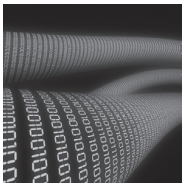

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The Management System of Detours in Urban Areas

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ABSTRACT
This article presents a concept of detour management system for the traffic flow that run through congested areas of the urban agglomerations. This system, using the wide range of the ITS devices, allows to judge the current traffic conditions on the highly urbanized areas and, on the basis of the received data, direct the traffic on the alternative routes, by means of an active traffic information system.

1. Introduction

Currently implemented traffic management systems are an attempt to an active response for the problems connected with both the limited traffic capacity, and the issue of improving the traffic safety. The principle is that those systems should in an active way measure the current traffic conditions (intensity, directional and generic structure vehicle speed, etc.), weather conditions in the management system area and factors that can, in a vital way determine the traffic capacity and safety. The intelligent transport systems are increasingly installed both for the urban areas and expressway, as well as the motorways. An important issue in the TMS is the lack of the mutual system integration, which comes from the administrative borders of particular areas, and the lack of the statutorily described communication standards between the management centres. This situation is especially noticeable on the national roads that run trough the city and highly urbanized areas. The distinction between the managing entities blocks the possibility of a full integration, thus creating restrictions in efficiency of managing the traffic flow. An alternative for the situation described above is creating an integrated traffic management system.

Current traffic management systems in Poland are mainly created on the national roads, which are owned by the National Treasure, and managed by the General Directorate for National Roads and Motorways. Public roads from other categories – regional, county, district – belong to proper self–governments. This distinction, along with poor cooperation of the self–government bodies and the GDDKiA, different regulations, available budgets, etc. makes the integration of the ITS systems that already exist on national and self–government roads very hard or even impossible. However, one should take into consideration that construction and integration of the traffic management systems on the area of the whole state in the perspective of a dozen or so years is inevitable in order to have a proper economic and social development of Poland.

The management system of detours in urban areas will help in choosing the best route for the travellers, and allow them reach the target fast and safe. For the city inhabitants it means lowering the inconveniences connected with the obstruction of the urban road network, as well as lowering the social frustration and aggression connected with the traffic excessive intensity. One can also expect that it will reduce traffic accidents and collisions not only in the urban areas, but also on the main roads.

Urban areas are huge and complex systems. When designing a ring road, or city expressway with telematics systems, one should take into consideration many factors that characterize particular agglomeration. The TMS do not have to be restricted only to direct drivers towards the alternative routes, they can also manage the traffic directly in the city centres. The aim of the system would be to optimize access to logistics centres, shopping centres or transshipment of goods from out side city traffic to inside road traffic. Further consideration to reduce congestion in cities can be a restriction of movement or the charging of fees. The solution

is operating in London and Rome and had a positive effect on reducing the movement of people in urban centres in favour of public transport [8], but this concept will not be further addressed in this article.

Figure 1 presents a contour map with chosen cities in which during the last two years major investments regarding the ring roads have been finished or are planned to be finished within the next two years. Singled out cities represent important transit centres in Poland, it confirms the necessity of constructing global traffic management systems.

Fig. 1 Chosen cities in which large investments in regard to the construction of the ring roads are being made.

2. The concept of detours management system

2.1. System assumptions

The main goal of the detour management system is to direct the traffic flow in the traffic nodes before the urban areas. According to the Figure 2, the system consists of a current traffic conditions subsystem, active traffic information system and additional measuring subsystems.

The current traffic conditions measuring subsystem is the basic element of the detour management system This element is responsible for acquiring the parameters connected with the traffic intensity on the area of particle urban area. The gained data are the start signal for the superior system, thus being the basic decisive criterion of the active traffic information system. This data should come from the urban traffic management systems.

The traffic information subsystem is a set of active luminous elements in a form of a variable message signs located in the nodes set prior to the urban areas. This subsystem is an executive element of the superior system, which task is to inform drivers about the necessity of choosing an alternative route.

Additional measuring systems may be a supplement of the subsystems mentioned above: traffic condition in the urban areas subsystem and the traffic information subsystem. Those additional subsystems would be systems that record the parameters of the traffic flow on the sections prior to the agglomeration and alternative routes outside urban areas. Information regarding the traffic intensity, generic structure and the parameters of particular vehicles are important for the city traffic management system. It is also an additional decisive criterion for the detours management system.

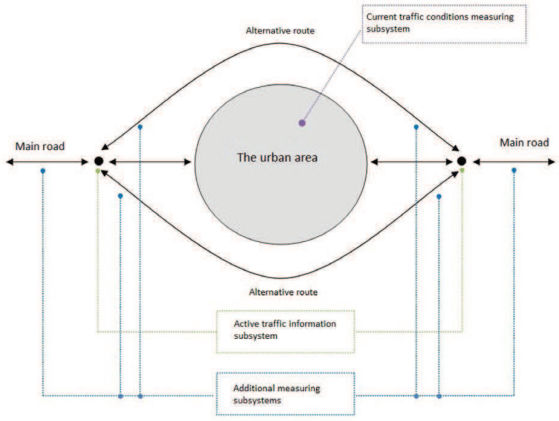

Fig. 2. The concept of the detours management system in the traffic nodes before the urban areas.

The information flow between particular modules of the system are presented on the figure 3.

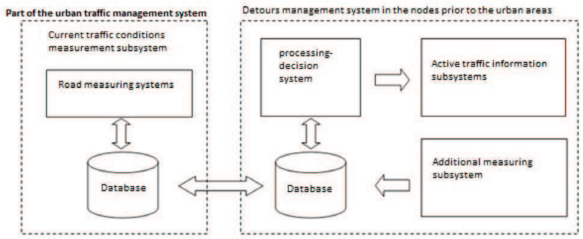

Fig. 3. The architecture of the detours management system

The central element of the system is the processing–decision module, which is responsible for processing the data gathered in the dedicated database cluster, inference in accordance to earlier set algorithm and activation of the proper information in the active traffic information device. Data from the additional measuring subsystem are gathered directly in the data base of the detours management system. The current traffic condition measuring subsystem, which should be a part of a city traffic management system, sends chosen information through the communicated database systems.

2.2. The application of the ITS device

Described in previous section detours management subsystems require an effective ITS equipment. Example of devices that can be used in the present primary system is shown in Figure 4.

VIDEO/ANPR systems are part of the visual recorders, which aim to acquire the image, both as a video sequence and an isolated frames showing the picture of the vehicle, as well as the vehicles

identification through registering plates recognition mechanism and calculating the current, actual intensity of the traffic. Those systems are applied as a part of the current traffic conditions measurement subsystem in the city agglomeration areas and in an additional measurement subsystem.

The VMS systems are the basic elements of the active traffic information subsystem. They consist of variable message signs, which depending of the need, can be made in predefined technologies, full RGB technologies, as integrated sign boards put above the main road, single signs above particular lanes or signs located next to the side lane. They can emit information about recommended detours, current speed limits, weather conditions and other significant infomations.

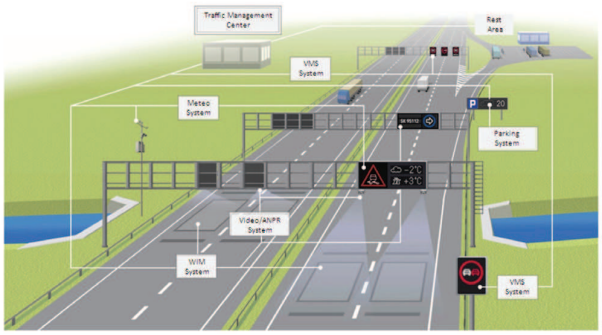

Fig. 4. An example of the ITS devices and systems

The WIM system (Weight in Motion system) are the elements of an additional measuring subsystems. Information obtained from the subsystem will allow for a detailed classification of vehicles, both in terms of generic structure as well as weight, pressure from the axes, and optionally detecting a vertical gauge overshoot. The data will be an important criterion in choosing the alternative route, depending on the current generic structure of the traffic, and class of the roads that are available. Moreover, there will be possibility to send to the proper services in the real time information regarding the possible speed limit violation.

The METEO systems, by analogy to the WIM systems, are part of the additional measurement subsystems. The data obtained from weather stations installed along the road and road weather sensors are the perfect complement to decision–making system, allowing the selection of an alternative route based on current weather conditions. The meteorological information along with the VMS system allow to keep drivers with the up–to–date information regarding the weather conditions in the road area.

PARKING systems are the third element of the additional measuring systems. They can be used to inform drivers about available parking places along the main routes, as well as the alternative, and as information system for the city park & ride systems.

3. Conclusion

The creation and the integration of the TMS systems in the city agglomerations can potentially give big benefits for both the citizens and travellers. Ring–roads are being continuously build in Polish big agglomerations, as an alternative roads for the down town areas. One can expect that this trend over the next few years will remain constant. Increasing traffic levels in city centres increases the aggressiveness of drivers, which further aggravates congestion and significantly increases the likelihood of traffic accidents [7]. Diversion of transit traffic flows on alternate routes, avoiding city centres, will result in a substantial organic traffic in city centres. Since the most of the investments regarding the ring–roads construction in the Polish cities are new, information regarding the benefits of using alternative roads is necessary in a social aspect. The basic tool of an active informing the drivers are the Variable Message Signs. They can convey the information regarding e.g. travel time through individual alternative routes, information regarding the accidents or difficult weather conditions. One should also remember that driver is the one who decides about the route, however (s)he should have as much information necessary to optimize it as possible.

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