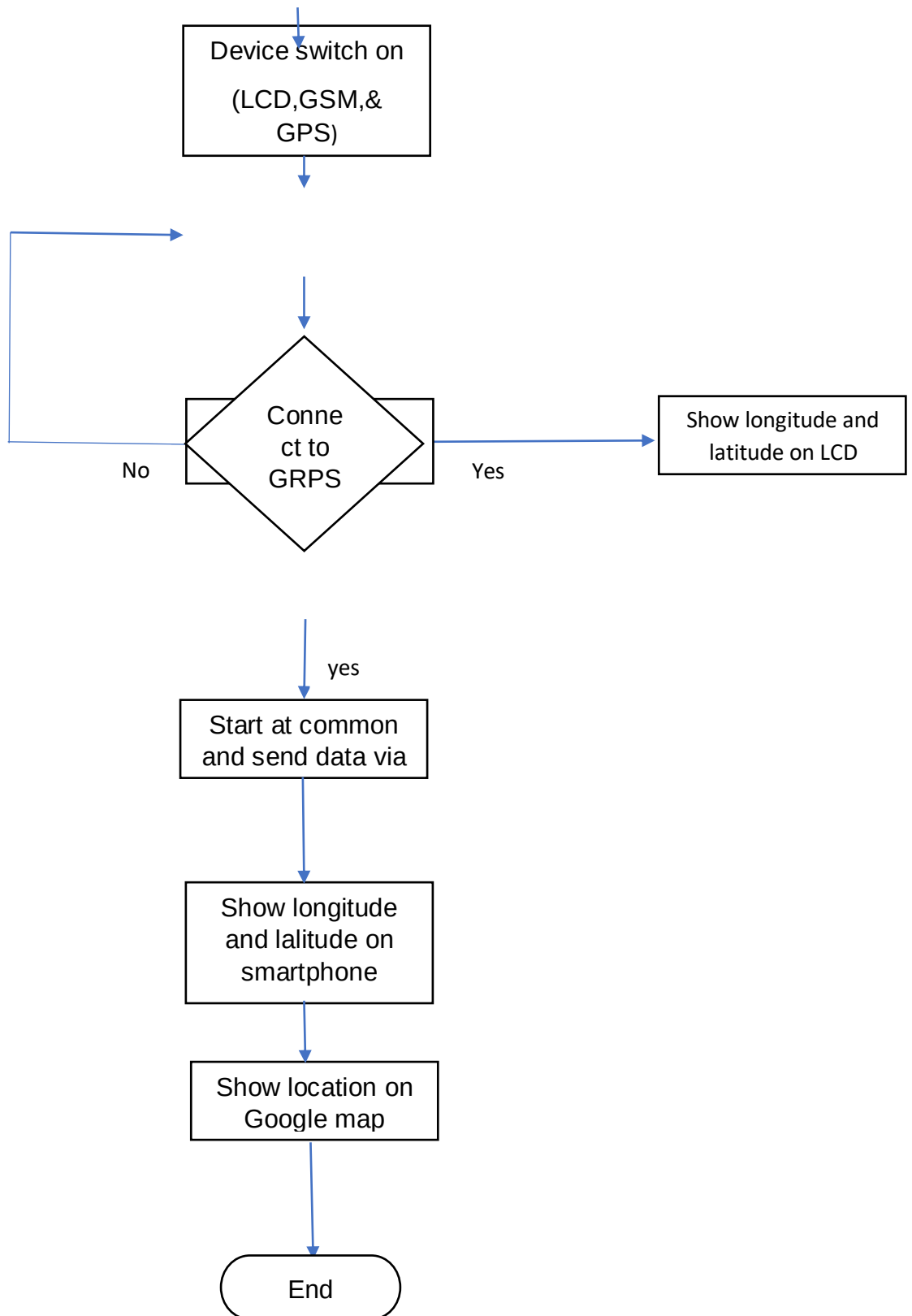


Fig.3.3:Flow chart

GPS Receiver: This is the device that receives signals from GPS satellites and calculates the device's location using trilateration.

Mobile Device: This is the device that transmits the GPS data to the tracking server, usually through a cellular network.

Tracking Server: This is the server that receives GPS data from the mobile device and processes it.

Database: This is where the tracking server stores the GPS data, along with any other information associated with the tracked device or user.

Mapping Application: This is the application that displays the GPS data in a user-friendly format, usually as a map.

User Interface: This is the interface that allows the user to interact with the mapping application and view the GPS data.

Communication device: This component transmits the location information from the GPS receiver to the central server or monitoring system. It can be a cellular modem, satellite communicator or radio transmitter.

Central server or monitoring system: This component receives and processes the location information sent by the communication device. It can be a software application or a cloud-based service that provides real-time tracking and monitoring of the location of the GPS-enabled object.

The GPS receiver determines the location of the object being tracked and sends this information to the communication device, which then transmits it to the central server or monitoring system. The monitoring system processes the location information and provides real-time tracking and monitoring of the GPS-enabled object. This allows the user to know the exact location of the object, its speed and direction, and other related information.

3.3 Feasibility Study

A feasibility study is an essential step in determining whether a project is viable and worth pursuing. Here is a feasibility study of the identification, location tracking system, and SOS generation for human safety using RFID and LoRa network:

- **Technical Feasibility:** The system's technical feasibility depends on the availability and compatibility of the RFID and LoRa components. Both RFID and LoRa technologies are widely used and readily available, making the

project technically feasible. RFID technology has been in use for many years and is widely used in various applications, including asset tracking, inventory management, and access control. Therefore, there are many suppliers of RFID components and systems, making them readily available in the market. In addition, RFID technology is compatible with many other technologies, including LoRa, which means that integrating RFID into a LoRa-based system is technically feasible. LoRa technology, on the other hand, is a relatively new technology but is gaining popularity rapidly due to its long-range, low-power capabilities. LoRa components and systems are also widely available in the market, and many companies are investing in LoRa-based solutions for various applications. Furthermore, LoRa is compatible with various other technologies, including RFID, which makes it easy to integrate with existing systems.

The compatibility of RFID and LoRa technologies makes it possible to develop an identification, location tracking system, and SOS generation system using both technologies. For instance, RFID tags can be used to identify and track individuals or assets, while LoRa can be used to transmit the location data to a central server. In addition, LoRa can be used to generate SOS signals in emergency situations. Therefore, the availability and compatibility of RFID and LoRa components make the proposed system technically feasible, and with the right design and development, the system can be implemented successfully.

- **Economic Feasibility:** The cost of the system's components, installation, and maintenance is a significant factor in determining its economic feasibility. While the initial cost of RFID and LoRa components may be high, the system's operational costs are relatively low, making the project economically feasible in the long run. The economic feasibility of the proposed identification, location tracking system, and SOS generation system using RFID and LoRa network can be evaluated based on the cost-benefit analysis of the project. The initial cost of the project includes the cost of RFID and LoRa components, the cost of hardware and software development, and the cost of installation and maintenance. These costs can be significant depending on the size and complexity of the system. However, the benefits of the system can outweigh the initial costs.

The system can improve safety and security, reduce the risk of loss or theft of assets, and increase operational efficiency. For instance, the system can help organizations track the movement of assets or personnel, ensure timely delivery of goods, and reduce the risk of accidents or emergencies. These benefits can result in cost savings for the organization, such as reduced insurance costs, reduced labor costs, and improved asset utilization. In addition, the system can also generate revenue by providing location-based services to customers or clients. For instance, the system can be used to provide real-time location tracking of delivery vehicles or assets, which can be useful for logistics and transportation companies. These services can be offered as a value-added service to customers, generating additional revenue for the organization. Therefore, based on the potential benefits and revenue streams, the proposed identification, location tracking system, and SOS generation system using RFID and LoRa network can be economically feasible, and the initial costs can be justified by the long-term benefits and returns on investment.

- **Legal Feasibility:** The use of RFID and LoRa technologies may raise legal issues related to privacy and data protection. Therefore, the system's legal feasibility depends on complying with the applicable laws and regulations related to data protection and privacy. Legal feasibility is an important aspect to consider for any project, especially those related to tracking and monitoring of individuals or assets. The proposed identification, location tracking system, and SOS generation system using RFID and LoRa network must comply with various legal requirements and regulations.

One important legal aspect to consider is data privacy and protection. The system must ensure that the data collected and stored is kept confidential and protected from unauthorized access. This may require implementing secure data storage and transmission protocols, and ensuring that access to the system is restricted to authorized personnel only. Another important legal aspect is compliance with regulations related to tracking and monitoring. Depending on the jurisdiction and application of the system, there may be regulations related to tracking and monitoring of individuals or assets, such as data retention and reporting requirements. It is important to

ensure that the system complies with these regulations to avoid any legal issues or liabilities.

Furthermore, the use of the system must also comply with ethical and moral considerations. For instance, the system must not be used for unethical purposes, such as tracking individuals without their consent or monitoring employees beyond reasonable limits. This can be achieved by implementing policies and guidelines related to the use of the system, and ensuring that they are communicated effectively to all stakeholders.

In summary, legal feasibility is a critical aspect of the proposed identification, location tracking system, and SOS generation system using RFID and LoRa network. The system must comply with data privacy and protection regulations, tracking and monitoring regulations, and ethical considerations to avoid legal issues and liabilities.

- **Operational Feasibility:** The system's operational feasibility depends on its ease of use and compatibility with the existing infrastructure. The system should be easy to use and integrate with the existing infrastructure to be operationally feasible. Operational feasibility refers to the practicality of implementing the system within an organization. The system must be acceptable to the users, and they must be able to understand and operate it easily. In the case of the proposed identification, location tracking, and SOS generation system, it is crucial to ensure that the system is easy to use and understand by the end-users, who are likely to be individuals who are not technology experts. To ensure operational feasibility, the following factors need to be considered:
 - User training: Adequate training must be provided to the end-users, including how to use the identification, location tracking, and SOS generation system. The training should be simple and straightforward so that the users can operate the system without difficulty.
 - User acceptance: The end-users must accept the system and be willing to use it. This can be achieved by involving them in the design process, getting their feedback, and addressing their concerns.

- Integration with existing systems: The proposed system should be integrated with the organization's existing systems to ensure smooth operation and avoid duplication of efforts.
- Maintenance and support: Adequate resources must be allocated for system maintenance and support to ensure that the system is always operational and any issues are promptly resolved. Overall, the operational feasibility of the proposed identification, location tracking, and SOS generation system can be achieved by involving end-users in the design process, providing adequate training, ensuring user acceptance, integrating with existing systems, and allocating resources for maintenance and support.
- **Social Feasibility:** The system's social feasibility depends on its acceptance and adoption by the people being tracked. The system should address their safety concerns while respecting their privacy and autonomy to be socially feasible.

Based on the above feasibility factors, it is feasible to design and develop an identification, location tracking system, and SOS generation for human safety using RFID and LoRa network. However, it is essential to address the legal and social concerns and ensure the system's ease of use and integration with the existing infrastructure to make it operationally feasible. Social feasibility refers to the potential impact of the project on society and its acceptability by the stakeholders. In the case of the identification, location tracking system, and SOS generation for human safety using RFID and LoRa network, the system has the potential to enhance the safety and security of individuals in various scenarios, such as in industrial sites, educational institutions, and hospitals.

The system can be useful in emergency situations, allowing for quick identification, location tracking, and SOS generation. This can potentially save lives and minimize injuries. Additionally, the system can provide peace of mind to individuals and their loved ones, knowing that they are being monitored and can send an SOS signal if needed.

However, there may be concerns about privacy and data protection. The system must comply with legal requirements and data protection regulations to ensure that personal information is kept confidential and not misused.

Overall, the social feasibility of the system will depend on how it is perceived by the stakeholders and the general public. If the benefits of the system are communicated effectively and privacy concerns are addressed, it has the potential to be socially acceptable and beneficial.

Risk analysis

Data security: One of the primary risks associated with any system that involves the transmission and storage of sensitive data is the risk of data breaches. To mitigate this risk, the system should employ robust encryption techniques to secure the data both in transit and at rest.

RFID interference: In densely populated areas or areas with many RFID tags, there may be instances of interference between the tags, leading to incorrect readings or missed readings. To mitigate this risk, the system should use frequency-hopping techniques that can avoid interference.

Battery life: If the system relies on battery-powered RFID tags or other components, the battery life may be a limiting factor. To mitigate this risk, the system should use low-power components wherever possible and employ power-saving techniques such as sleep modes.

False alarms: There is a risk of false alarms if the system is too sensitive, leading to unnecessary interventions and wasting resources. To mitigate this risk, the system should be designed with a threshold for triggering alerts and alarms.

Network coverage: The system relies on LORA network coverage to transmit location and SOS data. There is a risk of areas where the network coverage is weak or non-existent, leading to delayed responses to SOS signals. To mitigate this risk, the system should use multiple network providers, where possible, and have backup communication methods like SMS or satellite communication.

User error: There is a risk of users forgetting to carry their RFID tags or not activating SOS signals in emergency situations. To mitigate this risk, the system should have reminders and alerts for users to carry their tags and provide user training on the use of the system.

Device failure: There is a risk of device failure due to hardware or software malfunctions, leading to incorrect readings or no readings at all. To mitigate this risk, the system should have redundancy and backup systems in place, such as using multiple RFID readers, and have a comprehensive maintenance and testing program.

3.4 Software Requirements Specification Document

- **GPS tracking algorithm:** to determine the location of the user and update it periodically



Fig.3.4: Software Requirements Specification Document

- **SOS generation algorithm:** to trigger an emergency alert when the SOS button is pressed
- **User identification algorithm:** to identify the user based on a unique ID or biometric data (e.g., fingerprint)
- **Location tracking algorithm:** to track the user's location and store it in a database
- **Android Studio:** Android Studio is the official Integrated Development Environment (IDE) for android application development. Android Studio provides more features that enhance our productivity while building Android apps. Android Studio was announced on 16th May 2013 at the Google I/O conference as an official IDE for Android app development. It started its early access preview from version 0.1 in May 2013. The first stable built version was released in December 2014, starting from version 1.0. Since 7th May 2019, Kotlin is Google's preferred language for Android application development. Besides this, other programming languages are supported by Android Studio.



Fig.3.5: Android Studio

APK extractor: APK Extractor will extract APKs that are installed on your android device and copies them to your SD card. ★ Fast and easy to use.
★ Extracts almost all applications, including system applications.

3.5 Hardware Requirements Specification Document

- **GPS module:** to determine the location of the user. Targeted customs from surveying and mapping, UAV, robotics, precision agriculture etc. Professional and experienced R&D team. provide 7/24 technical support. leading GNSS technology. High precision & reliable. 20+ years' experience.



Fig.3.6: GPS module

- **Microcontroller:** to control the system and process the data. Microcontroller is a compressed microcomputer manufactured to control the functions of embedded systems in office machines, robots, home appliances, motor vehicles, and a number of other gadgets. A

microcontroller is comprising components like - memory, peripherals and most importantly a processor.

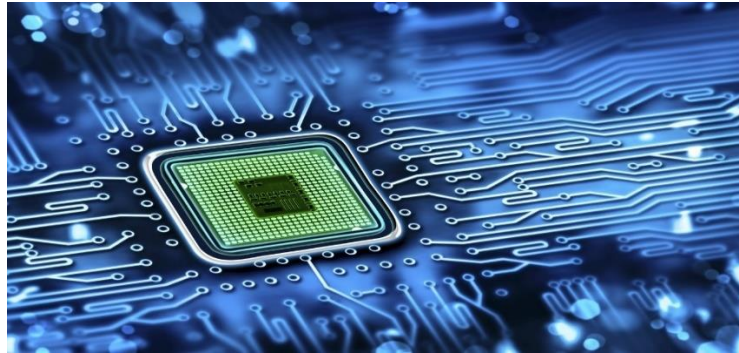


Fig.3.7: Microcontroller

- **GSM module:** to send/receive SMS and voice calls. A GSM modem or GSM module is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. GSM modems are used in mobile telephones and other equipment that communicates with mobile telephone networks. They use SIMs to identify their device to the network.



Fig.3.8: GSM module

- **Battery:** A **battery** is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices.

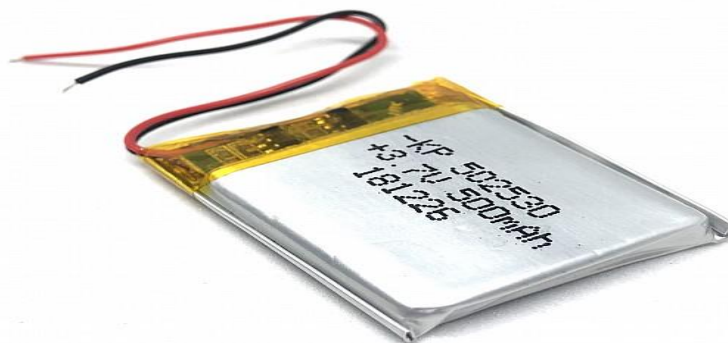


Fig.3.9:Battery

- **IOT SIM:** An IoT SIM card, also known as M2M SIM Card (machine-to-machine), is a Subscriber Identity Module that is used in IoT (Internet of Things) devices to identify them as they try to connect to a 2G, 3G, 4G-LTE, Cat-M, NB-IoT, or 5G wireless cellular network.



Fig.3.IOT SIM

3.6 Requirement specification:

The identification, location tracking system, and SOS generation for human safety using RFID and LoRa network can be broken down into several categories:

Functional Requirements:

The system should be able to identify and track the location of the RFID-tagged individuals in real-time.

The system should be able to generate an SOS signal in case of an emergency.

The system should be able to notify the relevant authorities and emergency response teams in case of an SOS signal.

The system should be able to work in environments with low connectivity, using LoRa network technology.

The system should be able to operate on a low-power battery for an extended period.

Performance Requirements:

The system should be able to provide accurate location information with a high level of precision.

The system should be able to generate an SOS signal within a short amount of time.

The system should be able to operate efficiently in a variety of environments and weather conditions.

The system should be able to operate for an extended period without requiring frequent maintenance or repairs.

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

4.1 Proposed methodology of location tracking

System Requirements: Define the requirements of the system, including the number of users, the range of the tracking system, the frequency of data transmission, and the level of security required.

Hardware Design: Design the hardware components of the system, including RFID readers, LoRa nodes, and SOS buttons. Select the appropriate components that meet the system requirements.

Software Development: Develop the software components of the system, including the RFID reader software, LoRa node software, and SOS generation software. Ensure that the software is compatible with the selected hardware components.

System Integration: Integrate the hardware and software components of the system. Test the system to ensure that all components are working together as intended.

Deployment: Deploy the system in the intended environment, such as a building or outdoor area. Ensure that the system is functioning correctly and meets the system requirements.

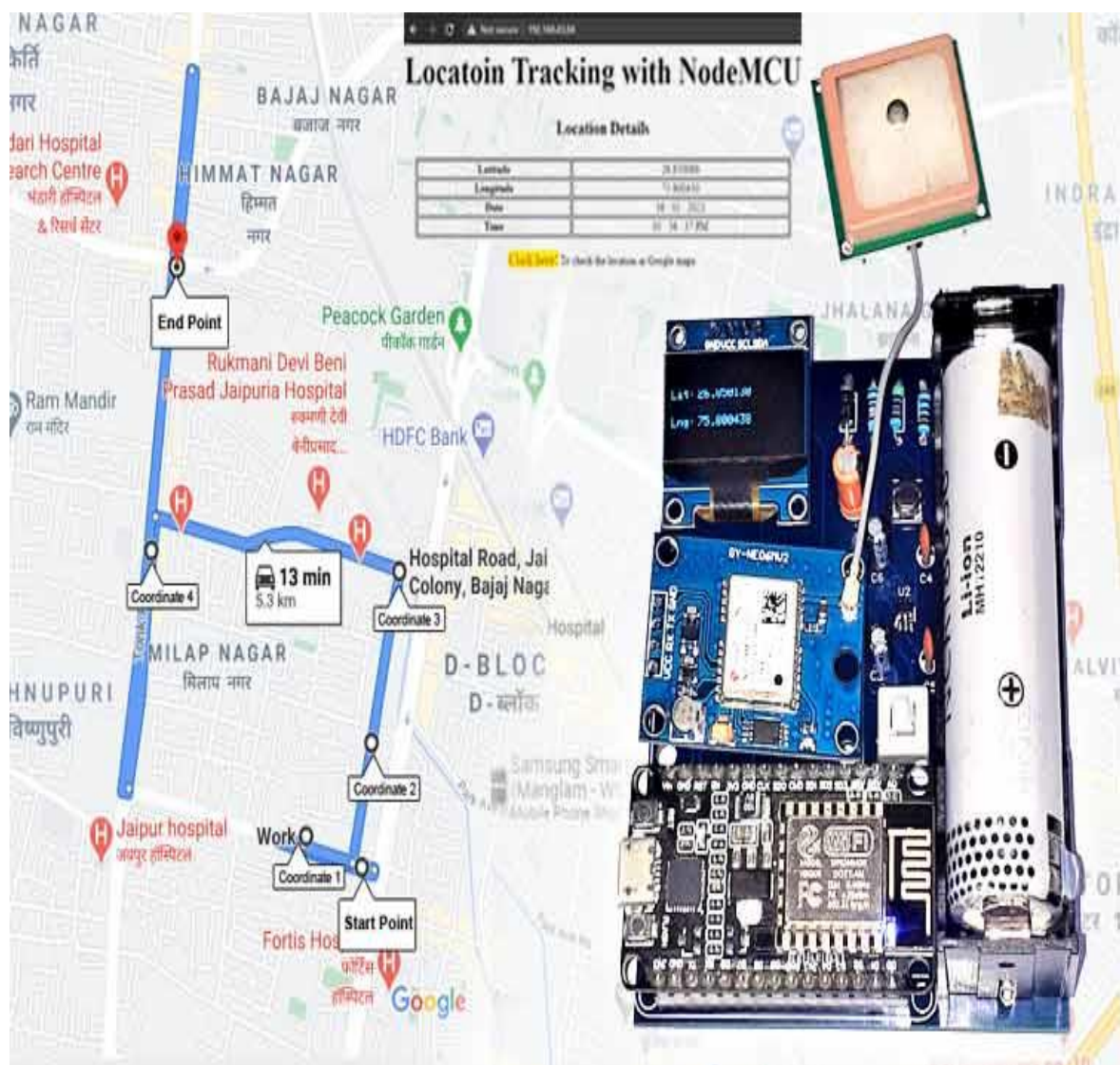
User Training: Provide training to the system users, including how to use the RFID tags, how to activate the SOS button, and how to locate other users using the tracking system.

Maintenance and Support: Provide ongoing maintenance and support for the system, including updating software and replacing hardware components as needed.

Our proposed system can deliver higher levels of precise GPS data since we use a 4g network as an interface. Optimized Routing of fleet tracking system that combines GPS data with real-time mapping data can provide current fleet locations. Analysis of trip history and voice calling ability can be availed in the Modern Maduino 4G system. Our proposed fleet tracking can also be used to reduce operating costs and improve asset utilization. It can ensure improved driver

safety that can help organizations protect their most valuable assets. A completely wireless system that works with wireless data power. It works on the principle of a tesla wireless charging coil. The chip has an inbuilt memory device that can be used to store data. A maximum of 32 kb flash memory can be used to update the information. It works in a wet and moist environment also. Energy efficient, less radioactive technology for sharing the data

The proposed system for fleet tracking aims to deliver higher levels of precision in GPS data by using a 4G network as an interface. This allows for optimized routing of the fleet tracking system, combining real-time mapping data with GPS data to



provide accurate fleet locations.

Fig.4.1:Location tracking with node MCU

Advantages of proposed system

In this project, a study on indoor positioning and navigation techniques and technologies which can maximize positioning has been done considering with following metrics such as RFID, GPS, and so on. These metrics are an offshoot of measurement characteristics such as angle, distance, and signal strength. While these techniques aid effective positioning, their right application is critical in a system. The indoor navigation-based application of these techniques will determine the degree of accuracy, scalability, complexity, and performance of a wireless system. More Advantages of this are

- Higher levels of precision in GPS data: The system uses a 4G network as an interface, allowing for optimized routing of the fleet tracking system and combining real-time mapping data with GPS data to provide accurate fleet locations.
- Reduced operating costs: The system can help organizations to reduce operating costs by improving asset utilization and reducing fuel consumption through optimized routing.
- Improved driver safety: The system can help organizations to improve driver safety by monitoring driver behavior and identifying potential safety risks, such as speeding or harsh braking.

4.2 Software Architecture

The software architecture of the identification, location tracking, and SOS generation system using RFID and LoRa network can be designed using a layered architecture pattern. The layered architecture pattern consists of multiple layers, where each layer has a specific responsibility and interacts with the layers above and below it. The following layers can be included in the software architecture:

Presentation layer: This layer is responsible for user interface design and presentation. It provides the user interface for the system, where users can interact with the system using a web-based or mobile-based application.

Application layer: This layer is responsible for implementing the business logic of the system. It processes the user inputs received from the presentation layer and performs the necessary operations required for identification, location tracking, and SOS generation.

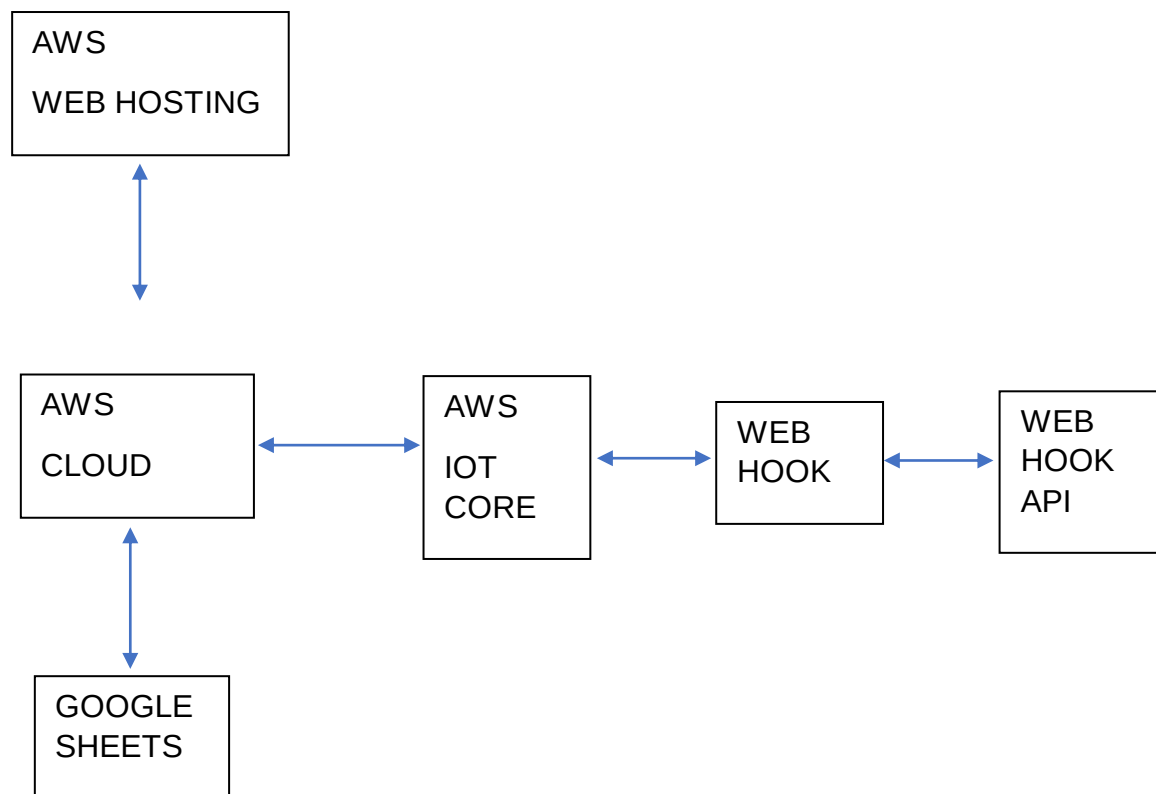


Fig.4.2: Software Architecture

4.3 AWS WEB HOSTING:

Amazon Web Services (AWS) is a cloud-based platform that provides web hosting services for various types of applications, including websites, mobile apps, and enterprise software. AWS offers a wide range of hosting services, including virtual machines, databases, storage, and application services, which can be used to host and run web applications.

To host a website on AWS, users can choose from several hosting options, including Amazon Elastic Compute Cloud (EC2), AWS Lambda, Amazon S3, and Amazon Elastic Beanstalk. Each of these services provides a different level of control and flexibility, depending on the user's needs.

Some of the key benefits of using AWS for web hosting include:

Scalability: AWS provides the ability to scale up or down the resources allocated to a website based on the site's traffic and demands. This allows users to avoid over-provisioning or under-provisioning resources, which can lead to performance issues or wasted resources.

High Availability: AWS offers multiple availability zones, which are geographically dispersed data centers, to ensure high availability and redundancy of data and applications. This provides resilience and ensures that websites remain available even in the event of a failure or outage in one of the zones.

Security: AWS provides a wide range of security features and compliance certifications to help users secure their applications and data. These features include network security, data encryption, identity and access management, and compliance certifications such as SOC 2, HIPAA, and PCI DSS.

Cost-effectiveness: AWS offers a pay-as-you-go pricing model, which means that users only pay for the resources they consume, without any upfront costs or long-term commitments. This can help users save costs and optimize their spending on web hosting. In summary, AWS provides a powerful and flexible platform for web hosting, with a wide range of features and benefits to meet the needs of different users and applications.



Fig.4.3: AWS WEB HOSTING

AWS CLOUD:

AWS (Amazon Web Services) is a cloud computing platform provided by Amazon. It offers a wide range of cloud-based services such as storage, computing, networking, security, database, analytics, and IoT (Internet of Things) to

individuals, businesses, and governments. AWS provides a pay-as-you-go pricing model, which means customers only pay for what they use and avoid upfront costs and long-term commitments.

Cloud computing is a model of delivering IT services over the internet. It allows users to access computing resources such as servers, storage, databases, software, and analytics over the internet instead of owning and managing them locally. Cloud computing offers many benefits such as scalability, agility, flexibility, cost-effectiveness, and security.

AWS cloud provides a wide range of services that can be used to host web applications, run databases, store files, and perform various other computing tasks. Some of the most popular AWS services are Amazon S3 (Simple Storage Service), EC2 (Elastic Compute Cloud), RDS (Relational Database Service), Lambda, and DynamoDB. AWS also provides many tools and services for managing and monitoring cloud resources such as CloudWatch, CloudTrail, and AWS Config.

Overall, AWS cloud offers a robust, secure, and reliable infrastructure for running applications and services in the cloud. It is widely used by businesses of all sizes, from startups to enterprises, as well as by governments and non-profit organizations

4.4 AWS IOT CORE:

AWS IoT Core is a managed cloud service that enables secure communication between Internet of Things (IoT) devices and the AWS Cloud. It provides a platform

for connecting and managing billions of devices and their data securely AWS IoT Core offers various features like message processing, device shadowing, security, and integration with other AWS services like Lambda, Kinesis, S3, and more. It supports various communication protocols like MQTT, HTTP, and WebSocket, allowing devices to communicate with the cloud over different networks. With AWS IoT Core, developers can easily build and deploy IoT applications without worrying about managing infrastructure. It provides scalable and flexible solutions for managing IoT devices, handling data, and analyzing data in real-time.

AWS IoT Core also provides a rules engine that can be used to process incoming data from devices, trigger actions, and forward data to other AWS services for analysis. This allows users to create powerful workflows that can automate tasks and improve operational efficiency.

Overall, AWS IoT Core simplifies the process of building and managing IoT applications, making it easier for businesses to leverage the benefits of IoT technology.

4.5 WEB HOOK:

A web hook is a way for web applications to provide real-time information to other applications or servers. It is a simple event-notification mechanism that sends HTTP POST requests to a specified URL when an event occurs. The URL can be configured to run a script or application, allowing for easy integration with other services and systems.

Web hooks can be used in a variety of applications, such as:

Integrating with third-party services, such as payment gateways or social media platforms.

Providing real-time notifications for events, such as new orders or messages. Automating tasks and workflows, such as updating a CRM system when a new lead is added. Web hooks are easy to implement and can be used with any web-based application or service that supports HTTP requests. They are a powerful tool for building integrations and automating workflows, allowing for more efficient and effective operations.

WEB HOOK API:

A webhook API, also known as a web callback or HTTP push API, is a way for applications to provide other applications with real-time information. It allows an application to subscribe to specific events or notifications on another application or server and receive updates in real-time.

In simple terms, a webhook API allows one application to send data to another application in real-time, triggering actions or events in response. For example, a

social media platform may use a webhook API to send notifications to an external application when a user posts a new comment or likes a post.

To use a webhook API, the receiving application must provide a URL or endpoint where the sending application can make HTTP POST requests. The sending application includes a payload of data in the request, which is then processed by the receiving application.

Webhook APIs can be used for a variety of purposes, such as:

Real-time notifications: A webhook can be used to receive notifications when certain events occur, such as when a new user signs up for a service or when a new order is placed.

Data integration: Webhooks can be used to integrate data between different applications, such as syncing customer data between a CRM and an email marketing tool.

Automation: Webhooks can be used to trigger automated actions or workflows, such as sending an email or updating a database when a specific event occurs.

Overall, webhook APIs provide a flexible and efficient way for applications to communicate and share data in real-time, improving automation and integration between different systems.

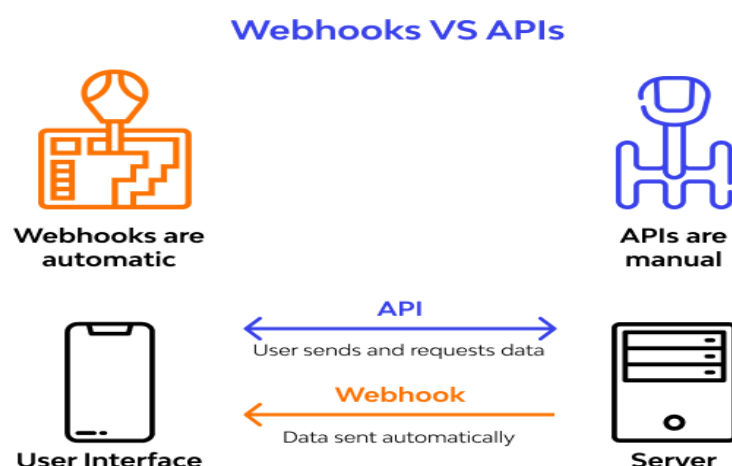


Fig.4.4: WEB HOOK API

4.6 GOOGLE SHEETS:

Google Sheets is a cloud-based spreadsheet software developed by Google. It is part of the Google Workspace productivity suite, and can be accessed through a web browser or mobile app. Google Sheets offers similar functionalities to other spreadsheet software, such as Microsoft Excel, including the ability to create, edit, and format cells, organize data in rows and columns, and perform calculations and data analysis.

One of the main advantages of using Google Sheets is its collaboration features. Multiple users can work on the same spreadsheet simultaneously, and changes made by one user are automatically updated for all others. Additionally, Google Sheets offers various integrations with other Google Workspace applications and third-party tools, such as Google Forms and Zapier, which allow for data collection and automation.

Data access layer: This layer is responsible for accessing and manipulating data stored in the database. It provides an interface between the application layer and the database, where data is fetched, updated, or deleted.

Database layer: This layer is responsible for storing and managing the data required for the system. It stores the data related to user profiles, location data, and SOS generation data.

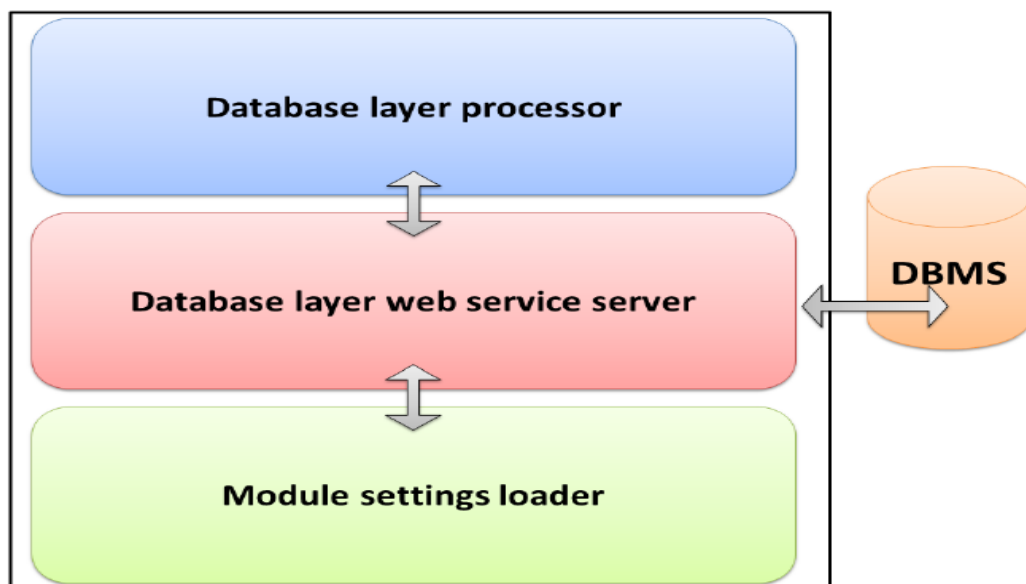


Fig.4.5:Database layer

RFID reader layer: This layer is responsible for communicating with the RFID reader and receiving data related to user identification and location.

LoRa network layer: This layer is responsible for communicating with the LoRa network and transmitting data related to user location and SOS generation.

Functional Block Of The System

The functional blocks of the system are as follows:

RFID Reader: The RFID reader is responsible for reading the unique identification number of the RFID tag attached to the person or object. The reader captures the signal emitted by the tag and transmits it to the central processing unit for further processing.

LoRa Gateway: The LoRa gateway acts as an interface between the RFID reader and the central processing unit. It receives the signal from the RFID reader and transmits it to the central processing unit through the LoRa network.

Central Processing Unit: The central processing unit is responsible for processing the data received from the RFID reader and LoRa gateway. It processes the data and performs various operations like identification, location tracking, and SOS generation.

Cloud Server: The cloud server is responsible for storing the data received from the central processing unit. It also provides a user interface for data stored in the cloud.

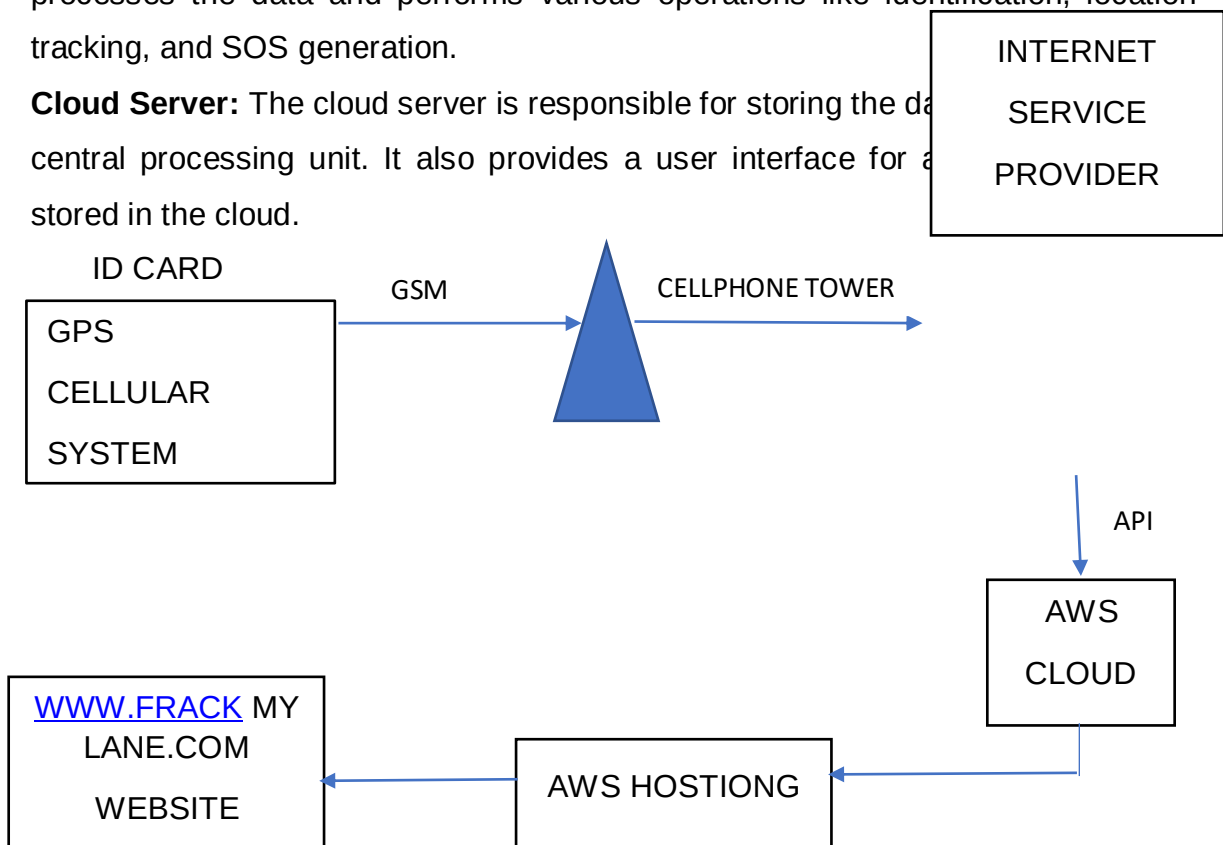


Fig.4.6: Functional Block Of The System

4.7 GPS CELLULAR SYSTEM:

A GPS cellular system is a type of location-based service that utilizes GPS technology to determine the device's location and uses cellular networks to transmit that information to the server. This system can be used for a variety of applications, including fleet tracking, asset management, and personal tracking.

The GPS technology in the system uses a network of satellites to triangulate the device's location on the earth's surface. The device then uses cellular networks, such as 3G, 4G, or 5G, to transmit this location data to a central server or cloud-based platform. The server then processes and stores this data, allowing users to access real-time location information and track the device's movements over time.

GPS cellular systems are widely used in industries such as logistics, transportation, and emergency services to track vehicles, assets, and people in real-time. The use of cellular networks for data transmission makes these systems highly reliable and ensures that location data is transmitted even in areas with poor GPS reception.

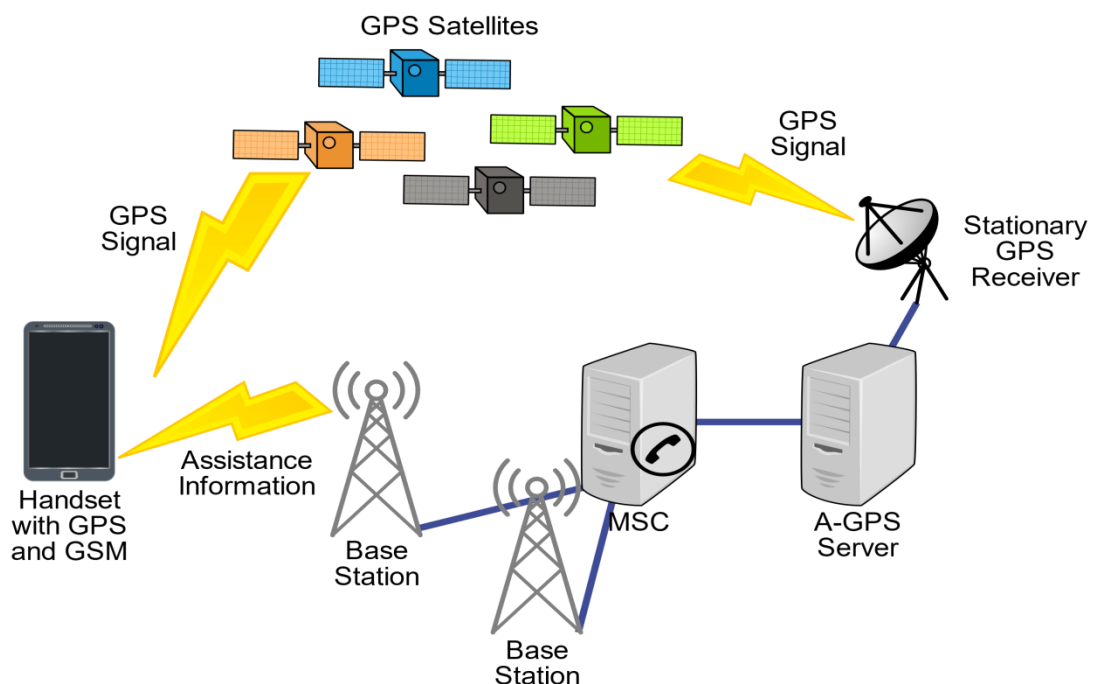


Fig.4.7: SYSTEM GPS CELLULAR

GSM:

GSM (Global System for Mobile Communications) is a digital cellular network technology that is widely used for mobile communication. It is the most widely used mobile communication standard in the world, and it operates on four frequency bands (850, 900, 1800, and 1900 MHz). GSM networks use a combination of time division multiple access (TDMA) and frequency division multiple access (FDMA) to allow multiple users to share the same frequency band. GSM provides a number of features such as voice and data communication, messaging, call forwarding, caller ID, and roaming. It also supports a range of data services such as GPRS (General Packet Radio Service), EDGE (Enhanced Data rates for GSM Evolution), and 3G (Third Generation) technologies.

CELLPHONE TOWER:

A cellphone tower, also known as a cell tower or a mobile tower, is a structure that is used to facilitate communication between cellular devices. These towers are typically tall structures that are equipped with antennas and transmitters that allow mobile devices to connect to the cellular network. When a person makes a call or accesses the internet on their mobile device, the signal is transmitted to the nearest cellphone tower, which then routes the signal to the appropriate network. The tower is connected to the network via a wired or wireless connection, which enables it to send and receive data to and from other cell towers and the cellular network. Cellphone towers are an essential component of the cellular network infrastructure, and they are strategically placed to ensure that users can access the network wherever they are.



WITH EDITABLE STROKE

Fig.4.8: CELLPHONE TOWER

4.8 INTERNET SERVICE PROVIDER :

An Internet Service Provider (ISP) is a company or organization that provides Internet access to customers. ISPs typically offer different types of Internet connections, such as broadband, DSL, cable, and wireless, and provide various plans with different speed and data usage options. ISPs are responsible for maintaining the infrastructure and network equipment necessary for connecting customers to the Internet, as well as providing technical support and customer service. ISPs may also offer additional services such as email, web hosting, and virtual private networks (VPNs).



Fig.4.9:INTERNET SERVICE PROVIDER

API:

API stands for Application Programming Interface. It is a set of protocols, routines, and tools that allow different software applications to communicate with each other. APIs define the way different components of a software application should interact with each other, and what kind of data can be exchanged between them. APIs can be used for various purposes, such as accessing web services, retrieving or updating data from a database, or integrating different software systems. They play an important role in software development and allow developers to create new applications and services by leveraging the functionality of existing systems.

4.9 AWS CLOUD:

AWS Cloud is a comprehensive cloud computing platform offered by Amazon. It provides a wide range of services, including computing, storage, databases, analytics, machine learning, networking, mobile, development tools, security, and

Internet of Things (IoT). AWS Cloud is designed to provide scalable, reliable, and cost-effective infrastructure for businesses of all sizes, from startups to enterprises.

Some of the key benefits of using AWS Cloud include:

Scalability: AWS Cloud allows you to easily scale your infrastructure up or down based on your needs. You can add or remove resources as required to handle changes in demand.

Reliability: AWS Cloud is designed to provide high availability and reliability. It uses redundant infrastructure and automated failover to minimize downtime.

Security: AWS Cloud provides a wide range of security features and compliance certifications to ensure that your data is protected.

Cost-effectiveness: AWS Cloud offers a pay-as-you-go pricing model, which means you only pay for what you use. This can help you reduce your infrastructure costs and optimize your budget.



Fig.4.10: AWS CLOUD

AWS HOSTING:

AWS (Amazon Web Services) hosting refers to the cloud computing services provided by Amazon that allow individuals and organizations to host their applications and websites on Amazon's infrastructure. AWS offers a range of hosting services, including virtual servers (EC2), storage (S3), and databases (RDS), among others.

AWS hosting is popular due to its flexibility, scalability, and reliability. With AWS, users only pay for the resources they use, and can quickly scale their infrastructure up or down depending on their needs. Additionally, AWS provides a range of security and compliance measures, making it a popular choice for businesses with strict security requirements.

Some of the benefits of AWS hosting include:

Flexibility: Users can choose from a wide range of services and customize their infrastructure to meet their specific needs.

Scalability: AWS can easily scale up or down to accommodate changes in traffic or usage patterns.

Reliability: AWS provides multiple availability zones and redundancy features to ensure high uptime and minimize downtime.

Security: AWS provides a range of security and compliance measures to help

User Interface: The user interface is responsible for displaying the data collected by the central processing unit. It provides an easy-to-use interface for users to track the location of the person or object and generate SOS signals in case of an emergency.

Overall, the functional blocks work together to ensure efficient identification, location tracking, and SOS generation for human safety using RFID and LoRa network.

CHAPTER 5

IMPLEMENTATION DETAILS

5.1 Development and Deployment Setup

Requirements Gathering: The first step is to gather requirements from stakeholders and end-users about the features they require in the system. The system should be designed to be user-friendly, reliable, and accurate.

Hardware Selection: The next step is to select the necessary hardware components for the system, such as RFID readers, tags, LoRa gateways, and sensors.

Software Development: Once the hardware is selected, software development can begin. The software should include functions such as RFID tag identification, location tracking, and SOS generation.

Testing: After the software development, testing should be conducted to ensure that the system functions accurately and reliably.



Fig.5.1: Real time tracking

Deployment: Once testing is complete, the system can be deployed in the intended environment. This can involve installing RFID readers and sensors, setting up LoRa gateways, and integrating the software with the hardware.\

The deployment setup for the system would involve the following steps:

Hardware installation: Install RFID readers, sensors, and LoRa gateways at strategic locations in the environment where the system will be used.

Software Integration: Integrate the software with the hardware components installed.

5.2 Algorithms

Hardware Design:

Design a hardware module that includes RFID reader, LORA module, and SOS button.

The RFID reader will be used to identify and track the location of the person wearing the RFID tag.

The LORA module will be used to transmit the location data to a central server or monitoring system.

The SOS button will be used to trigger an emergency alert when the user needs help.

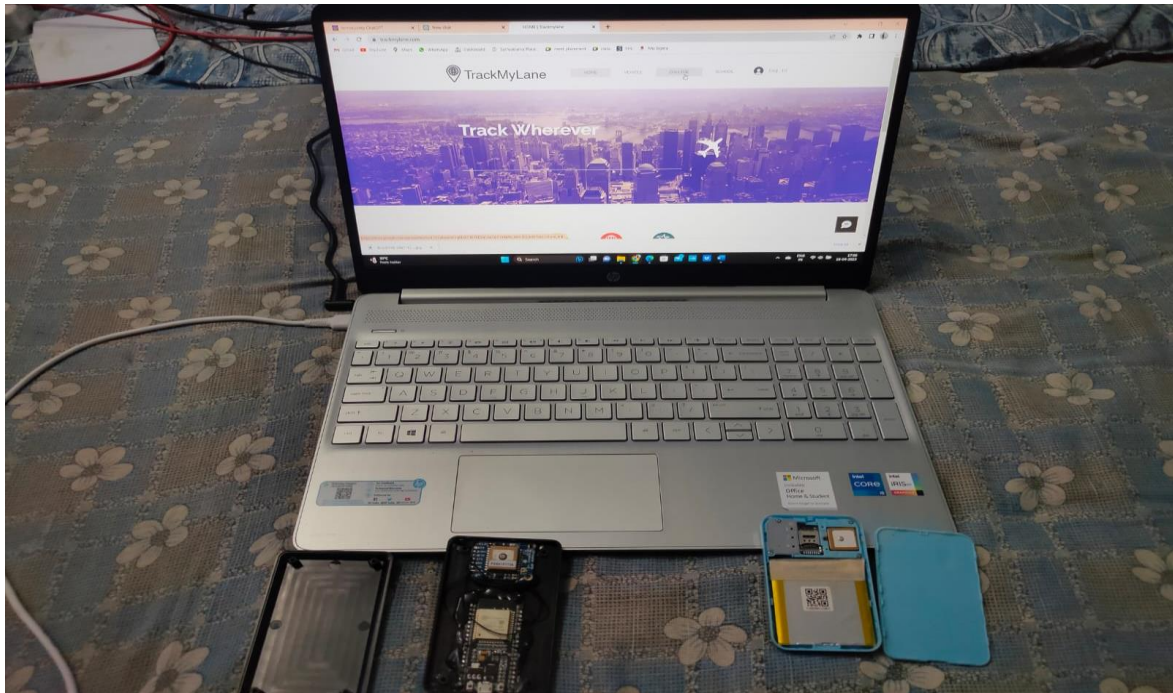


Fig.5.2: Hardware Design

Software Development:

Develop a software application that will run on the hardware module and will be responsible for reading the RFID tag and generating the location data.

Develop an algorithm for transmitting the location data to a central server or monitoring system using the LORA network.

Develop an algorithm for generating an SOS alert when the user presses the SOS button.

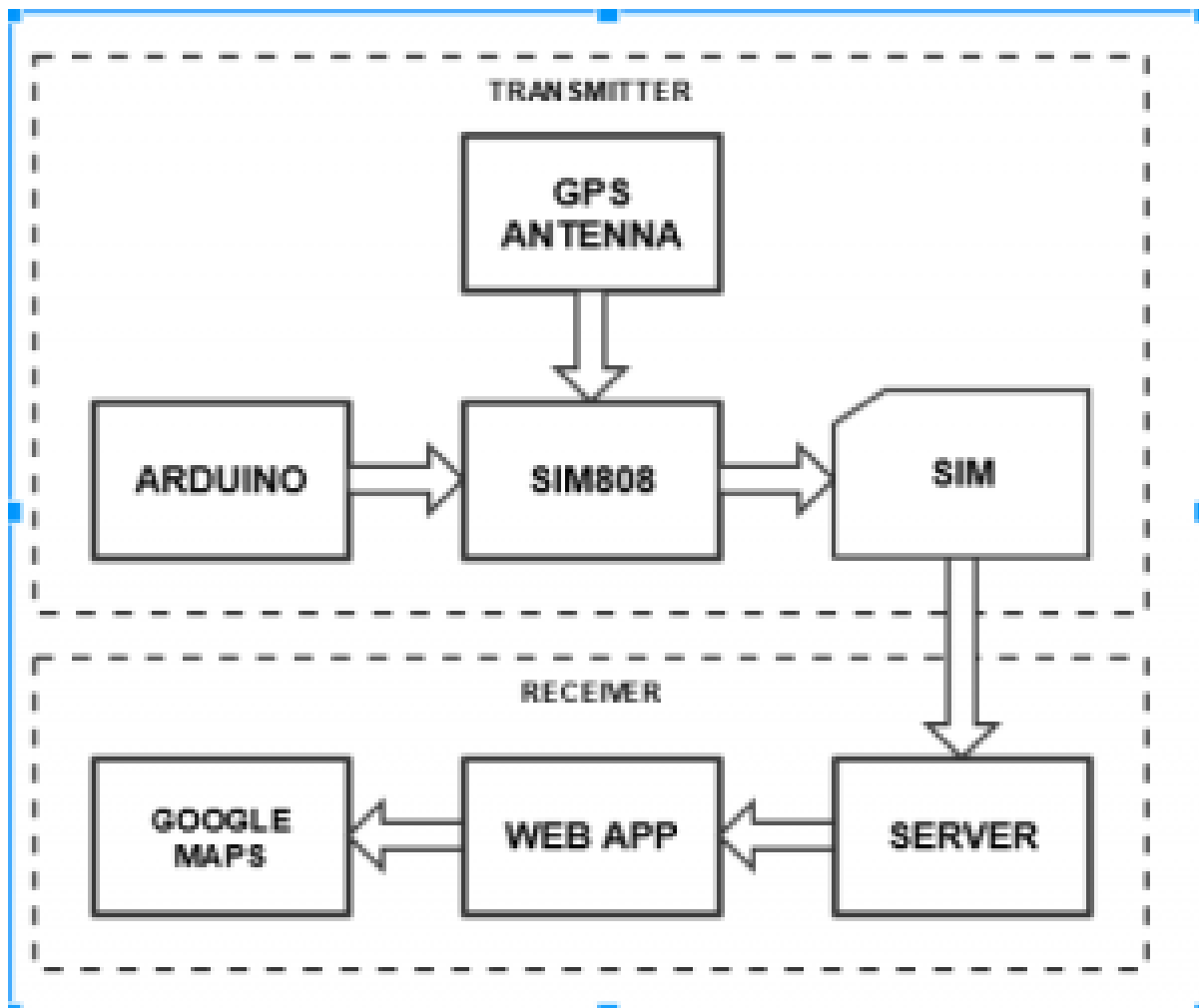


Fig.5.3:software Development

Network Integration:

Integrate the LORA network with the central server or monitoring system, so that the location data can be received and processed.

Develop a user interface for the monitoring system to display the location data and SOS alerts.

5.3 TESTING

Testing is a critical component of any project, including the design and development of an identification, location tracking system, and SOS generation system using RFID and LoRa network. Here are some types of testing that can be performed in this project:

Types of testing

Unit testing: In this testing, each unit of the system is tested independently to ensure that it is working correctly.

Integration testing: This type of testing verifies the correct functioning of different modules when integrated with each other.

System testing: This testing validates the system's compliance with the functional and non-functional requirements and ensures that the system meets the end-user's expectations.

Performance testing: This testing measures the system's performance under various workloads, traffic volumes, and network conditions.

Security testing: This testing checks the system's security against external threats and verifies the system's ability to handle different types of security attacks.

Acceptance testing: This testing ensures that the system meets the client's requirements and that the end-users are satisfied with the system's functionality.

Usability testing: This testing evaluates the system's usability, user-friendliness, and user interface to ensure that the system is easy to use and understand by end-users.

Testing Techniques

There are several testing techniques that can be used to ensure the proper functioning of the identification, location tracking, and SOS generation system using RFID and LoRa network. Some of the testing techniques are:

Integration Testing: This technique is used to test the integration of individual modules to ensure that they are working correctly together as a whole. It is a black-box testing technique where the input and output of the integrated modules are tested.

System Testing: This technique is used to test the entire system to ensure that it meets the requirements and functions as expected. It is a black-box testing technique where the system is tested in a real-world environment.

Acceptance Testing: This technique is used to test the system from the end-user's perspective to ensure that it meets their requirements and is ready for deployment. It is a black-box testing technique where the system is tested by the end-users or stakeholders.

Performance Testing: This technique is used to test the performance of the system under different loads and stress levels to ensure that it can handle the expected traffic. It is a white-box testing technique where the internal workings of the system are analyzed for performance bottlenecks.

Security Testing: This technique is used to test the system's security features to ensure that it is protected against external threats and attacks. It is a black-box testing technique where the system is tested for vulnerabilities and weaknesses.

Regression Testing: This technique is used to ensure that the system's new changes or upgrades do not affect the existing functionalities of the system. It is a black-box testing technique where the system is tested after each change to ensure that it is still functioning as expected.

CHAPTER 6

Results and discussion

RFID (Radio Frequency Identification) is a technology that uses radio waves to identify and track objects or individuals. RFID tags are attached to objects or

people, and a reader emits radio waves to communicate with the tags and obtain information about them. RFID technology has various applications, such as inventory management, access control, and tracking of goods in logistics.

LoRa (Long Range) is a wireless communication technology designed for low-power, long-range communication between devices. LoRa networks use low-frequency radio waves to transmit data over long distances, making them suitable for IoT (Internet of Things) applications, such as smart cities, industrial automation, and environmental monitoring.

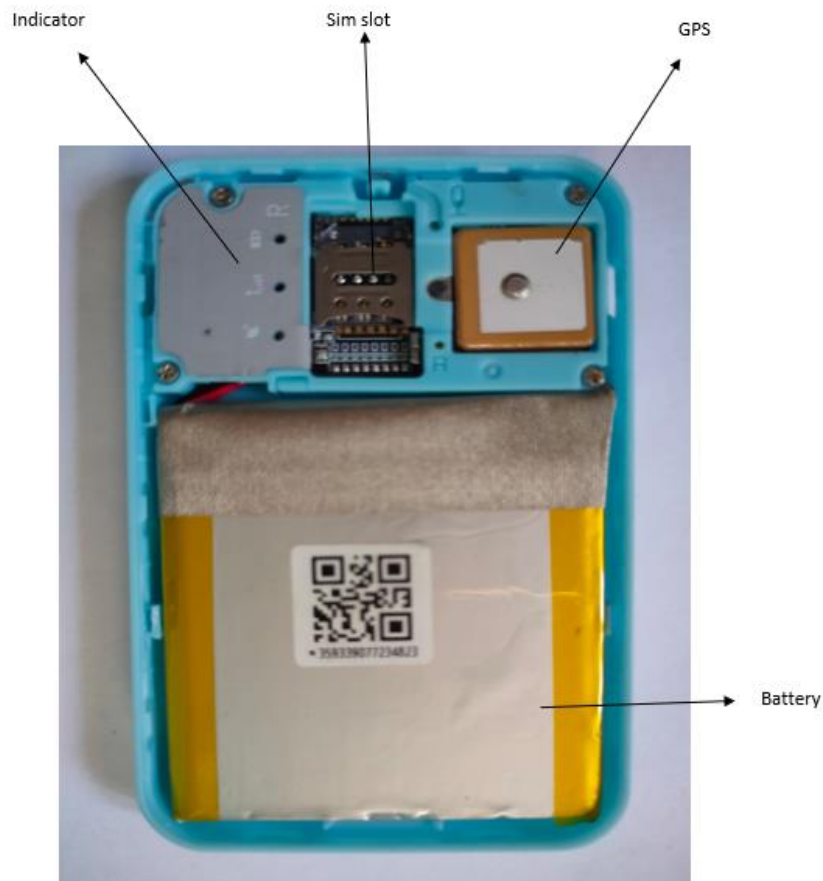


Fig.6.1:ID CARD WITH CELLAR NETWORK

The combination of RFID and LoRa technologies can enable the development of a human safety system that can identify and track individuals, and generate SOS signals in case of an emergency. RFID tags can be attached to people, and LoRa gateways can be placed at strategic locations to receive the signals from the tags and relay them to a central server or a monitoring system. The system can then analyze the data and generate alerts or SOS signals in case of unusual or

emergency situations, such as a person getting lost, a fall, or a medical emergency.

In the context of the project, the design and development of an identification, location tracking, and SOS generation system using RFID and LoRa networks would require careful consideration of various factors, such as the type of RFID tags, the frequency and range of the LoRa network, the placement of the LoRa gateways, the data processing and analysis algorithms, and the user interface and user experience design. The performance of the system would depend on the accuracy and reliability of the RFID and LoRa technologies, as well as the robustness and efficiency of the data processing and analysis algorithms.

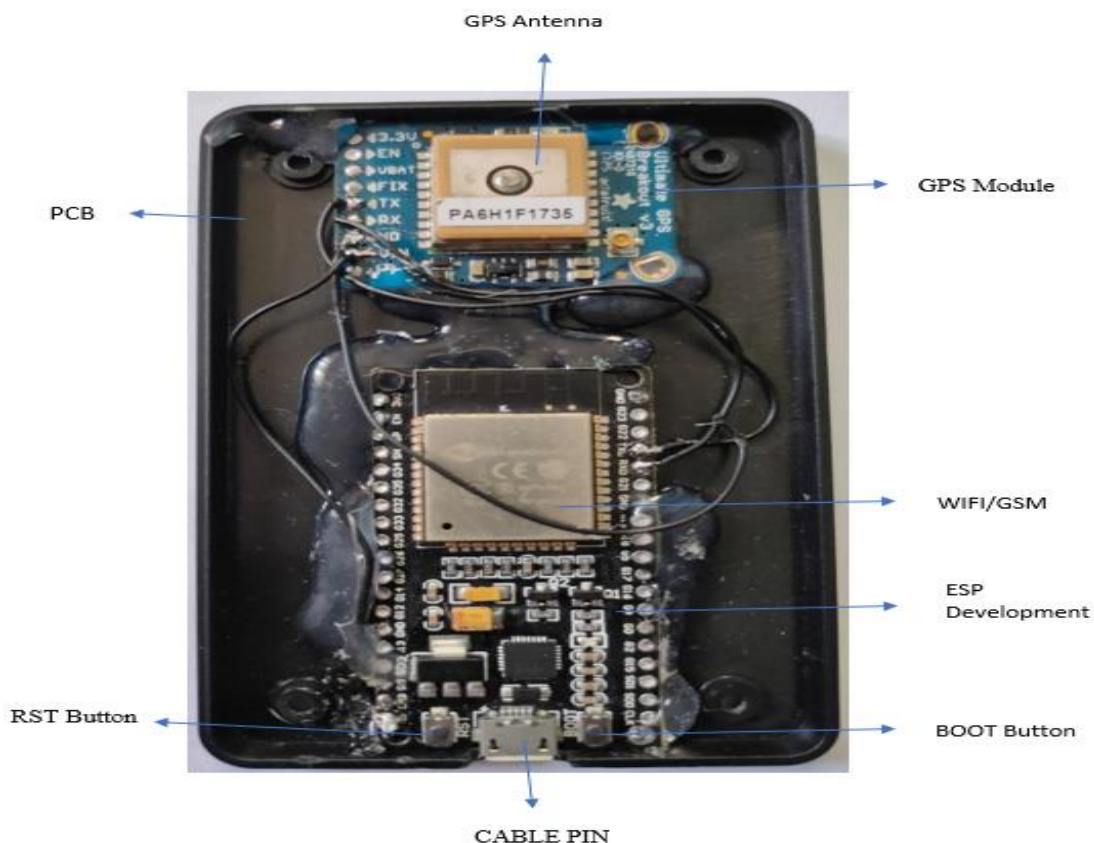


FIG.6.2: ID CARD WITH WIFI

CHAPTER 7

CONCLUSION

7.1 Conclusion of the project

In conclusion, the design and development of an identification, location tracking system, and SOS generation using RFID and LoRa network have the potential to significantly enhance human safety in various applications, such as industrial, healthcare, and public safety. The system uses RFID tags and LoRa network to identify and track the location of individuals in real-time, enabling quick response in the event of an emergency.

The system's SOS generation feature allows individuals to send emergency alerts to the control center, enabling quick response and rescue operations. This feature can be especially useful in hazardous environments where immediate action is required to ensure the safety of individuals.

The integration of RFID and LoRa network provides an efficient and reliable means of communication, enabling the system to operate even in areas with poor network coverage. The use of low power consumption devices such as LoRaWAN makes the system cost-effective and energy-efficient, thereby making it suitable for various applications.

Vehicle tracking system becoming increasingly important in large cities and it is more secure than other systems. Now a day's vehicle theft is rapidly increasing, and with this, we can have good control over it. This technology can also help to advance the system of transportation and can be used in many organizations for security purposes and tracking. Through the 4G tracking system of the Recent GPS module we can also make emergency calls and drop text messages. This is a stand-alone system with a lot of inbuilt features with GPS systems.

In summary, the identification, location tracking system, and SOS generation system using RFID and LoRa network have the potential to revolutionize the way we ensure human safety, offering an efficient and cost-effective means of enhancing safety in various applications.

7.2 Future work

1) Improved accuracy and range: While RFID and LoRa networks offer a high degree of accuracy and range, there is always room for improvement. Future work could involve optimizing the hardware and software of these systems to enhance their accuracy and range, potentially incorporating advanced technologies like artificial intelligence and machine learning to improve their performance.

2) Testing and validation: Before deploying the system in real-world scenarios, it will be essential to conduct extensive testing and validation to ensure its accuracy, reliability, and effectiveness. Future work could involve designing and executing a comprehensive testing plan, including simulated emergency scenarios and real-world testing in a controlled environment.

3) Development of a mobile application: To make the system more user-friendly, you could develop a mobile application that allows users to monitor their location, receive alerts, and send SOS signals from their smartphones.

7.3 Research Issues

1) Technical Feasibility: The first research issue in designing and developing an identification, location tracking system, and SOS generation for human safety using RFID and LORA network is to determine the technical feasibility of the project. This involves evaluating the current state-of-the-art technologies and determining whether they are capable of meeting the requirements of the system.

2) Interference and Signal Strength: Another key issue in developing an RFID and LORA network-based safety system is to ensure that there is no interference between the different devices and the signal strength is sufficient to provide reliable tracking and identification of individuals.

3) Data Security and Privacy: The system will be collecting and storing personal information about individuals, so data security and privacy are critical issues that need to be addressed in the design and development of the system. This involves implementing appropriate security measures to protect against unauthorized access, data breaches, and other cyber threats.

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APPENDIX

A.SOURCE CODE

```
#ifdef ESP32
#include <WiFi.h>
#else
#include <ESP8266WiFi.h>
#endif

#include <Wire.h>
#include <Adafruit_GPS.h>
#define GPSSerial Serial2
Adafruit_GPS GPS(&GPSSerial);
int pinValue;
#define GPSECHO false
uint32_t timer = millis();
float LAT;
float LOT;

const char* ssid = "skydo";

// Replace with your unique IFTTT URL resource
const char* resource =
"/trigger/gps/with/key/gxxOA4MWv64Oot1WleKE7TyQ7evTyWqz6c-
RQ1ST1jh";

// Maker Webhooks IFTTT
const char* server = "maker.ifttt.com";
```

```

// Time to sleep

uint64_t uS_TO_S_FACTOR = 1000000; // Conversion factor for micro
seconds to seconds

// sleep for 30 minutes = 1800 seconds

uint64_t TIME_TO_SLEEP = 1800;

void Timer();

void setup() {
  Serial.begin(115200);

  Serial.println("Adafruit GPS library basic parsing test!");

  GPS.begin(9600);

  GPS.sendCommand(PMTK_SET_NMEA_OUTPUT_RMCGGA);
  GPS.sendCommand(PMTK_SET_NMEA_UPDATE_1HZ);
  GPS.sendCommand(PGCMD_ANTENNA);
  delay(1000);
  GPSSerial.println(PMTK_Q_RELEASE);
  initWifi();
}

void loop() {
  Serial.print("Connecting to ");
  Serial.print(server);

  WiFiClient client;

  int retries = 5;
  while(!client.connect(server, 80) && (retries-- > 0)) {
    Serial.print(".");
  }

  Serial.println();
}

```

```

if(!client.connected()) {
    Serial.println("Failed to connect...");
}

Serial.print("Request resource: ");
Serial.println(resource);

char c = GPS.read();
if (GPSECHO)
    if (c) Serial.print(c);
    if (GPS.newNMEAreceived()) {
        Serial.print(GPS.lastNMEA());
        if (!GPS.parse(GPS.lastNMEA()))
            return;
    }
    if (GPS.fix) {
        Serial.print("Location: ");
        Serial.print(GPS.latitude, 4);
        float LAT = (GPS.latitude, 4);

        Serial.print(", ");
        Serial.println(GPS.longitude, 4);
        float LOT = GPS.longitude;
    }Serial.print(LAT);

    String jsonObject = String("{\"value1\":\"" +
    "https://maps.google.com/maps/place/" + (GPS.latitude) + "\",\"value2\":\""
    + (GPS.longitude) + "\"}");

```

```

client.println(String("POST ") + resource + " HTTP/1.1");
client.println(String("Host: ") + server);
client.println("Connection: close\r\nContent-Type: application/json");
client.print("Content-Length: ");
client.println(jsonObject.length());
client.println();
client.println(jsonObject);
int timeout = 5 * 10; // 5 seconds
while(!!!client.available() && (timeout-- > 0)){
    delay(100);
}
if(!!!client.available()) {
    Serial.println("No response...");
}
while(client.available()){
    Serial.write(client.read());
}
Serial.println("\nclosing connection");
}

void initWifi() {
    Serial.print("Connecting to: ");
    Serial.print(ssid);
    WiFi.begin(ssid);
    int timeout = 10 * 4; // 10 seconds
    while(WiFi.status() != WL_CONNECTED && (timeout-- > 0)) {
        delay(250);
    }
}

```

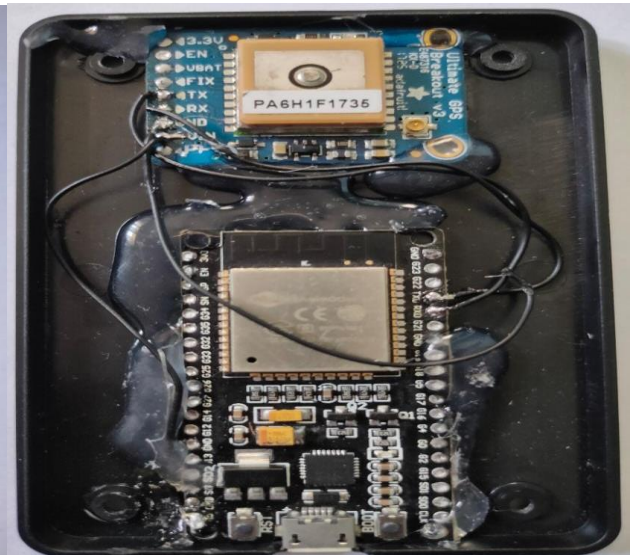
```

Serial.print(".");
}
Serial.println("");

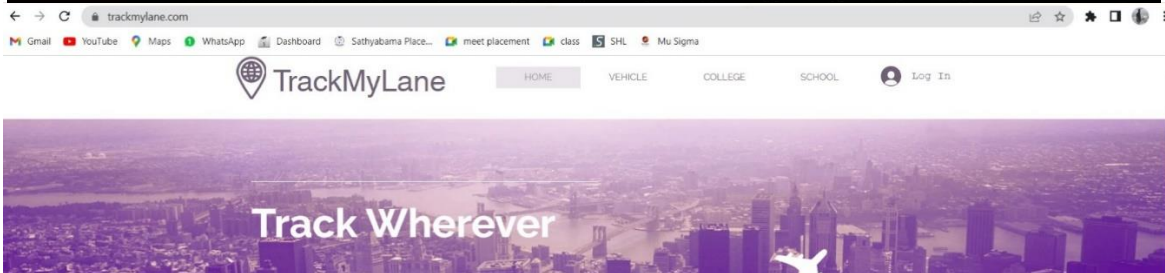
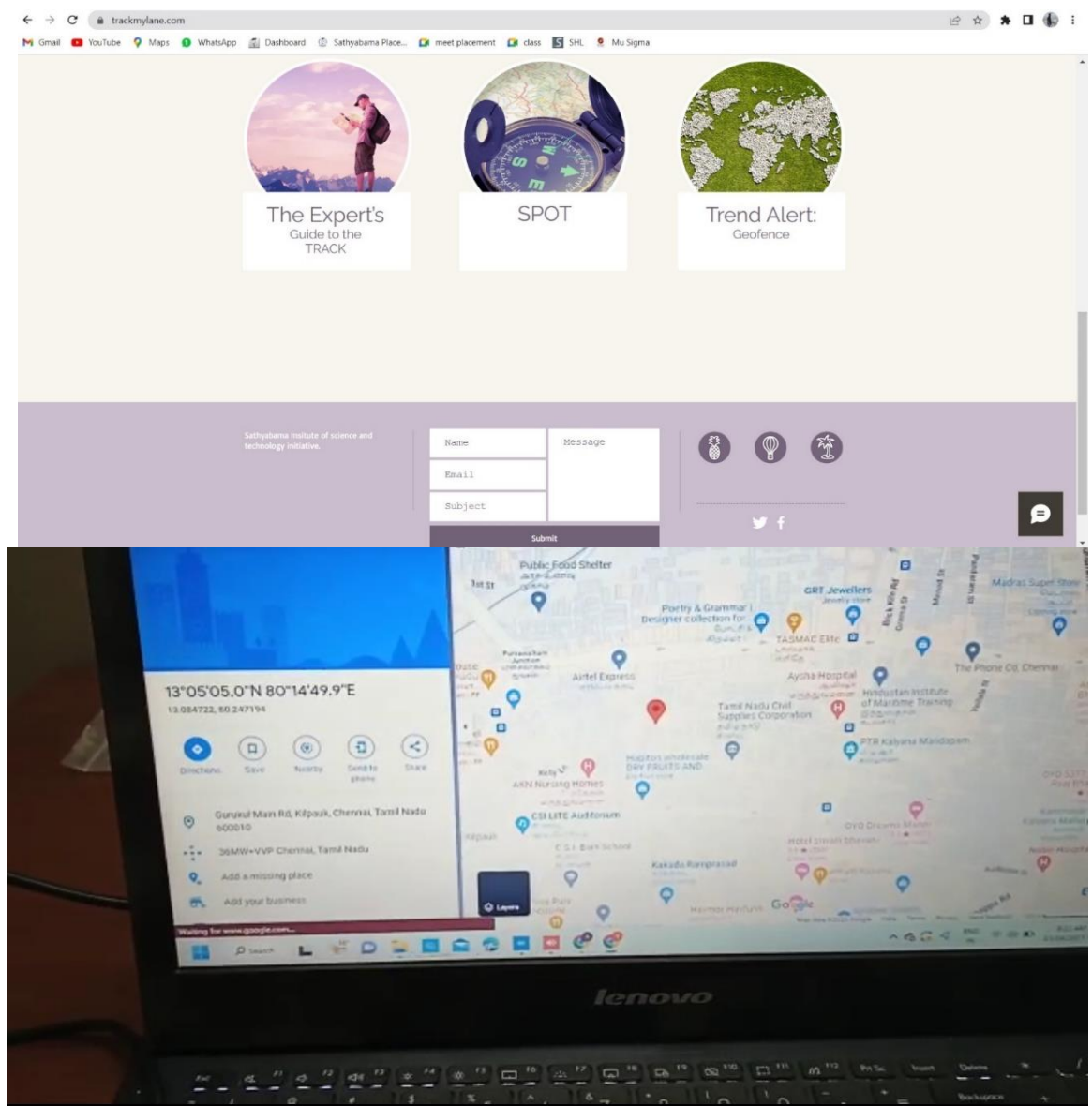
if(WiFi.status() != WL_CONNECTED) {
    Serial.println("Failed to connect, going back to sleep");
}
Serial.print("WiFi connected in: ");
Serial.print(millis());
Serial.print(", IP address: ");
Serial.println(WiFi.localIP());
}

```

B.OUTPUT SCREENSHOTS



ID CARDS



WWW.TRACKMYLANE.COM WEBSITE