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MULTIMEDIA COMMUNICATION IN URBAN TRANSPORT

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Abstract: *The authors of the paper present possibilities of multimedia communications use in a special area of transport. Changes and improvement of urban transport based on possibilities of ICT tools and multimedia data exchange will be elaborated. Benchmarking analysis of some multimedia communication applications will be elaborated in the paper. The authors provide several suggestions for the improvement of transport in urban areas in Serbia to raise the quality of life in the city.*

Key words: *multimedia communication, ICT, urban transport italic*

1. Introduction

Smart city is a challenge of new area. In spite of globalization which is based on IC technology which enables permanent connection and interchange of information between people, people gravitate towards big settlements such creating big cities. People have need to be concentrated, to live together in a dynamic environment. They even need a dosage of stress, as stimulation for activities. Stress becomes part of human metabolism, it is practically request for a full living and human satisfaction. Living in a big city is based on continuous giving and receiving data with information and reaction on them. Complexity of living in a big city could be solved only by use of ICT services. This makes a city, smart city. One definition of smart city is that it is a city which systematically makes use of ICT to turn its surplus into the resources, promotes integrated and multi-functional solutions and improve its level of mobility and connectedness. It does all this through participatory governance based on collaboration and open source knowledge.

Smart city must grow on an intelligent transport platform. Long distances within city and huge number of movements of people which is happening permanently requires distinguished transport solutions. Transport has to function by using different ICT tools which are going to create smart transport shaped according to human demands. IC technology has raising performances with very big interchange of data, huge quantities of transferred information and sufficient quality. Such infrastructural platform enables transfer of different communication medias (two or more) through electronic means at same time and permanent. These medias could be text, audio (voice), video (still: photo or moving: video). Video signal is more and more valuable in gathering, analyzing and reacting to the external world. Multimedia communications are offering more information at the same time.

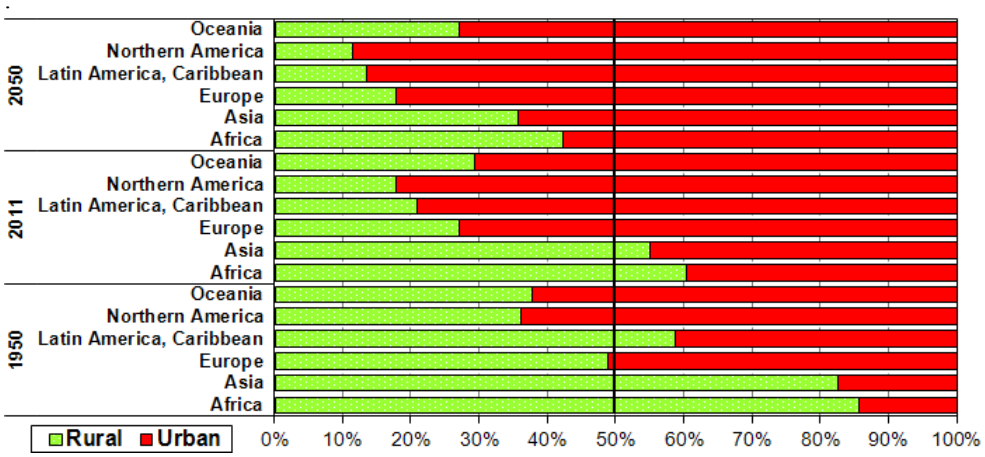

Figure 1. *Urban and rural population by development regions, 1950, 2011 and 2050 (per cent of total population, Source: [1]*

Multimedia communications are integrated into IC technology and of a big importance in area of smart transport.

Authors of the paper present possibilities of multimedia communication use in a special area, area of transport. Urban transport goes through changes and improvement based on possibilities of ICT tools, by using more and more multimedia data exchange and these improvements will be elaborated by authors. Benchmarking analysis of some multimedia communication applications will be shown in the paper. The authors provide several suggestions for the improvement of transport in urban areas in Serbia to raise the quality of life in the city such creating a segment of general concept of smart city.

2. Literature review

RFID was patented in 1973. It was presented to investors with its use in transportation (vehicle identification and routing), in banking (credit card), security service (identification and surveillance) and medical area (patient history) [2], [3]. RFID technology is often used in area of transport, specially for its optimization and better management. The number of applications enables new approach to the transport and solution of its problems [4]. Situation today gives possibilities to combine RFID technology with other different ICT tools like multimedia which is adding new value to the exploitation of RFID. Geographic information systems are additional possibility for RFID [5]. GIS is a good support to spatial observation and solution of transport problems value [6], [7]. Concepts of ICT use in transport area will develop fast with bringing of endless news and surprises [8].

3. Concept of a smart city

ICT is a powerful tool to make a city smart. When looking on a smart city it could be discussed through different intelligent subsystems like: smart education, smart infrastructure, smart energy efficiency, smart integrated billing system, smart amusement system, smart health system, smart economical system, smart culture, smart transport. All these subsystems are horizontally banded with a concept of sustainable city. Sustainable city is a city which has

future which will continuously stay attractive for citizens and which will offer human conditions of living. Smart city is watching at citizens, is interactive and are listening to their needs and it carefully creates human oriented living hub. Smart transport is a very important segment of concept of sustainable and smart city.

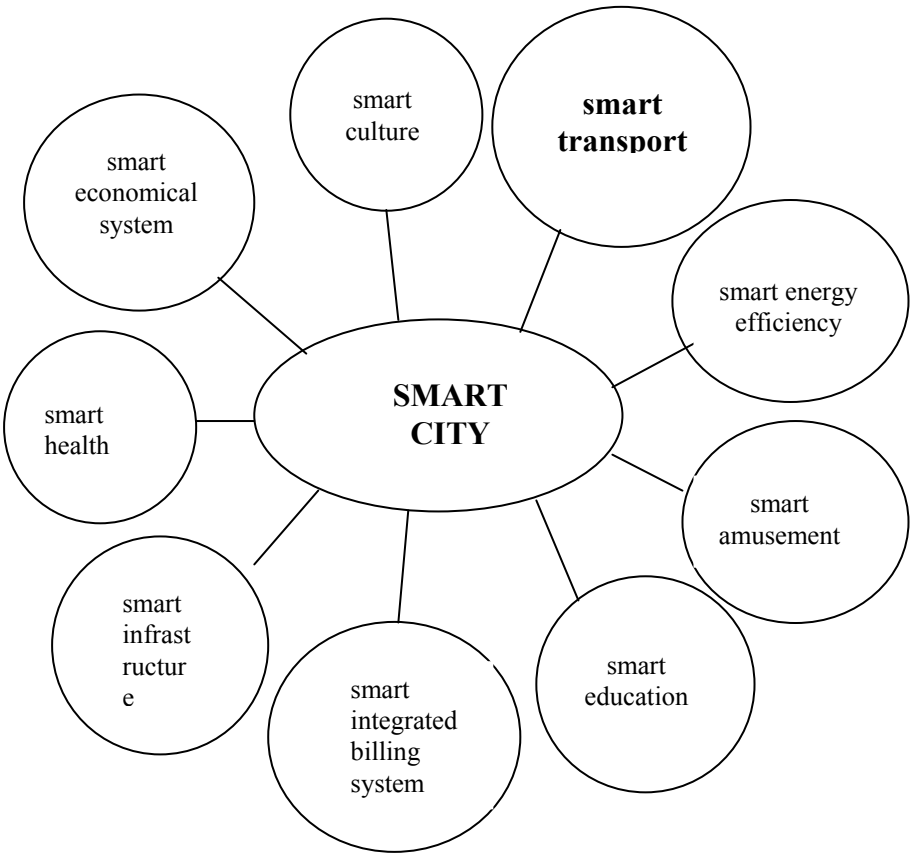

Figure 2. *Smart city concept*

4. Smart transport – part of smart city concept

Modern cities are hubs for smart devices like: PCs, internet, network of all networks, smart phones, cloud computing, social networks like LinkedIn, Twitter, Facebook and iPads, Tablets. Devices are incorporated into the infrastructure of the city as smart sensors, cameras etc. or they are constantly moving across the city on cars, buses, trains, or people walking through the streets. These smart devices have ability to collect, store and provide data about their surroundings and to monitor transport conditions. Data and information are complex and more and more consist of different medias which are used simultaneously.

4.1. RFID technology

Radio-frequency identification (RFID) is non-contact system which functions wireless by using radio-frequency electromagnetic fields for data transfer. RFID technology

could be used as an automatic identification system which identifies and tracks groups or objects with electromagnetic waves and exchanges responses. It was seen as system which automatically identifies and track tags which are attached to objects or persons. The tags contain data with information which are electronically memorized. There are many types of tags. Some tags are powered by and read at short ranges of few meters by using magnetic fields. They are called: short distance tags. Other tags are battery powered tags. They may operate at hundreds of meters. RFID technology has similarity to barcode identification systems. Difference between tag and bar code is that the tag does not necessarily need to be within line of sight of the reader. It can be embedded in the tracked object. It is capable of transmitting data by a portable device (i.e. a tag) that is remotely detected by a reader. In addition, unlike bar-code, RFID can read multiple tags simultaneously. The capacity of tags can be expanded to carry more information than a barcode. This technology is best suited for smaller spaces, where the infrastructure is already in place to use it. RFID requires specialized scanners to read and transmit data, and without one specific to the proprietary receivers, there's no point. The dedicated infrastructure may be of great cost on a large scale, but on a small, localized scale, may be incredibly powerful for both tracking and for providing information.

RFID tags are used in many industries (automotive, pharmaceutical…). Tags could be referred as data base which is traveling together with product or people. There are tags that could be implanted within people. This information which is transferred can be anything, from heartbeat to the name of a dog, and is useful for a huge variety of purposes.

4.2 GPS and GSM technology

GPS is a very different beast from RFID. While it also uses radio waves to transmit data, it does so using, the global positioning system of 24 satellites, as opposed to specialized scanners on the ground. Radio waves sent out from this system of satellites transmit their time and orbital data to receivers down on Earth. Using the data from multiple satellites, receivers can then triangulate their position relative to the satellites, and thus on the Earth's surface.
GPS, is best suited for tracking anywhere in the world. The weakness of the system is that because of the big distance of the satellites, the signal is weaker, and it happens not to get a signal. Civilian models are not for use at the bottom of a canyon or indoors.

Emergency homing beacons, car trackers or navigational devices tend to be the most well known civilian uses, which don't require accuracy within a few inches, but happen on a large scale where no other infrastructure such as RFID or radio towers are set up. GPS is, global, and so the sort of tracking it's best at happens on the scales of tens or hundreds of miles.

Development in mobile tracking technology focuses on two principal technologies: global systems for mobile communication and global positioning systems. GSM is used to send and collect data from a central unit through a data call.

The availability of signals for positioning and the accuracy of positioning lead to the principle difference between GPS and GSM. In general, GPS devices require a clear view of the sky, although you can receive reliable information with increased sensitivity even with obstructions. GPS devices will experience problems if they are surrounded by tall buildings. Conversely, GSM provides locations by using closely-spaced base stations, even in tunnels and dense areas where GPS can’t provide information. If there are no base stations, GSM devices can’t provide positioning. GPS is the newer technology for mobile tracking. It can track the location of a mobile device or phone in real time by using digital maps, such as Google maps, and compatible applications, and is mostly used in smartphones. GSM, on the

other hand, triangulates the location of a cell phone in a network by using the phone's international mobile equipment identity, or IMEI, number.

4.3. Multimedia

- Smart billboards in streets

Smart billboard technology which is introduced during last years is example of multimedia use and its influence on human living. Smart billboard is a billboard (advertisment table) which has intelligent functions and which enables its adaptation to the surroundings with objective, to be more atracttive and to influnce the surroundings the most. It is an interactive tool which uses data, image, video, animation, all together and simultanously. How does it work? The software combines video analytics with environmental factors and Twitter information. It is with propose to decide what the best ad to display at that moment is. Smart billboard is the billboard created to change the advertisement it is displaying depending on the person who is looking at it and how many people of a particular demographic are in the area. It gets this information by looking at Twitter feeds and makes it completely aware of its surroundings. Billboards like this are changing the way marketers advertise completely [9].
Some examples are: when a young man is looking at an advertisment, the billboard will know to show, for instance, an aftershave ad and not a tint ad. If the room is loud, it will choose not to show an ad that has an audio component. If Twitter or Foursquare data indicate that there's a tenis game going on in the region, it will show an Adidas ad and not a FedEx ad.

The video analytics technology uses is not new. Many digital billboards already have web cams that can determine gender and the relative age of passers who are looking at them. They also collect data of the duration of each person's stay in front of them or observes it directly. Advertisers use them to measure the effectiveness of ads. It helps to decide where to post ads and of what kind. The constant changes of billboard's ad is a real technologiacal innovation based on video identification and other enviornmental information. The software learns what works and improves over time.

In a test perforemd by a store, changing advertisments dependently of people surrounding it had result of 60% improvement in keeping people attention (this is measured by time that people looked at the advertisments) [10].

Japanese company NEC lounched electronic billboards with technology capable to do facial recognition and identify the age and gender of people around it. It tailored the ads due to the structure of persons who are watching at it, or passing by. Technological improvments are going further and now intelligent ads have database with imposing set of personal data which enables option of even calling subjects by names [11] This is due to RFID chips that are built into cell phones and credit cards. They enable storing data and contact-free access by use of sensors (the solution is like "touch pay" feature on some credit and debit cards which avoid swiping by clients). RFID signal is picked up by sensors on the billboard during passing by of cardholders. Sensors is collecting information like name, gender, age, shopping habits, and personal preferences.

Smart bilbords could be of grate help in transport regulation. They could be at transport hubs giving information tailored for the passangers who are in the most quantity around it. Such smart transport billbords could present actuel transport timetable interesting for the most people passing by, or data about a travel agent, or integral transport end to end solutions, or video data about state of main crossings on the passengers way, or it could present video from other stations, or situation inside of transport vechles.

- Smart billboards on maps

Smart billborads on maps are virtual version of real billbords in streets. A famous company Google combines new technology with classic billboards. Google started implementation of smart advertisements into Google Maps [12]. Such combination enables running of dynamic advertisements over pictures of billboards in the street view of Google Maps. This technology functions with an algorithm that recognizes advertisements as distinct from other elements in the street view photos. It automatically replaces them with new, virtual advertismnets.

Such new approach makes Google Maps always up to date. Possibility is that user selects any displaying mode and watches at virtual billbords during his virtual walk through Google maps streets. Some modes could be connected with urban transport. That smart maps billbords could present video records from real streets, crossings, transport stations, give timetables, data about travel companies, agences, best drivers, the best way of transport.
The virtual billboards could be linked with back contents. This means that according to clients need, billboard could give more information about selected topic. For example, if client is watching a time schedule in a station, further link could give video record of this station, next link could give data about dalays, or transport agence with less delay time, and so on. Even buzing of travel tickets could be done through selecting this interesting option. User can simply click on the image for more information.

The new Google Maps could be used to for example select stations of one travel agency or station connected to fitness centres, or schools, or stations which have connection with specific end point. data on billboards on virtual Google map could be collected from social networks according to interest of virtual passerbuy.

- Data Visualization (GIS Interactive Application)

GIS is beiing developed for geographical visualization of data [13].. Researches are showing that visual data are more acceptable by people and if data are geographicaly visualized that is bringing results and decisions much more faster than simple data processing without geographical connection. GIS could be considered as an integrated system of computer hardware, software, geographic data and trained people designed to store, manipulate, retrieve, analyze, display and report all forms of geographically referenced information towards a particular set of purposes [4, 8]. GIS is a spatial and statistical method of analyzing attribute and geographic information.
Visualization is an added value to ICT use in transport area. All mobile devices with sensors using RFID or GPS or GSM

Case study

Mulimedia technology is irreplaceable tool for big logistics events like the pilgrims' movements, olimpic games, etc. Solution of integration of RFID and GIS is helping managing the pilgrims' movements. This interactive integrative framework provides real-time online information about the movement of people, vehicles and other blocks necessary to monitor. System enables capturing and storing of information and data for the future use in transportation planning. The RFID system consists of RFID tags embedded on the vehicles for transport and RFID sensors which do reading of information and which are situated at key locations. The collected data by the RFID are wirelessly sent to a hub which is analyzing them and presenting processed on interactive maps. Maps are created by utilization of GIS application. In such a system movement between one point to the next can be followed and use for planning, monitoring

and transport management. This system is capable of automatically tracking, visualizing, and analyzing spatial-temporal data over a specific period of time and handles with accurate information which can be used to support future redesign of the road network and urban planning in order to enhance performance and efficiency.

5. Conclusion

Multimedia communications are result of fast development of information communication technologies, which enable fast exchange of huge quantity of information, and human need to use all their senses in acquiring information and data from surrounding world. They are spreading into many human areas. They enable creation of smart cities which are cities of the future, adoptable to human needs and citizens oriented. Transport is an important subsystem of city smart system. Due to multimedia communications it can be vital, flexible and a base of a quality city life.

Transport in Serbian cities should use IC technology based on multimedia much more than it is today. There are many possibilities for the use of multimedia communication within transport sector. This use could be put into several categories:

- raising awareness about transport possibilities, improvements, changes
- advertisement of transport companies, agencies, lines, services
- gathering information and data about passengers (location, structure, history of traveling and their needs)
- offering information and data for passengers (services)
- improving transport management (collection of on line passengers services need, of available routs, accidental situation, reorganization of transport routs, optimization of transport).

Technical ubsystems that could be implemented are:

- use of RFID technology with visualization on GIS platform. Such system could enable smart ticketing system which is tracking users and puting their movement on maps. Transport planning and management would be significally improved by use od spatial, geogrphical refered presentation should be base for transport planning and menagement of urban transport system.
- smart billboards could be used to trackle passangers movement. After collecting personal information of passers nearby billboard they could display information created specially for them, like timetables, travel companies information, video records from some stations of public transport....
- Google maps could be used for collecting of many different information about travel around town.
- mobile sensors in combination with cameras could trnsmit useful information to relevant places or users.
- smart phones are tool to have all information mobile and permanent.

Visualization (GIS) is an important opion that facilitates solutions of transportation problems in an integrative manner.

Such applications could significantely change functioning of transport within urban and rural zones in Serbia and even help in retention and return of inhabitants to rural zones. It is time to accelarate development of smart transport in Serbia.

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Sadržaj: *Autori rada će prikazati mogućnosti korišćenja multimedijalnih komunikacija u specifičnoj oblasti transporta. Biće obrađene promene i poboljšanja urbanog transporta koje se baziraju na IKT alatima i multimedijalnoj razmeni podataka. Benchmarking analiza nekih multimedijalnih aplikacija će biti date u radu. Autori daju nekoliko predloga za poboljšanje transporta u urbanim zonama u Srbiji koje bi podigle kvalitet življenja u gradu.*
Ključne reči: *multimedijalne komunikacije. IKT, urban transport*

MULTIMEDIJALNE KOMUNIKACIJE U URBANOM TRANSPORTU

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