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## **ANALYSES OF SURPLUS TRAFFIC LOAD IN URBAN INFRASTRUCTURE**

**Summary.** In the urban infrastructure, the factors affecting transport have been analysed. In order to solve the problem, practices of foreign countries have been considered. Offers on decreasing surplus traffic load, have been worked out.

## **АНАЛИЗ ВЛИЯНИЯ ИЗБЫТОЧНЫХ ТРАНСПОРТНЫХ НАГРУЗОК НА ГОРОДСКУЮ ИНФРАСТРУКТУРУ**

**Резюме.** Анализируются факторы, влияющие на транспортные нагрузки в городской инфраструктуре. Рассматривается практика зарубежных стран в решении этой проблемы. Выработаны предложения для уменьшения избыточных транспортных нагрузок.

### **1. INTRODUCTION**

Increase of the amount of cars raises complicated problems before, first of all, infrastructure of big cities. In spite of the increase of transport vehicles in megapolis, especially cars, the demand of population for transport vehicles is not satisfied. So as not to be dependent on public transport, as a rule, low-speed and overladen transport in rush hours, city-dwellers buy cars for private use. However, the number of such cars becomes so great that, travel by them requires not least time, but sometimes more time than by public transport. In particular, this happens in traffic jam, that causes, on the one part, needless delays, in densely populated cities, and is characterized waste of time and funds, but on other part – deterioration of ecological environment. It makes impossible to provide supply of different services, in its turn: such as medical emergency services, on time delivery, hazardous cargo transportation, all kinds of garbage disposal, mail and messenger service etc.

Outstanding specialists of various branches, search for ways to solve such actual problem. In consequence of the works done on roads of many cities, decrease of traffic load was a partial success, but settlement of this problem is still far.

The present article is devoted to the analysis of the ways to solve this unordinary problem.

### **2. THE REASONS OF CREATING SURPLUS TRAFFIC LOAD, THE FACTS AFFECTING IT, THE WAYS OF DECREASING THEM**

Traffic congestion quite often arises due to traffic accidents, but more often the movement becomes congested itself, without apparent cause. Mathematicians from universities of Exeter and Budapest have tried to understand the nature of this puzzling event. It appears, even if it is a lot of

automobiles, basically they are capable to move with comprehensible speeds. Authors of research recognize a dense stream if the kilometer of a way is always occupied with 15 and more cars. According to mathematicians, the congestion is formed like this: there is a certain obstacle before any driver - not necessarily some emergency, but it needs to be slowed down. It stops, however reduces speed more, than it is required in the given situation. The driver, who follows closely to compensate time of the reaction, should depress the brake pedal more strongly, but the next driver - even stronger. Consequently movement stops, also congestion increases. It is like a domino effect: stream promptly moving back stops machines one by one [1].

Here arises a question: for what reason a driver stops the car? While researching the reason of primary obstacle and traffic load of urban infrastructure, availability of factors of several aspects were brought to light:

- increasing the number of cars reasonably,
- state and quality of roads,
- using one part of the roads as stop,
- improper development of transport infrastructure in modern town-building,
- chaotic driving,
- sparse driving of service vehicle in the city,
- routine of traffic lights crossroads,
- growing number of large housing estate and trade units,
- stream of population from regions and abroad,
- chaotic distributing of goods to shops by companies,
- artificial obstacles in roads,
- driving out of direction lines,
- withdraw all kinds of transport to the city center,
- using central roads while moving from one part to another one,
- poor organization of dispatcher services,
- unavailability of automated management system of transport,
- climatic condition and various extraordinary situations.

Each factors above-mentioned, play a negative increase of role in traffic load in the city. As a result of it the amount of traffic jam increases, the traffic capacity of the motor ways and the intensity of vehicles reduces sharply, let alone ecological loss and waste of time. This unpleasant extra traffic load is considered to be harmful for city and creates surplus (parasite) traffic load in town infrastructure. Besides, such load badly influenced to transport infrastructure and requires, in its turn, to take various measures for a solution to the problem.

The reasons of such problems, in foreign countries, are investigated and necessary measures are taken for the solution of the problem by the government and several companies.

One of the latent sources of creation of the traffic congestion is inexact information supply at extensive information resources. Everybody knows that in all conditions all people in the world search the sources of information intensively. Availability of the necessary information, as a matter of fact, also is one of actual and vital tasks. So, it is necessary to organize the information resources for general use. All countries gradually pass to the information society that assumes electronization of all fields of human life. People search for information either at home and at work or in a car. Search of necessary information source is an actual point, and in the execution of such search, necessity of use of cars becomes the most important reasons, affecting the increase of surplus traffic load.

Just lack of the information and realization of the search by population, are among the reasons of stopping of cars.

While dividing information searchers into two groups – those who are familiar with city and those who are strangers, we see that, to overcome  $l$  distance, in a certain  $t$  time, people meet the various obstacles mentioned above. People who are stranger to the city gets to the necessary point more quickly and for a short time, but people who are stranger to it, later and though a longer way. We can

see, by comparison, ways of strangers (having less information) are getting longer, and lost more time on the way. So, the city is subjected to surplus traffic load.

$$\Delta t_{surplus} = \bar{t}_f - \bar{t}_s$$

$$\Delta l_{surplus} = \bar{l}_f - \bar{l}_s$$

where,  $\bar{l}_f$ ,  $\bar{l}_s$  and  $\bar{t}_f$ ,  $\bar{t}_s$  is the distance overcome by drivers familiar with the city and stranger and time they spend on the way. After this, the investigation must be conducted on the ways of providing information exchange among people, as well to conduct information search exactly and in time, on the effective formation of inquiry between people and services performed.

But what does world practice say? How is information search conducted in the transport? How is this problem solved?

There are various approaches to this matter in different countries, [2, 3] and scientists have made different offers for the solution of the problem [4, 5].

Many specialists, including scientists suggest to organize a special center for informing clients on various parts of the roads. The Internet (sensor) stands are one of the examples for organizing special centers notification in the public places of the city.

Another way of the solution of this problem is setting cheap and available means of controlling transport flow.

The practice of foreign countries considers mobile telephones may have positive influence on the reduction of traffic load. However, the mobile phone is not the only way on performing of different services.

One of the ways to provide people with the information is to make drivers to get information of roads. There are several methods for it. Drivers are provided with information of roads at the very moment, by a special navigator.

The surplus traffic load seriously damages today's transport problem. Naturally application of modern technologies, including searching for the solution of this problem in this way, may give positive results.

So, electronic maps of cities are created, as well as satellite navigation is used in several service spheres. In order to achieve the aim, electronic-digital map of service area will be worked out. Coordinations of the important state units and the place of traffic signs will be indicated in the map. These maps have already been properly used. Arrangement of radiotelephone channel between dispatcher and drivers by the electronic map planned to be set, increase probability of driving on optimal route. It will result, in its turn, in positive influence on traffic congestion.

Efficient work has been done in computerization of city life, in order to electronize connection between people in developed countries. Cities differ from each-other. All service depends on features of cities, as well, increase of stream of people, products, information, and capital. Authors[6] draw attention to the aspects of culture in urban infrastructure, including daily rhythm of urban life, its dynamics and diversities.

In a context of electronic business and electronic commerce, people are always compelled to improve support of interaction among themselves. However business - environment is based on support of financial interests, schedules of works and paid collective. The organization of such environment is often formal and structured, and the enterprises cooperate on a regional, national and even world scale. The author [7] asserts that the success of new social network systems for urban districts mostly depends on an opportunity of the software to stimulate and support intelligent interaction of territorially close users, and also to provide integration with the ways of interaction accepted in existing social networks.

For the development of the systematic approach to development of the city environment as integrated system of architecture and universal technologies, selection of knowledge, theory and methods of fields of architecture and computer sciences is required. A key to this interdisciplinary integration is a concept of "space" as which authors of the article understand not only physical

territory or volume, but also public reports, agreements and the values connected to the given space. Authors show [8], that owing to the structurization of space, city-planning plays an important role in formation of a society and public behavior. In research of syntax of city spaces were represented as the spatial systems created by artifacts of architecture and city-planning, and were analyzed with the purpose of finding-out of how the spatial structure of city corresponds with its functioning. Syntax of spaces was used for studying pedestrian and transport movement, land tenure, social and economic indices, criminality and other functional aspects.

The universal computerization considerably changes a way of an establishment of contacts of people among themselves and an environment. Urban residents, for dialogue and coordination of the activity, usually use mobile phones, switching SMS, and Smart phone and the handheld computer with access to Internet that allow to get "on-the-run" access to virtual communities and services. Expansion of cheap wireless sensor networks allows mobile services to adapt to the content for physical and social context of users. All these tendencies induce researchers of man-machine interactions, and also sociologists, city architects, schedulers and designers to experiment use of universal computerization technologies [9].

Municipal employees, city-planners and urban residences are compelled to struggle with traffic congestion, excessive consumption of resources, growth of city territory, etc. Decision on new main highways, expansion of services of a municipal transportation and rules of building are often inconsistent and expensive, and consequences of these solutions have long-term character. In many cases town-planners, inhabitants are not satisfied with the information on how various alternatives of decisions could affect the future of city that is an essential handicap during competent decision-making. As such solution will influence region as a whole, for many years, it is advisable to anticipate decision-making, whenever possible, with the exact analysis of its long-term consequences. Such analysis can be made on the ground of the advanced imitating models, permitting to predict long-term effects of alternative policies. But the data is only one of the elements on which process of democratic decision-making is based. It assumes public discussion of alternative politics; therefore the system of imitating modeling of city besides maintenance of the exact information should promote understanding of a corresponding politics of urban residents. In the article [10], intermediate results of research of methods to form human interaction are described. The system of imitating modeling of city UrbanSim developed at the Washington University allows predicting use of the ground areas and transport, and also influences on an environment of various policies and investments for 20 years forward. Results of the work are represented as parameters, such as population density and its employment. The tools providing the best recognition of these parameters by town-planners, inhabitants and other interested persons are developed for support of systems use of imitating modeling city in public discussions.

### 3. RESULTS

It is clear from the analysis carried out that, lack of information among the population of town infrastructure is one the main causes affecting surplus traffic load in urban infrastructure. In comparison with other impact aspects lack of information increases surplus traffic load. Obtaining necessary information in time, makes drivers avoid surplus stops. Therefore world scientists work on the electronization of urban life, transport and different services. While searching ways of solving of this world-wide actual problem, the necessity of working out intellectual management system of urban transport arises. To form such management system, it should be based on classic management principles. Each service rendered to the people should be available and economically justified from the abundance of information point of view. Matters such as ways of providing the population with the information on the electronic maps of service areas, unit and services in the last point, the active roads, and situation thereof, must be worked out. In order to solve the problem, availability of intellectual online system for optimal realization of the services is necessary.

First of all, virtualization of the services, to create web-pages (sites) of activities, and electronization of all kinds of services under the e-government content, are considered to be necessary factors and investigation of this point will play an important role in decrease of surplus traffic load.

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