

# Vehicle Detection and Tracking System IoT based: A Review

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**Abstract** - The vehicle tracking system is technology that is used by many companies and individuals to track a vehicle by using many ways like GPS that operates using satellites and ground-based stations or by using our approach which depends on the cellular mobile towers. It is a fleet management solution and a total security, it is used to determine vehicle's location by using different methods like GPS which is operating via ground-based stations and satellites or by using cellular towers to get the latitude and longitude to represent them on maps. The internet of things (IoT) may provide satisfactory and good results in our work by relying on a mixture of software and hardware, which is in the overall interest of the project. The aim of using IoT for tracking and monitoring is due to the great advantages that provide when working with its components. In this paper, we propose a vehicle tracking system by using Raspberry Pi connected to a 3G/4G USB dongle used as a modem.

**Key Words:** Vehicle tracking, Vehicle detection, Vehicle monitoring, Raspberry Pi and IoT

## 1. INTRODUCTION

Vehicle tracking systems are popular among people as a retrieval device and theft prevention. The main benefit of vehicle tracking systems is the security purposes by monitoring the vehicle's location which can be used as a protection approach for vehicles that are stolen by sending its position coordinates to the police center as an alert for the stolen. When a police center receives an alert for stolen vehicles, they can make an action to prevent this theft. Nowadays, it is used either as a replacement or addition for car alarms to protect it from theft or it can be used as a monitoring system to keep track the vehicle at the real time. So, many applications can be used for this purpose to block car's engine or doors as an action to protect the vehicle. Due to the advancement in technology vehicle tracking systems that can even identify and detect vehicle's illegal movements and then attentive the owner about these movements. This gives an advantage over the rest applications and other pieces of technology that can serve for the same purpose.

Nowadays, vehicle tracking is one of the most important applications. For example, the maps given to vehicle drivers may play a large role in vehicle tracking and monitoring. The major difficulty is that vehicle owners may not be able to distinguish the vehicle in a place as a result of overlapping maps, which adversely affects the process of tracking and monitoring[1]. It requires some types of systems to identify and detect where objects were at some time or what

distance traveled during a trip to a vehicle. This may be an additional point and help the police in preventing thefts and locating the vehicle by relying on reports from these approved systems and studying and analyzing them to detect stolen vehicles' locations. This system is a necessary device for tracking of vehicles any time the owner wants to observe or monitor it and today it is really trendy among people having costly cars, used as theft avoidance and recovery of the stolen car. The collected data can be observed on a digital maps by using internet and software[2]. There is tremendous demand for object tracking application for the business process. The real-time tracking information on valuable things and assets could solve many problems in the world. GPS is the Global Positioning System which provides the location, using off-line and on-line both in any atmospheric conditions. There are several types of GPS tracking system available in the market[3].

## 2. LITERATURE REVIEW

Vehicle protection systems are the main worry for all vehicle holders. Owners just like most of researchers are always looking for upgraded and new vehicle security systems. Based on the great advances in technology, we have been able to track vehicles and monitor them closely at the real time, which helps to increase the protection of vehicles. This development requires us to be thankful for this technology, which helps to facilitate the monitoring and tracking of vehicles for the purpose of protecting them from theft[4].

Raspberry Pi is a sophisticated low-cost device used for several purposes that may be scientific or technical based on its ability to perform large tasks. This high efficiency is based on the infinite flexibility in the use of this device for several purposes, including Internet applications. In addition, its widespread use is due to the possibility of being programmed several times as a small computer that can be used as an accessory in other devices or in vehicles to perform specific tasks and functions that may be for surveillance, tracking or protection purposes in general[5]. It can be ancestry that the discussed system design and construction, and about to be prototype current the basic level of home appliance control and remote monitoring interval the wanted goals and objectives of home automation system have been done. Results have discovered that the Raspberry Pi is a low-priced and small computer by the whole of a lot of strength, which enables its utilization, not simply in home automation work, but also in a different range of research applications. And in [6]A novel method is

proposed to detect vehicles based only on the color of the vehicle and does not consider any other features to detect them thereby reducing the time cost without sacrificing the accuracy. The proposed system model makes use of Raspberry Pi interfaced with USB or Pi camera instead of using powerful workstations, traffic surveillance cameras. This system is portable. Raspberry pi is accessed by remote computers, android devices or laptops and makes provision for view selection. Because of the static IP address assigned to the Raspberry system it enables them to communicate it with other remote computers. It has been experienced that the cost of the proposed system is much less than the existing systems.

In[7] they proposed bus tracking system using Raspberry Pi for the primary feature of tracking the bus on Google map on web app and android app. The bus tracking system will predict the bus arrival time for students as well as uses different sensors to give additional information about bus for security. And the addition Modules like GSM/GPRS module can attach to it for web connectivity. The Geolocation Tracking method is used to identify the location of bus. This location is sent to the web server where this location is store in MySQL database and updated to display on map, as it is shown in Fig. -1

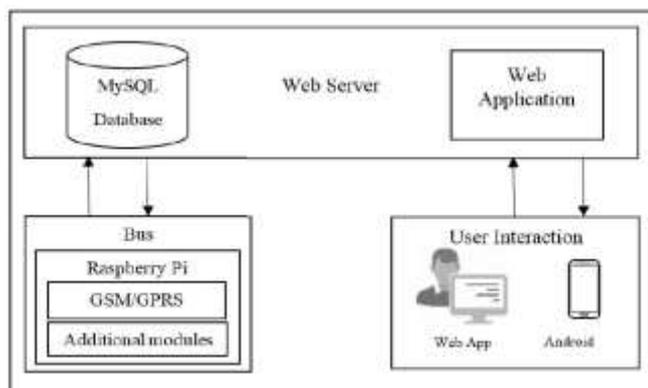


Fig -1: Block diagram(Nalawade & Devrukhkar, 2016)

Pradip V Mistary and R H Chile have proposed a vehicle tracking system based on GPS. The proposed system consists of some hardware equipment like GPS receiver, microcontroller and GSM modem for sim card, these equipment are embedded into the tracked vehicle as a transmitter part to send the required information to the other side where the tracker is. The receiver part consists of a graphic user interface (GUI) designed by using Matlab then the received information like latitude and longitude is represented on the map to get the real time tracking by using Google Earth as it is shown in figure2 that clarifies the diagrams of the transmitter part and the receiver part[9].

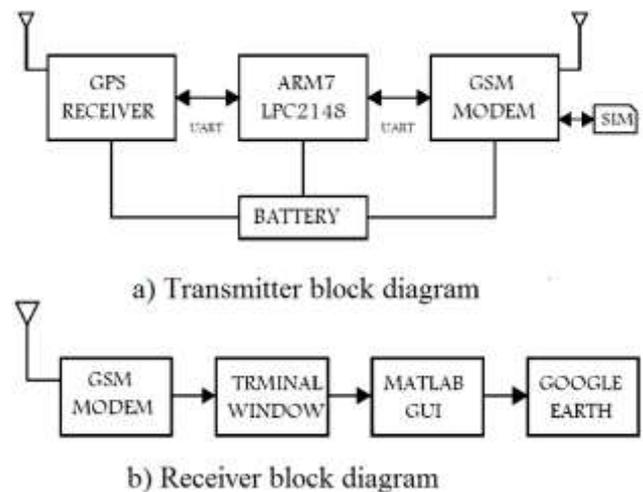


Fig -1: The diagram of transmitter and receiver[9]

Salman Almishari, Nor Ababtein, Prajna Dash, and Kshirasagar Naik have proposed a tracking system based on GPS as one of IoT applications for tracking systems. The proposed system ensures an efficient energy for real time tracking. This system consists of three main parts the tracking unit, Cloud and android application. The tracking unit resides inside the vehicle and sends the required information to the cloud like the temperature and the current possession of the vehicle by identifying latitude and longitude of the vehicle then the location is represented on the map to provide a real time tracking. This system provides an energy efficient way by reducing the power consumption around 17% lesser than the normal systems[10].

Prashant A. Shinde and Mane They have proposed and implemented a system that will increase the security of school buses through automatic follow-up and monitoring. The system is designed to bring the current school buses to traffic while using the Raspberry Pi, Linux-based, GPS receiver, GSM and GPRS. The site is periodically retrieved and compared with the coordinates of the known name and inventory in the database, each time the same process is repeated until the bus arrives at school or a wrong path is detected. In this case, the system expects that something is wrong so send the GSM message to the owners for the purpose of alerting and warning about the behavior of the wrong path[11].

Le-Tien, T. and Vu Phung described a system based on the global mobile communications system (GSM) and global positioning system GPS. The system is designed to track and control vehicles in open environments and outdoor areas as a practical model for monitoring and tracking applications. The system consists of accelerator sensor-KXSC72050 of Koinix to get a moving direction of the vehicle and a sensor compass YAS529 from Yamaha. The system will receive the vehicle's location through the data received from the GPS which is received through the GPS receiver. This data will be

sent directly to the main center by using the services of short Message Services (SMS) or General Package Radio Service (GPRS). The main center contains advanced equipment and auxiliary tools that support GSM techniques-WMP100 of the Wavecom. Lastly, the located position of the vehicle will be represented on Google maps [12].

[13] proposed an mtracker which is a Mobile application for the purpose of tracking the mobile cellular devices depending on the geographical location of the device. This allows the program user to track the cell phone and send alerts and warnings outside the geographical coverage area. [14], They have proposed and implemented a mobile program for the purpose of tracking and analyzing the spatial data and information of a particular object or object based on navigation software and GPS. For the purpose of implementing this application in an ideal manner, satellite images taken by satellite were gathered, stored and used to do the required function.

**Table -1:** The critical review of current problem and justification

Paper	Purpose	Description	Problem
System[10]	SVS is a smart vehicle system to get some information about the vehicle such as temperature, movement speed and the current location.	Consists of three main parts to do the function of the project, these parts are tracking unit, Cloud and android application.  Advantages:  Reduce power consumption and efficient tracking approach.	For the power supply they have used batteries. The battery life is a limited. So, that means many time of battery changing that leads to additional cost.
[6]	They proposed a novel idea to detect, track and count the vehicles on a road by using Raspberry Pi 3, and they connect the Raspberry Pi via internet by using Ethernet cable to send the information	Real time vehicle detection, tracking and counting of vehicles is of great interest for researchers and is a need of the society in general for comfortable, smooth and safe movements of vehicles in cities.	Do Raspberry Pi can connect every time with Ethernet cable especially this device used on the road and exposed to many weather conditions and if we lose the Ethernet connection how can send information
[11]	Vehicle tracking and monitoring system has been proposed and implemented for the purpose of securing it further. The location of the school cars is tracked between two different locations, A and B	The proposed system is based on the advantages of the Raspberry Pi, which supports the latest technology as an extension on the Linux system. By using this system, information and data are stored and used for tracking and monitoring	The problem and challenge in this proposed system is that the system can't distinguish whether the path is actually wrong or is just to avoid a traffic problem. The system will send GSM messages directly if a

	for the purpose of providing a safe environment for transportation.	purposes at the real time.	mismatch is detected between the current coordinates and those stored in the database
[9]	Vehicle tracking system based on GPS, GSM and microcontroller with the aim of enabling users of the system to get the current possession and locate the vehicle.	A prototype to track the actual location of the vehicle.  Advantages:  Low cost navigational and possession system.	The cost of sending GSM message that may be several times for many locations that would be costly.
(Sivar aman & Trivedi 2013)	Vehicle Detection, Localization & Tracking	Advantages:  Adequate accuracy for vehicle detection  Disadvantages: This technology is suitable and suitable for working with slow cars because it works on a video system 11 fps. Thus, it is difficult for the system to detect the rapid vehicles, which leads to the neglect and work only partially and not comprehensive.	Lane movement based vehicle tracking for driver assistance.
[13]	Proposed a mtracker which is a Mobile application for the purpose of tracking the mobile cellular devices depending on the geographical location of the device.	It allows the program user to track the cell phone and send alerts and warnings outside the geographical coverage area.	The gap of time that occurs as a result of tracking and monitoring buses.

### 3. DISCUSSION

This subsection is to discuss the test of some previous studies and how we can improve it. The scenario of testing mtracker that was designed by Varandas, as it is shown in Fig. -3a it displays information related with GPS such as number of satellites, longitude and latitude in the mTracker main window. Moreover it also shows the real GSM cell ID. Fig. -3b shows the personal digital assistant (PDA) receiving a SMS that warns the user of the device location. In the presented state, the SMS includes the present GPS coordinates and the present GSM Cell. If the device is within the security radius, no alerts are triggered by the application[13]. From the explored researches and the browsed cases we elicit some main issues can be solved in our proposed system.

The proposed SVS is efficiently identifying the required information like the vehicle's temperature, possession and speed then stores these information and upload it on cloud to represent the location on the map as a real time tracking system. The interfaces for this system have designed as an android application programmed by using Java and eclipse as it is shown in Fig. -4.

Chart -1: Name of the chart

IRJET sample template format ,Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.



(a) Main window (b) SMS warning received.

Fig -3: mTracker [13]

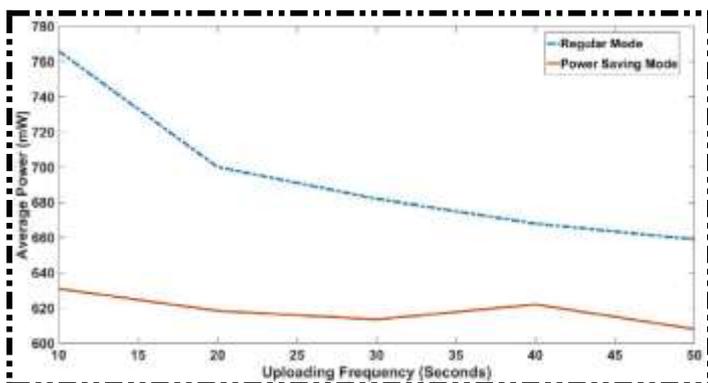


Fig -4: Average Power Consumption between Normal and Proposed Power Saving Mode for Tracking Unit[10]

This system provides the power consumption by eliminating two stages from the whole processing flow; they have eliminated the storage and comparing stages that ensures a 17% power saving more than the traditional systems. The main challenge at the previous projects was the source of the internet because they were using an Ethernet

cable to be connected to the device which is not suitable because of the vehicle's movement, for that we suggested LTE USB dongle to be used for this purpose. It can broadcast internet without using wires which is helpful for our case. Another problem we can improve it with our project which is the delay of getting location, the proposed system is a real time based system by applying our approach many times as a loop function to get the real possession of the vehicle; the delay will be reduced because of the strong signal from the cellular tower.

### 3. CONCLUSION

The vehicle tracking system is technology that is used by many companies and individuals to track a vehicle by using many ways like GPS that operates using satellites and ground based stations or by using other approaches which depends on the cellular mobile towers. The vehicle unit, which is the hardware component that is attached to the vehicle, is configured to receive signals from the cellular mobile tower and send it to the web server to represent the location on the map by using Google maps in real time. It is very important to consider some hardware specifications in order to get satisfying results. Thus Raspberry Pi can be used as an embedded computer attached to the tracked vehicle especially when using cellular method.

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