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catalogue, management of telematic systems

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CATALOGUE OF TELEMATIC SYSTEMS

Constant develop and increasing number of telematic systems needs an efficient presenting and managing. Such systems consist of many elements spread on wide urban area. The paper presents a computer system based on an advanced databases and an electronic map service GIS (*Geographical Information Systems*) as a useful tool for many different services, for example road service. The system helps implement new telematic systems on traffic area and is especial useful in emergency situation.

PASZPORTYZACJA SIECI TELEMATYCZNYCH

Ciągły rozwój oraz wzrost znaczenia systemów telematycznych wymaga wprowadzenia i stosowania efektywnych narzędzi do prezentacji i zarządzania w/w systemami. W artykule zaproponowano system wspomagania komputerowego do zarządzania miejską infrastrukturą telematyczną. Zaproponowane narzędzie wykorzystuje komputerowe bazy danych oraz mapy elektroniczne GIS (*Geographical Information Systems*), które wspomagają lokalizację poszczególnych elementów sieci.

1. INTRODUCTION

In the last years we can observe exceptionally high increase number of telematic systems. Its primary tasks are influent on safety and order on the roads. It is no concern only monitoring roads in the cities by hidden cameras and supervises speed limit, but it give opportunity to advice drivers about free parking places and guide through traffic jams. Telematic systems inform people waiting at a stop about time to arrival next a bus or a tramp, lighting panels inform about weather condition, air pollution, our speed drive, a traffic jam, etc. A teleinformatics infrastructure of telematic systems in the cities is getting complicated. Sensors, cable distribution boxes, signal lights, lighting panels, cameras, etc. are connected altogether in complex networks. It causes that number of cables and its location is difficult to identify.

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Our research shows that the documentation of telematic systems is unsatisfactory and often not updated through the years. Systems work independent from one other while should work together and improve its performances. It seems that for a few years the problem will be very dangerous.

Fig.1. A lighting panel on the road [8]

It seems that good solution is creating a software application that allows cataloguing mentioned systems and representing its elements on a digital map. Our work focused on elaborate brief foredesign.

2. RANGE OF CATALOGUE OF TELEMATIC SYSTEMS

The catalogue of telematic systems focused rather on an infrastructure than real working or temporary state. In the range of catalogue system follow each an element of a telematic system and a network of connections. We can distinguish following systems:

- Road traffic signaling system,
- Telemetric system,
- Monitoring system,
- Emergency system,
- Meteorology system,
- Toll expressway system,
- Road situation system.

Number of systems is still growing. Rapid development of teleinformatics increases this process. Nowadays urban drivers each day meet with a free parking places problem or a traffic jams problem. Mentioned systems should help drivers. To effectively operate the infrastructure of the systems road services have a complex documentation of that system. The documentation is useful when system is growing or it need repair. Finding common elements (for example cables) for at least two or three systems in that documentations are difficult.

An application that permit managing all built in road telematic systems give opportunity to precise which system is reality implemented on the road. In the collaboration with GIS system all mentioned road services have an access to all necessary information about the actual state of their systems, its history and localization. It improves actions connected with upgrade, repair or install a new system.

3. GEOGRAPHICAL INFORMATION SYSTEMS

One of the most important features of a good software application is the Graphic User Interface (GUI). In the application catalogue of telematic systems such GUI is directly connected with visual representing all elements of the system on a digital map.

The Geographic Information System (GIS) is an information system that creates new thematic maps by maintaining and processing a variety of information associated with spatial locations based on the locations and supports decision-making by using the maps. The geographic information system has been used for management facilities of utility (electric power, gas, water and sewage). Map example is presented on Fig.2.

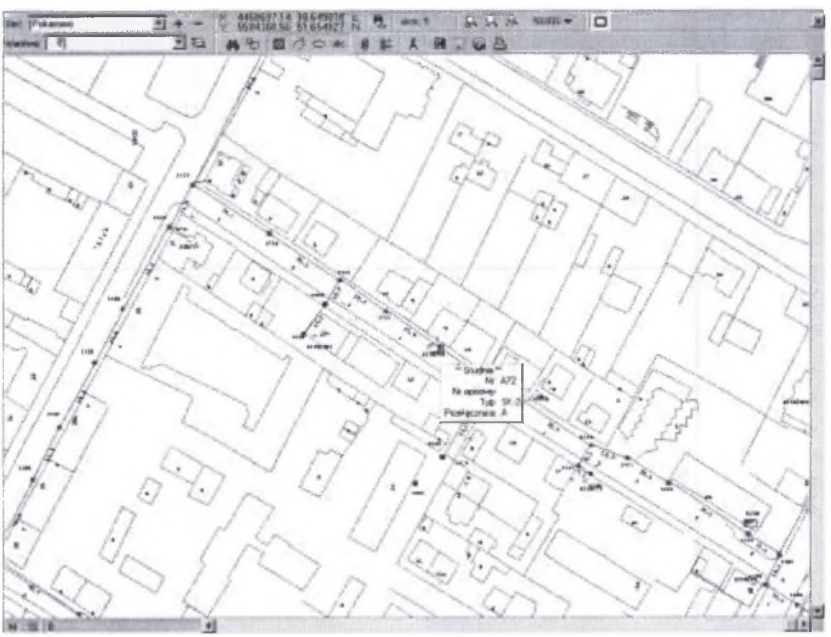

Fig.2. Example of an application using the digital map [9]

Because a variety of roads information is managed in association with spatial locations, a data item may be found based on a location or a location may be found based on a data item. Consequently, the road services can quickly obtain the information they need to identify for example free cables for new sensors or cameras to a road monitoring.

Collaboration between different services simplified because they have visual information comes from other services and their decision can be taken after made analysis general situation on the location.

The key to building the geographic information system is the construction of its database. Each systems mentioned in chapter 2, existing in the database and is organized as a separate layer. The data in each layer associated with spatial locations is processed based on the location information to produce new information. The information is provided to the road administrator to aid them in their work. In general the GIS databases consists following information:

1) Digital road map database: road maps on which road networks are represented as nodes, links, and their relationships (topology).
2) Road management database: a unitary database into which road drawing data and specifications data for location road structures of systems, way of connection, etc,
3) Systems and items history: a database, which stores data such as: date of install system, date of exchange sensors, loops, or other elements of particular system, the results of the road prevention inspections, etc.

4. SOFTWARE APPLICATION

The catalogue of telematic systems has the client-server structure. All data are stored in a separate place (computer) named the server. Access to its data is possible by a client applications installed on the users' computer. Clients are connected via for example a local area network (LAN) or wide area network (WAN). The solution gives many advantages for future users. The central bank of data (server) gives certainty that all users have an access to the same updated data. Any change of the infrastructure telematic system may be input to the catalogue system directly by the service that change made. It causes that the update data will be available for all users soon after updated. Access to the server's data is restrict depend on the service need. It protect against free access to the data for unprivileged persons.

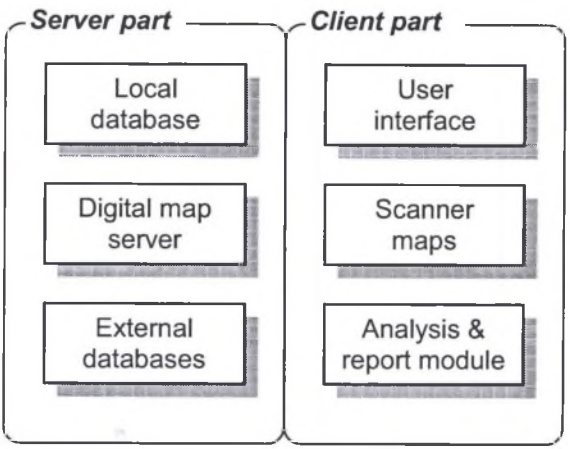

Fig.3. Main parts and modules of the catalogue of telematic systems

Software based on an object-oriented architecture (OOA). The object-oriented methodology supports natural modelling and designing of modular architectures. The nature of catalogue system confirm properties this choice. The origin of the OOM is connected with the need to bring under control the complexity of data structures and their processing. The basic concept of this methodology is the object, understood as entity combining data and operations processing this data. A class defines the object. The data enclosed in the object are called the attributes and the operations processing this data are called methods. One of the basic rules is the indirect modification of values of the attributes with the use methods. This rule assures flexibility of the object data structure. The OOM enables to divide large and complex problems into smaller parts that are easier to manage. The object-oriented technology has already a stable position as a modelling methodology [1].

Using the OO technology is especially effective in the catalogue system as a complex database. Each real items of the telematic system has own interpretation as the object. The object consist its name, a function in the system, a date of install, a geographical location, etc. The collection of objects in the database is natural interpretation of the real part of the telematic system. The software structure combined six mainly modules.

The local database consist all necessary information about saved telematic systems, their items, remarks, etc. The digital map server stores a graphic representation of spatial locations a system's item may be found. The external databases module allows users to access to an external temporary databases to improve the knowledge about the telematic system. The graphic user interface combine all data comes from different module into the one comprehensible view easy to interpret by user. The map scanner allows to the preparation of an external maps to use with the system. The last module is responsible for the analysis loaded data from the server as an answer to user's question. Other function the last module is the reporting. It is the one of main function of the catalogue program. Particular parts of the software are presented in Fig.3.

5. CONCLUSIONS

Rapid development of teleinformatics influent on the development of telematic systems. We can distinguish many systems that help to drive urban drivers. The paragraph two specifies areas of the implementations.

Nowadays many different road services need fast and complex information about state of the roads, its infrastructure, number and places of cables, etc. That information may avoid a situation where for example a digger damage a cable connection, or a gas pipe or a service looking for free cable connection to a new lighting panel.

Presented idea of the computer program to cataloguing of the telematic systems give a chance to efficient managing the transport telematic systems. The application permit managing all built in a road telematic systems allows to precise which system is reality implemented on the road. In the collaboration with the GIS system all road services have an access to all necessary information about the actual state of their systems, its history and localization. It improves actions connected with upgrade, repair or install a new system.

Using the client-server architecture and an object-oriented architecture enable to the distributed access all users and supports natural modelling and designing of the modular architectures of the catalogue system.

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