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Road Safety Advances

eSafe
Belarusian Road Safety Network

Results of Belarusian Transport Research

Promotion Problems of Intelligent Transport Systems in Belarus

The article tells about the use of Intelligent Transport Systems (ITS) to solve aggravating transport problems. It is shown that ITS is a complex, continuously developing system where in the creation and promotion of the system a wide range of stakeholders participate: transport employees, as well as car producers, road constructors, communications and information processing producers, municipal authorities, industrial companies, scientific organizations, training centers, and etc. It tells about approaches to the creation of ITS as a complex system, about the experience of developed countries and the specifics of Belarus.

1. ITS as a Means of Solving Transport Problems

Nowadays, cars are becoming more powerful, their speeds increase, and in the end they become like powerful and brainless monsters. The number of cars all grew, gradually cars blocked the streets of cities, and speed (for example, 17 km per hour in Minsk) significantly decreased in respect to the technical capabilities of cars. The problems of traffic safety and ecology have sharply increased. More and more congestions occur not only in cities but also on the roads. It is becoming more expensive to increase the speed of traffic due to the construction of additional roads, highways and road junctions.

Assistance in solving these problems came from high-tech, primarily from information and communication technologies. As a result of using them on transport, Intelligent Transport Systems (ITS) appeared. The benefit is numerous and exists in every sector of the transport sphere [1], [2]:

- *Assistance in reduction of congestions*
- *Safety improvement*
- *Environmental benefits*
- *Output and efficiency*
- *Confort factors*

2. ITS is Not Just a Few Software Solutions

Since ITS is only part of our life, there is a divergence in understanding the essence and tasks of ITS. Belarus has a very little and not very successful experience of creating ITS. The previous attempt to introduce ITS in Minsk has formed an extremely simplistic view of ITS for some of our people. When they tried to order the Minsk ITS in China, it seemed to many that the ITS was a kind of box lying on the table and controlling traffic lights. It's enough for programmers and electronics engineers to make a good box, then you need to press a button and everything works by itself. This perception of ITS played an extremely negative role in the subsequent development of ITS in Belarus and threw us back for several years. The experience of developed countries shows how far the real ITS from such a “box”, and it is necessary to approach the problems of creating ITS systematically and with full responsibility [4].

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Results of Belarusian Transport Research

CASSETTE ROBOTICS TRANSPORT SYSTEM OF MASS CONVEYOR TRANSPORTATION OF PASSENGER ON THE BASIS OF MOBILE ROBOTS

In this work the idea of transport system of transportation of passengers on the basis of mobile robots is presented. The main objective of consideration is development of model of the automated system of transportation of passengers with use of artificial intelligence. The main active operating unit of transport system is the car established on rails. It is completely autonomous in its independent active actions. The computer module provides management of all functions of a car and "communication" with other cars that belong to the system. Such system will allow to increase efficiency of transport.

Robotics transport system, intellectual control

Introduction

Growth of load on the main highways of a street road network (SRN) of the cities leads to steady decrease the speed of movement of transport streams and to formation of traffic block. Under traffic conditions close to a traffic block, the turn of vehicles can not go in on a stage between the next intersections that leads to violation of an operating mode of the traffic light system of the previous intersection. Such situation extending on some intersections, received the name of a network jam or network [1-2] saturation.

The network jam against spasmodic growth of park of cars even more often comes in SRN of the large cities. Besides automobile transport (AT) the second consumer of an SRN resource is the city public transport (CPT) which share in passenger traffic is 60 % (earlier this figure was 90 %).

It should be noted that CPT uses the SRN resource more effectively. On the average in the bus, a trolleybus, a tram 150 people, while in the car only 1,5 persons [3] go.

To avoid in the future of collapse of transport system and to support its functioning at optimum possible level it is necessary to carry out cardinal reorganization of all transport complex including SRN, management of transport streams, development of new types of CPT.

If the first position within historically developed city building hardly gives in to reorganization, the second and the third are quite possible. So use of adaptive management by transport streams in SRN allows to increase capacity of a network [4-5] on 20-30 %.

Further it will be necessary to limit unreasonable growth of transport streams from cars to a way of input of quotas of a trip. Everything that above this quota, should be paid. In economy it is known that free of charge provided resource injuriously is taken away. The share of CPT in transport streams plying in SRN as a result will increase at the general reduction of number of transport units.

Given above a measure are necessary, but are insufficient. Essential expansion of capacity SRN excluding collapse, is possible on a way of essential revision of principles of management of transport streams on the basis of modern achievements in the field of informatics, telecommunication systems, collective behavior of automobile, a robotics.

All in large quantities and in a variety of qualities the robots become our reality: in art, life, production, etc. There are robot violinists [1], robot cooks [2], robot nannies, robot engineers, robot firemen [3], security guards and others.

Robots are indispensable in many industries. For example, the robot welders are commonly used in automobile production. There are robots engaged in painting. In the electronics industry robots are used for soldering microscopic wires, placement of integrated circuits on circuit boards in monitoring and diagnosis of completed devices, and more. Robots are used in traffic management of vehicles [4]. These specialized robots make the same high-precision work every day. For a human, such work is boring and tedious - the monotony leads to fatigue, which causes errors. Production errors are decreasing the labor productivity. This in turn leads to increased production costs.

Robots are ideal for monotonous work. The speed of their work is higher; they are cheaper than workers because people are inclined to fatigue. This is one of the reasons for the low prices of products.

We propose another type of robots - pedestrian, working at pedestrian crossings and performing a set of cyclic operations. In the real work one more type of collectives of robots – transport, working in SRN of the city and cyclic operations carrying out a set is offered.

Task statement

The last twenty years the idea of management of motor transport without participation of the driver actively develops. One of the directions of development of intellectual transport is development of vehicles for intracity transportation of passengers. A distinctive feature of such vehicles is interaction of the passenger with a vehicle and absence of the operating person. Further development in this direction will allow to create intellectual information system of movement of vehicles.

The project «The robotics pipeline system «Crosswalk» [10] is known. This system carries out shuttle transportations on a crosswalk of pedestrians through the highway with heavy motor transportation traffic. The basis of system is made of the mobile robot.

Electric vehicle runs along a pedestrian crossing nonconstantly. Transport detectors measure the intensity of traffic flow and in a case of falling below set value, the electric car moves to left side (Fig. 1). In this case, the crosswalk is used in the traditional way.

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International News

SafetyCube

The project

SafetyCube is a research project funded by the European Commission within the Horizon 2020 Research and Innovation Program.

The project was officially launched on 1 May 2015 and would last for three years.

Fig. 1 - The logo of the SafetyCube project.

The research activity is coordinated by the English University of Loughborough and involves the participation of the following partners: National Technical University of Athens (NTUA); Belgian Road Safety Institute (BRSI); SWOV Institute for Road Safety Research (SWOV); Austrian Road Safety Board (KFV); French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR); SAFER Vehicle and Traffic Safety Centre (CHALMERS); Institute of Transport Economics (TØI); European Union Road Federation (ERF); Centre for Transport and Logistics, University of Rome “La Sapienza” (CTL); Agency for Public Health, Barcelona (ASPB); Medical University of Hannover (MHH); Slovenian Traffic Safety Agency (AVP); Laboratory of Accidentology, Biomechanics and Human Behaviour (LAB); Centre Européen d’Etudes de Sécurité et d’Analyse des Risques (CEESAR); Foundation for Transport and Energy Research and Development (CIDAUT); DEKRA Automobil GmbH.

Objectives

The main objective of SafetyCube is to implement an innovative Declaration Support System (DSS) in the field of road safety for service of European policy makers and stakeholders. The DSS will enable the selection and implementation of appropriate strategies/ measures to reduce mortality and injuries (both minor and severe) in relation to all road users who are in same time considered as economically efficient.

The project seeks to complete a thorough analysis of the underlying causes of road accidents and to provide estimates on the effectiveness and efficiency of interventions in terms of reducing the number of dead and injuried.

The underlying objectives are the following actions:

- Development of new analyzes and methods for: Definition of intervention priorities, Evaluation of the efficiency of measures, Monitoring of serious injuries and assessment of their socio-economic cost, Costs Benefit Analysis taking into account material and human damages;
- Application of these methods to road safety data to identify the causes and mechanisms of accidents, risk factors and countermeasures more efficiently for fatal and serious injuries;
- Developing an operational *framework* to ensure that access to developed tools can also be made to a project that has been completed;
- Strengthening the European Road Safety Observatory (ERSO) and collaborating with stakeholders in order to ensure the widest possible implementation of project results.

Methodology

The project develops the operational and conceptual *framework* of the DSS at the same time as the definition of a methodology for the assessment of the risk factors of accident rate and possible measures related to all road safety components: infrastructure, vehicle and human behavior.

The selection and evaluation of heterogeneous measures requires the establishment of a procedure with the flexibility to allow the use of different types of data and estimation methods, yet ensuring the comparability of the final results. In addition, a cost-benefit analysis approach is developed to take into account the efficient use of available resources which requires the efficiency of the measures to be reported to their costs. Figure 2 shows the methodology scheme.

Fig. 2 - SafetyCube – Metodology scheme.

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Results of International Road Safety Research

STAR RATING DRIVER TRAFFIC AND SAFETY BEHAVIOR THROUGH OBD AND SMARTPHONE DATA COLLECTION

Abstract

The objective of this paper is to demonstrate the potential for monitoring and star rating driver traffic and safety behavior, through the use of continuous data collection from the vehicle (On Board Diagnostics) and the smartphone. Current technological advances in Europe and worldwide make data collection and exploitation substantially easier and more accurate than before. The present work examines the correlation between driving behaviour and degree of exposure with traffic risk. Moreover, the impact of critical behavioural and exposure indicators on traffic risk as well as driving behavior and exposure models using the above indicators for traffic risk calculation are also examined.

Introduction

Road Safety is a typical field with high risk of important investments not bringing results. Absence of monitoring and accountability limits seriously road safety performance. Therefore there is a high need for monitoring road safety policies and performance.

Road Safety Performance Indicators (SPIs) are the measures (indicators), reflecting those operational conditions of the road traffic system, which influence the system's safety performance (Hakkert et al., 2007). SPIs aim to:

- reflect the current safety conditions of a road traffic system;
- measure the influence of various safety interventions;
- enable comparisons between different road traffic systems e.g. countries, regions, etc.).

Until recently, the high cost of real-time driving data recording systems, data programs, cloud computing services, the inability to accumulate and exploit massive data bases (Big Data) for transport and traffic management purposes (De Romph, 2013, Lee, 2014), as well as the low penetration rate of Smartphones and social networks, made it extremely hard to collect and manage real-time data and, therefore, to study the relation between driving behaviour and travel behaviour and the probability of crash involvement.

More specifically, current technological advances in Europe and worldwide make data collection and exploitation substantially easier and more accurate than before. For example, On Board Diagnostics (OBD) systems are more affordable nowadays and big data analysis is becoming more and more insightful because of the advanced tools that have been developed to exploit it. Such an example is also the Internet of Things (IoT) which comprises of several proposed developments of the Internet in which everyday objects have network connectivity, allowing them to send and receive data. Examples of the IoT application which are progressively bringing new possibilities and opportunities towards this direction are:

- wide penetration of smartphones & social networks,
- efficient data transmission (through GSM networks),
- powerful cloud computing,

It should be mentioned that research has indicated that barriers like those mentioned above can be overcome when consumers are given an incentive such as a monetary prize (Reese and Pash, 2009).

The objective of this paper is to demonstrate the potential for **monitoring and star rating driver traffic and safety behavior**, through the use of continuous data collection from the vehicle (On Board Diagnostics) and the smartphone. More specifically this research attempts to address:

- the correlation between driving behavior and degree of exposure with traffic risk
- the impact of critical behavioral and exposure indicators on traffic risk
- driving behavior and exposure models (and their combination) using the above indicators for traffic risk calculation

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