Construction of Emergency Command and Decision System for Military Civilian Medical Rescue Based on Gis

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Abstract. According to the actual needs of the emergency rescue after the explosion accident in the central city, this paper puts forward the design ideas and functional objectives of the military civilian joint emergency rescue command and decision system, and puts forward the structure, operation mechanism and functional modules of the system, which includes eight modules: comprehensive query, space positioning, path analysis, plan management, decision support, command scheduling, decision evaluation, training and performance practice. The advantages of the system include: flexible data management function, powerful spatial analysis and planning function, dynamic command and decision-making and scheduling function, and comprehensive training and drilling function. Under the condition of information, the system can provide a basis for decision makers to make emergency rescue decisions after the explosion accident in the central city, and can greatly improve the efficiency of emergency rescue.

Keywords: GIS, Explosion accident, Emergency rescue, Decision system

In recent years, natural disasters, terrorist attacks and other emergency events occur frequently and force China to pay unprecedented attention to the construction of emergency command capacity in all kinds of disaster events. According to the new international view on disaster management, the more effective the information command organization is, the better the corresponding rescue results will be [1]. Therefore, under the situation of obvious shortage of emergency medical rescue resources in China, effective command, organization and control, and full mobilization of limited resources to maximize the effect are the core of emergency medical rescue capacity building.

The emergency command and decision system is the central nerve of emergency medical rescue after the disaster accident. The system makes full use of modern network and information technology [2], can respond to the emergency crisis in the shortest time, and make all levels and institutions work together to cope with the crisis [3]. The research on the emergency command and decision system mainly focuses on the detailed analysis of the urban public health emergency command system which has been built in a certain area, including the design, composition, function setting and application of the system [4-9]. There is no research on the emergency command and decision system involving the...
military civilian joint medical rescue under the background of the explosion accident in the central city. Therefore, this research plan is based on a GIS system and establishes an emergency command and decision-making system for joint military-civilian medical rescue in the context of a central city explosion.

1. Design ideas and Objectives of Emergency Command and Decision System

1.1 System Design Idea
Explosion emergency decision-making is a complex system decision-making problem \cite{10-11}. The target system is based on system engineering, operation research and artificial intelligence. It realizes the comprehensive integration from qualitative analysis to quantitative analysis by means of computer technology, information technology, geographic information system, expert system, database and simulation mathematical model. Aiming at the semi-structured and unstructured decision-making problems, it constructs an intelligent human-computer interaction system, which can be used for emergency treatment The analysis, reasoning and decision-making functions of the relevant knowledge in the aid field, and the connection with other systems to realize the scientific and reasonable scheduling and management of emergency resources.

1.2 Functional Design Objectives of the Target System

1.2.1 Display, edit, query, retrieval and spatial target location of electronic map. The target system uses electronic map of satellite image to integrate information such as geography, landform, population density and medical rescue resource allocation. In case of an explosion, the command center can quickly find out the location, building layout, population distribution and rescue resource allocation of the explosion accident \cite{12,13}, and realize the positioning function of space targets \cite{14,15}. The scene of explosion accident can be located quickly and the surrounding conditions can be displayed intuitively and maximize emergency response efficiency.

1.2.2 Optimal path analysis. The emergency command and dispatching center needs to determine how to allocate the emergency rescue resources to reach the scene and expand the rescue in the shortest time according to the obtained explosion accident area and the surrounding environment. The core problem is the distance between the scattered emergency resources and the explosion accident area As well as the planning of the best path for a variety of emergency rescue forces to arrive at the scene.

1.2.3 Optimization decision and command scheduling. The target system uses GIS and simulation system platform to reproduce the site situation, and lists alternative plans according to the built-in database and model library. It connects the provincial public security emergency platform, the municipal government public emergency platform, and the subordinate and relevant emergency organizations of each county and district to realize the scientific scheduling of public security, fire prevention, transportation, medical and other resources.

1.2.4 Integrated accident tracking management. The target system is not only the auxiliary system during the explosion accident, but also includes pre-warning and post tracking and evaluation. Through the establishment of case database of accident tracking and handling process, case tracking query and further iteration of model and scheme, the continuous optimization and improvement of system model are realized, and the optimization of tracking decision-making function is realized.

2 Target System Structure and Function Design

2.1 Hierarchical Structure Design of Target System
The structure of the target system is designed in layers. From information data collection to function application, the target system is divided into five layers: information source layer, information
processing layer, central information layer, decision support layer and application layer. See the figure below for the hierarchical structure design of the standard system.

![Hierarchical Structure Design](image)

Fig 1. The hierarchical structure design structure of the emergency command and decision system of the military civilian joint medical rescue under the background of the explosion accident in the central city.

2.2 Operation Mechanism of Target System

After the explosion accident, the operation of the target system includes four links: information collection → model establishment → on-site evaluation → on-site rescue. After the explosion accident, the command decision-making and dispatching operation mechanism of military civilian joint medical emergency rescue is shown in the figure below.

![Operation Mechanism](image)

Fig 2. Operation mechanism of emergency command and decision system of military civilian joint medical rescue under the background of explosion accident in central city.

3
2.3 Functional Module Analysis of the Target System

The target system contains eight functional modules: comprehensive query, spatial positioning, path analysis, plan management, decision support, command scheduling, decision evaluation, and training exercises. The modules are not strictly delimited and independent, with some overlap. And overlap, the specific functional module construction is shown in the figure below.

**Fig 3.** Function module of emergency command and decision system for military civilian joint medical rescue under the background of explosion accident in central city

2.3.1 Integrated query module. After the explosion accident, the information and data needed for the emergency command and decision-making of the military civilian joint emergency medical rescue are extensive, which can be specifically divided into: geospatial information, explosion source information, emergency resource information, etc. These information sources are also very rich, including the linked information at all levels. Public security database, information collection and input of users at all levels, emergency medical rescue information system and GIS system, etc.

2.3.2 Spatial positioning module. Information that requires spatial positioning after an explosion accident includes: positioning of the explosion accident site and the surrounding environment, including the source of the explosion, a dangerous source that may cause secondary disasters, traffic conditions and so on; positioning of emergency resources, including fire forces, medical institutions, transportation Hub, etc.

2.3.3 Path analysis module. The core problem that the emergency command and dispatching center needs to solve after the explosion accident is to plan the best path for the scattered emergency resources to arrive at the scene of the accident rescue, so as to achieve the emergency rescue in the best time by arriving at the scene in the first time.

2.3.4 Plan management module. The plan management function refers to the intelligent search and analysis of policies, regulations, emergency rescue technical specifications, and similar case processing experience based on the plan database built in the target system. Based on the results of the explosion accident site assessment and trend analysis, and further combined with the expert team's perfect opinions. Automatically generate military-civilian emergency medical rescue plan after explosion accident.

2.3.5 Decision support module. The decision support module includes the following functions: On-site assessment of an explosion accident refers to a comprehensive evaluation of the impact range and
hazard level of an explosion accident through indicators such as the number of deaths and injuries at the scene; medical rescue resource analysis is to estimate the manpower required for on-site medical rescue, Physical resources, analysis of emergency resources that can be dispatched in the surrounding area; on-site medical rescue plan analysis is to evaluate the emergency medical rescue plan provided by the system based on the knowledge base and historical disposal plan.

2.3.6 Command and dispatching module. The main function of this module is to give instructions to each support system after determining the emergency medical rescue plan at the scene of the explosion accident, to coordinate the overall rescue work, to connect the mobile terminals and databases of each support system to form a unified comprehensive command decision-making and dispatching platform.

2.3.7 Decision evaluation module. The evaluation is not the ultimate purpose, but the feedback of the disposal results, rationality and scientificity of the corresponding emergency decision and rescue measures to the system and users to further improve the next step of decision-making and command scheduling, and finally optimize the command decision-making scheme in real time according to the site dynamics.

2.3.8 Training exercise module. The training and exercise module is the on-site exercise of different emergency plans for explosion accidents, including the reasonable scheduling of emergency resources, communication and cooperation between multiple departments and within, etc. its purpose is to clarify the positions and responsibilities of all departments and individuals involved in emergency rescue, refine the on-site emergency rescue process, effectively improve the on-site medical rescue ability, and improve each The feasibility of the plan.

3 System Advantages
The advantages of the emergency command decision system formulated in this study are reflected in the following four aspects: first, it has flexible data management function, and the target system covers many general databases, so that users can reorganize, extract and use the data through different models according to their needs; second, it has the following advantages: The powerful spatial analysis and planning function, based on the visual characteristics and interactive positioning of GIS system and the link with a wide range of databases, can intuitively provide users with spatial query and layout planning functions; the third is the dynamic command decision-making and scheduling function, the target system can timely adjust the decision-making according to the real-time rescue status and feedback information on site, and implement the emergency response force Emergency dispatching; fourth, comprehensive training and exercise functions, through which the rationality and scientificity of the emergency plan can be fully improved, and the emergency response ability of all members of the society after the explosion accident can be effectively improved.

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