

GeoGuard (GPS based Tracking System)

Abhishek Bhosale¹, Soham Atram², Sarvesh Pardeshi³, Aditi Shiradkar⁴, Aditi Jadhav⁵, Mahesh Nigade⁶

^{1,2}Computer Engineering, AISSMS Institute of Information Technology Pune, India

^{3,4,5}Electrical Engineering, AISSMS Institute of Information, Technology, Pune, India

⁶Assistant Professor, AISSMS Institute of Information, Technology, Pune, India

Abstract—Geoguard is a simple GPS based tracking device which is made for safety and location tracking. This project uses a GPS module to send that location to the user through SMS alerts and mobile application. An Arduino Nano controls the whole system and connects all components together. This system can be used for vehicle tracking, Child safety, Elderly monitoring and Logistics tracking. If the tracked object moves outside tge selected specific range or area, then sends a SMS alert and a link of current location of that device through a mobile application. The main goal of this project is to create a low-cost, easy to use and reliable tracking device which can work even in wide range areas with weak internet connection.

I. INTRODUCTION

Nowadays, tracking system are becoming very important in Daily. Many times, we hear the news of vehicle stolen, Child Get kidnapped, Elderly person lost his path to go home, Important accessories get stolen etc. At that moment, We Think that if there is any clue/thing to know the exact location of that object, then it would a smaller number of this kind of news. 'Geoguard' is tracker which can easily use by people to track or know their object's location. This tracker can use for child safety, vehicle monitoring, package delivery and many emergency situations. Geoguard is a GPS (Global Positioning System) based Tracking system which is developed using ArduinoNano, NEO-6MGPModule, and SIM800LGSM (Global System for Mobile communication). In this tracker, The GPS Module receives live location coordinates from satellites, The Arduino which is a microcontroller is used here to send the Location coordinates to the GSM module, then this GSM module sends location details through an SMS alert. This project also includes a mobile application made Using ReactNative. The application helps users to Monitor live tracking of an object. Unlike Bluetooth

trackers like JioTag or AirTag, GPS Based tracker scan work with in wide range of Areas. On other side, The Bluetooth based trackers can Work with in very short-range distance(20-50m), Which is usually not useful when tracking any device to outside of 20-50m radius circle.

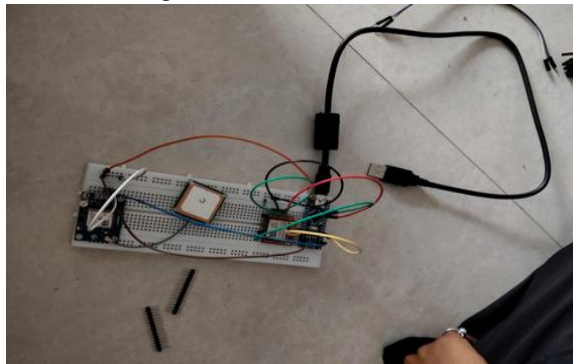
II. LITERATURE REVIEW

Several GPS and GSM based tracking systems have Been developed for vehicle monitoring and personal Safety applications. Existing systems mainly focus Either on fleet management or family safety services. Most of them depend heavily on internet connectivity and cloud communication. The proposed system Improves these limitations by integrating GPS Tracking, GSM based emergency alerts, geofencing, And a mobile application in a single platform. The System can also function in areas with weak internet connectivity by using SIM800L SMS communication. Some researchers also developed geofencing Systems for child safety and elderly monitoring. These systems generate alerts when a person Moves outside a selected safe area. However, many of these systems requires able internet Connectivity and cloud services. JioTag is a tracking device used to find keys, wallets, bags and other personal items. It works with Bluetooth, so its range is up to to20-50m. Here Users can connect device with their smartphone and can check location of item through mobile app. Due to its light weight it's very easy to carry out. Due to Bluetooth connectivity, if a device goes few meters away, it finds out difficult to track item. Similarly, with Airtag which depend only on nearby apple devices, which seems not be convenient and its price also very high. But on other hand, GPS based tracker directly connected to satellite, due to this connectivity, GPS tracker has wide range, so it can monitor device within kilometre of radius

III. SYSTEM ARCHITECTURE

The overall working architecture of the proposed system is divided into four stages.

1. GPS Module receives live satellite coordinates.
2. Arduino processes the received coordinate data.
3. Geofence logic checks whether the object is inside or outside the safe zone.
4. Alerts are sent from GSM Module to application on Mobile phone that shows the tracking information on display. So, we use mobile application as medium to monitor while Arduino collects coordinates from GPS Module and sends SMS through a SIM card.



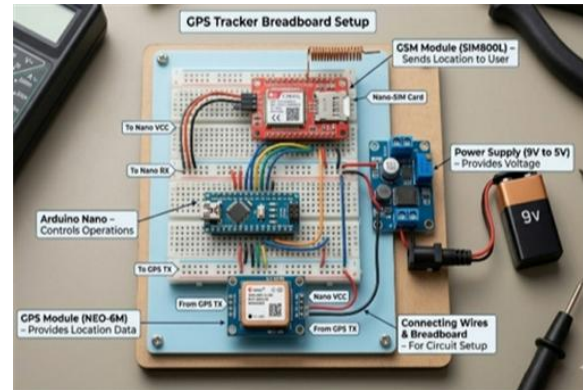
IV. METHODOLOGY

The system that we proposed contains both Hardware and Software parts.

A. Hardware Components

- Arduino Nano/Uno
- NEO-6MGPSModule
- SIM800LGSMMModule
- Power SupplyUnit

The satellites send latitude and longitude coordinates, And GPS module receives it. Then the coordinates are Processed by Arduino, and it checks if object or person Is inside or outside geofencing area. If there is any Boundary breach emergency SMS alert is sent by GSM Module to mobile number given.



B. Software Components.

The coding language used to developed mobile application be mobile application is React native and Expo framework. The application provides:

- Logistics Tracking
- Personal Safety and monitoring Geofence Configuration
- Emergency contact handling
- GPS coordinates display

C. Geofencing Technique

The distance between safe zone coordinates is calculated using Haversine formula which is If system leaves the set radius, then it sends SMS alert to mobile phone.

D. SMS Alert System

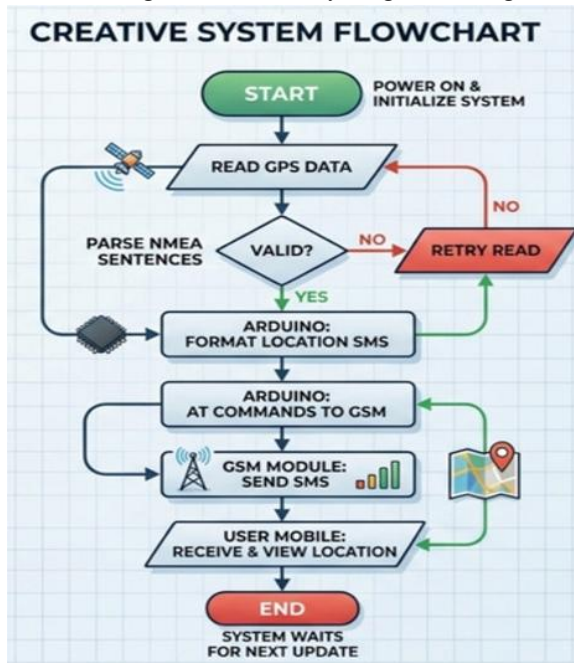
The SMS alert sent by SIM800L GSM module contain:

- Current GPS coordinates
- Google Maps location link
- Package or profile details
- Emergency status

V. WORKING OF THE SYSTEM

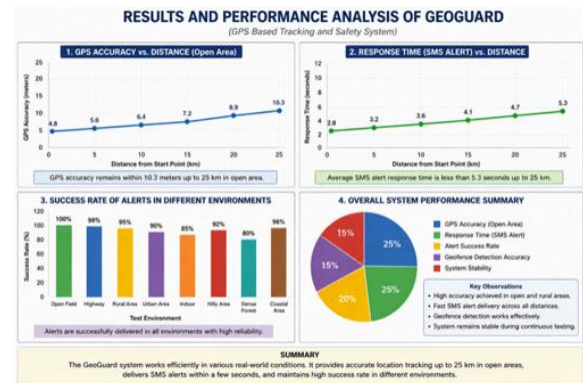
To start off, the user gets to choose between two primary modes on the app: Logistics Tracking or Personal Safety. If they select logistics, the app prompts them to fill in the package specifics, where it's going, when it's due, and who to call in an emergency. On the other hand, switching to personal safety mode lets them set up dedicated profiles for kids, senior citizens, or even pets. Once the system is running, the GPS module stays active, constantly refreshing the coordinates. At the same time, the geofencing system

keeps an eye on whether the target is still inside the designated safe zone. The moment it crosses that boundary; the system instantly triggers emergency alerts and sends SMS notifications. The app also includes features for manual SOS alerts and simulated breach testing to check if everything is working fine.



VI. RESULTS & DISCUSSIONS IX. REFERENCES

The system is built to handle both logistics tracking and personal safety setup smoothly. On the hardware side, the GPS module is set up to stream live location coordinates to the microcontroller, ensuring that tracking stays accurate. The geofencing logic is flexible; we coded it to support any radius from 1 km up to 50 km, so the system can instantly detect if someone or something crosses set boundary. For the user, the mobile app takes this incoming location data and displays it clearly on a live map interface. If any breach, the SIM side takes over using a SIM800L module, that t automatically sends an emergency SMS containing a direct Google Maps link. The whole setup is designed to offer a reliable framework for real-time tracking and monitoring.



The graphs show that the GeoGuard system works properly in different locations like open fields, highways, urban areas, and rural areas. The GPS provided accurate location tracking with an average error of around 5–10 meters. The GSM module successfully sent SMS alerts within a few seconds during testing. The system performed best in open areas, while accuracy slightly reduced in indoor and dense forest areas due to weak signals.

VII. ADVANTAGES & LIMITATIONS OF PROPOSED

Advantages:

- It provides real-time GPS tracking device
- Sends emergency SMS alerts quickly
- Works even in weak internet areas using GSM
- Low-cost and easy to build
- Useful for logistics and personal safety
- Simple and user-friendly mobile application
- Supports geofencing for safe-zone monitoring
- Compact and portable system
- Can be used for vehicle, child, and elderly tracking
- Provides live location through Google Maps link

Limitations

- GPS accuracy may reduce in crowded areas
- Indoor GPS signal may become weak
- SIM800L requires proper mobile network signal
- Continuous GPS usage increases battery consumption
- SMS alerts may delay during poor network conditions
- System performance depends on weather and signal strength
- Requires regular power supply for continuous tracking

- GPS may not work properly in tunnels or underground places

VIII. CONCLUSION

We introduced a low-cost, practical GPS tracking system built by integrating an Arduino with a React Native mobile app in this paper. We tried to create a flexible platform by combining GPS, GSM module, and geofencing, that easily adapts to logistics and personal safety monitoring both. A major highlight of this design is its reliability because it uses standard SMS alerts, the system can send emergency location data even without an internet connection. While the hardware part does the core job of collecting coordinates, the mobile app gives the user a clean, modern interface to track everything in real time. This project shows how combining embedded hardware with cross-platform mobile apps can result in a highly effective, real-world tracking solution.

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