РАЗРАБОТКА ИНТЕЛЛЕКТУАЛЬНЫХ ТЕХНОЛОГИЙ ТУШЕНИЯ ПОЖАРА В БОЛЬШОМ ГОРОДЕ

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В статье изложена концепция системной платформы и конструктивного контента системы интеллектуального пожаротушения в городской черте. Основываясь на реальном опыте пожарно-спасательной работы в сочетании с тенденцией развития и характеристиками больших объемов данных, технологиями IoT и технологиями интеллектуального города, разрабатывается подход интеллектуального пожаротушения.

Предлагаемая интеллектуальная система предупреждения и тушения пожаров базируется на трех основных аспектах: «автоматика» для предупреждения и раннего оповещения в случае пожара, «интеллект» для управления работой аварийно-спасательных служб и коммерческих предприятий с учетом всех особенностей городских зданий, «информатизация» для координации сил и средств спасательных лужб. Интеллектуальная система предупреждения и тушения пожаров может применяться в больших городах и имеет перспективы в предотвращении пожаров и спасении пострадавших.

Ключевые слова: интеллектуальное пожаротушение; большие объемы данных; интеллектуальный город; IoT.

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RESEARCH ON MANAGEMENT AND APPLICATION OF SMART FIREFIGHTING TECHNOLOGY IN URBAN CITY

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Purpose. This paper is devoted to propose the platform system and construction content of smart firefighting in urban city.

Methods. Based on the actual work of the fire prevention and rescue, combined with development trend and the characteristics of big data, IoT and smart city technology, it analyzes how to develop smart firefighting.

Findings. The demand for smart firefighting construction is mainly concentrated in three aspects: «automatic» for urban fire early warning, «intelligent» for city emergency rescue and business management «informatization» for the fire emergency disposal.

Application field of research. The research results can provide advice on smart firefighting construction to deal with problems of fire prevention and rescue.

Conclusions. Smart firefighting construction should proceed from «automatic», «intelligent» and «informatization», combined with big data, IoT technology, in line with the concept of smart city construction.

Keywords: smart firefighting; big data; smart city; IoT.

Introduction. With the advent of the big data era, big data has penetrated into all human life in social society, people are aware of the importance of big data, which not only changes human life, but also changes people's thinking, determines the knowledge system and working mechanism. Based on the Internet of things, cloud computing, big data and other technical supporting, big data thinking will have different far-reaching impact in the future, and even for a technological revolution.

With the rapid development of big data, Internet of things and smart city technology, the concept of smart firefighting has gradually become a hot topic in the firefighting area.

Smart firefighting includes all areas of fire prevention and protection engineering and fire service emergency response, and it addresses all phases of resilience (i.e., pre-incident, during an incident, and post-incident). Smart firefighting will transform traditional fire protection and firefighting practices to ensure the flow of critical information where and when it is needed.

Fire prevention is the most important essential element of smart firefighting. This will be achieved by enhancing the power of information through enhanced data gathering, processing, and targeted communications. An evolving range of databases and sensor networks will be tapped to create, store, exchange, analyze, and integrate information into critical knowledge for the purpose of smart firefighting.

In the new generation of information technology support, smart firefighting work should take big data as the core, by using of social resources, constantly enrich the sources and types of external data to form big variety of firefighting sample data base, based on the processing technology and computing capabilities, apply data mining, analysis and decision making to realize full coverage of the disaster accurate positioning and effective disposal of social firefighting management, provide strong technical support for smart firefighting.

Big data and big data thinking. Big data refers to a large scale data collection in the acquisition, storage, management and analysis greatly beyond the traditional scope of database software tools, it has four characteristics of data size, fast data transfer, massive variety of data types and low value density. In the field of firefighting, big data brings not just technical changes, but also new ways of thinking [1].

(1) From single sample thinking to full sample thinking

More comprehensive and systematic understanding of the overall situation of things, and accurate description of the characteristics.

(2) From precise thinking to chaotic thinking

More emphasis on data, focusing on completeness and chaos, allowing deviations, and even the existence of erroneous data, to predict overall trends.

(3) From causal thinking to related thinking

Analyze the correlation of things by data mining technology, without the need to understand why, to assist decision-making.

(4) From natural thinking to intelligent thinking

Big data systems automatically acquire valuable information, analyze relevant data, mine hidden rules, active logic analysis, judge situations, and show the ability of predicting the future.

Big data and smart firefighting. With the rapid development of information technology, urban cities has gradually formed the concept of construction of smart city. As an important part of urban city construction, firefighting also has to build an intelligent system to match the smart city construction.

Smart firefighting is to use the technologies of big data, IoT, cloud computing etc., based on the requirement of fire prevention and rescue, get all the valuable information, discover the law, analyze the situation, and realize the intelligent fire prevention and rescue. And it use big data thinking to design the fire work mechanism, to activate the government, industry departments, social units and community masses into the firefighting work, finally establish the firefighting field ecosystem and realize smart firefighting.

Internet of things technology (IoT). The IoT technology is based on a protocol criterion, use information sensing devices as the media to connect items with the Internet to achieve information communication and exchange, then implement the intelligent identification, positioning, tracking, monitoring and management. Internet is the core technology, and the information sensing equipment mainly includes GPS, infrared sensors, laser scanners and so on.

IoT and smart firefighting. The full application of IoT technology in social fire safety management, can strengthen the quality of social fire protection facilities and comprehensiveness of maintenance, and improve the fire safety management standardization and social intelligence, help to improve professional skills of fire management personnel, to alleviate the problem of insufficient rescue force, meanwhile achieve interoperability between public fire management information and resources, realize the construction of mobile office and remote supervision mode [2].

Demand of smart firefighting. The demand for smart firefighting construction is mainly concentrated in three aspects [3]:

(1) To meet the need of «automatic» for urban fire early warning. Urban fire prevention work is closely related to economic and social development. There are more and more hazard factors, so that it should implement the prevention guidelines to strengthen the monitoring work of all time for the city fire safety. It relies on the establishment of interconnected fire monitoring network, and analyzes the fire risk integrally and systematically to improve early warning ability, finally realizes fire early warning automation.

(2) To meet the need of «intelligent» for city emergency rescue. Now, the city is not only facing high-rise and underground buildings, chemical industry, old houses and other «old problems», but also facing the «new issues» deriving from new buildings, new materials, new energy, new technologies, and new projects etc., fire emergency rescue is becoming more and more difficult. Therefore, there is an urgent need to further expand and enrich the means of disposal, and constantly improve the level of scientific rescue. In order to quickly improve the city emergency rescue level, it should pay attention to the «intelligent» of emergency rescue and disposal, especially focusing on the disaster site communication and emergency rescue information support.

(3) To meet the need of business management «informatization» for the fire emergency disposal. As an important component of the government administrative enforcement, it should realize data convergence and information sharing among relevant government departments of all levels. Meanwhile, in order to ensure that the city fire safety, it should implement the sophisticated management based on informatization to meet the demand of firefighting management.

Construction content of smart firefighting.

Construct content of «automatic» for urban fire early warning.

(1) Urban fire automatic early warning system.

To establish automatic fire alarm system, that can monitor the real-time status of fire alarm equipment, fire water system, electricity system and smoke control equipment etc., and achieve integrated and dynamic management of fire control operators.

(2) High-altitude observation video surveillance system.

To install high-altitude cameras in the important and sensitive areas, combined with public security street image surveillance system to facilitate the command center to retrieve the video and understand the disaster situation at any time after the fire.

(3) Fire analysis and evaluation system.

To establish city fire risk assessment model, develop fire distribution system of the city, which can identify the risk situation and trend to determine the order of priority, then forecast to the public and take corresponding measures to dispose.

Construct content of «intelligent» for city emergency rescue.

(1) Fire and emergency rescue information sharing system.

To collect information of city emergency relevant departments timely, comprehensively and accurately, and achieve interconnection of contingency plan and emergency rescue, to enhance emergency monitoring, decision-making and emergency response capabilities, and meet the city's comprehensive emergency rescue command demand.

(2) Personnel handheld terminal system.

To equip Individuals with digital equipment such as individual station, hand-held terminal, individual positioning system, individual life signs transmission system etc., combined with wireless sensing and image technology to enhance individual combat effectiveness and safety levels.

(3) Intelligent call-taking and dispatching system.

To realize GIS map visualization resources dispatching, combined with various types of contingency plan and resource dispatching degree, achieve a real sense of intelligence dispatching.

(4) Firefighting resource management system

To establish firefighting resource management system, so the command control center can manage all the firefighting resources, such as vehicles, rescue equipment, etc., that can greatly improve the efficiency of resource dispatch in the process of emergency response.

(5) Mobile intelligent command system.

To equip the field commander with mobile command terminal, develop mobile command platform, realize real-time dispatching of fire vehicles, fire equipment, fire water etc., to meet the demand of mobile command disaster site.

(6) Digital wireless communication system.

To establish digital wireless communication system, also wireless coverage system in high-rise buildings and underground space closed wireless blind area, equipped with mobile fire communication relay station, to increase communication channels and improve the wireless call rate and sound quality.

(7) Firefighting geographic information system.

To establish firefighting geographic information database, combined with remote sensing data and city 3D geographic data, make internal real map of super high-rise building, chemical area, underground space (subway) and high fire risk areas, to realize real-time acquisition and real-time application of all kinds of geographic information.

Construct content of business management «informatization» for the fire emergency disposal.

(1) Fire simulation and training system.

To establish firefighting and rescue simulation & training system, expand the system in the rescue training application gradually, so as to improve the training level of officers at all levels.

(2) Fire vehicle real-time management system.

To integrate advanced and reliable wireless communication technology, GIS, GPS, RS, Beidou Positioning System, install vehicle terminal with automatic satellite navigation function, to receive and report real-time information with the command control center, realize dynamic monitoring and management of the vehicles.

Conclusion. Now, urban city still have problems of backward firefighting system, chaos management of fire equipment and backward technical means, Smart firefighting construction should proceed from «automatic», «intelligent» and «informatization», Using big data and IoT technology, it is certain that the development concept of smart city is met. In addition, it is the future direction of smart firefighting expertise.

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