



## APPLICATION DEVELOPMENT FOR GEO-REFERENCED AUDIO VIDEO RECORDING OF THE TRAFFIC SYSTEM USING MOBILE PHONES

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**Abstract:** The paper analyzes the development feasibility and the possibilities of using the application for mobile terminal devices with the aim of generating geo-referenced audio-video recordings of the traffic network. The application has been developed at the Faculty of Transport and Traffic Sciences in Zagreb, in J2ME environment. The application is meant to create a geo-referenced audio-video recording of the traffic network, and can therefore be efficiently applied by all who are involved in activities regarding the general condition of roads, road signage, road environment, in short, by anyone who may benefit from the geo-referenced audio-video recording of the traffic network in order to operate more efficiently.

**Key words:** GPS, J2ME, mobile phone, geo-referenced, traffic system

### 1. INTRODUCTION

At present we are witnessing the ever faster development of the technologies and devices in the field of information and communication traffic. This results in the advent of new and interesting services and applications on the market. Using advanced communication technologies and accompanying applications it is possible to increase the level of information of the potential users. This group includes also the application for recording of geo-referenced audio-video recording of the traffic system using mobile terminal devices.

### 2. GEO-REFERENCED AUDIO-VIDEO RECORDING

The geo-referenced audio-video recording is generated by simultaneous saving of audio-video data and GPS (Global Positioning System) coordinate, which are eventually integrated into the final product called geo-referenced audio-video.

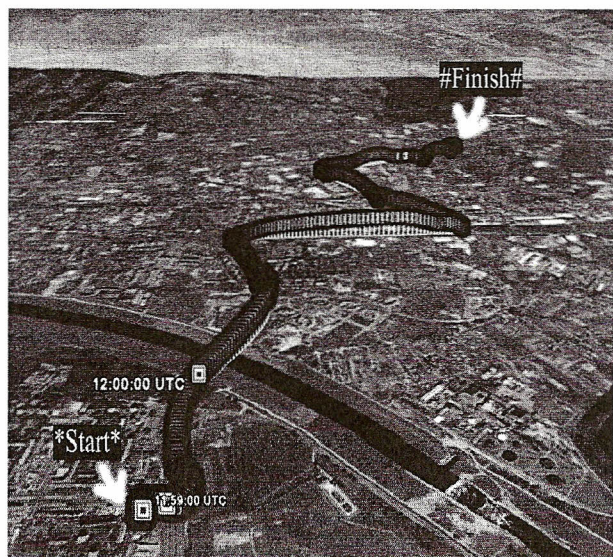


Fig. 1. Display of the route in Google Earth application

As the name says, every single recording i.e. every single frame of the audio-video recording, i.e. second, corresponds to a certain coordinate at the time of recording the audio-video data. Every part of the audio-video recording is referenced to a single geographic location. In the subsequent control of the recording, the possibility of response is opened up, where, that is, at which location the single audio-video recording has been made. Each point presented on the map corresponds to the geographic location of the audio-video recording at that specific moment, whereas the vertical length of the line of a certain point presents in an intuitive graphical display method the recorded speed of the moving object. Besides, the synchronized exact time, the number of accessible satellites, speed, changes in the speed and direction of movement, and the length of the travelled route are displayed.

### 3. PREVIOUS SOLUTIONS

The previously developed solutions in the function of generating the geo-referenced recording of the traffic system and the accompanying infrastructure required expensive and massive equipment. Usually these are specially designed vehicles of big dimensions fitted with several huge hardware facilities, and reminding a lot of mobile radio or TV units. All this affects the final result that aims at generating the geo-referenced audio-video recording of the traffic system manifested in the speed, quality, processing and analysis of the results obtained from the geo-referenced audio-video recording. The integral solution described in this paper has been developed at the Faculty of Transport and Traffic Sciences, University of Zagreb, at the Department of Information and Communication Traffic, called mobileGPS, dealing to a great extent with the abovementioned problems.

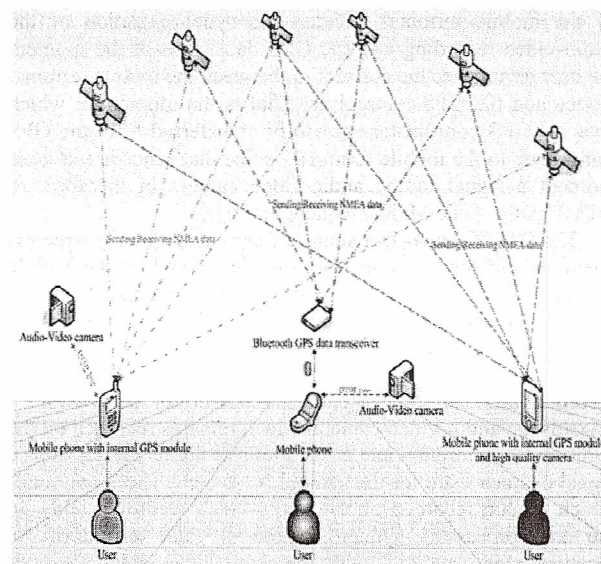


Fig. 2. Modules required for the operation of mobileGPS application



#### 4. MOBILEGPS APPLICATION

The application of mobileGPS is a solution made for mobile terminal devices in order to create the geo-referenced audio-video recording. It has been developed in J2ME (Java 2 Platform Micro Edition) environment and as such is compatible with a large number of mobile terminal devices regardless of the platforms on which the devices operate.

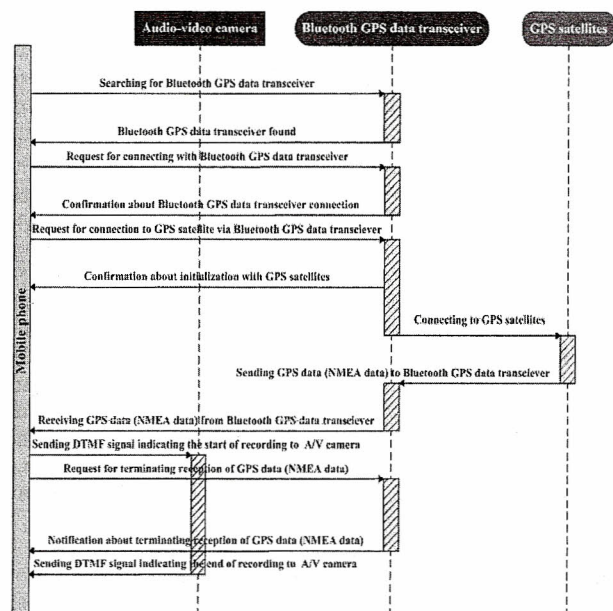


Fig. 3. UML Sequential diagram of mobileGPS application

Although this solution requires a much smaller number of hardware entities, they do exist. In order to successfully create the geo-referenced audio-video recording the following is necessary: mobile terminal device with the respective memory card for the storage of the coordinate recordings, video camera and audio-video cable which connects the camera with the mobile terminal device. The mobile terminal device has the application which is the centre of the whole system. Its task is the saving of GPS coordinates obtained by means of an external GPS transceiver or the one that has already been built into the mobile terminal device itself. In case of an external GPS transceiver, data are transferred from the transceiver to the mobile terminal device by means of Bluetooth or other adequate technology. All the data are saved on a memory card of the mobile terminal device. The synchronization of the audio-video recording and the GPS data starts at the moment the user establishes the connection between the mobile terminal device and the GPS transceiver. That is the moment at which data i.e. GPS coordinates start to be transferred from the GPS transceiver to the mobile terminal device that sends at the same moment a signal to the audio-video camera in the form of DTMF (Dual Tone Multi Frequency) tones.

The DTMF signal is a sound of certain frequency which is characteristic for every number on the keypad of the mobile terminal device and is generated by pressing the key of a certain number. In the application mobileGPS is used for signaling the start i.e. end of the recording of a certain route in such a way that at the moment of the very start of the recording a DTMF tone is sent characteristic for the symbol '\*' towards the audio-video camera, which remains recorded on the audio-video recording, and at the moment the recording stops a signal characteristic for the symbol '#' is sent. These two tones which remain recorded on the audio-video recording allow in the later processing synchronization of each second of the received video material with the data obtained by the GPS transceiver.

#### 5. POSSIBLE IMPLEMENTATION OF THE APPLICATION

Past experiences in the implementation have shown that the application of the mobileGPS is adequate in the function of recording the traffic system and the corresponding infrastructure. Its implementation provides the possibility of timely identification, recording and repair of certain devastations, damage or any other difficulty in the whole traffic system which may lead to a decrease in the quality of providing services regarding the traffic infrastructure or determine possible events that represent danger for the total traffic system. Thus created, geo-referenced audio-video recording allows optimization of the business processes of the network operators and is a good basis to repair or reconstruct the resulting problem in the traffic network within a short period of time. Apart from the very physical anomalies of the traffic system, it is possible to control also those non-physical ones i.e. sound anomalies. The level of noise may be measured at certain sections of the roads, at different time intervals, during different traffic intensities, and according to the obtained results a multi-criteria model may be developed for the reduction of noise at certain points of the traffic system in accordance with the latest environmental guidelines. The mobileGPS application finds its implementation in the development of a digital audio-video cadastre of the entire road infrastructure, as well as in the production of a digital audio-video cadastre of infrastructure port and railway facilities and roads. It can be used as a module in the processes of automated traffic count.

#### 6. CONCLUSION

The development of information and communication technologies and the implementation of the same traffic systems have created the preconditions also for the development and experimental implementation of the application for the recording of geo-referenced audio-video recording on small and light terminal devices, widespread and very user-friendly. The use and benefit of the information on the location of an entity and its environment, in the traditional and new markets will become increasingly present. Further research and development will be directed toward implementations of new value added services based on gathered geo-referenced audio-video data. Mentioned content will enable development of new class services for location based services.

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