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Vehicle Tracking and Accident Prevention System

Shubham Jaiswal[1], Shivam Shukla[2]

[1,2]*Computer Science and Engineering, Goel Institute of Technology and Management, Lucknow.*

Abstract - The Vehicle Tracking and Accident Prevention System (VTAPS) is a technology that integrates GPS tracking, telematics devices, and real-time monitoring to enhance vehicle safety and management. It collects data on vehicle location, speed, acceleration, and braking, transmitting it wirelessly to a central server or cloud-based platform. The system features geofencing, alerts, and notifications for various events, including speeding, unauthorized usage, and collision avoidance. It also aids in efficient fleet management, providing maintenance alerts and comprehensive reports on vehicle performance. VTAPS is expected to impact industries like logistics, transportation, and public safety.

***Key Words*:** Vehicale tracking, GPS, GSM, VTAPS.

1.INTRODUCTION

The features of the vehicle tracking system fleet management and comprehensive security solution. It is the technology that makes it possible to find a vehicle using a number of methods, such as various satellite- and ground-based navigational systems, such as GPS.However, other automatic vehicle location methods may also be used on occasion. GPS technology is used by modern automobile tracking systems to track and locate our cars anywhere on the planet. The installed vehicle tracking system provides location data as well as the capacity to store and download the data to a computer for additional analysis. People who own expensive devices are regarded by automakers as a vital resource for tracking their vehicles whenever they want to keep a check on them. They make use of it to stop theft and find stolen cars. The collected data can be viewed online, using software, or on electronic maps after receiving the position coordinate through SMS.

Heightened demand for cars has, however,additionally more traffic congestion and car accidents. The people's lives are in terrible risk. This is because our country lacks top emergency facilities. An automatic car accident alert system is presented in this work. This program, that can identify accidents far more quickly and transmits vital information, such as the location, time, and angle at which an accident happened, to a chosen contact in a matter of seconds. an automobile crash occurred. This alert message is quickly transmitted to the main alarm center, allowing the emergency dispatch server to immediately alert the emergency services, potentially saving many lives. An alert message is automatically transmitted to the alarm center in the event of an accident. The GSM is what sends the communication. Using the GPS module, the GPS module locates the accident's location. A vibration sensor can be used to precisely identify an accident. This method offers the best possible option for difficult cases related to auto accidents. The "Vehicle Tracking and Accident Warning System Using GPS and GSM Technology" work was created to address the requirements of today's fleet management firms. It is a very practical and adaptable tool that you can use.

not just a fleet firm, but for everyone who needs to strengthen security and maintain track of their assets. This chapter discusses the work's background in general as well as its concepts, goals, scope, and troubleshooting. The tracking system, which is GPS-GPRS based, gives all the details on the vehicle's location. Vehicle travel is tracked by the system using time and geographic location data from global positioning satellites. Location mapping is done using Google Maps. The GPS location is looked up by the GSM modem and sent to the server through GPRS. The device includes cutting-edge software and hardware elements that provide online and offline tracking and car identification. The tracking system is composed primarily of three components: the vehicle unit, the database and software system, stationary station (ASHUTOSH et al., 2014SMS was transmitted using GPS coordinates in the early days of GPS and GSM connectivity. By delivering position coordinates to a distant server from any internet-connected device, GPRS technology enables remote item tracking. A GPS tracking gadget can use the Global Positioning System to determine an asset's exact position, such as a connected car. A user on the ground employs a GPS receiver. It calculates the amount of time it will take for radio signals from four or more satellites to arrive at its location, subtracts that amount of time from each satellite, and then adds the result to determine its longitude, latitude, and altitude. Using triangular or trilateral approaches, The location of the vehicle is quickly and precisely determined using a tracking system (ASHUTOSH et al., 2014). Utilizing the geometry of triangles, trilateralization is a technique for calculating the relative positions of objects. In order to "triangulate," Using a GPS receiver, a precise measurement of the satellite's brief voyage to Earth (less than a tenth of a second) and, as a result, calculates its distance from the satellite using the radio signal's transit interval. The distance from the satellite is calculated by multiplying the recorded duration by the radio wave's speed, which is 300,000 km (186,000 mi) p/sec.. (2014) Ashutosh and others. Latitude and longitude coordinates can be sent and saved in the database using the GSM modem that is built into the device, a cellular or satellite modem, or they can be sent to the user via SMS upon request. As a result, Using a Google map, the user may see where the object is located immediately or later, depending on whether the data needed for further investigation.

2. LITERATURE REVIEW

An electronic device that is installed in a car as part of a vehicle tracking and emergency alert system allows the location of the car to its owner or another person. The bulk of modern car tracking systems employ the Global Positioning System, or GPS, to pinpoint the exact location of the vehicle. The location of the vehicle is transmitted to a distant user using a combination of communication tools, including a mobile phone (GSM) and a satellite transmitter. Software on a computer can be used to view vehicle information. Fleet managers frequently employ vehicle tracking systems for fleet management duties such as routing, dispatching, and vehicle information. as well as security. Monitoring driving behavior is another use, for example, by a parent of a young driver or an employer of an employee. Commercial vehicles frequently use vehicle tracking systems as a tracking and anti-theft tool. The cops could easily follow the tracking system's signal to find the stolen car. A vehicle tracking device can supplement or replace a traditional automobile alarm when utilized as a security system. As a result of the greatly decreased danger of losing the vehicle, the existence of a vehicle tracking system can lower insurance rates. Other applications for tracking include asset monitoring scenarios, where businesses who need to Tracking a valuable object for insurance or other reasons is now possible in real time and correctly follow movement and operational status. The situation of sales professionals is, nevertheless, readily available in real-time locations in mobile field sales. For instance, they may locate themselves, customers, and potential customers in strange locales, acquire driving instructions, and include last-minute appointments in travel schedules. Benefits include higher output, shorter travel distances, and more contact with customers and potential customers.

Table-1: Comparison of Existing work

SYSTEM NAME	AUTHOR	YEAR	FUNCTIONALITY
The phrase "real-time vision systems for traffic and vehicle observation"	Benjamin et al.	2003	This element-based global positioning system was used to locate vehicles in challenging situations, such as a growing traffic jam.
" A chip-based GPS vehicle tracking system"	Adnan et al.	2008	This functioned as an actual time, quick, and trustworthy information processing program.
"Vehicle tracking information systems based on the cloud."	Albert et al.	2011	This global positioning system was developed using distributed computing and integrated online administration. The GPS, GSM, and distributed computing framework innovations were prerequisites for the suggested innovation. The automobiles had a specific installed gadget, a GPS gadget, and a GSM-enabled gadget.
The "Embedded Controller for Automobile In-Front Obstacle Monitoring and Compartment Safety Notification System."	V.Ramyaet	2012	While traveling, this technique had offered good safety and security. This measured the interior's levels of dangerous gases like CO, LPG, and alcohol, the car and provided ready information as a precaution under normal circumstances.

Based on GSM and GPS, "Tracking and Locking System."	A. Ramani et al. B.	2013	To prevent vehicle burglaries, this framework was developed for the security of vehicles. In order to follow the spot and lock the engine, a vehicle following and locking structure was designed.The location was identified using GPS and GSM.
Permanent Vehicle GSM and GPS-based global positioning system innovation An Invasion Opponent a global positioning system	Maurya Kumar et al.	2014	In order to enable an individual or an outside organization to track the precise location of the vehicle, an electronic device was put in an automobile.

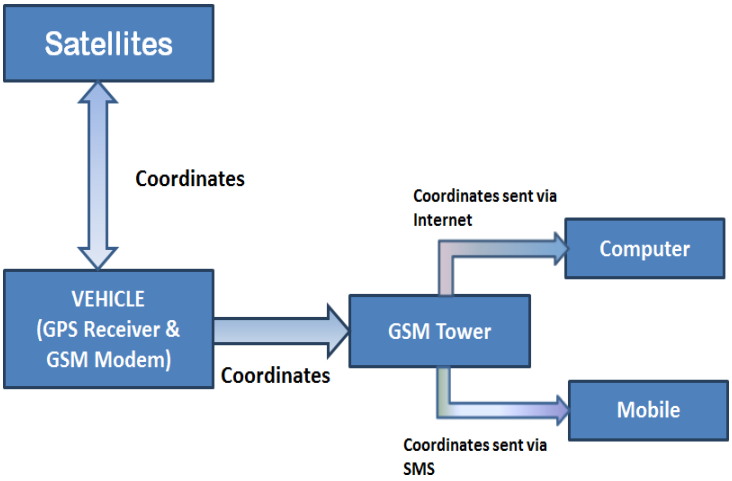


Fig -1: System Block Diagram for Vehicle Tracking

3.2 KEY Materials USED:

In the planned work, the getaway car was tracked using GPS and GSM gadgets utilizing a sophisticated approach for vehicle following and an accident warning system. This system changes from dynamic to rest mode while the car being driven by the owner or another authorized person remains in dynamic mode, based on the possibility of the manner of operation is effective modified locally or remotely. The press button on the air pack connected to it detects a sign in the event of an accident and sends an SMS to the microcomputer. The authority notifies the owner of the vehicle or any designated party of the accident with the vehicle.

3. METHODOLOGY

3.1 System Block Diagram

The getaway car was tracked using GPS and GSM methodology in the planned work utilizing a sophisticated approach for vehicle following and an accident warning system. While the motorist nor another designated individual is driving a car that continues to function in dynamic mode after being shifted to rest mode either locally or remotely, this system enters rest mode. If an accident occurs, the air pack's press button connected to it recognizes a sign and sends an SMS to the microcontroller. The authority notifies the owner of the vehicle or any designated party of the accident with the vehicle.

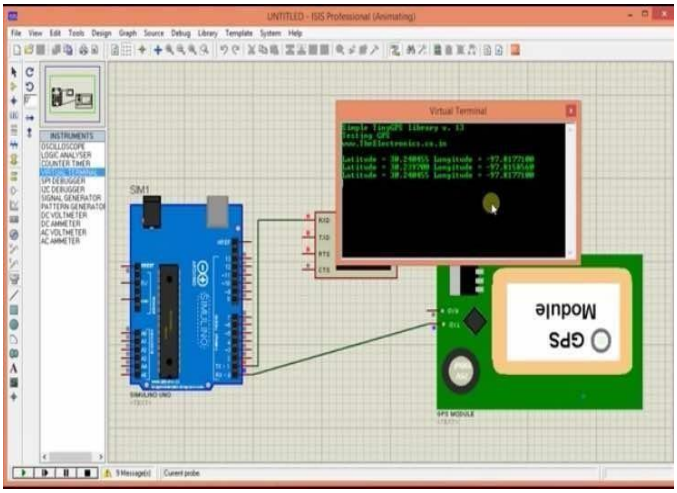


Fig -2: VTAA system simulation with Proteus software

3.3 DESIGN AND CONSTRUCTION ROCESSES

A microcontroller-based framework is a sophisticated mechanism in which hardware and software communicate with the outside world. A microcontroller-based framework's effective design requires the ability to use the variety of available investigating and testing tools. Two groups were studied and tested for microcontroller-based systems: programming-only devices and programming equipment apparatuses. Screens and test systems for programming just tools that are independent of equipment are a work in progress. In general, programming equipment apparatuses are more expensive, equipment-dependent, and range from in-circuit emulators and debuggers to in-circuit test systems. Generally speaking, the more the degree of combination with the objective equipment, the greater the advantage of a device, resulting in a quicker rate of improvement, but also the greater the expense. Cost, simplicity, and the features of the examining system should all be taken into account when choosing a troubleshooting tool.

A product testing system is a PC application that runs on free hardware and simulates the target microcontroller's computer processor, instruction set, and input/output (I/O). Test systems are the most cost-effective testing solutions for microcontroller-based frameworks. Companies make available the test system programs that they utilize. By exploring the code for fun, one can investigate incorrect reasoning or math errors. Since test systems operate at speeds that are 100 to many times slower than the actual micro regulator When replicating a software, lengthy delays should be avoided. Many external components that are frequently challenging to replicate, Engines, I/O ports and timepieces, A/D converters, displays, pushbuttons, sensors, and sign generators are examples of such components that are connected points on the majority of micro regulator-based frameworks. Several cutting-edge testing equipment, such the Proteus from Lab focus A wide range of specialized devices, including engines, LCDs, 7-section screens, and consoles, can be recreated using hardware, and users can even design new specialized devices. The test system may benefit from documents that store complex advanced I/O indicators and waveforms. Results are often presented on screens or saved in papers as waves or any other digital data. Only the bottom level of the microcontroller's objective's computing architecture is accepted by some test methodologies. Because most microcontroller programming is done at substantial level languages like C, Pascal, or Fundamental, it has been essential to reproduce a program that was created in one of these languages. The software for the product was written in C or, failing that, a low level computer architecture that uses Keil programming. the compiler activity is followed by the generation and storing of the hex code in the PC. Use Top win all encompassing software engineer to stack the program's hex code onto the AT89C52.

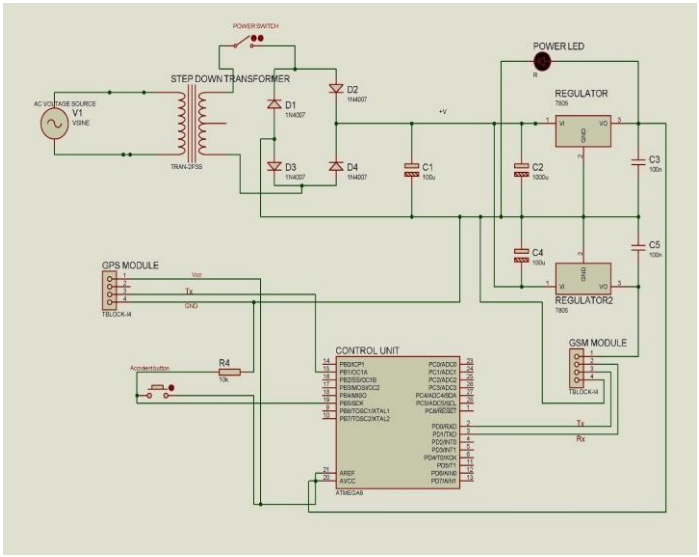


Fig -3: Circuit Diagram of VAATsystem

3.4 VEHICLE TRACKING AND ACCIDNT ALERT WORKING PRINCIPLE

This framework sends data to RS232 after receiving it from GPS. Before being communicated to the Microcontroller's Rx (collection pin), where it is saved in the USART support, the information that the Rs232 transmits into the Max232 is altered before being sent back through the Tx pin into the Max232. The data is sent to GSM using RS232 at a maximum speed of 232. This is how vehicle following is implemented using GPS and GSM. Although there's a good chance the incident may entail a car crash or a fire in a car. These buttons can be pressed on the car's air-bag located close to the steering wheel. The microcontroller is used by the press button to transmit a specific A notification about the accident was sent to the registered GSM phone when an accident happens.

3.5 SYSTEM ARCHITECTURE

The Mishap Alarm and Global Positioning System is a system that monitors a vehicle's current location using the GPS.This item gives location information and real-time updates about unanticipated automobiles. It makes sure that the car that is prone to accidents transmits location data to a web server at the emergency rescue vehicle center and that the vehicle that just happened to get into an accident provides location data to surrounding emergency vehicles and displays it on a map. The global positioning system and Mishap Caution both function in the ways listed below. The system will be used when the accident occurs. convey the accident alert message and the location of the unintentionally hit car are sent to the emergency dispatch cutoff. The neighboring rescue vehicle will also receive the alarm message so it can head to the scene. We can reduce the number of fatalities brought on by accidents by using such a method.

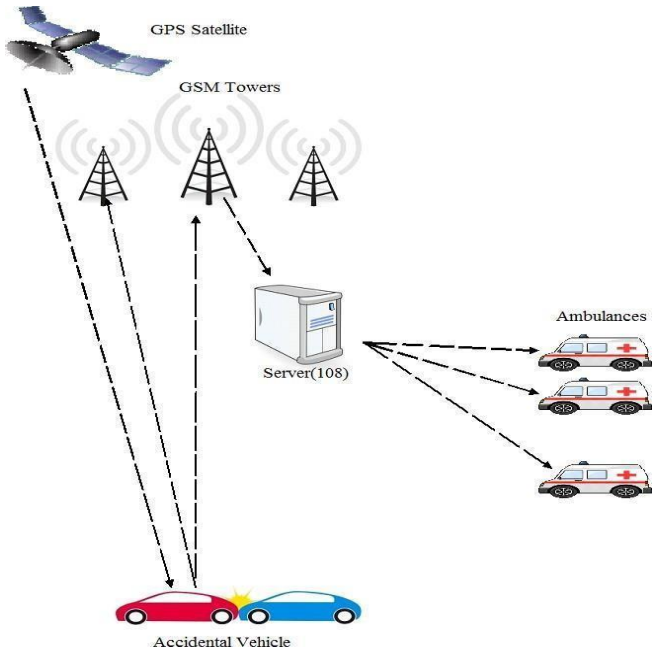


Fig -4: System architecture

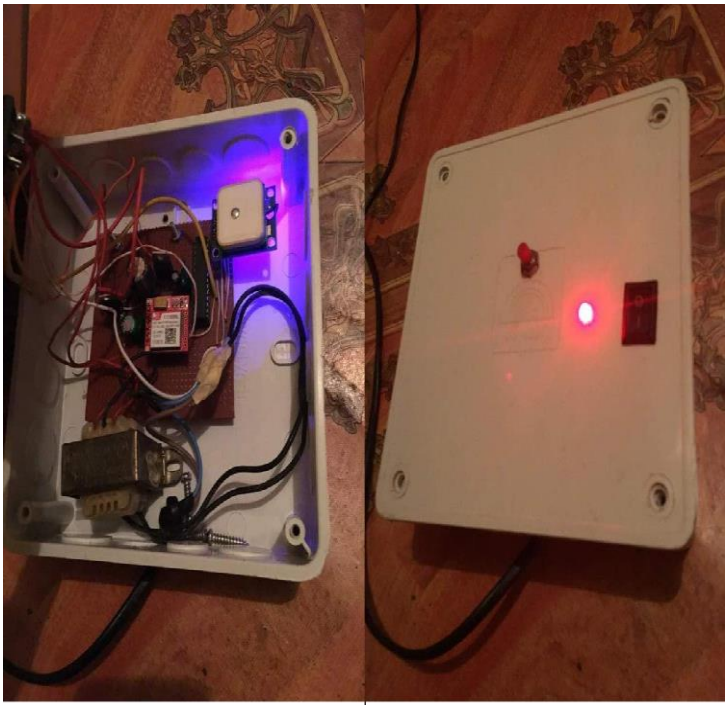


Fig -5: testing and evaluation view

4. RESULTS AND DISCUSSION

4.1 RESULTS AND DISCUSSIONS on testing

4.1.1 Hardware Assembling and Testing:

Making a transition board design for the circuit

diagram was the first action conducted. Following that, the accompanying advancements were then made.

1.Put every component on the transition board together according to the circuit diagram, connect the GSM modem's TX and RX pins to pins 13-14 of the "MAX 232", and insert a sizable SIM into the GSM modem.

2.Following the wiring diagram, attach the GPS gadget.

3.The work was completed and validated satisfactorily.

4.For owners of vehicles, this structure is incredibly beneficial and secure.

4.2 RESULTS

I have integrated a component that will send SMS to the client upon request to enable checking the location of the vehicle in the event of an accident or vehicle theft. The value of the vehicle's latitude and longitude will be put into SMS. The SMS also includes a link that enables the customer to view the location using Google Maps.

Message for theft:

the client transmits:

Create solutions using a connection (Google Programming interface) that includes the device's direction in the mark.

Mistake message: Accident notification!

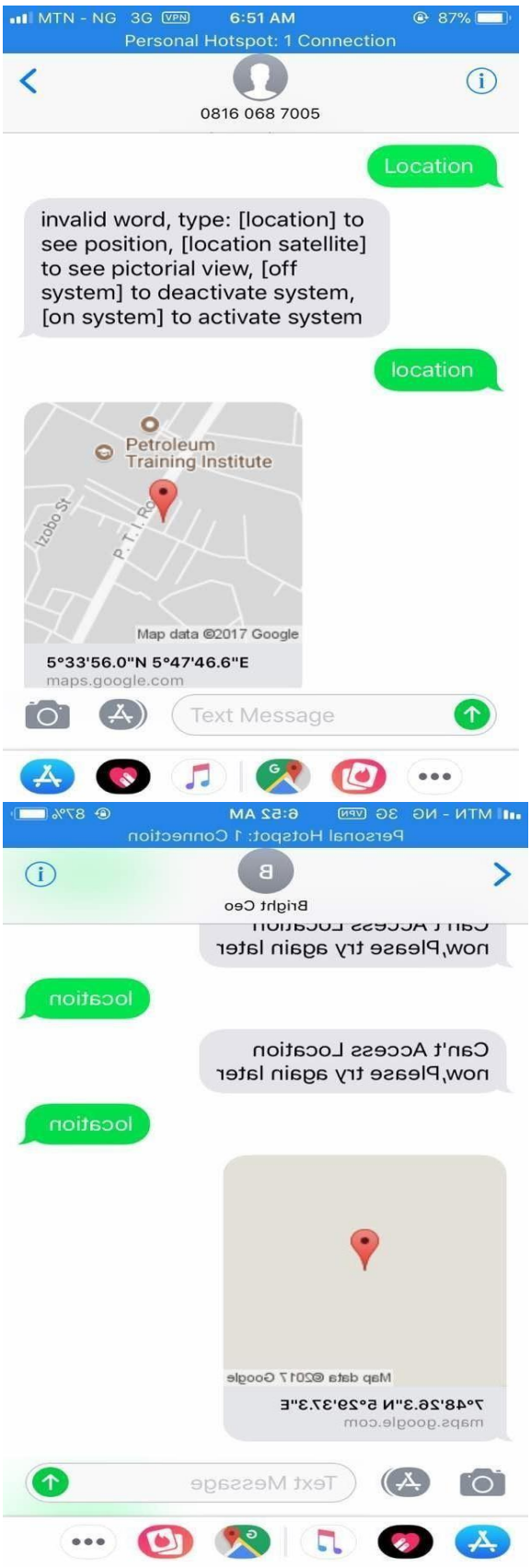


Fig -6: perspective of text message interactions between the user and the VTAA system

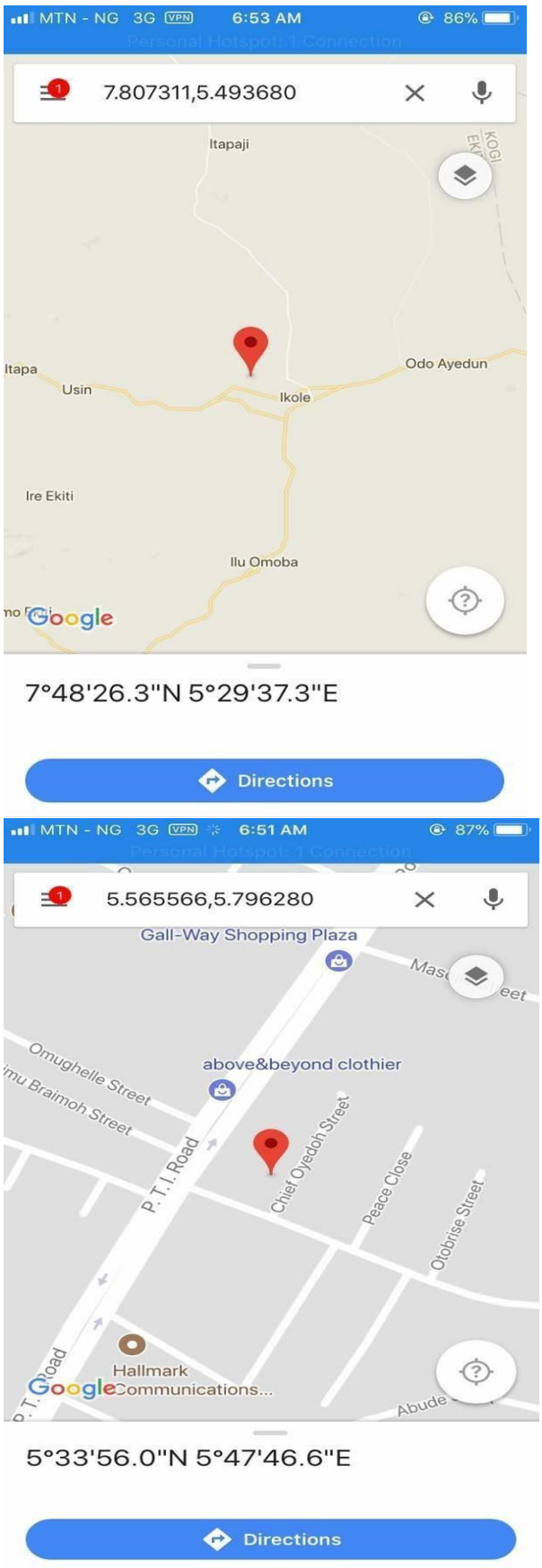


Fig -7: Google Maps view of the website's location

4.3 PERFORMANCE EVALUATION

I evaluated the entire plan of action while keeping an eye on the delayed evaluation. It is how long I saw the in-car device taking to answer or send a message, keeping the end user in mind. We used the SIM cards 6555556UU of four different directors to create this impression of the delay evaluation. The deferral for each set of linked SIM cards was then recorded. We have used "MTN, 9MOBILE, Glo, and Airtel SIM" cards which are four different providers. It is done to keep track of different data game strategies, and regular time is meant to focus on the concede test. The table below displays the outcomes.

Table-2: SIM in GSM module fixed MTN

SIM IN GSM MODULE	SIM IN USER END	DELAY
MTN	MTN	49 Seconds
MTN	GLO	1 minutes 41 seconds
MTN	AIRTEL	1 minutes 32 seconds
MTN	9MOBILE	1 minutes 50 seconds

Table 4.2 SIM in GSM module fixed Airtel

SIM IN GSM MODULE	SIM IN USER END	DELAY
AIRTEL	MTN	1 minutes 26 seconds
AIRTEL	GLO	1 minutes 30 seconds
AIRTEL	AIRTEL	54 seconds
AIRTEL	9MOBILE	1 minutes 41 seconds

Table 4.3: SIM in GSM module fixed GLO

SIM IN GSM MODULE	SIM IN USER END	DELAY
GLO	MTN	1minutes 58 seconds
GLO	GLO	1minutes 37 seconds
GLO	AIRTEL	2minutes 9seconds
GLO	9MOBILE	2minutes 14 seconds

Table 4.4: SIM in GSM module fixed 9MOBILE

SIM IN GSM	SIM IN USER END	DELAY
9MOBILE	MTN	1minutes 36 seconds
9MOBILE	GLO	1 minutes 37seconds
9MOBILE	AIRTEL	1 minutes 41 seconds
9MOBILE	9MOBILE	1minutes 42 seconds

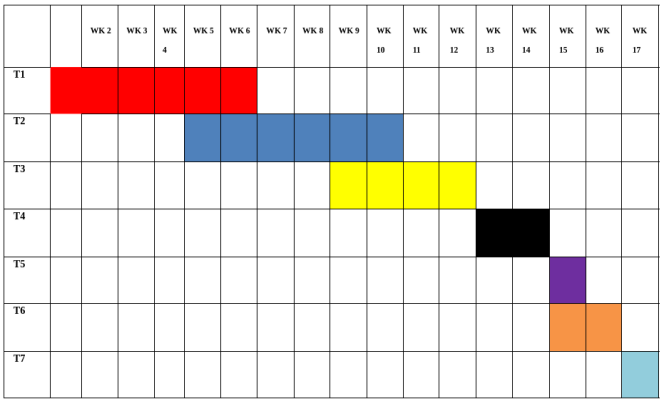
Speed of communication between device and User terminal(s) is a cogent factor for good performance of VTAA system. The tables above is the result of analysis carried out during performance testing at the Electrical and Electronics Departmental Laboratory, Federal

4.4 Work MANAGEMENT

From start to finish, a range of jobs were completed for the work. A Gantt chart was created to chart the work's progress. work assignments were monitored against their expected start and end times to make sure the work was finished precisely within the allotted time range. However, there were delays in the task's completion because SIM908 had to be imported, which took the majority of the day and roughly 30 days, and was not instantly available on the local market. The Gantt chart in use appeared as follows:

GANTT CHART

Table-3: Gantt chart depicting work operations and duration .



T1 for work research task, T2 for Create a work circuit layout. T3 for code implementation, T4 for acquisition of tools and components, T5 for building a circuit on a bread-board, T6 for long-term soldering on a Vero board and T7 for work performance evaluation.

5. CONCLUSIONS

Vehicle GPS devices have a number of benefits and enhance executives. We can accomplish more in the time we have available if we have better scheduling or course planning. When a personal or professional event occurs, vehicle following enhances safety and security, communication, execution monitoring, and effectiveness. As a result, throughout the course of the upcoming year, assumptions will substantially shift in our daily lives. The focused goal of the accident-ready framework work is to reduce the likelihood that someone would die in an accident that is out of our control. When an accident is suspected, paramedics are dispatched to the scene to increase the chances of survival. Accidents that occur during odd hours will benefit far more from this invention. in areas that are desolate. In the future, this vehicle-following and accident-prepared component will be considerably more common in daily life. In my concept, I've created a precise, adaptive architecture for global vehicle placement. After creating the GSM modem, I experimented with and used the GPS system to track the location of the vehicle online and by SMS. display a Google Map of the situation I've utilized the Google map programming interface. The microcontroller is the system's brain because the GSM modem is constrained by AT directives that allow information transmission via the GSM network and the GPS gives location information. Google Maps displays the area whenever the GPS receives new information, which causes the data set to be refreshed The system provides accurate information continuously, enabling the client to track the car and enabling an early recovery in the event that the vehicle is stolen. My understanding of GPS has greatly increased thanks to this proposal, which has also helped me improve my programming skills.

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