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TELEMATICS AS A SUPPORT FOR ROAD TRAFFIC MANAGEMENT

Abstract

In this paper we analyse telematic devices having an impact on road safety improvement. We also present the information concerning the structure of road safety management in Poland as well as selected elements of road traffic telematics. Owing to the use of telematic devices supporting road traffic management it is possible to ensure continuous traffic flows via dynamic transmission of the obtained data and information which, to a large extent, contribute to better road safety.

INTRODUCTION

Technology and transport development and, in particular, a growing number of passenger cars result in increased danger on the roads and consequently in urban areas posing a threat to the whole society. Increased traffic intensity causes traffic jams on city roads and in the suburbs. It is a problem not only for the infrastructure or human beings but also environment. Non-uniform car driving, frequent stopping and starting cause a higher fuel consumption and, as a result, growing amounts of toxic gas emissions to the atmosphere. These are the reasons why the issues related to transport telemetics attract increasingly more attention. This paper presents the structure of the road safety management in Poland and selected elements of road transport telematics supporting the process described which together allow continuity of traffic flows and, to a large extent, favour road safety. Owing to the use of telematic solutions it is possible to dynamically transmit the obtained data and information meeting the needs of potential groups of users.

1. STRUCTURE OF THE ROAD SAFETY MANAGEMENT IN POLAND

The road traffic management system should be understood as a tool supporting the decision making process responsible for [1]:

– enabling road users to drive safely (e.g. during a journey),
– minimising the number of dangerous incidents and their consequences,
– promoting the right track thinking and better decisions concerning safety in all activities carried out.

It is assumed that the road safety management system is a part of the management system of appropriate organisations, such as central or regional institutions of road transport, roads authority, or a carrier. It embraces organisation structures and responsibility for them, methods and procedures of acting and tools and indispensable resources needed for development, implementation, carrying out, monitoring as well as maintaining the safety policy declared by a given organisation and its targeted goals [2].

A proper system of road safety management should fulfil the following criteria [2]:

- to enforce supervision,
- to involve managerial staff in safety issues,
- to involve road traffic participants,
- to be flexible,
- to be perceived in a positive way.

The main purpose of the road safety management system is protecting life and health of all road users.

The road safety system in Poland consists of the following sub-systems:

- the system of barriers and protective measures including: intangible barriers, tangible barriers, symbolical barriers and functional barriers,
- functional systems including: systems of education and communication, systems of training and certification, inspection systems of the vehicle technical condition, systems of road infrastructure construction and maintenance, road rescue systems, victim assistance systems and the judiciary system,
- safety management system including: appropriate institutions and staff, tools of influence, support tools and management methods.

In road safety management the following groups of methods can be distinguished: systemic management and threat and risk management. The road safety management sub-systems include: automatic management systems of road safety, database or information system. These systems are, to a large extent, aided by various telematic devices supporting the management process in the case under study. Figure 1 depicts the structure of the road safety management system in Poland.

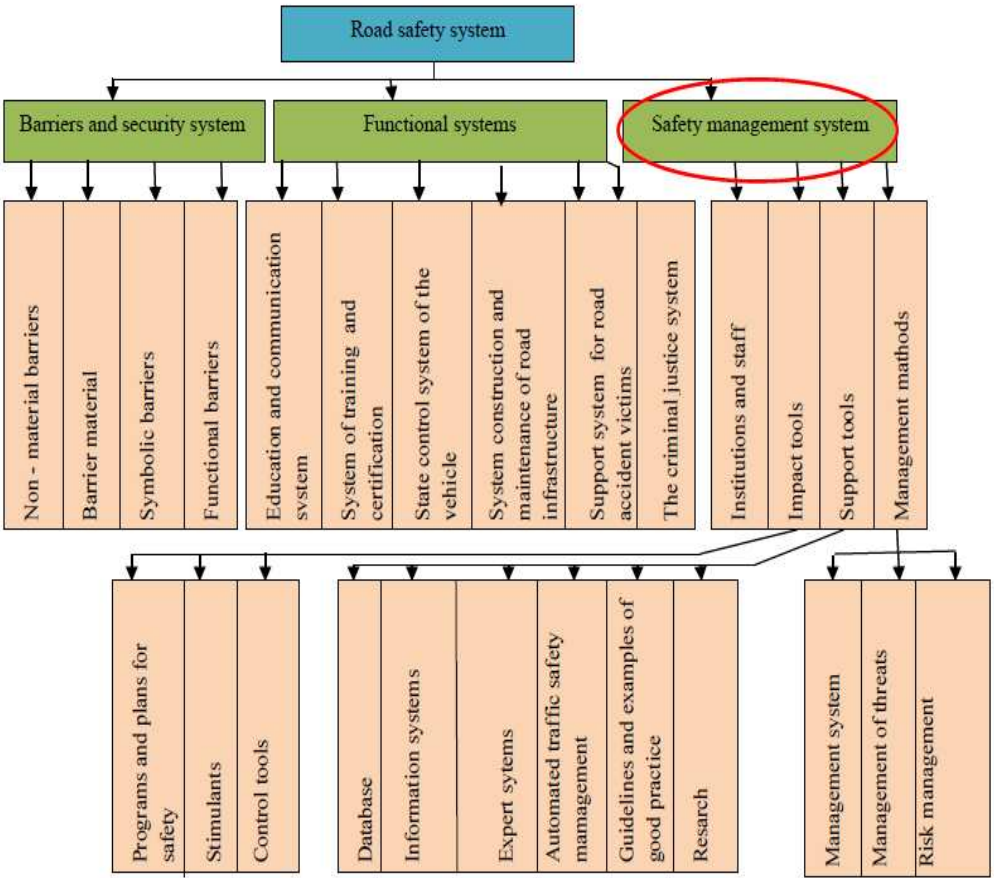

Fig. 1. Structure of road transport in Poland in the field of its safety.

Source: [2]

2. MOST FREQUENTLY ENCOUNTERED TELEMATIC SOLUTIONS USED IN THE ROAD SAFETY MANAGEMENT IN POLAND

Transport telematics is a branch of knowledge about transport which integrates computer science and telecommunications in applications for the needs of an organisation, management and traffic control in transport systems stimulating technical and organisational activities ensuring the quality of carrier services, improved efficiency and safety of these systems functioning [5].

Intelligent traffic light signalisation deserves special attention. Its task is to adjust signal frequency to actual traffic intensity. These installations require permanent monitoring of their performance in order to avoid unintended effects. A proper light signalisation fulfils the role of a "traffic manager" very well. It is an indispensable element of bigger crossroads, but it also performs well at pedestrian crossings where crossing the road due to racing cars is almost a wonder.

Meteorological stations have also found an application in road safety management. They are carriers of weather data, which are used to enhance road safety in unfavourable road traffic conditions. Among the elements of an efficient road meteorological system we can mention:

- appropriate use of heat maps for road networks,
- effective communication system,
- effective information distribution system.

Also the devices used to transmit information to direct road users are helpful in road safety management. Usually, among these devices we can find: variable message signs and boards installed above the roads or on their sides. Depending on the advancement level of the telematic system and expected needs, the information given can be [6]:

- weather warnings (black ice, slippery surface, side wind, fog),
- road traffic warnings (accident, traffic jam, road works, other dangers),
- measurable traffic parameters: vehicle speed or information on exceeding a permitted limit,
- warnings and information for drivers, e.g. expected time of reaching the destination, recommended diversion, recommended speed, recommended direction, etc.,
- measurable meteorological parameters, usually air and road surface temperatures,
- electronic road signs: warnings and prohibitions, activated dynamically or statically.

A particular feature of variable message signs and boards used in the road telematic systems is their universality, understood as both a possibility of work in the automatic mode (self-operating, where displayed messages are a result of the functioning of a decision algorithm from data processing), and manual mode enabling control of presented messages [6]. On Polish roads, in urban areas, we can mainly encounter synchronisation of traffic lights with changeable message boards, the task of which is informing travellers about a recommended speed. The main purpose of the system is to achieve a flow of traffic, and as a result fewer collisions, lower emissions of exhaust gases and improved comfort of drivers. To ensure good work of the system, it must take into account the necessity of traffic measurements on the road sections included in the system in order to eliminate a possibility of traffic jams.

Traffic measurement devices and systems are also components of telematic equipment which is to serve the purpose of better road safety. The measurements are taken by measuring devices located in the road surface. Induction loops are usually the devices which help taking this kind of measurements. Thanks to them it is possible to detect vehicles, measure speed and classify road traffic. Also video cameras with picture analysers – vision detectors - allow us to measure speed and classify traffic. Their advantage is a possibility of monitoring many lanes

with the use of one device. Detectors are less efficient in bad atmospheric conditions and at night. These devices are most common in cities [4].

The data from the traffic measurement devices are most often transmitted to displays of variable message signs. These signs show the actual speed of a vehicle and warn when permitted speed is exceeded. The obtained data are also recorded and processed for statistical purposes.

It can be concluded that the basic task of telematic devices is efficient management of transport systems by appropriate management of information. The result of efficient management of this information is both improving the quality of a particular transport system functioning and improving safety of road traffic participants.

SUMMARY

The main purpose of road traffic management activities is to improve safety of road traffic participants. To ensure specific efficiency of the system, it is supported by many sub-systems including also telematic systems. Telematic systems used by infrastructure administrators are aimed at ensuring safety to all road participants. Thanks to rapidly growing possibilities of information and telecommunication technologies, telematics has quickly turned out useful in the field of transport. Undertaking appropriate activities aimed at improvement of road safety seems to be an important area of use. Therefore we can risk a statement that the tasks performed by particular sub-systems including, among others: meteorological stations, variable message signs and boards, and equipment and systems for traffic measurements make up an integrated whole. This whole is the proper system of traffic control and supervision, prediction of dangerous situations, management of traffic incidents, road maintenance and carrying out other activities useful for proper road maintenance. Using transport telematic devices allows higher efficiency of operational activities and creates possibilities of gathering information, which my help us to improve planning and organisational processes [3]. To sum up, telematics is an inseparable element of road safety management.

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TELEMATKA WSPARCIEM DLA ZARZĄDZANIA RUCHEM DROGOWYM

Streszczenie

W niniejszym referacie przedstawiona została analiza środków telematycznych wpływających na poprawę bezpieczeństwa ruchu drogowego. Przedstawiono także informacje dotyczące struktury zarządzania bezpieczeństwem ruchu drogowego w Polsce oraz wybrane elementy telematyki transportu drogowego. Dzięki zastosowaniu urządzeń telematycznych wspierających zarządzanie bezpieczeństwem ruchu drogowego, możliwe jest zapewnienie ciągłości przepływów ruchu poprzez dynamiczne przekazywanie uzyskanych danych i informacji, które w dużym stopniu przyczyniają się do poprawy bezpieczeństwa ruchu drogowego.

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