

Geographic information systems and their classification

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Abstract

One of rapidly developing branches of information technology over the last few years has become Geoinformatics, in particular, geographic information systems. Currently there is a huge amount of systems designed to virtually any electronic device: a computer, a mobile phone, the Navigator in the vehicle, etc. For example, known is easy to use and very fast developing system of 2GIS, created by the developers of Novosibirsk. Geographic information systems can be used in various fields.

The paper also describes two classifications which explain the essence of geographic information systems.

Geographic information systems are

- a. static
- b. dynamic,
- c. real-time.

Also geographic information systems can be divided into stationary and mobile.

Thus, GIS can be useful for larger organizations and citizens for solving of different tasks, from household to global.

Keywords: *geoinformation system, 2GIS, transportation, telecommunications, oil and gas industry, ecology, agriculture, static, dynamic, real-time system, stationary, mobile, handheld computer, smartphone, Navigator, GPS.*

One of rapidly developing branches of information technology over the last few years has become Geoinformatics, in particular, geographic information systems.

Geoinformatics is the science, technology and production activities on scientific rationale, the design, establishment, operation and use of geographical information systems, geoinformation technologies, GIS application for practical and scientific purposes.

In a broad sense a geographic information system (GIS) is a system of collection, storage, analysis and graphical visualization of spatial (geographic) data and related information about your objects.

If ten years ago at the household level, the most advanced geographic information system Yandex.Maps on which address you can find the right spot and the route to this point, currently there is a huge amount of systems designed to virtually any electronic device: a computer, a mobile phone, the Navigator in the vehicle, etc.

Commonly used GPS coordinates, which you can find any point on the Earth's surface, any object provided with a sensor: a mobile phone, the bus, the machine at the factory, people with a special bracelet, etc.

In modern geoinformation systems, you can create your own maps or routes, to link them to different coordinates, to add any data to finished maps.

Consider, for example, is easy to use and is very rapidly evolving 2GIS, created by the developers of Novosibirsk. As advertised on the website

"2GIS is a complete and always up to date information about the city:

- phone numbers and addresses of organizations;
- their websites and e-mail;
- the schedule of work of the organizations;
- map of your city and its satellite towns;
- routes of urban transport" [1].

When installing the system, we can choose maps of cities that we are going to use. In the system of 2GIS there are many of these cards, they are constantly updated and supplemented. Together with the basic program configuration our card set will be updated automatically about once a month, or at the request of the user. Fresh issues have been published monthly in three versions: for personal computer and for mobile phone and online version.

We will get a detailed map of the city and environs with scalability, addresses, lists of organizations of the city, public transport and other information.

By choosing the type of transport (public or private), we can pave the optimal route from one point to another card. If we are interested in whether the establishment of any type (power point, pharmacy, petrol station and etc.) in a neighborhood of a given point, we can choose the type of institution and the radius in which we are interested then in the circle to select the desired marked point of the program. Selecting on a map of a specific building, we can see what organizations are out there, as well as specified information about them.

Except for user geoinformation systems exist and professional. For example, recently in the public transport navigators are installed with special software that perform several functions. First, the Navigator helps the driver in route according to the schedule and location of stops. Secondly, the coordinates of the vehicle obtained from the Navigator Manager, show where exactly is the vehicle that detects and prevents violations by the driver (the downtimes or Vice versa, the use of the vehicle for personal purposes).

Geographic information systems can be used in various fields. Here are some examples of using GIS:

administrative-territorial management

- urban planning and design of facilities;
- maintenance of inventories of utilities, land, urban planning, green spaces;
- forecast of emergency situations of technogenic and ecological character;
- traffic management and public transport routes;
- construction of environmental monitoring networks;
- engineering-geological zoning of the city.

telecommunications

- trunk and mobile communication, traditional network;
- strategic planning of telecommunication networks;
- the choice of the optimal location of antennas, repeaters, etc.;
- determining routes of laying of cable;
- monitoring of networks;
- operational dispatch management.

utilities

- needs assessment in water supply networks and sewage systems;
- simulation of consequences of natural disasters for systems engineering services;
- designing of engineering networks;
- monitoring the status of utilities and the prevention of emergency situations.

transport

- road, rail, water, pipeline, air transport;
- management of transport infrastructure and its development;
- managing a fleet of mobile assets and logistics;
- traffic management, optimization of routes and the analysis of flows.

the oil and gas industry

- exploration and field survey work;
- monitoring of technological modes of oil and gas pipelines;
- designing trunk pipelines;
- modeling and analysis of consequences of emergency situations.

law enforcement agencies

- first responders, armed forces, police, fire services;
- planning of rescue operations and protection measures;
- simulation of emergency situations;
- strategic and tactical planning of military operations;
- navigation of first responders and other law enforcement agencies.

ecology

- assessment and monitoring of natural environment;
- modeling ecological disasters and the analysis of their consequences;
- planning of environmental protection measures.

forestry

- strategic forest management;
- management of logging operations, planning of the approaches to the woods and design of roads;
- forest inventories.

agriculture

- planning the cultivation of agricultural land;
- consideration of landowners and arable land;
- optimization of transportation of agricultural products and mineral fertilizers.

There are many classifications of GIS, but I would like to cite two possible classification [3], which explain the essence of geographic information systems.

Geographic information systems are

- static,
- dynamic,
- real-time.

Static geographic information systems can be updated once a month (or less frequently), the information contained in them varies slightly in time (for example, city map, road Atlas)

Dynamic geographic information systems are updated more frequently, once a day, an hour, etc. They show the condition of the roads, traffic jams, weather conditions in a certain neighborhood, etc.

Geographic information system *real-time* constantly updated when new information on the whereabouts of any object, state objects with sensors of different nature (video cameras, GPS navigation devices, satellites, etc.)

For example, GIS real time will provide the ride on a difficult road by car, the schedule and the status of the subway lines, control of the aircraft, including takeoff and landing (there must be automatic scaling of the map and get precise coordinates). Also GIS real time required for extinguishing forest fires, consequences of accidents and technogenic catastrophes, natural disasters.

Also geographic information systems can be divided into stationary and mobile.

Stationary geographic information systems are located in data centers, on personal computers that allow them to allocate large resources, high performance, and the ability to handle very large amounts of data. This system may be used for monitoring transport, to monitor weather

patterns, track one or more objects (e.g., cellular phone). Such as finding the location and size of traffic jams and offer alternative routes, already operates in several major cities.

Mobile geographic information systems are usually placed on portable devices such as handheld computers, tablets, laptops, smartphones, navigators, etc. Such GIS are markedly constrained resources and functionality, but have the advantage of quick response to its own movement and change the environment. So, when moving on the highway will be proposed for the small scale, at lower speed the scale increases, it is also possible to get voice guidance on the passage of the selected route.

Also, if the device is connected to the Internet (the server GIS, satellites, etc.), you can get information about traffic jams, accidents and other causes of route changes. In addition, we can get their GPS coordinates and get directions to needed place on the map, by address or GPS coordinate of the end point. You can filter the type of transport: public transport, private car, on foot (see [4])

Thus, GIS can be useful for larger organizations and citizens for solving of different tasks, from household to global.

We can conclude that Geoinformatics is a young and rapidly growing field with many vectors of development, which should be given due attention.

Referenses

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