NETWORK SPATIAL MODELS IN THE WORK OF EMERGENCY MEDICAL SERVICES OF QINGHUANGDAO CITY (PEOPLE'S REPUBLIC OF CHINA)

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Geographic information systems (hereinafter referred to as GIS) in the process of their development have evolved from automated mapping systems to full-featured geographically deployed information systems. Currently, GIS tools are used to inventory natural and labor resources, plan healthcare and public services networks, develop cities, design oil pipelines and highways, develop environmental measures and analyze election results, and solve a wide range of scientific and practical problems.

The main purpose of GIS is to provide the user with reliable and adequately processed information for solving managerial and analytical problems in a visual form that is convenient for operational analysis. In all industrialized countries, hundreds of GIS of various purposes have been created: land, cadastral, municipal, resource, environmental, oceanographic, navigation, etc. At present, the main task is the development of GIS and operational automated mapping, coordination of programs for obtaining, processing and distributing geoinformation, creating GIS networks, improving supporting hardware and software. Currently, GIS act as a means of systemic and targeted accumulation of information and environmental management.

The development and progress of GIS technologies is largely associated with telecommunication networks that provide a wide range of users with access to geoinformation resources. The combination and interaction of means of telecommunications, geoinformatics and automated mapping greatly enhances their effectiveness and significantly expands the scope. Since on a global scale the development of GIS technologies is dominated by trends towards enlargement, integration and globalization of end products, the purpose of this work was to evaluate the effectiveness of applying spatial analysis methods using GIS tools on a “desktop” scale, i. e. in terms of the possibility of creating small user applications by a wide range of users who do not have special training in the field of GIS technologies.

The use of GIS technologies allows, in particular, to solve such problems as determining the location of the nearest object with given characteristics and identifying a network of objects with given characteristics located around a selected point, which seems to be very relevant for the activities of emergency services (rescue services, law enforcement agencies, emergency medical care, and others).

The raster spatial model of a part of the territory of Qinhuangdao city (Fig. 1) served as the topographic basis for the vector network model (Fig. 2).

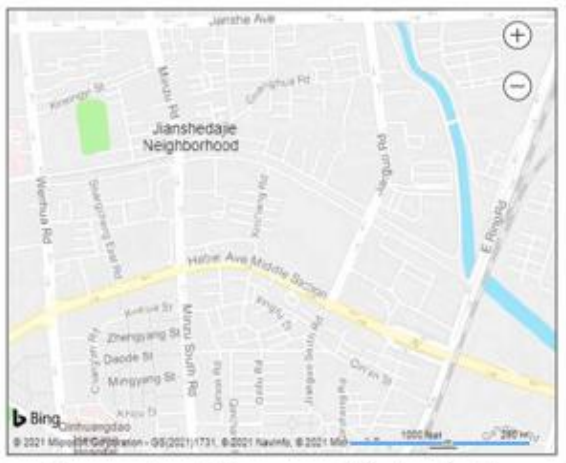

Figure 1. – Topographic basis for creating a network spatial model of a part of the territory of the city Qinhuangdao

Figure 2. – Network spatial model of the main streets and driveways of the studied part of the city Qinhuangdao

Application of geographical information system technology in the activities of emergency service

The simulation of the optimal route for the ambulance crew from the ambulance substations located at different distances from the call address was carried out (Fig. 3-4). Since the routes were optimized by the factor of minimizing the distance traveled, it is obvious that the operational modeling of the optimal route for each call will allow to obtain the effects of reducing the mileage and time to arrival. And a reduction in mileage at one exit, albeit insignificant, taking into account the intensity of the work of the ambulance service and the number of trips, can have a significant positive impact on reducing the corresponding material costs. Reducing the time before the arrival of this service in general is difficult to overestimate.

Figure 3. – The results of modeling the optimal routes for the movement of an ambulance brigade at various addresses

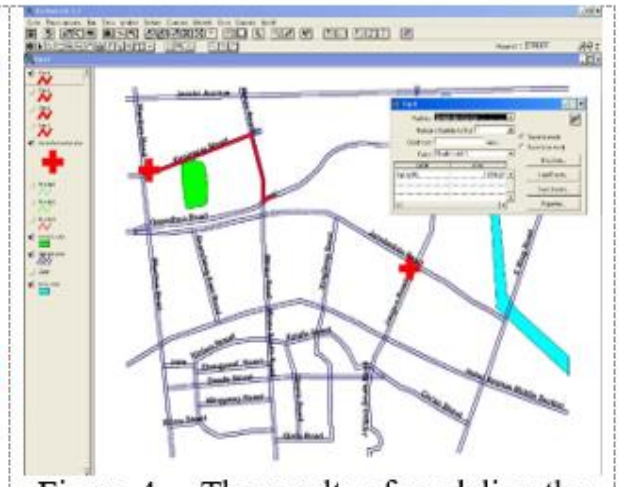

Figure 4. – The results of modeling the optimal routes for the movement of an ambulance brigade at various addresses

Service area optimization modeling

The location of the facility was optimized for maximum accessibility to all consumers within the road network using ArcView GIS and the Network Analyst extension. Spatial accessibility models of a service point located at different points of the territory are shown in Fig. 5-6.

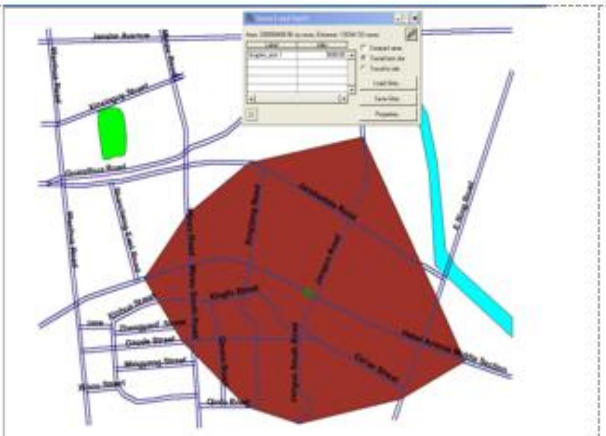

Figure 5. – Optimization of service areas for different location of the service point

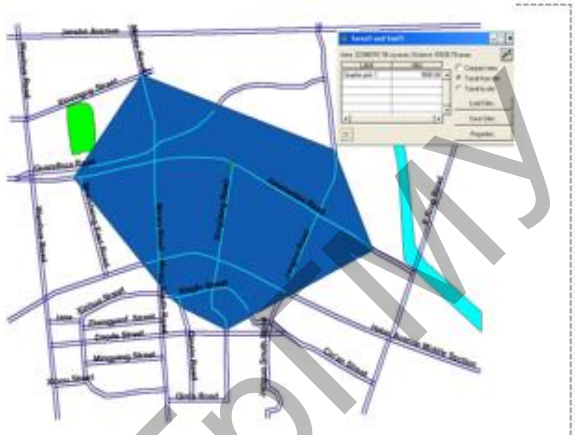

Figure 6. – Optimization of service areas for different location of the service point

Based on the above, it can be concluded that GIS technologies and software can be effectively used in the activities of emergency services to solve network spatial problems in the operational search for the nearest service points and modeling optimal routes for special transport in order to minimize response time and reduce material costs for ensuring the activities of emergency services.

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USE OF COMPUTATIONAL TECHNOLOGIES IN MODERN CARDIOLOGY

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Relevance. The last decade has been marked by the widespread implementation of computational technologies (CT) in cardiology, which has significantly enriched the diagnosis and treatment of cardiovascular diseases. Computational cardiology,