

# Real-Time Vehicle Tracking and Alerting System

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**Abstract**— A tracking system in vehicles is implemented and designed in such a way that it tracks the position of the vehicles within a given associate of time. The proposed system uses an application-oriented tracking design with the help of the technology Global Positioning System (GPS). This system utilizes android mobile as a peripheral for receiving the required information. Here Global System for Mobile (GSM) and GPS modems along with processor are used to install in the vehicles. Using General Packet Radio Service (GPRS), the locality of the moving vehicle can be continuously reported and updated to the server. The plot of the data acquired through GRPS will be displaying the accurate position of the vehicle with the help of Leaflet Maps on a monitoring device. Here SIM900D module is used which incorporates GPS and GSM modules. Also, the vehicle's location-coordinates are obtained with the help of a GPS module. GSM module sends the coordinates data to monitored devices. At initial, the GPS continuously takes input data and is used to get a vehicle's location coordinates. For tracking the vehicles, a message is sent to the GSM device, so that it can be activated. Once it is operated, the GSM module takes the last received data of latitudinal and longitudinal positions from the buffer and sends a message to registered devices. With the above application, we are adding a proximity sensor that detects the speed of other vehicles and specifies the distance of that vehicle, which indeed helps as an accident alerting mechanism.

**Keywords**—GPS, GSM Module, GPRS, and IR Proximity Sensor.

## I. INTRODUCTION

A Modern vehicle tracking system use commonly Global system for mobile communication, a Global positioning system, and GLONASS technology for vehicle location. Vehicle information is usually captured on leaflet maps through the internet or any software. Generally, GPS is a satellite-based navigation system made up of minimum 24 satellites. This formally named because the NAVSTAR Global Positioning System was introduced in 1973 to cut back the usage of navigation aids which the people are using. GPS could also be a vehicle tracking system, made of satellites and receivers. The GPS receivers display the user's time, velocity, and position by collecting signals from satellites. The user determines their position in space by measuring their distance from the group of satellites. Each GPS satellite transmits a symptom and an accurate position. The user's receiver measures the time delay for the signal to attain the receiver and these measurements collect simultaneously from four satellites and are processed to unravel the three dimensions of some-time (latitude, longitude, and altitude) and position [1]. The GPS receiver can compute how far it's from the satellites supported the time and speed it took for the signal to reach the satellite receiver. Now knowing its distance and size of the satellite from the receiver we all know that the receiver is somewhere on the circumference of a

circle with space thanks to the radius and satellite within the middle [2].

Computing an analogous circular path using multiple satellites at the same time it becomes possible for the receiver to know its position thanks to the intersecting points of such technique is called Trilateration. Today, all we would like could even be a straightforward hand-held GPS receiver to work out exactly where we are at any time anywhere within the earth. But we still need objects high within the sky to trace things and determine where we are. This structure forms the basis for the functioning of the vehicle tracking system. Hence, we used GPS and GSM data processors during this work to detect all the needs mentioned [3].

## II. RELATED WORK

Amol Dhumal proposed to work out the precise location of the thing, Ravi Mishra and Abid khan have proposed a tracking unit which is attached and employed to a GSM modem by which the information is transmitted to the user. This contains GPS and GSM modems alongside an ARM processor that is acknowledged within the vehicle. Through SMS things about the vehicle are sometimes reported. GPS and GSM techniques provide the exact information to trace the vehicle. Real-time control is provided by SMS. We will get information from anywhere by this method [4].

Manyi Qian proposed a smartphone is built-up of sensors like an acceleration sensor, direction sensor, magnetic sensor, etc. The authors have proposed that when this mobile has any movement, the relevant data of the sensors within the smartphone gets changed [5]. The system writes an APP that calls the Android Operating system's accelerometer to urge the corresponding sensor data. The vehicle's position identified by its latitudes and longitudes is usually tracked by using the positioning function of the GPS.

Kunal Maurya proposed a design on an embedded system by using GPS and GSM that is used for positioning and tracking of any vehicle. In this device microcontroller AT89C51 is used for interfacing with various hardware parts [6]. AGSM computer unit is used to send the location (Latitude and Longitude) of the vehicle from a bit. The GPS modem will constantly give the information indicating the position of the vehicle.

Miss. Chetna Pardeshi proposed that a tracking device of an automobile is supposed and finished for tracking the movement of any automobile from any place at any time [1]. The proposed device made specific use of a preferred generation that mixes a Smartphone software coordinating with GPS. Here addressing unit is an Android Application through which Admin receives to apprehend the actual feature of proposed vehicles. This android presents the interface through which the individual communicates with the device. It presents a login to the device. After login to the device individual is receives the correct place of an automobile the usage of google-map. The tracking device will continuously attraction to GPS

satellites for its place. At the equal time, GPS will provide place statistics to mobile devices.

### III. METHODOLOGY

#### 3.1 GPS Tracking System Working

Global Positioning System trailing may be a technique of understanding specifically wherever one thing is. A trailing system GPS as an example is placed in every vehicle connected through a mobile phone, or on special GPS devices, which might either be a set or moveable unit. GPS works by providing information about the actual location. It can even trace the motion of a person or a vehicle [7]. So, as an example, a GPS trailing system may be used by an organization or authority to observe the route and progress of a vehicle, and by oldsters to see the situation of their kid, or maybe to observe high-valued assets in transit [8].

This trailing system can add various locations. From a user viewpoint, the GPS tool is mainly used to record the position of vehicles as they create their journeys. Some systems send the knowledge to a centralized database or system via a modem within the GPS system unit on an everyday basis and some other systems will store the data within the tracking system itself called 2-Way GPS. This method is additionally placed in an extreme vehicle, on a cell phone, or on specialized GPS devices which can either be fast and portable or tough [9].

As this working process of GPS is as follows, we are adding a proximity sensor there to which incorporates the next leads in it. A proximity sensor detects the presence of nearby objects without physical contact. It frequently emits the associated magnetic field or a beam of electromagnetic radiation (infrared, for instance), and seems for changes at intervals the sphere or come signal. The infrared proximity sensor is used for detecting the metallic objects and ignored all non-metallic objects. By providing influence supply which is generated to the proximity sensor circuit diagram represents the sphere produced by the coil. Whenever this field is disturbed by a metal object (as a metal object enters this field), then it associates eddy current changes that help proximity sensor to detect nearby objects.

#### 3.2. Vehicle Tracking System Block Diagram

We proposed to create a tool, which is helpful for tracking the vehicle's location by using the Global Positioning System and Global system for mobile communication in figure 1. This device is additionally capable of alerting users with the specified alerting system through IR Proximity Sensor. ATMEGA3268P is used for interfacing various hardware peripherals. Here GSM modem the position of the vehicle through latitudes and longitudes. GPS data processor sends will give the information continuously i.e., the longitude and latitude indicate the position of the vehicle [10]. GPS modem gives many values as output, but only NMEA (National Marine Electronics Association) data is important for locating the vehicle's location. And Infrared Proximity Sensors are used as an alerting mechanism for detecting obstacles that are nearest to the vehicle within the specified range of operation. Data collected by the above mechanism is displayed within the LCD Display. The navigated track of the moving vehicle is displayed with help of Leaflet Map.

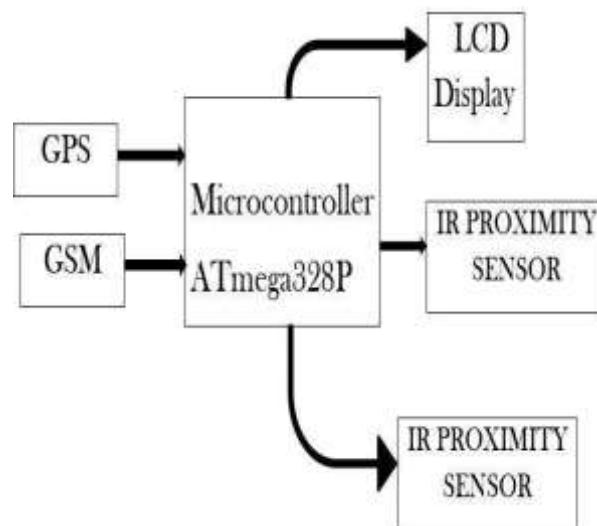


Figure 1: Diagram of the auto Tracking System

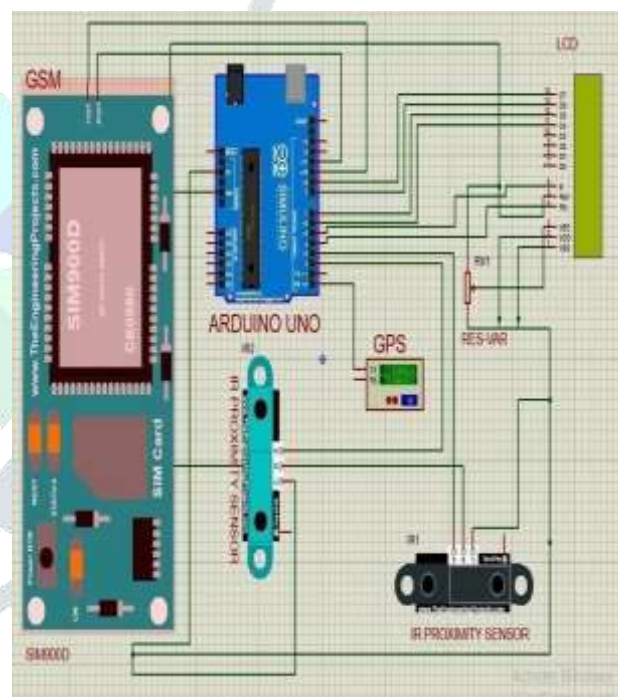


Figure 2: Circuit Diagram of Vehicle Tracking System

The Arduino UNO is the central part of the Circuit in figure 2. In this work microcontroller, ATmega328P is used for interlinking with various hardware components. For doing so, the GSM module is serially interfaced with pins 10,11(soft serial TX, RX respectively) of Arduino. The TX pin of the GPS module is given to the RX pin of Arduino. IR Proximity Sensors are grounded through the GND port of Arduino and the Power supply 5V port of Arduino is given to the V (specifically Vcc) port of both IR Proximity Sensors. The 2 and 3 serial ports of the Arduino are connected to the output(O) port of the IR2 and IR1 Proximity Sensor, respectively. This entire setup is connected to the LCD Display through the pins 1-6 & 11-14, where the serial pins 11,12,13,14 is connected to the Arduino pins 6,7,8,9 respectively and the rest of them are interfaced with the potentiometer and overall connected to the 5V power supply pin of the Arduino [11].



## IV. PROCESS AND REQUIREMENTS

### 4.1 Software Exigencies

- Arduino compiler:* Arduino IDE is an application written in java and it is derived from IDE for language and projects. This platform is employed just by Arduino programming with the fundamentals of C/C++ libraries. It also has the features to verify the code through compiling. Also, the code is sometimes successfully dumped into an Arduino by using the Upload feature. These make the Arduino IDE as a straightforward and robust tool for interfacing with an Arduino.
- Proteus Design Suite:* The Proteus Design Suite can even be a software tool used primarily for electronic design computerization. Proteus Design Suite is flexible enough to urge real-time simulations with great precision and accuracy.
- Leaflet maps:* Leaflet is an open-source JavaScript library accustomed build application associated with web mapping. It also supports most of the mobile and desktop platforms including HTML and CSS3.

### 4.2 Components

The following list of hardware components are used in this work.

- Global System for Mobile Communication SIM900D (GSM)
- Global Positioning System (GPS)
- ATMEGA328P
- Arduino Uno
- LCD Display
- Infrared Proximity Sensor

The subsequent list is that the hardware components used: GPS (Global Positioning System), GSM (Global System for Mobile Communication SIM900D), ATMEGA328P, Arduino Uno, LCD Display, Infrared Proximity Sensor, GPS could even be a worldwide navigation satellite system that has the case, time, and velocity of a particular vehicle. GSM could even be extensively used mobile communication system in the world. GSM is a mobile voice operate at the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency range and digital cellular technology used for transfer data services. ATMEGA328P could even be a high performance, low power an 8-bit microcontroller from Microchip. The Arduino Uno is an open-source microcontroller board supported by an ATmega328P. LCD could even be a flat panel display and an electronic visual display that uses liquid crystals in the sunshine modulating properties. The proximity sensor could even be a sensor that detects the speed of other vehicles and specifies the space of that vehicle, which indeed helps as an accident alerting mechanism [12].

## V. ADVANTAGES AND APPLICATIONS

### 5.1 Advantages:

- ❖ May reduces the accidents
- ❖ Automatic Theft /unauthorized use notifications.
- ❖ Notifies the speed and distance of other vehicles
- ❖ This allows you to reduce running expenses, by spotting the reckless drivers that speeds.

### 5.2 Applications

- Vehicle Tracking System is widely used by the Fleet Owners for Fleet Management.
- This device is also helpful for security of school buses.
- Ambulance Tracking and Emergency Medical Services Fleet.
- This mechanism is highly useful for tracking vehicles in Oil and Gas Industry.

Other applications include navigation, remote monitoring, remote control, security systems, Accident analysis etc.

## VI. RESULTS AND DISCUSSIONS

To guarantee vehicle safety, this work designs and develops a novel vehicle alarming and tracking system. And this system is realized to perform the function of vehicle tracking effectively in figure 3. Whenever the tracked vehicle is surrounded by other vehicles that are traveling beyond the speed limit then, they are also been tracked by the proximity sensor, and the information is provided by GPS and it is indicated in the Leaflet maps for which it has been connected. According to our virtual setup in proteus, the speed of the over speeded vehicles will be indicated on the LCD screen acting as a warning about the upcoming vehicle in figure 4. Through this, we can be safe from the over speeded vehicle.

❖ The result GPS maps are shown below:



Figure 3: GPS Map with vehicle tracking

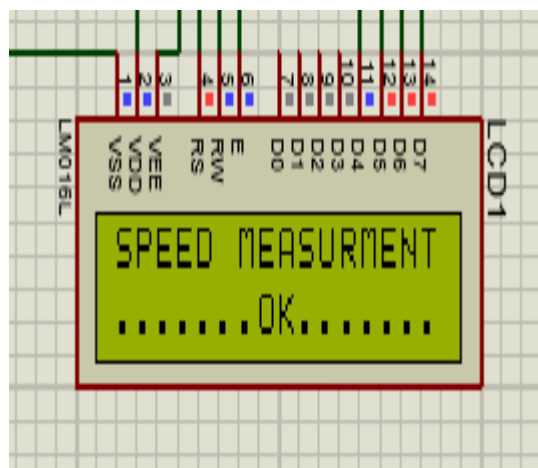


Figure 4: LCD Screen to indicate speed

## VII. CONCLUSION AND FUTURE SCOPE

### Conclusion:

This proposed system design can be used as an alerting and tracking mechanism by organizations to track their vehicles. This system allows those companies to expand their surveillance range over their crew members by monitoring the travelled routes through the help of Leaflet Maps API, which is robust in displaying a broad range of colours, to identify vehicles on the same path. The general appraisal result has shown that the system has been reliable upon displaying the positioning of the vehicle on the devices. This design is especially helpful for preventing midnight accidents. If any vehicle is traveling beyond the speed limits this may help in alerting the other vehicle and such that they can be safe from the accidents.

### Future Scope:

- This technology can be used by Companies for assessing the performance of their drivers, also can keep track of the business executives in their business tours.
- This also has futuristic scope of improvising productivity and efficiency of a given business.
- This technology can also be improvised for personal tracking purposes such as monitoring children's activities.

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