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Intelligent Transport Systems And Road Safety –A Survey

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ABSTRACT: *The Intelligent Transport Systems (ITS) technologies has the potential to develop a new ideas of road safety. Many ITS systems have a direct or indirect impact on road . In order to ensure that systems are deployed so as to ensure the more use to safety, it is important to carry out proper safety evaluation of these systems.*

Keywords**:** *ITS,HMI, ,ISA ESC,LDWS,EVI,EDR,CAS.*

1.0 INTRODUCTION

Many developments are taking place in the area of Intelligent Transport Systems (ITS) for traffic purposes. Many of the current ITS applications are mainly aimed at increasing comfort while driving and at improving accessibility. In addition, systems like the alcolock and the seatbelt lock are being developed with the primary aim of road safety. There are also systems, such as Advanced Cruise Control and Dynamic Route Information Panels, that are not specifically intended to improve road safety, but that can have an effect. There are high expectations for the positive effects of ITS applications. Public and political support, a possibly gradual introduction and cooperation between all parties involved are essential for successful implementation.

1.1 ROAD SAFETY

Transport safety can be defined in a number of ways. Safe road traffic is characterised by the absence of crashes, injuries and fatalities. Because the loss of health is the most serious effect of crashes for society and for the individual, It leads both to serious personal suffering and to huge societal losses.Therefore, it is essential to state at this early stage that loss of health is the main road safety criterion.

- The health consequences of road crashes may be influenced by actions taken before the crash (active safety), during the crash (passive safety), and post crash (rescue, treatment, rehabilitation).
- Most of the crashes are due to human errors, mostly unintentional.

There are three basic ways to reduce the human errors:

1. Selection of road users (for example, licensing),
2. Improving road users (for example, information,education, training, and enforcement),
3. Adaptation of road and vehicle engineering solutions (make it easier to drive,to walk in traffic).

ITS have the potential to improve safety along each one of the three mentioned dimensions. With the use of ITS

- It is possible and feasible now to influence and even control traffic exposure.
- It will be possible to reduce the probability of crashes, to prevent crashes.
- It will be possible to reduce the injury consequences of crashes.

1.2 Safety aspects of ITS

The safety implications of Intelligent Transport Systems are commonly classified into three areas

1. System Safety — covering safety problems from hardware design and from software design with particular focus on reliability, the propensity for malfunction and the potential to go into a dangerous system mode.
2. Human Machine Interaction (HMI), that is interaction between the user and the system. Main points are the design of buttons and controls,screen size,means of dialogue between the user and the system channel for information(auditory or visual), and feedback to the user (auditory or visual).
3. raffic Safety — this is the overall effect of system use on the safety of the traffic system as a whole. It covers the outcome of System Safety and HMI. More broadly, it also covers the overall ways in which a particular system might affect road user behaviour so as to alter the interaction between the driver, the vehicle, the road infrastructure and other road users.

In each of these areas, various procedures and guidelines have been developed in an effort to ensure that safety problems are minimised. Currently these guidelines are voluntary and as a consequence there are issues of how to ensure compliance with recommended practice. In addition, in some areas, because the systems are so new and there is so little experience on their effects, there is a need to develop further the basic knowledge required in order to develop standards to ensure safety.

1.3 Systems for vehicle use

1.3.1 Systems that prevent unsafe traffic participation -

First and well-known example of systems that prevent unsafe traffic participation, is the *alcolock*. Before drivers can start their car, they first have to take a breath test when an alcolock has been installed. If the BAC is too high (often 0.2 g/l), the car will not start. This system is already being used in various countries, especially for drivers who have been caught while driving under the influence. It has a considerable effect on unsafe traffic participation.

Second system is *seatbelt lock* which is based on the same principle: if the seatbelt is not fastened, the car will not start. Many cars already have a warning system that operates via a small light, an audible signal or a talking computer .The seatbelt lock goes one step further by making it impossible to drive without wearing a seatbelt. A seatbelt lock particularly has an effect on the outcome of crashes. The risk of being killed or severely injured is much greater without a seatbelt.

A step further than the above applications is the *smart card*, which is a sort of individual starting permit. All sorts of data about the driver's fitness to drive can be stored on a smart card, such as information about the validity of the driving licence (vehicle type, licence suspension) and any restrictions for using the vehicle.

1.3.2 Systems that prevent unsafe situations or actions while driving -

Systems that prevent unsafe actions during traffic participation are systems that offer support for vehicle control, record and prevent unintentional offences, offer support in observing, interpreting and predicting traffic situations, and react to a (temporarily) reduced fitness to drive. The most well-known systems and their intended effects are grouped together and described in following tabular format.

Vehicle control	Electronic Stability Control	ESC	Prevents a car skidding in a bend or when making a manoeuvre (autonomous system)
	Lane Departure Warning System	LDWS	Warns when crossing the road marking through video in vehicle.
Prevention of offences	Intelligent Speed Adaptation	ISA	Gives information about speed limit, warns of exceeding the limit.
	Electronic Vehicle Identification	EVI	Locates and follows a vehicle in the network; can for instance be used for 100% chance of apprehension when speeding
	Electronic Data Recorder (black box)	EDR	Registers all sorts of driving behaviour. Can be used both for punishing as well as for rewarding.
Support for observing, interpreting situations	Collision Avoidance System	CAS	Warns when a (moving) object is detected in front of the vehicle.
	Vehicle detection at intersections	--	Warns when crossing traffic is detected
	Night time vision system	--	Improves night time vision, and thus timely detection of pedestrians/cyclists
Temporaril y diminished fitness to drive	Fatigue Warning System (Distraction Warning System)	--	Detects deviations from normal brain activity, eye movements, or driving behaviour and warns.

1.4 Some developed system for vehicle control -

The development by Volvo of a 'Forward Collision Warning System' as an option to reduce rear end crashes caused by drivers following too closely, uses 'heads up' technology to produce visual signals on the windscreen that alert the driver when braking distance falls below a safe, legal minimum. The widespread adoption of such systems will go a long way towards addressing today's very large number of rear end collisions.

In Japan, the Nissan motor company has developed a 'Vehicle Lane Departure Prevention System' in response to the alarming number of accidents caused by vehicles straying out of their lanes in traffic. US statistics show that more than 40% of all road fatalities are caused by lane departure crashes. Nissan's 'Lane Keep' system uses a camera and other sensors (speed, angles etc) to detect veering. It then applies the exact amount of braking on the required side, rather than steering, to automatically bring the vehicle back into its lane.

Nissan has also developed an 'Adaptive Cruise Control' system that is capable of using the vehicle's existing satellite navigation system to detect curves in the road and to automatically perform the required manoeuvres, without driver intervention to ensure that the car behaves safely and predictably. For example, if the system detects a bend in the road it is able to decelerate the vehicle as it enters the corner, determine and hold a safe handling speed through the turn and then accelerate out to mimic normal driver behaviour - all without any input at all from the driver.

1.5 CONCLUSIONS

In terms of in-vehicle HMI, there is a need for research to develop criteria and procedures which would allow HMI to be evaluated on safety performance grounds. This would permit the development of standards for ensuring that systems while in actual use meet a certain minimum level of safety.

In terms of the overall safety evaluation of ITS, it is vital that:

- in the implementation of telematics systems and in future research programmes, sufficient resources should be provided to carry out proper safety evaluation, preferably with the use of expert advice on the most appropriate procedures to follow.
- National authorities require system providers to demonstrate that their systems have been properly evaluated;
- the monitoring of the safety impacts of systems be maintained beyond the initial phase of system introduction, so that the long-term effects of system use can be assessed and in order to increase the reliability of the assessment.

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