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A Review on Vehicular Monitoring and Tracking

Hemin Jose[1], Lekshmy Harikrishnan [2]
[1](ECE, PG Scholar, Vimal Jyothi Engineering College, India)
[2](ECE, Assistant Professor, Vimal Jyothi Engineering College, India)

Abstract : *In today's world the life has become very fast. The factors like increasing pollution and increasing population has affected day-to-day life. The number of vehicles and undisciplined traffic has invited the number of accidents every day. Road accidents are ever increasing in our country also. The victims are losing their lives as there is inordinate delay in reaching the hospitals and getting the medical treatment well within the time. Also, with rapid urbanization, vehicles are also increasing. More the number of vehicles more are probability of accidents. The government took a number of initiatives and many awareness programs but accident rate remains high. Keeping in view the ever increasing death cases on the road accidents, there are different methods to track the vehicle at the soonest possible time and rescue the accidents. In this paper we compare three different vehicle tracking techniques. First is by using arm processor second is by using AVL (Automatic Vehicle Location system) and third is by using on-line fusion of color and shape features.*

Keywords: *ARM, GPS, GSM, AVL, Vehicle Tracking*

I. INTRODUCTION

At present cars and other private vehicles are being used daily by large numbers of people. The most important problem regarding the increased use of private transport is the rising number of fatalities that are occurring as a consequence of accidents on the roads; the associated expense and related dangers have been recognized as a serious problem that is being confronted by modern society. According to the UK department of transport's report for road casualties in Great Britain for the first quarter of 2011, there were 24,770 people killed or seriously injured due to road accidents. This number represents a small decrease of 5 per cent, as compared to the previous 12 months period [2]. Driver errors due to affected by fatigue, being drunk, or reckless driving are the main factors responsible for most road accidents.

Every minute, on average, at least one person dies in a vehicle crash. Auto accidents also injure a minimum of 10 million people every year, and two or three million of them seriously. The hospital charges, damaged property, and other costs are expected to add up to 1%-3% of the world's gross domestic product [3]. With the aim of reducing injury and accident severity, pre-crash sensing has become an area of active research among suppliers, automotive manufacturers and universities. Vehicle accident statistics clarify that the main threats a driver is facing are from other vehicles. Consequently, developing on-board automotive driver assistance systems aiming to alert a driver about driving environments, and possible collision with other vehicles has attracted a lot of attention [7]. In these systems, robust and reliable vehicle detection is the first step — a successful vehicle detection algorithm will pave the way for vehicle tracking, vehicle recognition, and collision avoidance. The safety of private and public vehicles is a major concern nowadays so having GPS vehicle tracking system ensures their safety while travelling.

A 'Vehicle tracking system' is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle's location. All most modern vehicle tracking systems utilizes Global Positioning System (GPS) for accurate location of the vehicle. Many other systems also combine a communications component let us say a cellular or satellite transmitter to communicate the vehicle's location to a remote user. Vehicle information or identity can be seen through electronic maps via specialized software or the Internet. Current vehicle tracking systems have their roots in the shipping industry. Corporate companies with large fleets of vehicles such as oil tankers or taxy… require some sort of system to determine where each vehicle was at any given time. Vehicle tracking systems can also be found in consumers vehicles as theft prevention and as a retrieval device. Police can follow the signal emitted by the tracking system to locate the vehicle which is stolen. A large number of vehicle tracking systems are now using a form of automatic vehicle location (AVL) to allow for easy location of the vehicle. This system can provides information about the accident to the nearby hospital and police station. As a result sudden help can be received and thus life may be saved and also the traffic jams can be reduced. The GPS satellite system was built and is maintained by government and is available at no cost to civilians. This makes this technology cost effective. A server computer at the monitoring station is continuously waiting for data from the system is recording the actions of the vehicle into a database. This contains the information regarding Vehicle identity, position, velocity, and temperature. The development of vehicular design brings public much convenience in life.

II. VEHICLE TRACKING USING ARM PLATFORM

Taking ARM as platform, and GPS and GSM as wireless data communication platform, Vehicle Positioning can effectively overcome the past disadvantages of poor real-time and high operating costs existed in the system. Vehicle positioning system is stable, reliable and small with small delay, which trying to achieve complexion of positioning technology, integration of positioning systems, and network of location-based services in the form of the current Client or Server. The Vehicular System provides information regarding the vehicle such as velocity, position, through a GPS module and identity of a vehicle to a monitoring station and to a mobile phone according to a definite event stored in a program or a query from a monitoring station. Accelerometer which is interfaced with the arm processor senses the collision of the vehicle and sends this information in real time to nearby hospital/police station. The monitoring station displays this information like position, velocity… on GUI also stored these information in database for further process according to a program. The system is useful in much application such as surveillance, security, tracking, which may be installed in cargo trucks, cars, motorcycle, and boat. The system can be used in many applications.

Key feature of this design include:

a) Vehicle real-time monitoring by sending "its" information regarding velocity, Position (longitude, latitude) to the monitoring station and to the user/owners mobile that should help them to get medical help if accident or the theft.[1]
b) Display that information on GUI and also at the same time these information are stored in the database.[1]
c) User/owner has an access to get real-time position of a vehicle in real time.[1]
d) Also in case of theft vehicle should be stop at the same time where this system is ported on the mobile vehicle.[1]
e) It includes a temperature sensor that gives temperature in degree Celsius for monitoring the environmental conditions around the goods or other stuff in the transport vehicle.[1]

III. AUTOMATIC VEHICLE LOCATION SYSTEMS (AVLS)

To improve transit services, operators of transit vehicles must have feedback on the performance of their transit system. The idea of tracking transit vehicles grew slowly after World War II because the demand for transit transportation declined and labour costs rose (Roth, H., 1977). Transit operators need to be able to identify and locate specific vehicles while the vehicles are in service. Automatic Vehicle Locations systems (AVLs) are the means for determining the geographic location of a vehicle and transmitting this information to a point where it can be stored and used with certain software and database applications. These systems combine vehicle location and communications systems to track the locations of a fleet of vehicles. AVLs have been used by transit agencies for decades with varying levels of technological complexity (Zhong-Ren, P. et al., 1999).

In the past, transit system operators used manual systems to monitor their fleet. Individuals would stand at main points on the street to monitor the performance of the buses (TCRP Synthesis 22, 1997). These men, known as point men, used public phones as a means of communicating with a control station and of providing information based on their observations. Many transit agencies have adopted AVL systems to track their fleets and provide transport users with a reliable and credible service.

Modern AVL tracking systems should be automatically configured to transmit location data at a set time interval. AVL systems solve the problem of real-time vehicle tracking using a variety of radio communication networks. The main functions of AVL systems are to:

- ✓ measure vehicle location
- ✓ transmit vehicle data to a central server

IV. VEHICLE TRACKING USING ON-LINE FUSION OF COLOR AND SHAPE FEATURES

With the aim of accident severity and reducing injury, pre-crash sensing is becoming an area of active research among automotive manufacturers, suppliers and universities [7][8][9]. Developing on-board automotive driver assistance systems aiming to alert a driver about possible collision and driving environments with other vehicles has attracted a lot of attention. In these systems, reliable and robust vehicle detection and tracking are critical steps for driver assistance and collision avoidance. The focus of this method is on the problem of on-road vehicle tracking using optical sensors. Tracking moving objects using a moving camera has been a challenging topic in computer vision. The difficulties are caused by continuous changing of the camera position, variation of the appearance of the target in motion, and alteration of the illumination conditions and background. In particular, the camera assisted car is required to react to the on-road situations in real time, which adds one more constraint to the tracker: the tracking algorithm has to be computationally inexpensive.

The success or failure of any tracking algorithm depends a lot on the degree that the tracked object can be distinguished from its surroundings [10]. In particular, the set of features used by the tracking algorithm to represent the object(s) being tracked plays a major role in tracking performance. All of the mean-shift based

trackers use only color information to form the visual feature space from which the probability models are built. Using color information alone is not sufficient for on-road vehicle tracking. It needs to compete clutters having similar colors as the target may appear in the background quite often. Moreover, the color of the target being tracked varies due to light changes and road conditions edge, horizontal edge, diagonal edge and color using the HSV (Hue Saturation Value) representation. Mean-shift analysis is then employed in each feature space to derive the potential position of the target. This is done by finding the target having the most similar statistical distribution to a given model in the same feature space.

Vehicle Tracking Using On-Line Fusion of Color and Shape Features is an effective on-road tracking method which utilizes both shape and color information. Using color information and shape features based on edges in three directions, we build statistical models of vehicle appearance in each feature space. Then, by using the mean-shift algorithm the potential target location is found in each feature space. The results in each feature space are ranked by computing similarity scores between the model and the target.

V. APPLICATIONS OF VEHICLE TRACKING

1) For Personal vehicle: The main application of vehicle tracking is for personal vehicle use if any unfortunate accident had occurred to a vehicle fitted with black box then immediate help can be provided to the victimized car on receiving SMS.
2) Insurance companies: Most of the time of accident is false. So insurance companies can implement vehicle tracking in the insured vehicle and as a data before and at the time of accident is locked into black box. The insurance company can easily analyze the data recorded. And they can find out whether the accident had made or occurred. And so the false claim is avoided.
3) Research and development of vehicle: In testing the vehicle in R and D sent an engineer's required data at various speed and time. But this data is not available exactly as it is not possible to measure the data for every second and to measure the number of parameters at the same time. If we use black box then the data can be made available for each and every second with very high accuracy. Black box not only makes the data available but with the help of LABVIEW software the data can be plotted in graphical form by taking engine temp vs. time or speed vs. time,
4) Military applications: Military vehicles carry ammunition from one place to other for e.g. in Kashmir military vehicles can be fitted with car black box so if militants had attacked or damaged the vehicle immediate SMS is send to military based station and this ammunitions can be made save from wrong hands.[3]
5) Fleet control: For example, a delivery or taxi company may put such a tracker in every of its vehicles, which helps the staff to know if a vehicle is late or in time, or is going in its assigned route. The same applies for armored trucks which transports valuable goods, as it allows pinpointing the exact site of a possible robbery.
6) Stolen vehicle searching: Owners of expensive cars can put a tracker in it, and "activate" them in case of theft. "Activate" is a command which is issued to the tracker, via SMS or otherwise and it will start acting as a fleet control device, and thus the user can know where the thieves are.
7) Espionage/surveillance: When put on a person, or on his personal vehicle, a vehicle tracking device also helps the person to monitor and track his/her habits. This application is mostly used by private investigators, and also by some parents to track their children.
8) This system is also can be interfaced with Vehicle airbag system such that when the sensors detect the accident, the air bags get opened.

VI. CONCLUSION

Here we compare different vehicle tracking system. The vehicle tracking systems can provide information of a vehicle like velocity, position, through a GPS module and identity of a vehicle to a monitoring station and to a mobile phone according to a definite event stored in a program or a query from a monitoring station. If an accident occurs then it can provide the exact location where the accident has taken place. It will reduce the accident death ratio in considerable amount even in rural roads. Then it has a great importance in day to day life of the people in the country like India because it can provide vital information about the accidents even in unpopulated area. So, the emergence care center could be able to serve to the victims with better efficiency and they could plan to have important first aid kits which have to be brought along with them to the accident spot.

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