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# A Survey on Real Time Bus Monitoring System

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***Abstract -*** *Nowadays the students and staffs are using the various transport facilities to reach the institution such as government bus, private bus, institution bus, own vehicle.75% of the people prefers the transport service provided by the institution due to the safety and security reasons. Without knowing the exact location of the buses most of the students, staffs are waiting for long time in bus stop and also have a chance to miss the buses. There are various bus monitoring techniques that play a vital role in solving these problems. This study is an attempt to showcase various techniques for bus monitoring, accident detection and alerting system, fuel monitoring system and an overview about the proposed methodology.*

***Keywords*** **:** GPS, sensors, IoT, Raspberry pi.

## 1.INTRODUCTION

A variety of transportation facilities are available for the staff and students to reach their institution. Most of them uses their own transport vehicle or buses provided by the institution to reach destination on time. Probably 80% of people prefer to use institution bus services, because they consider safety and security as important factor.75% of them asserted they had been late to the destination because of waiting at bus stop for long hours and difficulty in knowing the exact location of the buses. This is one of the challenge problem faced by most of the people and calls for technology to solve the problem. With the help of tracking system the students and staffs can track the exact location of the buses, can view the arrival time of the bus to the requested location from their mobile device. Now-a-days lot of accidents happens due to increase in traffic and also due to rash driving of the drivers. In many situations the ambulance and police authority are not informed on time. It results in delaying the help reached to the person suffered due to accident. The accident alert system detects the location of the bus and sends alert messages to the hospital which provides timely treatment to the affected people. Another problem faced by bus administration and the driver is maintaining the fuel details. The actual record of fuel refilling and fuel consumption in vehicles is not maintained. The quantity of fuel refilling are noted manually by the driver or by the administration. The fuel monitoring system solves this problem and reduces the manual effort and error probability.

## 2.FOUNDATION

As a foundation, the basics of real time bus monitoring system are explained in this section.

### 1.1 Internet of Things

Internet of Things refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers but Internet of Things allows these devices to generate, exchange and consume data with minimal human intervention. IoT systems like networked vehicles, intelligent traffic systems, sensors embedded in roads and bridges makes a idea closer to "smart cities", which helps to minimize the congestion and the energy consumption. IoT implementations use different technical communications models, in which each has its own characteristics. The Four common communications models are

- Device-to-Device
- Device-to-Cloud
- Device-to-Gateway
- Back-End Data-Sharing

### 1.2 Global Positioning System

The GPS consists of 24 satellites, that circle the globe once every 12 hours, to provide worldwide position, time and velocity information. GPS helps to identify locations on the earth by measuring distance from the satellites. The GPS system comprises of three segments. They are

- Space segment
- Control segment
- User segment

When a GPS receiver is turned on, it downloads orbit information of all the satellites. Once the information is downloaded, it is stored in the receiver's memory for future use. Even though the GPS receiver knows the location of the satellites in space, it needs to know the distance from each satellite where it is receiving a signal from. The distance is calculated, by the receiver. It is calculated by multiplying the velocity of the transmitted signal and the time it takes the signal to reach the receiver. The GPS receiver's clock is less accurate than the atomic clock in the satellite. The distance measurement must be corrected to account for the receiver's internal clock error of GPS

**3.SURVEY**

There are various methods for bus tracking, accident detection and alerting, fuel monitoring. This section describes each method.

### 3.1 WiLocator

WiLocator is to track and predict the arrival time of an urban buses based on the surrounding WiFi information. WiFi Access Points (APs) are distributed densely along the road segments of the urban bus routes. It provides services to many transit agencies, third-party companies that are commonly equipped each bus with a GPS-enabled in-vehicle device. The WiLocator is made of three components: WiFi-enabled commodity off-the-shelf smartphones, carried by the bus driver for crowd sensing. The smartphone periodically scans the surrounding WiFi information, and reports it to the server, a back-end server shifts the computation burden to the server, which includes real-time bus tracking, arrival time prediction, traffic map generation and a user interface such that the real-time bus track, schedule of the buses, traffic map, can be readily available for intended bus riders.

*1) Drawbacks:* The unstable Wifi signals and complicated outdoor environment along the road segments are the challenges for tracking the buses. The WiLocator is installed in smart phone of the bus driver and it should be carried by the driver

### 3.2 EasyTracker

EasyTracker is an automatic transit mapping. The transit agency must obtain smartphone, install an app and place a phone in each transit vehicle. It can either be permanently fit in the vehicle, or may be carried by the bus driver. A central location server collects location updates from all in-vehicle devices. The acknowledged records are set through batch processing and online processing. In the batch processing, a huge set of recorded GPS traces are processed to produce route shapes, bus stop location and bus schedules. Online processing matches vehicles to routes and performs the arrival time prediction. In order to make arrival time predictions, these navigation-enabled systems requires additional information. This system produces high-fidelity route maps, extracts transit stop locations, and constructs transit schedules that consistently out-perform the official schedules produced by the transit authority.

*1) Drawbacks:* The tracking method is a complex process and it can accessed only by the transit authority.

### 3.3 GPS-GSM Based Tracking

GPS-GSM based tracking system is to track the location of bus with the help of google map. After installation the system will locate target with the help of a Web application which is a HTML based application in Google map. The web application named as 'Tracking System'. It represents the complete output of this system. In this system two applications are developed and they are linked to each other. The First application is used to get the initial position of the vehicle that is the starting point and as system will receive the different co-ordinates which is the longitude and latitude position switching to the next one will be done to get the distance travelled between the two positions. This application will run on WAMP server. The system allows to track the target anytime and anywhere in any weather conditions.

*1) Advantages:* This system is user friendly and it can be easily installed, easily accessed and can be used for various other purposes.

*2) Drawbacks:* The user has to open two application to enter the starting point and the co-ordinates.

### 3.4 Adaptive vehicle tracking

An adaptive vehicle tracking methodology is developed for public transportation. This methodology is a two pronged approach. The first one is User Request Processing and the other is Vehicle Information Processing. In the User Request Processing, the user first sends an SMS through their mobile to real time informer number with the information about the area codes of their source location and the final destination. The message sent user is received through a mobile at the server station. The system then processes the request and sends the approximate location of the bus and when it may arrive. The steps involved in vehicle information processing at first every bus is allotted a route and a unique mobile number is given to the bus the SIM card will do it. The route of the bus and its number is registered. Then certain codes for the buses are allotted

to every station which is made known to the driver. Whenever the bus reaches route station, the driver just needs to hold down the corresponding code key on the device in the bus. It automatically generates a message containing the current location and reports back to the server where the server is updated. When the user sends a request, data from the server is sent to the user through a text message about the location and estimated time of arrival.

*1) Advantages:* This is a real time system hence the results will be accurate to an acceptable level.

*2) Drawbacks:* The bus driver has to note down each time the bus reaches the new location and to hold on the key in the device.

### 3.5 Open MTC platform

It is a mobile tracking system using open MTC platform. It monitors the vehicles position and in special cases the speed, cabin temperature and number of passenger can also be monitored. The monitoring process is done using position of vehicle from satellite through GPS device and sends the received data to server through GSM modem. The vehicle data is managed using Machine-to-Machine (M2M) communication form. The Open Machine Type Communication platform for aggregating and processing location data. Monitoring application is supported by seven main modules they are GSM and GPS modules, SMS timer, a control system consisting of two sub modules namely data processing module and SMS sending interface. On the server side there is M2M platform to handle process of receiving information and giving services to application and on the side of user. The system has a web application to show vehicle's position that moves on Google maps which presents a real time movement of the tracked objects. A vehicle's position is detected by taking information from satellite data received by GPS module. The data received by monitoring system is processed by concerning timer and further it is sent to OpenMTC using SMS media. This sending process is periodically done and determined by user. The information received by OpenMTC gateway will be forwarded to the user application. The user should be previously subscribed to it using the OpenMTC APIs. The data is processed and adapted with the help of Google map format then displayed in form of Google map.

### 3.6 Accident Alert

Accident alert system gives the live updates of accidental vehicle with their location details with help of GPS. It ensures the vehicle which has got accident to send location details to web server located at emergency ambulance centre. The system uses the Raspberry Pi, Vibration Sensors, GPS and GSM modules to detect accidents. The GPS continuously takes input data from the satellite and stores the latitude, longitude values in ATmega16 microcontroller's buffer. To track the vehicle, message has to be forwarded to GSM device, by which it gets activated. It also gets activated by detecting accident with the help of shock sensor connected to Raspberry Pi. It deactivates GPS with the help of relay .Once GSM gets activated it takes the last received latitude and longitude positions values from the buffer. The GSM sends a message to a central emergency dispatch server which is predefined in the program.

*1) Drawbacks:* Central dispatch server is needed for processing the location details.

### 3.7 Fuel monitoring

It monitors the level of the fuel in the vehicle. It uses reed switch which works according to the principle of Hall Effect for sensing the amount of fuel filled in the vehicle and amount of fuel consumed. Then this record is stored in the system memory. The system is composed of central control system, communication system, sensor system, power system and a microcontroller based fuel monitoring. The interfacing unit consists of two fuel level sensors. Fuel Sensors 1 and 2.Fuel sensor 1 is placed at the inlet of fuel tank, as the disk of flow meter rotates, due to the magnet present on the disk it will make and break the reed switch. Pulses will be available as an input to the microcontroller. By counting these pulses and multiplying it by a flow factor will get exact amount of fuel filled. Fuel sensor 2 is placed at the outlet of fuel tank, as the disk of flow meter rotates, due to the magnet present on the disk it will make and break the reed switch. The square pulses are the input to the microcontroller. By counting these pulses and multiplying it by a flow factor we will get exact amount of fuel consumed.

## 4.CONCLUSION

Thus in this paper we have discussed the various methods used for bus tracking, accident detection and fuel monitoring and their advantages and drawbacks are explained.

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