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Some Aspects of GIS Implementation

Introduction

Geographical Information Systems (GIS) is a computer support system to create, store and analyze data bases of spatial character. It is software for digital mapping service, which consists of assisting in the creation of maps, their storage and analysis of data on the map. A new discipline, which is the analysis of spatial data using GIS, also opens up many possibilities in various disciplines. Most of the data collected in the modern world is a geographical reference, and so there is a need for processing in GIS systems.

GIS in life-saving [3]

GIS is implemented in life-saving (ambulance, fire brigade, police). Quick location of the place of incident, finding the nearest free ambulance and determining the best directions are just some of the advantages for the ambulance dispatcher placed in GIS. When you create security plans for medical emergency such technologies are becoming imperative. Analysis of demographic data on the maps and information about the emergency intervention teams with the division into their causes enable the optimal deployment of ambulances in terms of their personnel and equipment.

In fire brigade already at the time of alarm, the duty officer should have information about the exact location of the incident and its immediate environment, the number of people, the type of object elements of infrastructure (power, telecommunications and gas networks), and the active hydrants. With GIS all necessary information may be on the computer in the guard booth and at any time be sent fire-fighters in action.

The exact location of the event while tracking the location of all their radio cars on the ground makes it possible for the duration of the intervention and coordinates the activities of patrol and emergency services. In developing such systems for the Police it is worth using, the best on the market, digital maps and proven GIS software. Both of these elements are used in many well-known location and tracking systems for vehicles. In addition, data on crime collected in the databases of the police can be analyzed on the thematic maps allowing capturing the spatial and temporal dependencies.

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GIS in the management of road [5, 6, 9, 11, 16]

Dissemination of GIS with the increase in the knowledge of their opportunities, in the circle of practitioners (road workers), has resulted in opening specialized applications allowing to create sophisticated database management, supporting lane road. These functions are carried out by SIGNS applications (road signs and markings) and PASS ROAD (Pass porting lane), which allow you to collect, analyze and manage traffic lane in the following aspects:

- Vertical marking;
- Horizontal marking;
- Technical infrastructure of lane road;
- Surface (state and type), green in lane road (state and type).

They allow you to save in the database the following elements:

- Vertical marking: inter alia, the names of roads and data on trade;
- Horizontal marking: this is the type of mark and line width.

Computer information systems of spatial character are becoming more widely used in various fields such as road construction, for example: traffic analysis, traffic prognosis, conceptual design, traffic measurements, etc. They are very useful tools in the management of roads, traffic, and technical infrastructure giving the opportunity to make informed decisions based on the current data.

Application of GIS in meteorology and hydrograph system MeteoGIS [1, 4, 7, 10, 15]

MeteoGIS system is used to monitor atmospheric conditions and to generate warnings tailored to the specific requirements of individual users, as well as to carry out the analysis of current and historical weather events. The system monitors the following meteorological quantities: precipitation intensity, precipitation amount, type of precipitation, wind speed and direction, and lightning. Spatial resolution of data is 1 km, the time resolution depends on the resolution with which the individual data is generated - mostly radar data are available every 10 minutes. System users are not meteorologists or hydrologists, but for example, employees of government (Departments of Emergency Management). MeteoGIS system based on GIS techniques, is a system designed to monitor current weather conditions and weather warnings tailored to demands of the system user and for current analyzes and also past weather situations. With the power supply system in an operational course of meteorological data (from weather radar, ground-based weather stations, and the numerical model and storm discharge detection system), it is possible to assess in advance the risks of hazardous weather events such as the fierce wind, storms, lightning, heavy precipitation and arising, as a result of any large flood. The system is designed for state or local government authorities and local services that are interested in receiving warnings of hazardous weather phenomena. MeteoGIS system includes a set of tools for analysis of weather situations, which is an effective aid in decision-making connected with crisis management.

You have the following options:

- Joining any new GIS primers (e.g. counties, watersheds);
- Meteorological fields to update automatically when you receive new data;
- Animation (also automatically updated);
- Presentation of meteorological data in tabular form;
- Statistics generation of meteorological fields (mean values, numbers in each class values and for selected objects GIS layers);
- Time graphs generation of the meteorological field values for the selected pixel.

GIS in nature - the Karkonosze National Park [8]

The main purpose of the National Park, which is the protection of nature, is realized through appropriate management of the natural environment, which mainly relies on the management of space. Other tasks of the park such as the monitoring of natural environment, scientific research organization, management of tourism and environmental education, also have a relationship with space that is why national parks in a particular way can use the organ, which is a Geographic Information System. In discussing the application of GIS in the National Park should be paid attention to its features such as timely access to resources, perform analysis, and generate reports and visualization of results. The undoubted advantage of GIS application in wildlife conservation is a significant increase in the possibility of integrating data from multiple sources. This is important because the National Park carries out the extensive cooperation with local government bodies, scientific and educational institutions, and other units of the department of environmental protection. The important element of this cooperation is the sharing and exchange of data on the natural resources of the park. The creation of the GIS system in the Karkonosze National Park was started in 1997. This process included the organization of hardware and software as well as workers who began to gain the necessary knowledge and create the foundations of GIS. The creation of GIS on the Czech side of the Giant Mountains was favourable for it and the implementation of several projects in the field of nature conservation with the participation of foreign experts. An extremely important element was the experience of some park employees, gained through internships held abroad, workshops and international conferences. Park staff's enthusiasm and friendly approach of many aid funds caused the rapid development of the GIS system in the Karkonosze National Park, thus providing a modern and effective tool that not only serves to collect information about the natural environment of the park, but is used mainly for the effective and proper management of this environment. In 2000, the first in Polish national parks, GIS Workshop of the Karkonosze national park was appointed by the decree of its director. Its mission is to provide information about the natural environment in such a way that this information can be readily available almost on all workplaces and to such an extent that it is necessary for the accomplishment of the park tasks. GIS team is working with the park staff in data acquisition and

collection of new data from the inventory of natural environment and tasks carried out by conservation, education, monitoring, research, etc. It performs all more complex analysis and processing of data for management of the park, especially for the park management. GIS is used in everyday work in the Karkonosze National Park on many levels, often to solve problems apparently not having much in common with GIS. GIS Lab staff is still gaining new experience and use GIS to support environmental management and to support daily activities of the employees of the park.

GIS and remote sensing [2, 12, 13, 14]

Remote sensing is a branch of technical science dealing with obtaining, processing and interpreting data which are the outcome of the reflected or discharged by different types of objects electromagnetic radiation registration. The registration is performed with the devices transferred by the satellites or planes. Such measurements let us to assume about the essence and type of area and occurring there phenomena or examine the condition of seas and oceans. Remote sensing of the earth surface – satellites or its systems is also used to the exact measurements of the earth surface and the sea bottom relief. To the most often used methods we can include satellite interferometry.

Satellite interferometry – one or two satellites in the couple of day's interval are taking photos of a chosen earth area. On the base of two photos the difference in the reflected wave phase is counted (interferogram) and from it we achieve information about the area shape.

For instance in climate researches important is taking into consideration the maximal number of parameters affecting short or long time weather and climate changes. On the base of gathered data a digital model is built in which the earlier climatic changes are tried to reconstruct or the future changes to predict.

On the base of area researches, plane and satellite photos, maps, statistical data a base describing a given area is made. On the base of its data we have the access to the full information about the given earth area. The GIS systems are used to join different data in a coherent structure, which in an easy way can be researched to find the data we are interested in.

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Abstract

Geographical Information Systems (GIS) are used by different services, thanks to them we can specify an area of natural disasters, places of nature protection and the purpose for which order and rescue services can be sent and they also serve to determine safe places for pedestrians, cyclists and drivers. The paper is presenting some aspects of GIS implementation, e.g. life-saving, management of road, nature.