MANAGEMENT OF A TAXI SERVICES COMPANY THROUGH USE OF GPS POSITIONING AND GPRS DATA TRANSFER

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The article describes methods of management and use of the GPS systems in taxi companies through application of advanced information technologies, such as GPS positioning and GPRS data transfer. All these systems are united in an integrated solution – taxi information system (TIS), which includes all aspects of the activities of the taxi companies.

The light taxi ride is good alternative to city passenger's transport. The quality of the offered service “traveling” with its time duration and convenience make it preferable choice. The immediate execution of orders and the short destination are the basis for competition between the taxi companies and a premise for incorrect attitude to customers. By GPs systems an effective management and control over drivers’ activity is carried out. The implementation of the system provides:

- reducing the expenditure the taxi companies,
- immediate localization of the address,
- choice of a optimum itinerary,
- full control over the ether and orders,
- analysis of information.

The application of GPs systems by taxi companies is a serious step for perfect service of clients - mobility, comfort, security and complete solution for general management of taxi servicesin accordance with the European standards for transportation policy.

Key words: GPS positioning, GPRS data transfer, TIS taxi information system, taxi services

1 Introduction

Light taxi ride of passengers is of key factor for best satisfaction both of the transportation and other public needs. Social and economic essence of this king of transport services characterize them as speedy, high quality and comfort kind of transport product, meeting the public demand of transport services.

Need of taxi services is imposed by a number of factors as: inconvenient connections of the urban passenger’s transport, time saving, demand of convenient and comfort transport, bad meteorological conditions, etc. Implementation of GPS for management and logistics contribute light taxi ride to become

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one of the preferred solutions in the transport branch. Implementation of new technologies and innovations in taxi services is a step towards improvement of the quality of the service.

For instance taxi companies equipped with GPS control and navigation systems and GPRS for data transfer have a number of advantages compared to companies, which for one reason or another have not implemented taxi information system (TIS).

System is a modern solution for management of the operation of the car fleet, enjoying the newest developments in the field of GPS technologies. It is reliable and easy to use, ensures significant financial profit and revenue to each company, having own vehicles. GPS (Global Positioning System) system comprises 24 satellites, put into the orbit by the USA government initially solely for military purposes, however since the 80s its capacity is accessible for civil purposes as well. It operates 24 hours and covers each place worldwide and for its use no subscription or installation fee is collected. The principle of operation is as follows: satellite sends signal to the GPS-receiver on the ground and compares the hour of sending and the hour of receiving. If there are at least three satellites, location of the receiver is registered enough precisely in view location of the receiving unit, respectively vehicle or any moving object, to be localized.

Accuracy of the GPS signal is so precise that time can be determined precisely to one millionth of the second. Analogous is the preciseness of determining the speed and location of the object. Global positioning system GPS is the name of the satellite radio navigation system, determining the location, speed and time with preciseness up to 1 nanosecond at each point of the world and around the earth orbit in real time. Principle of operation is based on measuring the distance from the place, which coordinates we are looking for to a group of satellites, which coordinates are precisely determined and known (Fig.1). Distance is calculated based on the time of radio signal distribution from the satellite to the user.

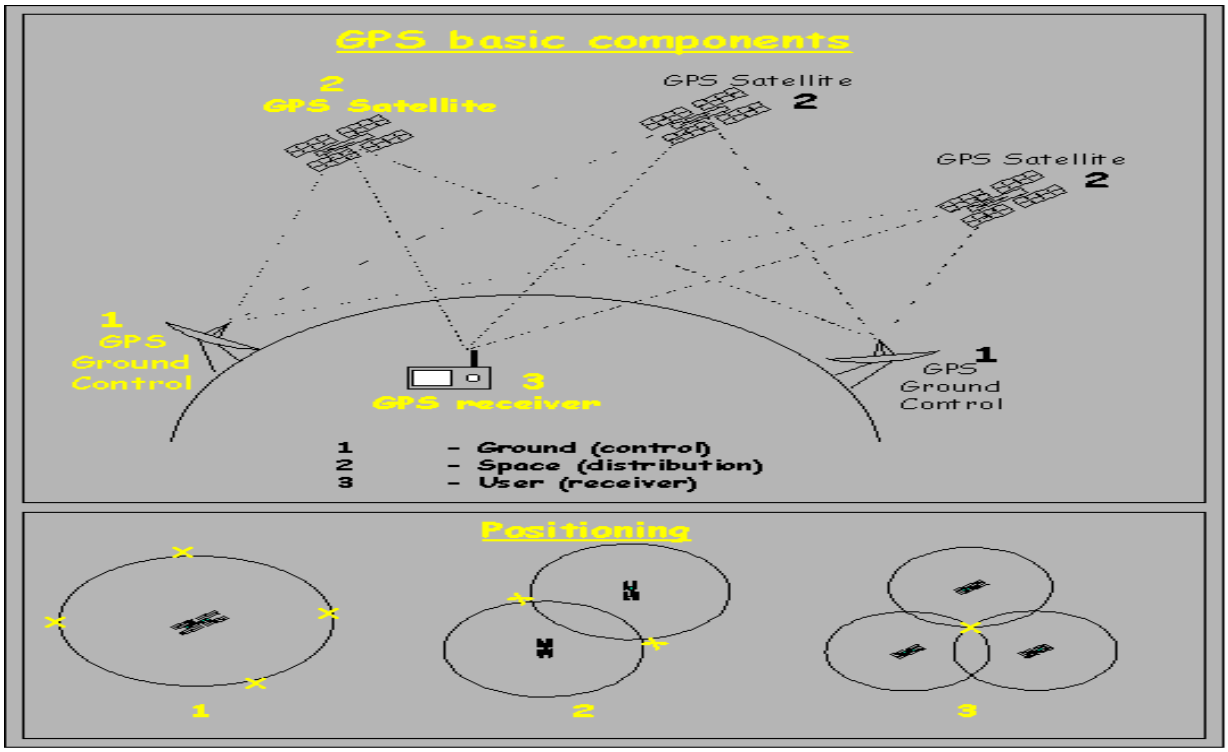

Fig.1 Principle of operation

Important feature of the system is the opportunity for free use, which makes it exclusively interesting on the consumer's market. Some of the main fields of GPS application are:

- management and control of the operation of vehicle fleet – security of vehicles and cargos;

- transport navigation – road, marine and air transport;
- science and research — geography, cartography, geology, geodesy, archeology, etc.
- agriculture — terrain planning, agricultural machinery navigation, etc.
- communications – synchronization of the communication systems;
- tourism and sports — orientation, mountain rescue services;
- determining the exact hour, etc

GPRS /General Packet Radio Service/ is technology for data packet transfer through the mobile network. GPRS allows constant link to Internet. GPRS ensures instant access and constant on line connection between the mobile device and the Internet network. The result from this is fast getting in line and opportunity users to stay on line paying for the information they send or receive but not for the time they are connected. In this line GPRS ensures to the end users:

- mobile connection to the global internet network;
- transition to third generation services;
- increased speed characteristics;
- fast access;
- payment for the really used data volume but not for the time of the session.

Since in 2001 Inter Soft Pro started its business with the development of taxi information system (TIS) for automation of the operations performed at the dispatch centre. Since then system has been improved many times, whereas a number of functional improvements had been implemented in view to ensure maximizing convenience and usefulness of its operation. For this purpose advance guard information technologies have been employed as GPS positioning, GPRS data transfer, SMS messages, etc. Today all these systems are united in a whole integrated solution, covering all aspects of the taxi companies operations, enabling owners to manage and control their operations as effectively as possible at any stage and at any time. Fig. 2 presents example model for the operation of the integrated solution, which is enough flexible as to be tailored to the needs of each individual company. Indications used in the model are as follows:

1. ***Customers***– users of the taxi services;
2. ***IP central*** – software and devices, automating the telephony of the transport company;
3. ***TIS*** – information system for control and automation of the dispatch centers operation ***(CDC).*** It integrates: - telephony communication; - clients servicing; - communication with the centre and taxi vehicles; - communication with the vehicle fleet.
4. ***Control centre*** – automates the operations of the vehicle fleet of the individual transport company. It integrates all modules, forming the vehicle fleet:- automation and control of movement of the vehicles “schedules”; - automation and control of the service and maintenance operations - autoservice; -accounting and control of the bank cash flows - bank; calculation and accounting of the salaries of the drivers and the administrative staff – accounting and financial control;
5. ***Central system for communication with the vehicles*** (taxi and other vehicles) through GPS devices. It integrates the following modules:
   - card module – integrates e-addresses database and coordinates for localization of the object;
   - finding closest agent – determines the closest taxi cars to the client based on the available GPS coordinates;
   - communication with the taxi vehicles and transmission environment for realization of the communication (radio-channel or GPRS);

Orders are accepted by dispatcher and are automatically input in the PC system with the telephone number and exact address, which are transmitted to the nearest vehicles, driver confirms them still until client is on the phone line and taxi has started to the address. In this line client has full information about the orders (date, hour of the order, destination, official number of the taxi). Company guarantees full confidentiality of the personal information – telephone, address, etc.

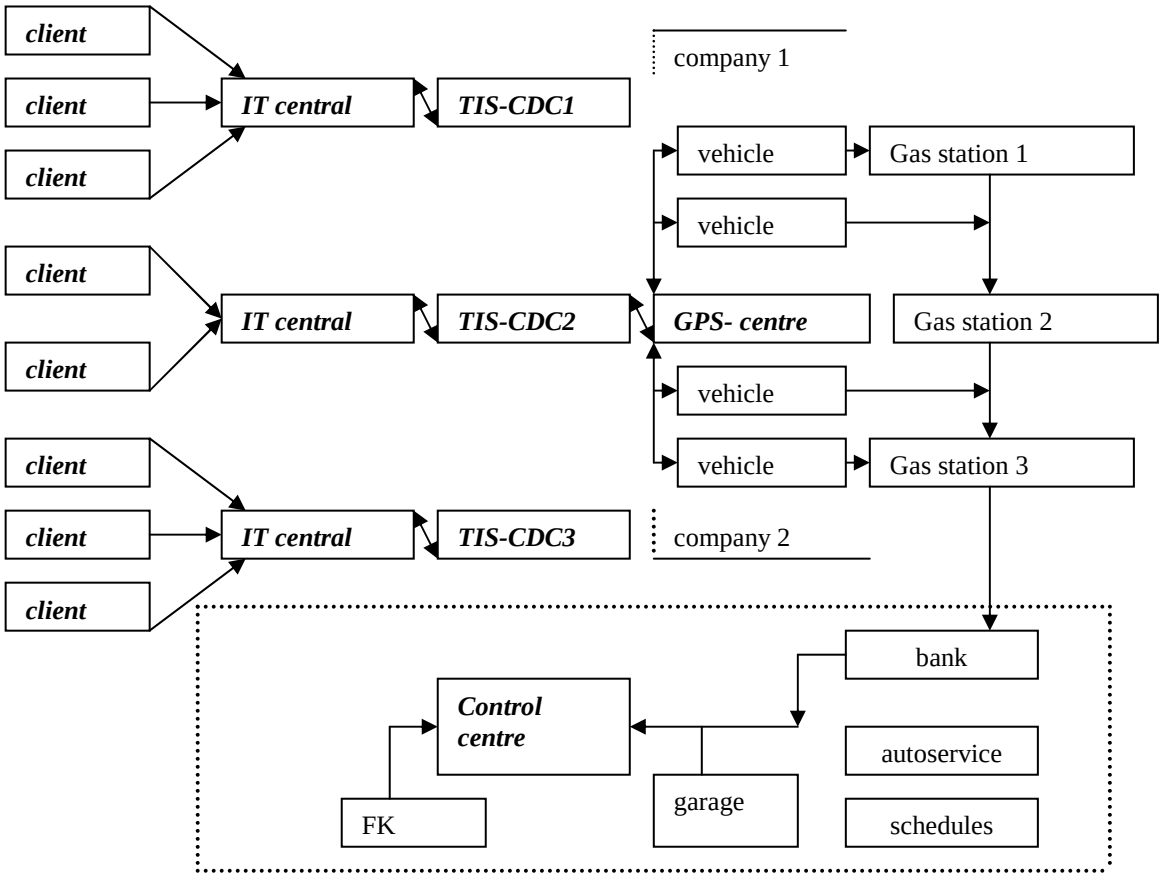

Fig. 2. Example model of taxi informationb system

System provides follow up of some parameters of the vehicle and distant control of the mobile GPS device from the control centre. In result from this information about the location of the vehicle and the current status of the vehicle is received in real time and afterwards this information is used for issue of various reports, based on the data gathered by the GPS telematic device.

Software package at the dispatch centre allows on the electronic map of the city taxi vehicles to be seen as icons oriented in traffic direction with stated official number of the taxi (Fig. 3); icons are different (in kind, colour, etc.) depending on taxi's status (free, in rest, performing order, etc.). Clicking on icon opens additional information about the taxi (list of the accepted orders, date, hour, etc.). Dispatcher can click on the place of the order and afterwards the system automatically selects the taxi car, closest to the address. Information about the orders is transferred to the taxi driver who performs them. Telephone directory is maintained and out of it addresses of the orders are obtained, whereas dispatcher can edit and supplement the telephone directory with new entries. Records of all events related to acceptance, processing and performance of orders, etc. are maintained.

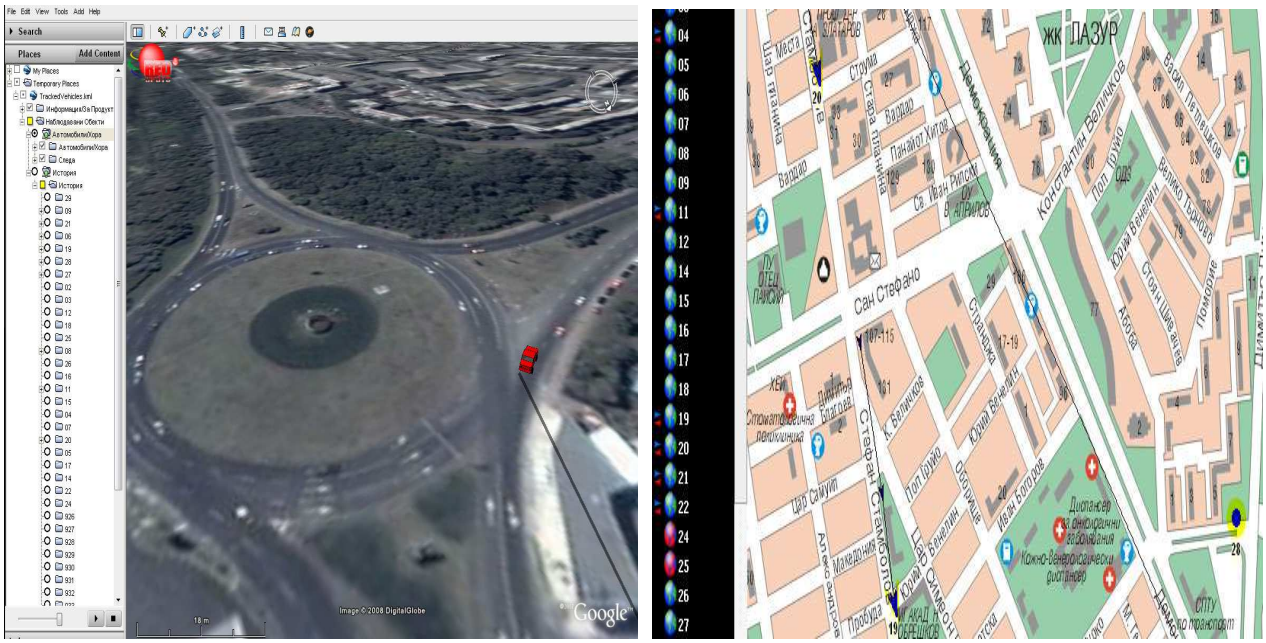

Fig. 3 Electronic map

Advantages of the taxi information system are as follows:

- increases efficiency of the operations at the taxi central;
- facilitates and automates dispatcher's functions;
- reduces the period from placing the order to reaching the address;
- cuts down the fuel costs and depreciation through minimizing the idle rides;
- minimizes conversations in real time, thus the disputes;
- full control on the network and orders;
- ensured safety of the driver, available panic button, transmitting signal to the dispatch centre in case of need;
- each ride can be followed and is recorded n archive;
- client can not be cheated – tariff, passed kilometers and other information, because everything is fixed and data are controlled at the dispatch centre;
- detailed electronic map of the city facilitates localization of any address to the maximum;
- eliminates the noise and disturbances of the radio stations;
- ensures more comfortable trip;
- client can take the advantage of the rich database, which includes key points – administrative centres, hospitals, first medical aid, pharmacies, hotels, amusement centers;
- selection of the optimal itinerary;
- client to know her/his location during the overall ride;
- ride to be paid cashless through e-card;
- on line ordering taxi services;

- telephone costs are reduced by 30 - 40 %;
- opportunity for data analysis, ensuring more effective management of the operations

Nowadays transport mobility of population constantly raises. This is due to the increase of the number of trips of each resident in line to realization of one's public and professional functions and meeting the daily needs. Time saving predetermines the need of realization transport services according to the principle "from door to door", which is possible solely by the means of individual taxi transport. It ensures traveling to be performed as straightforward and fast as possible with least stops and as conveniently as possible.

Taxi companies have already become aware that the existing solutions are unsatisfactory to meet the increase demands of the contemporary transport management. Implementation of the GPS systems ensures intelligent data management in view to determining the constant location of the vehicle and the time for reaching the address, thus improving clients servicing.

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