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A REVIEW ON INTELLIGENT SPEED ADAPTATION IN AUTOMOTIVE

Pratik Patil
B.E. Student, Mechanical Engineering Department
Indira College of Engineering and Management, Pune.

Vaibhav Warule
Assistant Professor, Mechanical Engineering Department
Indira College of Engineering and Management, Pune.

ABSRACT

This paper presentsa review for an intelligent speed validation and adaptation. This review focuses on formal modeling of the corresponding smart vehicle units, to increase the road safety as well as to allow formal analysis of the smart vehicle behavior. It suggest a number of models for speed check/limitation units, which reflect differences in the speed limits in several countries. It also present results from the case studies, based on two implementations of the model as an iOS and an Android app forIntelligent Speed Adaptation and Preliminary results of on-road study in Penang, Malaysia. Which was the field experiment with (ISA) Intelligent speed adaptation, was held in December 2010 in the state Penang?

Keywords: Road safety, Intelligent Vehicle, Transport system, Smart City

INTRODUCTION

Every year millions of road users are killed or injured in road accidents. Road accidents were ranked as the ninth most common cause of death in 1990 and are estimated to be the third most common cause of death by 2020. Also, the fatality rate is projected to increase by over 80% in the developing countries and by 65% including the developed countries by 2020. Road accidents are most unwanted thing to happen to a road user and the main reason for the road accidents is over speeding.

ISA is a system which all the time monitors local speed limits of the road and the vehicle speed, then execute an action whenever a vehicle is detected to be overstepping the speed limit of that location. ISA uses GPS (Global positioning systems) technology in its systems and thus the position of the vehicles can be identified using the GPS receiver. The information can be obtained with the help of digital map joining roadway facilitate as well as information of the roadway at that location and its speed zoning ISA gives general speed zoning information for a defined geographical region such as urban region where it will be one defined speed limit.ISA gives information of fluctuating speed zone (speed limits around school zones that only come under at certain times of the day and only on certain days).It also provides information on temporary speed zones such as limits changes in bad weather, at accident place, near road repair work. Many ISA systems will also be supplying data about locations where risk and hazards may come in picture like railway gate crossings, schools, hospitals etc.It is helpful for the drivers when they are in unfamiliar regions and when they travel through regions where speed limits are used for the vehicle.

TYPES 0F INTELLIGENT SPEED ADAPTATION SYSTEMS

Active system:

An active ISA system automatically manipulates the engine or braking systems and reduces or limits the vehicle speed. This systems mediate and then automatically corrects the speed of the vehicle to conform it with the speed constrains of that zone.

Passive System:

Passive devices just warn the driver who will be travelling at a higher speed than the speed constrains of that zone. These systems are basically a driver advisory system, they alarm the driver in the case that they are speeding, depending on this information driver will make a decision.

LITERATURE REVIEW

1. Intelligent speed adaptation and road safety:

Simulator studies and field trail with an instrumented vehicle showed a substantial reduction of speed and standard deviation on

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urban roads. Validation of calculated average speed reduction with field trial measurements showed great response. On premise that all cars fitted with ISA, a substantial reduction in casualties between 25%-30% may be expected. More computer simulation studies are recommended. Research regarding the maximum safe speed at the approach of specific locations such as intersection, bend pedestrian crossing, school, etc. is needed.

2. Formal models for Intelligent speed adaptation and validation:

Intelligent speed adaptation system is a step in the transportation system from fully controlled vehicle by the driver, to fully autonomous driving where the vehicle itself is the intelligent subject on road. Drivers can use benefits of the intelligent technologies without need to invest large amount of money in new car. Even with the small changes in the driving practice, there are many issues in psychological and human space. More we us this type of technology, more feedback we have and more human lives will be saved. In general, the ISA systems can be developed as warning ISA systems and speed limitation systems built in the vehicles.

3. Dynamic data update for intelligent speed adaptation systems:

The data transmission time and packet loss was predictable in indoor setup for number of trails. The transmission time was different for each trail but information transmission speed was high in outdoor environment few times. Data transmission comes in picture only when the tow hubs are very close in the dynamic setup; the scope area around ZigBee hub was around 80 meters. The moving node will approach when other node is fixed only when the two nodes come closer by 10 meters. So, the node should be fixed 10 meters before the tollgate to use the accessible brief time effectively to transmit the information.

4. A study on the impact of intelligent speed adaptation to bus drivers:

This study explored the effect of intelligent speed adaptation to bus drivers. The primary data is for speed profiles were obtained from ISA based GPS device, secondary data were collected by the information by inquiry from 10 respondents who was involved in this ISA experiment. This

experiment was aimed on the effects of speed profile and psychology aspects of the drivers. In speed profile test the average speed before implementing ISA was 33km/hr. and after implementing it was 31.5km/hr. In driver psychology test, most of them dint felt any stress and distraction while driving with ISA and were also comfortable with the system. They were satisfied with ISA device and appreciated the concept.

5. Analysis on acceptance of elderly drivers for ISA using a driving simulator:

For the mandatory ISA and advisory ISA, the acceptance of ISA by elderly driver on community road was generally high. The ISA makes the traffic safer by reducing driving speed and have good effects on traffic safety by reducing the mental loads of elderly drivers. The acceptance for the advisory ISA is high as compared to the mandatory ISA. Thus, the ISA introduction should be implemented from advisory ISA. As the business market, cannot be fully expanded, the support is need form the side of government and other publics by considering the high social acceptance of all age groups.

6. Intelligent speed adaptation preliminary results of on-road study in Penang, Malaysia (Case Study):

In this case the study is conducted between two tollgates that is A and B as showed in figure below which is of 18km distance and has varying speed limits of 50km/hr. and 60km/hr. (considering as segment 1and 2) near the two tollgates, and 110km/hr. at the middle (considering as segment 3).

(Fig.1)

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The analysis was conducted for three specific period i.e. the month when the feedback was off (warning was off), the month when the feedback was on (warning was on), the month when the system was deactivated again (warning was off), these three-time period has referred as "before", "during" and "after". The examination on the logged speed information displayed that vehicle speed will significantly come down with the system particularly in the 3rd. segment where they can take their speed on road more freely without the installation of other measures. The system had lower effect in segment 1 and 2 which is near to tollgate compared with segment 3. The present study used vocal warning system and hence it is resulted in reduction of serious injury by 13% to 18% in accidents and satisfactory of it.
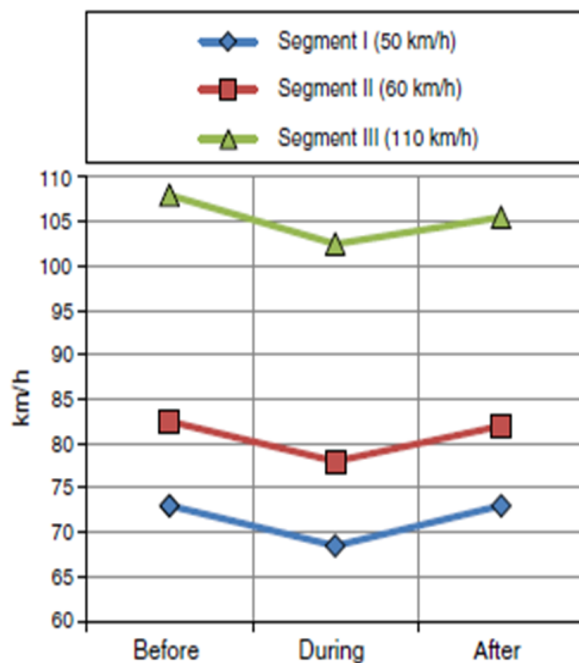
(Fig.2)

In this experiment, it is shown, the system has no larger and long-lasting effect on speed reduction when ISA system is not there and is removed from the vehicle. It is expected that the effect of ISA system will slowly fade off and the driver recommences with his normal earlier habits. The advisory system should not be removed from the vehicle like vocal warning system and should also be made as a permanent device. This study shows that this gadget is suited best as permanent assistance gadget than a temporary assistance gadget. The system also had effects on driver's behavior, they define that their degree of right yielding practice improved at the junction, which is possible due to the surrounding traffic awareness given by the system and resulted in reduction of speed and accidents. The advantage of getting feedback inside a car is that this statistic will remain in the place, will also provide warning uninterruptedly.

The existing study was first experimented in Malaysia and the study showed significant results of this technology and influenced drivers speed behavior.

CONCLUSION

ISA is now a mature technology which is capable of delivering substantial reductions in excessive speed and thereby considerable benefits in terms of safety. Intelligent speed adaptation (ISA), also known as alerting, and intelligent authority is any system that ensures that vehicle speed does not exceed a safe or legally enforced speed. In case of potential speeding, a human driver can be alerted, or the speed reduced automatically. The main aim of this study is to consider the effect of ISA system in terms of driving speed and driver acceptance, the speed warning system had brought a reduction in mean and maximum driving speeds. ISA will reduce the risk of road accidents and save many life of human beings, it is a precaution step in road safety. Drivers can use benefits of the intelligent technologies without need to invest large amount of money in new car. ISA has major advantages over other safety devices; it should be installed in all the vehicles for the safety of human life.

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