THE ROLE OF ICT IN MONITORING AND SOLVING TRAFFIC ISSUES

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Abstract

Operational systems for mobiles, especially for smart phones are more and more similar to each other**:** similar user interfaces, the way of entering text, virtual keyboard, more basic screens on which shortcuts can be arranged, integration of dates from social nets to phone applications and support for all important e-mail systems. The main goal of our research is to realize the system for traffic observation, by using modern mobile and internet technologies. Our cities have been continually growing at an uncontrolled rate leading to the problem of traffic congestion, which has discernible effects on all the aspects of sustainability, be it social, environmental or economical. This continual shift of increasing size of city's center and decreasing size of periphery poses huge sustainability challenge of meeting the consumption demands. On the other side of the coin, the advances of human technology have provided its greatest gift, information & communication technology (ICT). Today we have access to any data from any point of the world. There is a growing need to use this data and information with a holistic view to build more Intelligent Transport Systems.

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Introduction

We are in time when computers are taking more and more place in every day's life. There was small number of those who dared to use computers in various disciplines and areas like astronomy, physics, medicine, economic, traffic, using business intelligence programs, that would take the most important things from various databases as it were "irrelevant" information, what is crucial for today's decision.

Jobs that are performed with the help of knowledge use less frequently knowledge that was collected long time ago. The internet has become an indispensable segment, if we take for example mobile phone, there were many who resisted, especially old persons, who have despised the use thereof. Going on the road, sea, healing gave them the evidence of the necessity and the advantages thereof. Nowadays, for many people life is unthinkable without mobile phone. It evolved from its primary functions of sending and receiving massages and making calls into a really small portable computer with its own operating system, many new functions and imaginative applications. But of course, it has all the advantages and disadvantages.

Information and communication technologies marked and it is certain they will strongly mark following years. Today, many machines are used by the help of computer guidance or they are parts of various plants for production of parts, equipment and devices. ICT is used in various fields of industries such as tourism, agriculture, forestry, construction, transportation system for transporting of goods and passengers.

Combined information and telecommunication technologies in various application areas, it is possible to find innovative solutions. It is enough to design a combination of existing knowledge and solutions and be creative.

This paper examines the influence of information and communication technology (ICT) in traffic. The focus of analysis is the quality and quantity of ICT solutions that will have an influence on transportation system. It is necessary to suggest that ICT innovations that will help state that their performance can most effectively reduce traffic accidents and reduce fuel consumption.

ICT

Information technology is common term for the study of resources, procedures and methods for managing, saving, processing, transmission and presentation of data and information. (Storović, 2004) Emerged from the electronics, using the achievements of mathematics and physics. Using electrical engineering, information technologies are separated in particular area.

Information technology (IT) is a term that describes the components (hardware equipment) and programs (software) which enables us to access, retrieve, organize, manipulate and present information electronically. Communication technology (CT) is a term, used to describe telecommunication equipment through which, we can send, receive, search and access to them. All together it is called the information and communication technology.

Knowledge and use of ICT in the modern world is one of the basic elements of the literacy and the culture of man. ICT offers a wide range of specific advantages: increased efficiency and productivity, sharing and storing of information, communication, faster accumulation, dissemination and application of knowledge.

ICT is one of the most important factors that can accelerate the transition in the region. They are the main way to develop a network economy and information society, through which we can reach western European standards. The fact is that ICT technologies are not yet property exploited. It's not enough, just to introduce new technologies in the traffic as a mean of organizing and distributing of traffic information but solve traffic problems.

ICT in the traffic

Information technologies are represented in all fields of society and science, including the traffic and transport. They are the base of intelligent systems. Traffic and transport are areas that are directly related to the spatial relations, in terms of which they are no longer able to manage efficiently or maintain the system without adequate infrastructure and database GIS (Geographical Information System) character. (Duraković, 2011:5)

Traffic demand is growing steadily in the whole world and today the authorities are faced with daily challenges, such as the road and the time spent traveling. (Williams, 2008:72) There should be certainly added global concern about the protection of the environment different kinds of contaminations including noise and vibration caused by today's level of motorization. The impossibility of infinite construction of transport infrastructure and growing awareness of the concerns about endangering of the life surrounding activates the question about new intelligent solutions for transportation equipment (ITS).(Ghosh & Lee, 2000)

While many aspects of society were improved by implementing of progressive technology, we were satisfied with transport system whose basic control technology, traffic sign stayed unchanged since his formation 1923. Facing the question about

improvement of transport system the attention must be focused on three main themes (Woodrow & Barfield 1998:148):

- Traffic congestion – a bottleneck on many international routes remains main problem, and congestion of the city and intercity travel connections requires prompt action.
- Pollution and health – emission of dangerous gases is now globally recognized as a real threat to the future of human kind. Pollution problems in urban areas are increasing. At the same time, in the world where travelling is daily need, increasing of traffic congestion makes life more tens and stressful.
- Safety – regarding safety, road transport is the most expensive form of transport and refers 40 000 of lives each year.

The general problem of traffic congestion that occurs on the city networks all over the world cannot be effectively solved without information's about factors of transportation system, important for making decisions of control managers. Management, operation, and maintenance of expensive and more and more complex elements of transport infrastructure, as well as their complex interactions with other subsystem and technological and physical environment presents a relatively simple request that is successfully answered with the available GIS technology. So globalization of the problem in traffic and transport current trend of globalization in their approach to solve and systematic and complex observation find technological strong point in the integration of GIS technology and intelligent transportation system, which are not technology of the future but technology of today. (Yongfeng, Zhitao, Liu & Min, 2012:155-161)

Increasing of traffic volumes inevitability of road maintenance and rehabilitation are the problems that are very difficult to solve synchronized. Working zones on the roads are the risk to the safety for the users of the road and for the workers who perform works. Using intelligent transportation system in the areas of work can be increased the progression of routes, facilitate its use, to reduce the time of performing of works, to reduce the cost and the most important is to prevent accidents.

Exploiting road infrastructure it is increased the need for its rehabilitation as well as regular maintenance. On the other hand we are faced with the constant increase of the number of vehicles that use the same roads. Automobile traffic in urban areas, use 50% more energy than in nonurban areas. As a result of these processes inevitable traffic holdup on the road.

This paper examines the role of ICT in state level in improving of traffic and quality of life. We have focused on quantitative and qualitative impact of ICT on transport system. Generally speaking information and communication technologies are a set of heterogeneous technologies (hardware and software) that enables electronic communication , data collection and processing of data in distributed networks, ICT use in transport system are different according to complexity, beginning from simple electronic communication (signals) to the interactive and highly intelligent applications for management and traffic control. The difference according complexity becomes obvious if you take into consideration an attitude to new technology.

The sustainability of the transport sector in urban areas is a major concern for the government (state) with developed economies all over the world. Although the sustainability was focused on the negative influence of the transport sector on the environment in the early nineties, today the term has a broader meaning. Concerns about the greenhouse effect and global climate change and potential loss of oil supplies of the world largest transport fuel is added to the concern for air quality in urban areas, too much cars, traffic accidents and congestion on the roads.

Using intelligent transportation systems in work zones, traffic jams and places where the accident happened, these problems are significantly reduced. This system offers new ways to increase through input capacity of roads and traffic safety in critical areas.

Main advantages are that system provides information to the people in charge of the government about work zones, traffic accidents and congestions whether it is information of firms, that perform work on the road, the police or the citizens themselves. Checking the validity of given information the user is further informed and in that way the occurrence of delays is reduced, the time required for the identification and resolution of incidents is significantly shortened.

The instability of the transport system and the application of ICT

Greenhouse gases that cause global warming, emissions of harmful gases that pollute the air, a large number of traffic accidents and congestion on the roads are generally accepted as a problem of all big cities, before the examination of ICT on the problem of transport, experts in the field of transport system who are supposed to be engaged by government need to show what is very obvious. It is, that ale major components are related to the instability of the transport system under the influence of traffic volume. If there is a large number of kilometers, flown in the country, emission of harmful gases is large too. Traffic accidents and increased consumption of oil stocks are also the reason

for the increased volume of the traffic. How does the number of vehicles is increased, the impact on other vehicles is also more and more increased and it creates congestion.

ICT innovation in the transportation system can be categorized in accordance with the role of the information, concerning the behavior of drivers. The difference can be made between information that:

a) Supports the choice of drivers and passengers, for example travel information about upcoming congestion advice to change route of application in order to avoid congestion.
b) Reduce options or limit the driver's behavior, for example to avoid parts of the transport network and limit the speed.
c) It is used to take the drivers decision, in whole or in part as the intelligent system for adaption of speed or intelligent fuel consumption.

Mentioned roles, played by information showing different degrees of the influence on the drivers choice, but for the purpose helping drivers themselves. One of the innovations that applications can provide the user is that application possesses (GPS) combined with geographical information system (GIS) what offers possibility for reducing of the time on the network. Assuming that a user inserts his starting point and the destination in system, the shortest route will be suggested. Moving through route application will indicate various events by different markers that user will encounter. The user will be provided a possibility to choose information that he wants to be shown.

The system, that optimized route selection have rarely the goal to reduce bad influence on the environment (reduce fuel consumption), finding the shortest way or the fastest time to your destination. Even it is possible to implement the system for optimization of oil consumption into exiting navigation system, it stays unknown how the drivers will react to this system, what will this system mean and it will be clarified in future research steps.

Research questions

The goal of the work is introducing of basic advantages that intelligent system provide with intention to create conditions for their implementation on the bases of their understanding and in that way to enable easier informing of the government about problems of citizens on reducing citizens frustrations through solving of their problems.

The research should answer the following questions:

1. How the ITS fits into traditional transportation infrastructure?
2. What are the benefits of using this system?

3. To what extent it’s possible to improve public traffic using modern information technologies?
4. Will the government and citizens take part in this way of informing?

Mobile technologies as part of ICT in traffic

During the last ten years we are witness of increased use of computers and information technologies in transport infrastructure. Continued development and implementation of these systems comes from the belief that intelligent transport system promise an increase of capacity and productivity of traditional transport infrastructure as well as contribution to achieving of other goals such as security.

Intelligent transport systems include wide area of information based on wireless technology. Incorporated into infrastructure of transport system and the vehicle itself, these systems help in controlling and managing of traffic flows, reducing of traffic finding alternative routes saving of the environment and save time and many.

The main reason for the development of mobile application is to enable information about the road conditions for all participants in the traffic at the proper time with intention to reduce costs loss of valuable time as well as reduction of congestion in urban and suburban areas. There is also intention to reduce pollution by harmful gases and reduce noise level enabling pleasant and healthy environment for ale citizens.

The questions that are great motivation and great interest in the planned research are:

1. Will the use of these mobile applications increase the level of vigilance in drivers?
2. Will the number of accidents and congestion be reduced in the city?
3. Will this application and to what extent improve the quality of the life of citizens?

Purpose and the goals of research

The purpose of this paper is to show the possibilities of mobile technology in the system. The goal of the practical part of this paper is to present the procedure of the development and android applications, which will enable the display of traffic conditions. But, the intention is that the public sector can follow the deficiencies in transport infrastructure, so that citizens will inform them through applications and then state sector will solve the problems according to their necessity criteria.

The result of research should show how to implement mobile technology and information technologies in order to reduce intensity of traffic on the roads, improvement of the quality of the life and to reduce emission of harmful gases.

How it works

The development of ICT technologies has expanded the development of wireless and mobile devices, which become the most important technologies of today. Mobile applications are one of the newest and the most efficient channels of communication. The users of this technology were provided by new facilities allowing users to receive and send information to the right place at the right moment and possibility to access the internet at any time. Compared to the classical communication channels, except that they are always at users hand they offer the highest level of interactivity.

With over billion applications sold on Apple, App Store, and the growing popularity iOS and Android platform we can say that the classic mobile phones belong to the past and that smart phones are the foundation of the future. Mobile applications are just a factor that contributed to the explosion of smart phone market.

Android has already become the leading system in the world of smart phones. As it is predicted that share of the operating system will grow in the following years, an advanced mobile devices will not be a luxury but a necessity, the potential of development for Android is great. Together with development of new version of operating system there will be implemented new functionality so the applications will be continuously enriched with new contents.

Android system comes with great number of advanced technologies that have already been built into it. Mobile application, suggested as solution is a project with an idea to use some of technologies (GPS, WiFi, GSM, Google maps) in one application, and to create an application which is usable by people responsible for the administration of applications, but also usable by final users. the application is named “The traffic on the palm” as an association to its own primary purpose – it helps the user to be promptly informed about working zones, traffic accidents, congestion, which reduces the risk of downtime, it significantly shortens the time required for the identification and solving of incidents, but also that user informs governmental officials about the traffic problems, that user meets.

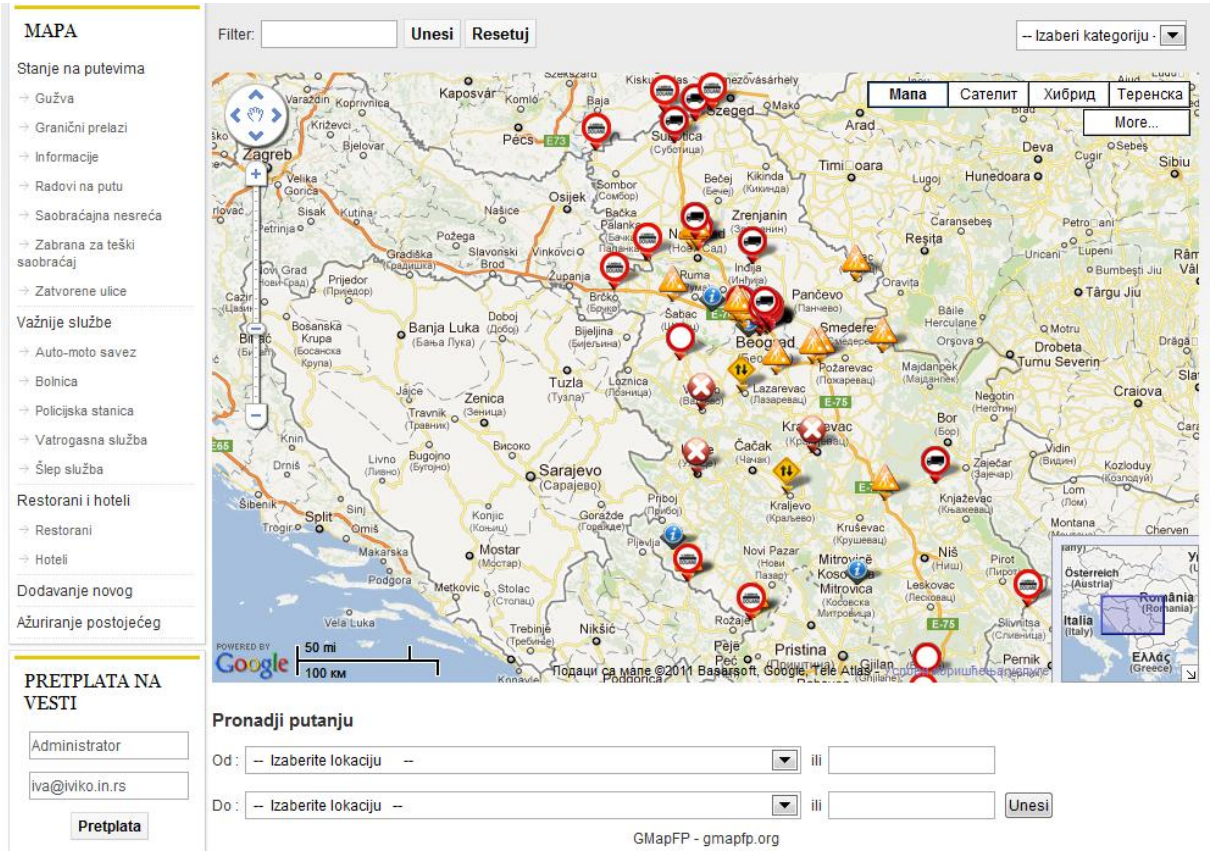
“The traffic on the palm” is the application intended to display ale important information that is currently happening on the major roads. It enables users to find the current location using GPS and displays location on the screen. The location is displayed on the map of Google maps package. After presenting of the users location on the map, there are drown different markers, depending on what kind of event is in question. Touching the screen, where the event is, the user can get information in details, whether it was

traffic accident, congestion or road works, or some important location, that you can get a name and detail description about.

The most important thing is that user can send his information through application about conditions on the road where he is and to chose event, which is the reason he is in the crowed (road works, traffic accidents).

All data are downloaded from the website that the government made for that purpose. It is a web application whose main activity is correct and precise information about activates in the traffic through the internet.

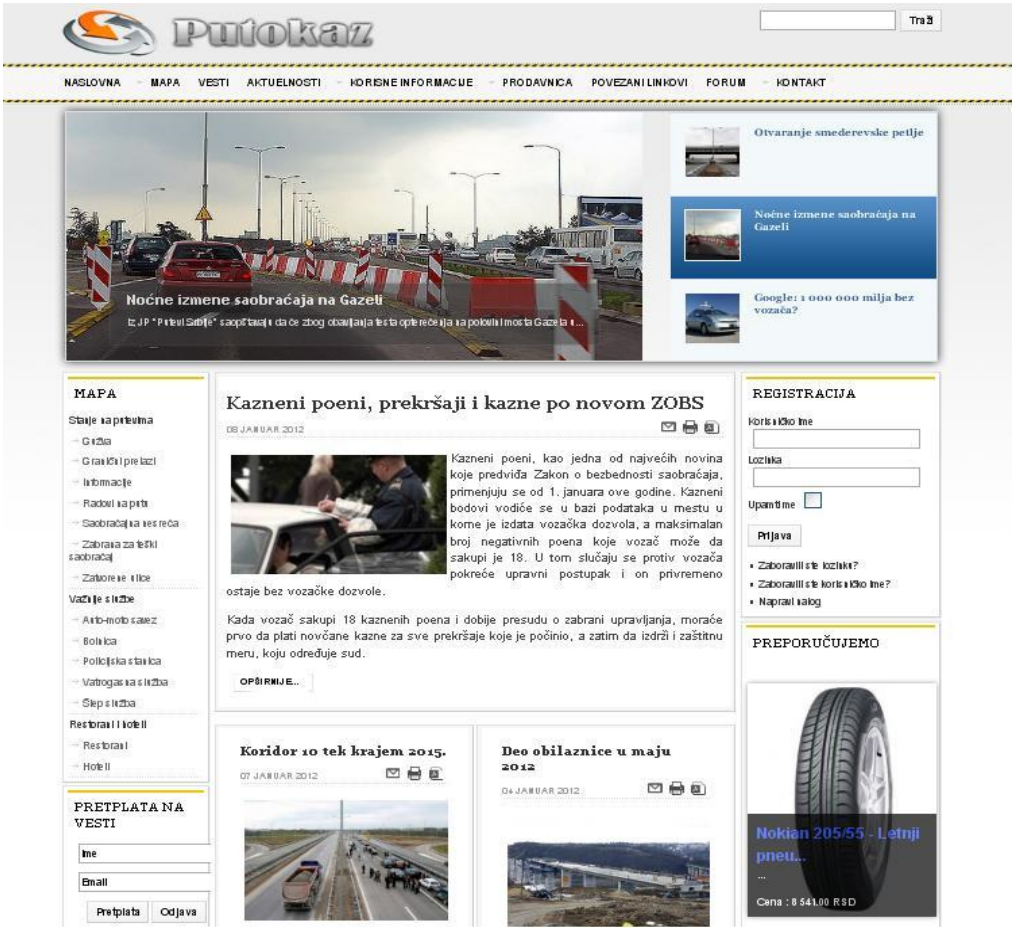
On the page, in addition to the usual news that contains every site as well as different interesting things, the site contains the most important component and that's maps. Depending on which city is in the question, the coordinates are adjusted in Google maps, that shows the city, markers are inserted in the map, each marker has its own meaning and should be the same as mobile application. Web application is synchronized with the mobile application, using the same data that is stored in the same base.



Picture : Map of events on the web application

Governmental administrators can use the web and mobile application for entry of markers, but users can also use mobile and web application for monitoring and informing about traffic problems that they meet.

Web application gives possibility to inform other users – citizens through news about the most important events, useful information about changes in the traffic as well as about suggestions by the users that the state decided to make.



Picture : Web application

The architecture of the project of mobile application

In this project, on the mobile application for traffic monitoring is suggested the use of three-layer architecture, consisting of:

1. users interference
2. web services
3. data base

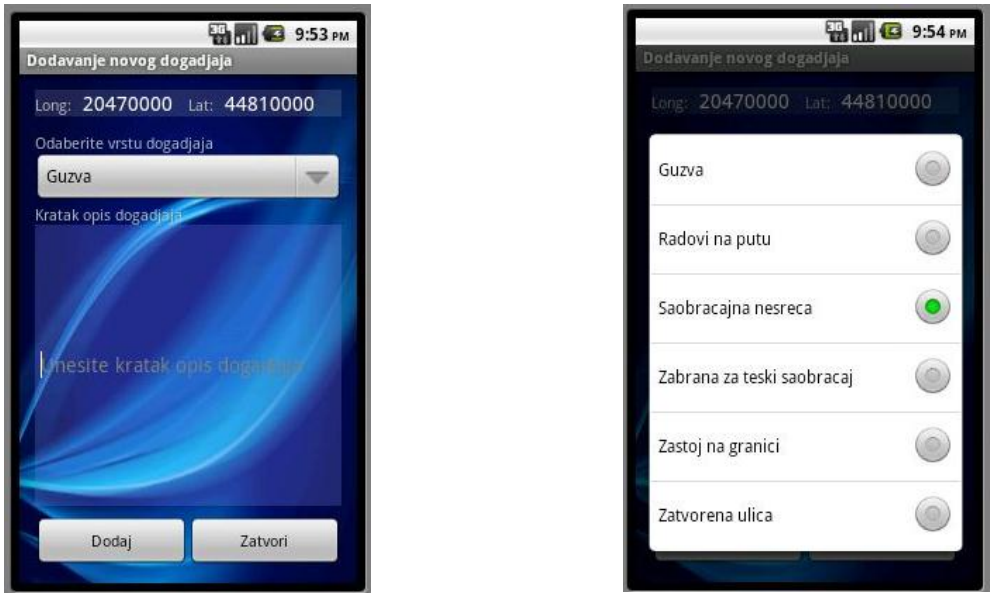
Picture : The architecture of the traffic application

On the photo above is the simplified view of the mentioned architecture. The user accesses to the application by Android mobile device. The application is connected to a REST web service through URL where it is. Web service takes desired data from the MySQL database and forms XML document.

The application takes over XML file, parse it using DOM technology and displays data on the device display.

Picture : Mobile application

One scenario is, if user entered a new event he has elected to “add new” from the menu that application contains. The system of GPS, which is located within the application takes coordinates of the user and enters them into lat and long form, user selects the type of the event he wants to enter, user enters a short description of the event and then press key to confirm. The system will inform users about the success of data entry.



Picture : Adding new events using mobile application

Only an administrator – state official who is responsible for the job will approve or disapprove given input of the user.

All the elements that make up the structure of the mobile and web application for traffic monitoring we can group as:

1. The context or environment in which the internet performance of web application is implemented and online notice is performed.
2. The context or environment in which, there is realized the performance of mobile application that performs notice.
3. Informative
4. Interactive
5. Elements for forming online community of users
6. Additional facilities for enrichment of application and creating of additional value for customers.

All these elements interwoven unit and form single functional with one of the key strategies of applications for traffic monitoring is providing information to potential and current users of application. In general, the more information you publish, the better. However, when setting up the information it is necessary to respect two basic rules:

1. The application must be well organized (information can be easily found), and
2. Information must be relevant to concrete facts, in this case veracity of information about events related to the traffic of the given city. It is also important that information on application are correct and up to date.

The application should contain a clear, precise and functional navigation system. If we take the example of application site, home page should provide users the ability to read and get acquainted with all necessary information about the situation on the road before. The map on the site and mobile application shows visually by markers events and road conditions on the map of the city. It is necessary to give users an opportunity to register and apply for the purpose of ease of check of information entered by user. It is also desirable to enable users to receive information's about any changes on the site and important news through e-mail by application on the mail list. One of the important parts of application is forum that represents community when users share their impressions, experience and different subjects in the forum. The focus is on exchanging of information. Web and mobile application are to be constantly enriched by interesting, updated, and new content in order to retain customers and not to lose its importance.

Conclusion

In this work we wanted to present the influence of ICT application for the benefit of administrative services combining mobile and web application, application of today. Every day road users are faced with the problems in traffic. The introduction of ICT into traffic systems will contribute to reducing of gas emissions, traffic accidents, save the time and money. ICT is revolution comparing to the way we were observing all things related to traffic till now. As a final result, the application shows us way of application of mobile and information technologies with intention to reduce the intensity of traffic and improve quality of life.

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