



A Real Time Tracking and Alerting System Using LabVIEW

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ABSTRACT: Real time tracking system for vehicles, locomotives and ships is required that can transmit the collected information about the vehicle after regular intervals or at least could transmit the information when required by monitoring station. This led to the development of active systems. An automatic position tracking based systems in real time has playing key role in present day scenario. The prototype of the Real-time Tracking and Alerting System consists of a two units; Tracker Unit that senses the position information, relays to central monitoring station, stores that information in the database and uses this data to locate the position of the vehicle on the Google maps. This paper concentrates on the proposed VI that interfaces with the database that has vehicle information and with Google maps that indicates the position of vehicle and alerts the person who is monitoring the information.

KEYWORDS: Position, Tracking, alerting, LABVIEW.

I.INTRODUCTION

Initially vehicle tracking systems were developed for fleet management. It was a passive tracking system, a hardware device installed in the vehicle that stores GPS location, speed, heading and a trigger event such as key on/off, door open/closed etc,. When vehicle returns to a specific location device is removed and data downloaded to computer[1]. Passive systems also included auto download type that transfer data via wireless download but were not real time. Passive systems did not serve much useful to track consumer's vehicle for theft prevention. Real time tracking system was required that can transmit the collected information about the vehicle after regular intervals or at least could transmit the information when required by monitoring station. This led to the development of active systems.

Active systems were developed to transmit vehicle's data in real-time via cellular or satellite networks to a remote computer or data centre. Many vehicle tracking systems that are in use now-a-days have some form of Automatic Vehicle Location (AVL) units. It is the concept for determining the geographic location of a vehicle and transmitting this information to a remotely located server. The location is determined using GPS and transmission mechanism could be a satellite, terrestrial radio or cellular connection from the vehicle to a radio receiver, satellite or nearby cell tower [2].

After capture, the tracking data can be transmitted using any choice of telemetry or wireless communications systems. GSM is the most commonly used service for this purpose. The transmitted data is received by the central monitoring station and stored in database. The designed Virtual Instrument (VI) connects the database and the Google maps and displays the position of vehicle on the Google maps[3].

II. OBJECTIVES

To develop a VI that interfaces with real time automatic vehicle Location tracking system information that is stored in database and Google maps to display the position of vehicle. The information in the data base contains following:

1. Vehicle's location information (latitude and longitude)
2. Time and date of arrival of information.

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III.BLOCK DIAGRAM

The Block Diagram of Real time Tracking and Alerting System is shown in figure 1. Each of these blocks are described below



Fig. 1 Block diagram of tracking and alerting system

A.POSITION OF THE VEHICLE

Position of vehicle is acquired by the tracking system the contains two basic units; data processing unit and data collecting unit.

Data processing unit is usually placed in the vehicle. It has a GPS that gives the position data, Microcontroller to process the data and generate messages and finally a GSM to transmit this data to the central monitoring station [5].

On other hand, the data collecting unit is placed in the central monitoring station. It contains a GSM, that receives and a microcontroller that formats the data and that data is displayed on hyper terminal of PC and the same is stored into database.

B.DATABASE

Oracle database is used to stores the information that is received by the data collecting unit in the format specified below:

GPS ,id, dd/mm/yyyy, hh:mm, latitude, direction, longitude, direction, checksum

C.ANALYSING DATA USING LABVIEW

NI Lab view software is used to analyse the position data stored in the database and displays the location on the Google maps. LabVIEW is a highly productive development environment for creating custom applications that interact with real-world data or signals in fields such as science and engineering. VI(Virtual Instruments)s are designed normally which are the quickest and easiest way to perform a task in LabVIEW. VI describes the functionality of task to be performed with the connection of blocks[5].

D.PLOT OF THE MAP

The latitude and longitude of the vehicle position obtained from the sensing unit and that information received by the tracker unit will be displayed as icon on the Google maps indicating the position of the vehicle as shown in figure 2.

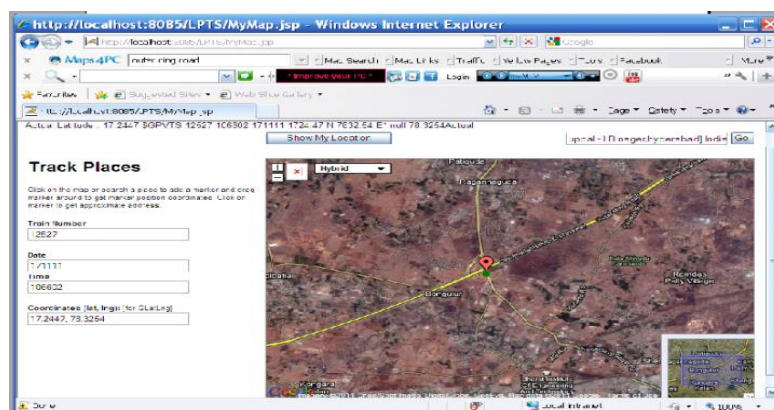


Fig2. A Red icon indicating the position of vehicle

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The VI design consists of interfacing of the Google APIs with the database. The database contains the information of vehicle with its unique identifier

IV.IMPLEMENTATION

The implementation of this design for Real time tracking and alerting system includes two parts:

- a. Locator system design
- b. Alerting system design

A.LOCATOR SYSTEM

The VI design consists of interfacing of the Google APIs with the database. The location coordinates are update to the database periodically. For every new coordinate added to the database, we need to locate the position on the maps using the static maps API. Using the coordinates available from the database, the map needs to be updated in real time. For this we need to build a URL string and query the Google API using an API key provided. The response of the Google will be a PNG image which can be directly opened in a browser which is in an ActiveX container. The VI to locate the position is shown in figure 3.

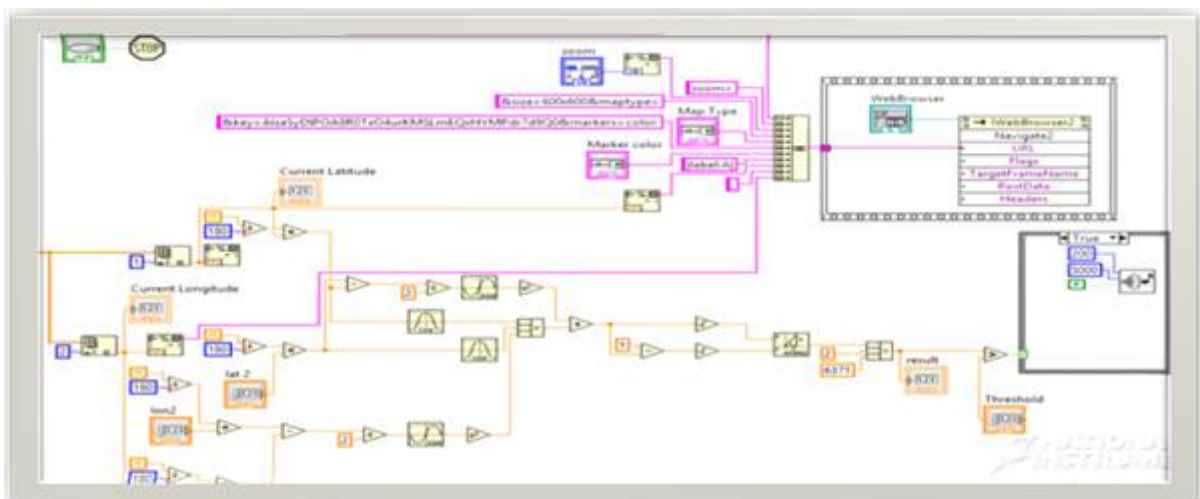


Fig3. VI to locate the position of the vehicle

The map to be displayed will be in form of an image which in non interactive. The measured location may appear entirely faulty. This is a generally result of simple operational models to compensate for the plurality of error sources. It proves impossible to serve proper location after ignoring the errors. As objects containing mass have limitations to jump, such effects are mostly beyond physical reality. Jumps of reported location not visible with the object itself generally indicate improper modeling with the location engine. Such effect is caused by changing dominance of various secondary responses. *Real time* is no registered branding and has no inherent quality[6]. A variety of offers sails under this term. As motion causes location changes, inevitably the latency time to compute a new location may be dominant with regard to motion. Either a real time system that requires waiting for new results is not worth the money or the operational concept that asks for faster location updates does not comply with the chosen systems approach.

B.ALERTING SYSTEM

The basic functionality of the Alerting unit is to measure the distance between two give coordinates and verify whether the distance is greater than the threshold limit. 'Haversine' formula is used in order to compute the distance shown in figure4. This formula can be used to calculate the distance between given latitude and longitudes.

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$$\text{Haversine } a = \sin^2(\Delta\phi/2) + \cos \phi_1 \cdot \cos \phi_2 \cdot \sin^2(\Delta\lambda/2)$$

$$\text{formula: } c = 2 \cdot \text{atan2}(\sqrt{a}, \sqrt{1-a})$$

$$d = R \cdot c$$

where ϕ is latitude, λ is longitude, R is earth's radius (mean radius = 6,371km);

Fig4. Haversine Formula

As the formula contains various trigonometric functions, Mathematical palette is used in the sign. In order to calculate the distance we need to convert the coordinates to radians from degrees. The VI in figure 5 shows the alerting unit design.

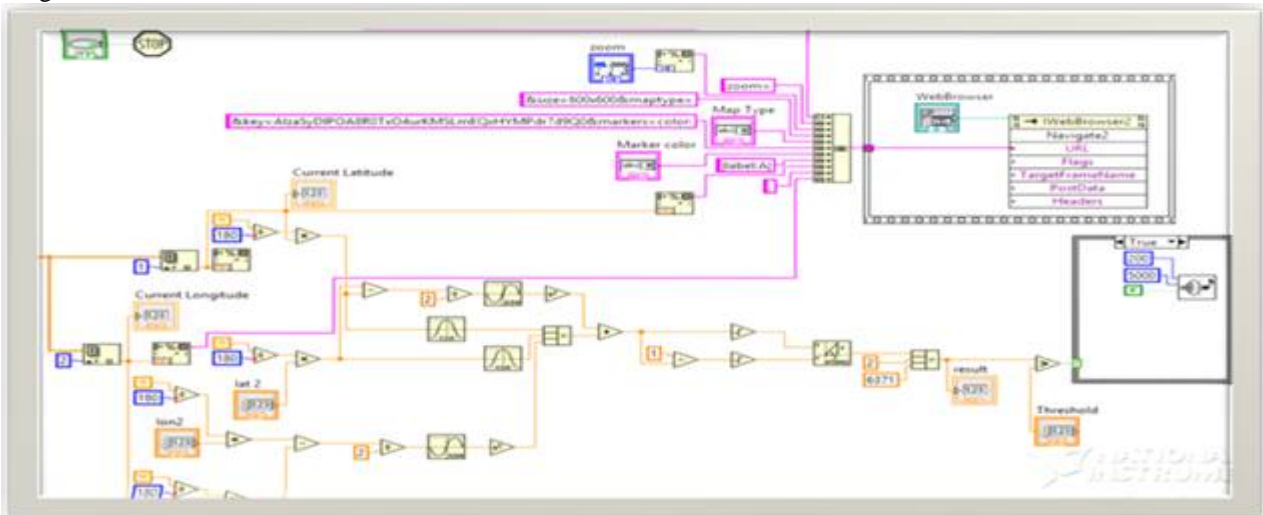


Fig5. VI for the alerting system

V. RESULTS AND DISCUSSION

The vehicle's position is detected and displayed on the Google maps [7]. The figure 6 below shows the location of area displayed on the maps with the tracked path from the starting point.

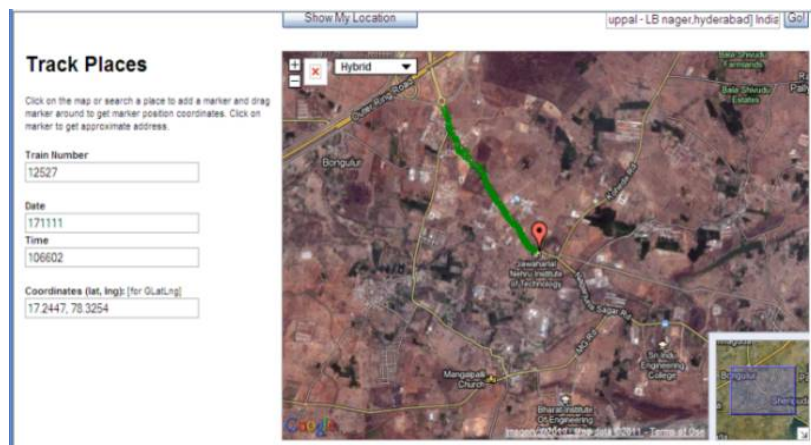


Fig6. Position of the vehicle on the map with the path



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VI.CONCLUSION

The work mainly concentrates on developing VI to track the position of vehicle in real time, locate it on the Google maps and alerting system included to caution the user of system if some diversion in route takes place. The design could yet be used to prevent disasters and direct emergency services to precise locations specified. The system can be expanded to easily handle huge fleet of vehicles. Identifying the location of the vehicle on the Google maps makes the user to see loco position at the remote place online so that it can reduce the waiting times for the travellers who are waiting for the trains or vehicles.

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