# Identification and Controll of Spark Ignition Type Vehicles using Intelligent Transportation Technologies

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Abstract. - In the existing Intelligent Transport System (ITS), only the vehicles are being monitored, instead of catching the faulty vehicle. In this methodology, the vehicles are controlled by controlling the power supply given to the spark plug through Global Positioning System (GPS) and Electronic Control Unit (ECU) within stipulated time duration from the control room itself. Particularly in Indian Transport System identification of faulty vehicle like hit and run accident vehicle, traffic violators, theft vehicles, escaping an accused in a vehicle and non-payment of tax vehicle etc., is a challenging task for the enforcing authority. In this research, a two wheeler was identified and controlled efficiently by controlling the power supply given to the spark plug from the control room itself.

**Keywords**: Spark Ignition Type Vehicles, Intelligent Transportation Technologies, Global Positioning System, Faulty Vehicles

# **I INTRODUCTION**

GPS based method was used to detect tire pressure changes and is based on the hypothesis that the effective tire radius varies according to tire pressure. The algorithm, which uses GPS and wheel speed signals to estimate the effective radius of the tires, is discussed and validated in simulation and experiment. The algorithm is based on Kalman filter theory and operates on the assumption that there is no wheel slip, which is valid for the un-driven wheels when the vehicle is not braking. Experiments are given to show how the radius estimate varies according to tire pressure, and a simple pressure loss detection law is presented. Experiments are also shown which illustrate how pressure loss in the driven wheels can be detected even when the no slip assumption is violated [1].

Real-time global positioning system (GPS) data [2] are the most common information source for vehicle location systems and the same can be proved [3,4]. Usually, this kind of system has a component to collect the GPS data from the remote devices. This component is installed in one computer connected to one or more radio terminals (with the same or different technology). The remainder of the system accesses this component from the same or different computers (connected to it through a network). This system architecture could have some limitations in terms of scalability and robustness. Furthermore, there could be some problems related to radio technologies. Most of them have radio coverage problems because they manage the communications in different areas that are not related (e.g. Global System for Mobile Communications (GSM) across different

countries). The use of more than one GPS data collector, distributed transparently along any kind of network, could offer new possibilities for managing all these kinds of problems. Moreover, it implies the use of a new architecture which can offer new possibilities for building complex vehicle location systems in an easier manner. In this paper, we present some of these possibilities by showing three examples of applications which work with distributed real-time GPS data collectors.

With the increasing uses of AVL in public transport, it is apparent that a wide range of architectures are being employed in different cities across the globe. Taking an example of PTP, there are differences in the way priority need is assessed, the method of priority request and the means of implementation. The variations in the bus priority architectures are usually due to the evolutionary approach of improving a bus priority system in the existing infrastructures. These various architectures have been categorised and compared in the studies carried out [5]. Despite these differences in system architecture, the common feature of these systems is to provide real time bus location data.

Global Positioning System (GPS) has established itself as a major positioning technology for providing location data for ITS applications. Global Positioning System (GPS) have been the platform for Automatic Vehicle Location systems (AVL) which are now supporting real-time passenger information (RTPI), fleet management and operations (FMOs) and public transport priorities (PTPs), to name three key applications [6].

A large number of applications have been developed in abroad for each of the above mentioned categories. In Greece, the use of GPS in the transport sector is relatively small. It must be mentioned at this point that there are a number of books providing information to engineers about the applications of GPS technology to the transportation system and especially to intelligent transportation systems [7,8].

Studies of highway design consistency require having reliable data about the geometric characteristics of the highway that are not often available, do not have the suitable format, are not updated or do not have the required precision. A fast and economic procedure was developed which allows obtaining the geometric definition of a two-lane rural highway horizontal alignment with sufficient precision to make studies of traffic safety and specially those of design consistency [9]. Furthermore, knowing the roadway centerline alignment is essential to support many ITS applications e.g., distance-based road user charging, dynamic road guidance, fleet management, location based services, accident and emergency services. The coordinates of points of a roadway by means of a GPS receiver mounted on a car and on the subsequent processing of this information was obtained. As the final result of this process, the highway alignment, defined by means of a spline curve was obtained.

The navigation satellite timing and ranging system (NAVSTAR) which is also known as the global positioning system (GPS) was firstly developed in the 1970s, primarily for military purposes i.e., cooperation between the US Departments of Transport and Navy. As this technology has been developing, the number of applications has been increased for military and civilian users. It must be mentioned at this point that, on the 1st of May of the year 2000 the selective availability (SA) of GPS which had been into force since 1990 terminated [10]. The SA was a method to reduce the accuracy provided by the system to the civilian users. Through the use of GPS technology, conventional positioning methods have been replaced. Nowadays GPS is the tool for a large number of kinematic and other applications.

Use of GPS receivers for obtaining geographic information of highways has been carried out with different aims. Its use in specific vehicles for inventory making of highways stands out [11, 12, 13]. They can also be used to collect data for making maps for highway navigation systems. They have been also used for studies of traffic congestion, integrated in specific vehicles and combined with Geographic Information Systems (GIS) [14]. Nevertheless, in these cases, the precision of the collected data or the alignment definition by means of straight lines makes it inadequate to make detailed studies about the highway geometry. The proposed procedure uses data collected by means of a GPS receiver placed in a standard vehicle; therefore, it has the advantage of not needing a specific vehicle for data collecting. In order to improve the accuracy of these data, they have been post processed in order to introduce a differential correction.

Deduced Reckoning (commonly referred to as 'Dead' Reckoning or DR) sensors consisting of an odometer and a gyroscope are routinely used to bridge any gaps in GPS positioning [15]. This information is then used with spatial road network data to determine the spatial reference of vehicle location via a process known as map matching. Intelligent transportation system (ITS) is the most important approach accepted worldwide to solve the problem of traffic congestion in cities, with distinctly low cost-effectiveness ratio. A range of intelligent transport system (ITS) applications and services such as route guidance, fleet management, road user charging, accident and emergency response, bus arrival information, and other location based services (LBS) require location information. For instance, buses equipped with a navigation system can determine their locations and send the information back to a control centre enabling bus operators to predict the arrival of buses at bus stops and hence improve the service level of public transport systems.

#### **II EXPERIMENTAL PROCEDURE**

Initially this experiment was conducted on two light motor vehicles of diesel engine type in which GPS instrument was fixed at the bottom of the engine bannet. These two vehicles are fitted with GPS transponders as shown in fig.1 with the aid of DOCOMO service provider which are connected with a common server and the movement of the vehicle are monitored with various parameters like Geographic location of the vehicle, Speed of travel of the vehicle at a particular location, ideal stoppage of the vehicle. GSM based TATA DOCOMO SIM was used to receive and transmit the signal from the server control room to the GPS instrument which was fixed in the vehicle. Once the power supply was cut down through this system, the engine gets controlled and stopped, but starting of the vehicle after this incident is the major problem faced during testing due to the air lock in the engine.

Hence this research was proceeded further on petrol(Spark Ignition) engines. For this analysis, initially the system was fitted with a two wheeler as shown in fig.2.



Fig.1 GPS Transponder



Fig.2 Connection of GPS instrument in 2 Wheeler

The date, time, location, distance from server, speed, district and state of the particular vehicle are stored in the memory of the instrument unit and the same can be viewed/printed in the form of tabular column. The resolution/time interval can be set as minimum as one minute between two successive set of readings. To control the vehicle a separate program and an electronic circuit has been made to suit with the Existing fuel injection system of a vehicle to regulate the fuel mixture.

## **III RESULT AND DISCUSSION**

Due to the rapid growth of the vehicles, identification and control of a faulty vehicle is tedious job for the enforcing authority. The instrument which is fixed in the two wheeler gives the best results. A set sample recordings for specific duration of a vehicle are shown in table.1. Vehicle No: TN 22 AF 6768 Date: 18/Jul/2013

Sl.N o	Date	Time	Location	DL	KM	Speed	District	State
1	18/Jul/2013	07:26:23	SRB Tools	290 M	0022.53	52	Chennai	Tamilnadu
2	18/Jul/2013	07:29:09	Mettukuppam	530 M	0023.64	15	Chennai	Tamilnadu
3	18/Jul/2013	07:31:44	PTC Qtrs BS	126 M	0024.81	0	Chennai	Tamilnadu
4	18/Jul/2013	07:34:51	PTC Qtrs BS Chennai	365 M	0026.07	43	Chennai	Tamilnadu

Vehicle Tracking System Track Report, Report Generated Date & Time : 07/18/2013, 07:32:0168 PM Table.1 TRACK REPORT Once the signal is given from the control room through GPS Transponder and Engine Management System, the supply to the spark plug gets stopped and accordingly the two-wheeler also stopped. If the same thing is being implemented for the vehicles which have more than one cylinder, the supply to the spark plugs can be cut down one by one so that the vehicle pulling power will be gradually reduced and finally the vehicle will be stopped. After this process, the starting of the vehicle is as usual than that of compression ignition vehicles, since the system does not interference the fuel ignition. While implementing this methodology it is easier to identify and control a particular vehicle within few minutes which results a rapid reduction of the crime rate.

## IV CONCLUSION

The implementation and testing of this ITS technology in a two wheeler concluds that the spark ignition engines are well controlled by using a specially designed electronic control unit (ECU) with the help of a good network provider and accordingly the speed of the vehicle can be reduced or stopped, so that the vehicle can be caught by the enforcing authority for necessary action. Due to proliferation of internet and mobile phone communication technology if any country introduces this ITS methodology in the transportation sector they will definetely get better results to the enforcing authority to reduce the crime rate.

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