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A Survey on Passengers Comfort Analysis from Driver's Skills

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ABSTRACT:This paper details an embedded system to detect factors which affect the passenger's comfort in car, due to driver's reckless driving skills. The system uses an accelerometer, an alcohol sensor, a temperature sensor support, along with global positioning system (GPS) interface with microSD card storage. An appropriate algorithm is used to detect if lateral and longitudinal acceleration of vehicle peaks over the threshold value out of comfort range. Thus rude driving styles and skills, bumps, holes, defects on pavements are detected. The alcoholic state of the driver is also detected. The alcoholic state leads to lower the passenger's comfort. The geographic location of reckless driving event or alcoholic state of driver is stored into microSD card. Also, the system detects the road unevenness, based on the analysis of collected data.

KEYWORDS:Passengers comfort, accelerometer, global positioning system, alcohol sensor, microSD, road unevenness.

I. INTRODUCTION

Transportation is important for society, because efficiency in the transportation system have a positive economic and social impact as better accessibility to markets, employment, welfare of populations and additional investments. The quality of service can be influenced by several factors as speed, travel time, reliability, convenience, maneuverability, cost, accessibility, safety, comfort, etc. Transport systems deficiency for reliability or capacity, can have an economic cost impact. An important social and environmental load is carried by transport. This cannot be neglected. The moving of people to places of work, education, and recreation and for their other needs and wants also requires transportation. Like goods, people are moved to their desired destination.

With the increasing development of vehicle technology, a lot of focus is being placed on safety issues. [1] Among them, vehicle accidents have a great influence on traffic flow and could lead to serious consequence. As one kind of intelligent vehicle system, pre-driving analysis of the driver could decrease the traffic accident and improve the passenger comfort. It mainly applies to long distance driving over highway. Hence establishing the factors for determining the driver's skills is a formidable task. [2] Due to the mental character of the driver factors, it is not possible to make direct measurements. It is necessary to choose a suitable indicating factor those can be evaluated. Road traffic injuries are a major but neglected public health challenge that requires concerted efforts for effective and sustainable prevention. Of all the systems with which people have to deal every day, road traffic systems are the most complex and the most dangerous.

According to the World Health Organization (WHO), one of the most important causes of mortality is traffic accidents, claiming more than 1.3 million annual victims around the world. Therefore, the scientific community has taken the initiative to develop vehicular measurement systems, as well as tools that seek to evaluate the performance of the driver, with the aim of establishing: a) the causes that may lead to an accident and b) driver's security while driving [3][4]. Worldwide, around 1.2 million people get killed in road crashes each year and around 50 million are injured. These figures are projected to increase by about 65% in the coming next 20 years. Global public health and development is seriously harmed by unsafe road traffic systems [5].

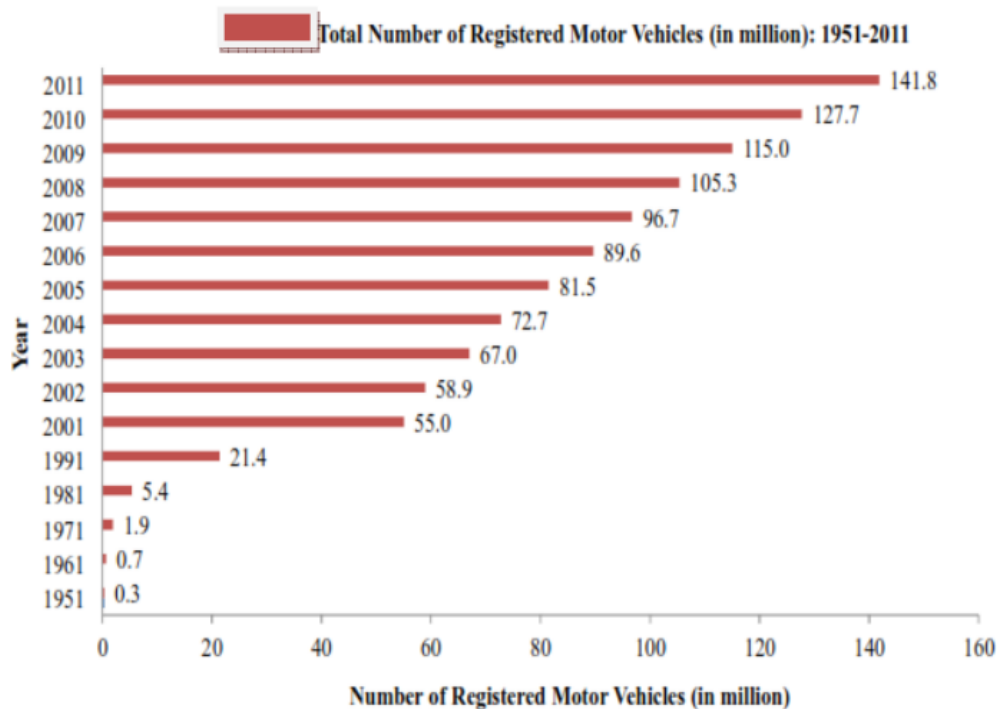
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II. INDIA VEHICLE POPULATION

India has experienced tremendous increase in the total number of registered vehicles from about 0.3 million on 31st March, 1951 to about 142 million as on 31st March, 2011. The total registered vehicles in the country grew at a Compound Annual Growth Rate (CAGR) of 9.9% between 2001 and 2011. [6]



Source: Offices of State Transport Commissioners/UT Administrations.

During 2001-11 growth rate of registered motor vehicles was almost three times the growth rate of road network. Amongst motor vehicles, except for jeeps, which recorded 75 per cent increase in registration, registration in other categories of vehicles, increased by about 100 per cent or more with cars and taxis recording an increase of about 200 per cent (192 & 182 % precisely). Overall growth in registration of motor vehicles, during the period was about 158 per cent. About 26 States/UTs had CAGRs equal to or more than the all India growth rate of 9.9 % during 2001-11.

In India increase in the total number of vehicles is from 37 million in 1997 to 73 million in 2004. This represents an annual average growth rate of about 11% for cars and 7% for trucks and buses. The sales also show an average annual increase of 10-12% per year. In the period 1997-2003 the total number of fatalities at an average rate increased by about 4% per year and the rate since then has increased to 8% per year. The number of fatalities per million population remained around 79-83 in the period 1997-2003 and has since increased to 101. An indicator of the health burden is the traffic fatalities per unit population of road traffic crashes on society at the city, regional, or national level. At the individual level, what is of consequence is the risk of injury per trip, and the total number of trips is proportionate to the population [7].

III. RELATED WORK

Ruina Dang et al. [1] analyze characteristic of driver's lane change on highway based on real vehicle states such as relative velocity, longitudinal velocity, time headway and inverse of time to collision and relative distance. The driver's behaviour is studied from the statistic of turn signal usage, lane change frequency and rear mirror usage. In the lane

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change period the results show that longitudinal acceleration ranges from -1m/s^2 to 1m/s^2 mainly. The system provides assistance in respect to lane change decision, collision avoidance.

Tomas Krotak et al. [2] describes the analysis of a vehicle, when driving, for its dynamic behavior. The behaviour of the driver is indirectly reflected. The analysis of lateral and longitudinal acceleration of the vehicle provides for assessing the condition the driver. The changes that occur when the driver changes (even slightly) his driving style, or if the driver is loaded with an additional activity (for example phoning) is studied.

Gerardo Reveriego et al. [5] proposed a system capable of identifying dangerous situations caused by human mistakes and hazardous spots in roads. Nokia N95 mobile phone is used as it has inbuilt GPS (Global Positioning System) and accelerometer. An application designed exclusively for Nokia N95 was required and developed. The necessary captured data by the application would, be analyzed afterwards off-line in a computer. Geographic Information System (GIS) would show the report of the result on the route and any other potential problems that may have arisen. Various compatible GIS can be used to visualize this standard-based report. Google Earth is used as it is public and freely accessible. The validity of results of the approach have been proven in different road trips by different drivers.

Jeffrey S. Hickman et al. [9] assess risk behaviours using a video monitoring system for commercial vehicles. A video recording, is studied to recognize dangerous behaviours and maneuvers of the drivers. They implemented a visual recording low-cost system which allowed reducing the probability of a risk event. Also, the registration and control purpose is done using audio and video recordings during a route. They allowed sending real-time data or at the end of the tour.

Chien-Chuan Lin et al. [10] developed a system which acts as the flight recorder of a vehicle which records the behavior of a running vehicle. An online real-time navigator as well as an offline video data viewer is supported. The recorded video can be played with the viewer system and find for the facts of the vehicle when a traffic accident occurred.

Omar Bagdadi et al. [11] develops a system as per the characteristics of the braking caused by the driver in time critical situations for detecting jerks in safety critical events. It analyses different characteristics of acceleration profiles like the rate of change of the acceleration profiles, i.e. jerks, like negative jerk and a peak-to-peak value of the jerk.

IV. CONCLUSION

Transportation is important factor of society as it creates a positive economic and social impact. The quality of service of the transportation is influenced from several factors as speed, travel time, reliability, convenience, maneuverability. The comfort monitoring system in transportation vehicles identify the sources of discomfort like acceleration, jerk (rate of change of acceleration), temperature and alcoholic state of the driver. The rude driving skills of the driver risk life. These reckless driving skills are analysed.

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