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Application of Voice Recognition Interaction and Big Data Internet of Things in Urban Fire Fighting

Xianchun Sun[1*], Kui Cai[1], Bingjing Chen[1], Jingyu Zha[1], Gang Zhou[2]
[1]Bochuang Materials Branch, Jiaxing Hengchuang Electric Power Group Co., Ltd., Jiaxing 314000, China
[2]State Grid Zhejiang Electric Power Co., Ltd., Jiaxing 314033, China

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Abstract. With the continuous development of science and technology, especially computer technology, people need a more convenient and natural way to communicate with the machine. Language can provide people with convenient and efficient information, and speech recognition technology makes this convenience extended to the field of science and deep into human daily life. In this paper, based on human-computer speech recognition interaction system, using big data Internet of things as technical support, the contribution of intelligent social service robot to urban fire protection is studied. In this system, the user can control the action of the service robot through voice command, and the user can also realize voice interaction with the robot. Because of the continuous expansion of information technology and computer technology, human beings have entered the era of information overload, and big data technology has become a hot spot in people's production and life. The integration of big data and Internet of things technology will make the intelligence of human society to a new level, and its development has unlimited possibilities in the future. In recent years, China's urbanization process continues to accelerate, and the land price and house price of cities begin to rise rapidly. In order to meet people's need, a large number of high-rise, super high-rise and underground buildings continue to increase, which not only provides us with convenience, but also makes fire safety a hot concern of the whole society. Fire fighting plays an increasingly important role in the life of urban residents. In order to greatly reduce the lack of fire safety monitoring ability, this paper uses speech recognition technology to design a city fire safety management service platform based on big data Internet of things.

Keywords: Speech recognition technology; Big data; Internet of things; Urban fire protection

I. INTRODUCTION

In this article, the core knowledge of speech recognition technology is introduced in detail, and the system is designed using speech recognition algorithms. According to the characteristics of the embedded system and the functions to be implemented in this article, specific schemes for the implementation of system hardware and software are given. . In this article, the DTW algorithm with dynamic time adjustment is adopted. This method can realize the functions of voice control and human-machine voice interaction with less calculation and less system resources, and conduct training and storage of voice information. Processing of voice interaction, voice resource storage and serial interface communication. In this article, in order to improve the system's ability to accept speech, a multi-channel input circuit was selected in the design to strengthen the system's ability to accept and distinguish speech in different positions and states, which can distinguish the recognition rate. It can also test the performance of multi-channel voice input lines in various states. In addition, voice control tests and human-machine interaction tests of the service robot system will also be carried out. With the development of the quality of the Internet of Things technology, the Internet of Things is becoming more and more popular in daily life, and people have more and more demand for the application of the Internet of Things technology (Attiya et al. 2005). The technology of the Internet of Things has involved sports, military, education and other fields (Balakrishnan and Ethel 2014). At present, many technologies and software related to the Internet of Things have appeared on the market. In the field of sports and security where the Internet of Things is applied, two products designed based on the hardware technology of the Internet of Things have been applied in 18 universities and other places in China. The results show that the software based on the Internet of Things has relatively good results (Ming et al. 2016). It is relatively stable in actual operation, and its expansion performance is also high. Background data shows that the number of users of these two products has exceeded 200,000, which also proves that the application of the Internet of Things technology does have a good effect (Murray and Arnott 1995).

At present, the issue of fire safety has become a concern of the whole society, but most of the existing fire safety monitoring systems are independent systems and cannot form information sharing (Murty and Yegnanarayana 2008). The current fire safety system only has the ability to monitor early warnings, and the system still plays an important role in human factors (Nguyen et al. 2016). If the system's early warning and monitoring capabilities are insufficient, it is likely that a fire accident will occur due to human negligence, leading to major property losses and casualties (Pravena and Govind 2016). If the big data Internet of Things technology is applied to the construction of urban fire safety system, the system platform of the intelligent data collection layer can collect real-time data of fire protection information data, the network application layer can obtain real-time fire processing information data, and the monitoring department can Sending information to relevant personnel through the telephone achieves the early warning function, improves work efficiency, and can effectively reduce the casualties and property losses caused by fire accidents (Pravena and Govind 2017).

II. RELATED WORK

The literature points out that in today's society, machines are like industrial control systems and office automation systems, which can be seen everywhere in human production and life. With the assistance of these systems, people's work efficiency has been greatly improved, and their lives have become more convenient and comfortable (Rachman et al. 2018). However, human service expectations for robots are constantly increasing. In order to meet people's needs and enable robots to more flexibly and accurately understand the individual needs of users, it is necessary to continue research on intelligent machines (Rao and Vuppala 2013). The future development prospects of this market are huge. Language, as the most direct, most convenient, and most natural means of information exchange, is the most important way for users and robots to communicate with each other (Sarkar et al. 2014). At present, speech recognition and conversion systems can realize human-computer interaction (Schröder 2009). These systems are also called intelligent machine interfaces, so in theory, speech recognition technology can be added to any program. This technology is highly universal (Tao et al. 2006). The literature pointed out that with the continuous improvement of China's urbanization level, the continuous upgrading of residents' lifestyles and consumption patterns, the continuous transformation of social production structure, the emergence of a large number of shopping centers and messy complex buildings in the city, and the continuous consumption of various factories in the city increase (Theune et al. 2006). The complexity of architecture is getting higher and higher, and the complexity is mainly reflected in two aspects. First, the complexity of the environment. For example, commercial buildings combine functions such as catering, shopping, entertainment, hotels, offices, etc., with complex internal structures and greatly increasing operating difficulties. Second, there are various causes of danger, electrical equipment is everywhere, pipe gas and cork gas are extremely common, smoking is difficult to control, interior decoration welding work is frequently performed and there is a lack of appropriate protective measures (Toda et al. 2007). Various problems have brought great obstacles to the maintenance of fire safety. Most of the current fire cases are difficult to detect in time and difficult to rescue (Vekkot et al. 2019). With the continuous gathering of population and the increase of buildings, fire safety problems will become a problem in the future. The literature shows that the use of collaborative filtering heuristics can greatly improve the availability of information, and the services generated based on this method will also be more professional and personalized (Vekkot and Tripathi 2016a). It is mentioned in the literature that the Internet of Things is an object-centric data source network (Vekkot and Tripathi 2016b). At present, more and more testing equipment have emerged on the market. With the strong support of Internet technology, the Internet of Things technology has surpassed the Internet and has become a source of massive data (Vekkot and Tripathi 2017). The traditional Internet can provide a series of applications including file transfer, e-commerce, and online games (Verhelst and Roelands 1993). The use of the Internet of Things has become a social service in which the physical world is used as a data source. It covers areas such as urban safety inspection and maintenance, smart city construction, target recognition and tracking (Verma et al. 2015). The Internet of Things is a highly universal technology, and there are more aspects that can be applied to this technology in the future. According to the literature, the emergence of big data has changed not only the way people live, the way people work, the way enterprises operate, but also the way of scientific research. Big data, like natural resources and human resources, is an important strategic resource with great value. Its application in science, economy, and society has attracted attention from all walks of life. Recently, top international academic journals have published a large number of special issues on big data research. With the development of the times, big data will have a greater impact in our daily lives.

III. SPEECH RECOGNITION INTERACTION AND THE THEORETICAL BASIS OF BIG DATA INTERNET OF THINGS

A. Theoretical basis of speech recognition interaction

A.1. Template matching and dynamic time warping

Data itself cannot create value. The key to making the value of data visible is to analyze how to use big data to help actual business. Big data often shows the characteristics of high-level, large-scale, and complex structure. How to use and give full play to the value of these materials has aroused the attention and research of all walks of life. At present, people are beginning to study the dualization of data, which means storing data with high efficiency and low cost, exploring new data expression methods, trying data fusion, and processing non-formal and inverse-form data with higher efficiency. Researchers apply big data analysis tools to various industries, such as data processing, storage, and communications. With the support of big data, the energy consumption of new technologies is greatly reduced. Among them, feature selection and learning is a method of data processing, and it is a hot topic of widespread concern in the fields of statistical pattern recognition, machine learning, and data mining.

In the current big data environment, many researchers mine the knowledge contained in the data to guide actual production and specific applications. Among them, the selection and learning of features are particularly important. This can not only solve the difficulties in the generation of multidimensional numbers, but also alleviate the rich information. The lack of knowledge reduces the complexity of calculations and operations, and can better understand and understand data. The normalization function of time adjustment is m=W(n), and the time axis of the input template can be mapped on the time axis m of the template using a nonlinear method with reference to n, and W satisfies

$$D = \min_{w(n)} \sum_{n=1}^{N} d[n, w(n)] \tag{1}$$

This article focuses on data from multiple sources but with different structures. In the big data environment, the comprehensive understanding of information will no longer limit data sources with a single scarce description. The storage and description of data show the characteristics of wide sources and multi-view manifestations. Data samples from different sources contain different knowledge structure information, which express different views among data samples from different perspectives. In order to obtain data with a complex structure and a variety of source code descriptions, this paper has done a lot of data sorting and fusion, the purpose is to find the best time planning function and the corresponding D(n,m).

$$(n, m) = \min_{w(j)} \sum_{j=1}^{n} d[j, w(j)] \tag{2}$$

The normalized aggregation formula is:

$$r^{l}_{c,s} = k \sum_{s \in S} \mathrm{sim}(s', s) \cdot r_{c,s} \tag{3}$$

In general, the normalization factor k is expressed as:

$$k = 1 / \sum_{s \in S} \mathrm{sim}(s', s) \tag{4}$$

Researchers often use the recall rate to accurately determine the accuracy of TopN recommendations. R (u) assumes that the recommendation system lists a list of items recommended to users, and T(u) represents a list of user behaviors in the test set. The mathematical performance of the final recall rate is:

$$\mathrm{Re\,c\,all} = \frac{\sum_{u\in U} |R(u) \cap T(u)|}{\sum_{u\in U} |T(u)|} \quad (5)$$

The similarity between item i and item j can be measured by Pearson's correlation coefficient:

$$\mathrm{sim}(i,j) = \frac{\sum_{c\in C}(r_{c,i}-\bar{r}_i)(r_{c,j}-\bar{r}_j)}{\sqrt{\sum_{c\in C}(r_{c,i}-\bar{r}_i)^2 \sum_{c\in C}(r_{c,j}-\bar{r}_j)^2}} \quad (6)$$

B. Big data algorithms and the foundation of the Internet of Things

B.1 Big Data Algorithm

In recent years, research on feature selection methods and their applications based on cluster theory has attracted much attention. When we encounter some uncertain or inaccurate problems in the process of research, theory can be a very effective tool, which provides a theoretical basis for the research of the problem. In this article, according to the granular theory, in addition to processing prior information, no other data need to be analyzed. The specific situation is shown in Figure 1. It is based on the premise of keeping the classification unchanged and avoiding the loss of data. Through the simplified processing of knowledge, it proposes classification rules or problems and provides decision-making services.

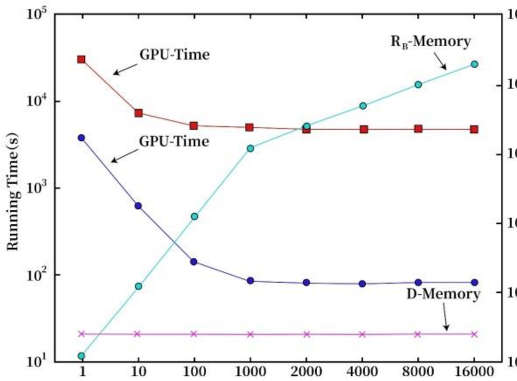

Fig. 1. Research on efficient feature selection and learning algorithms in a big data environment

The main frequency of GeForceGTX480 is about twice that of TesIaK20m, so in small tasks, GeForceGTX480 may perform better than TesIaK20m, as shown in Figure 2.

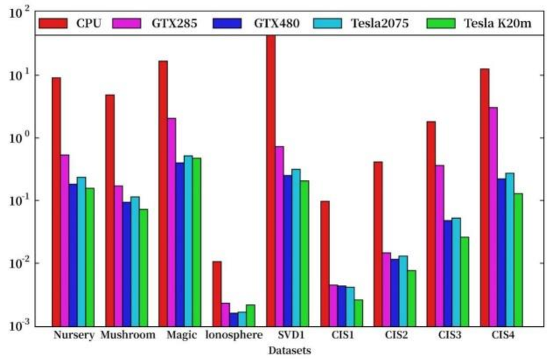

Fig. 2. The average running time of different types of CPUs and multiple types of GPUs

Experimental verification on different types of GPUs and GPU clusters is shown in Figure 3:

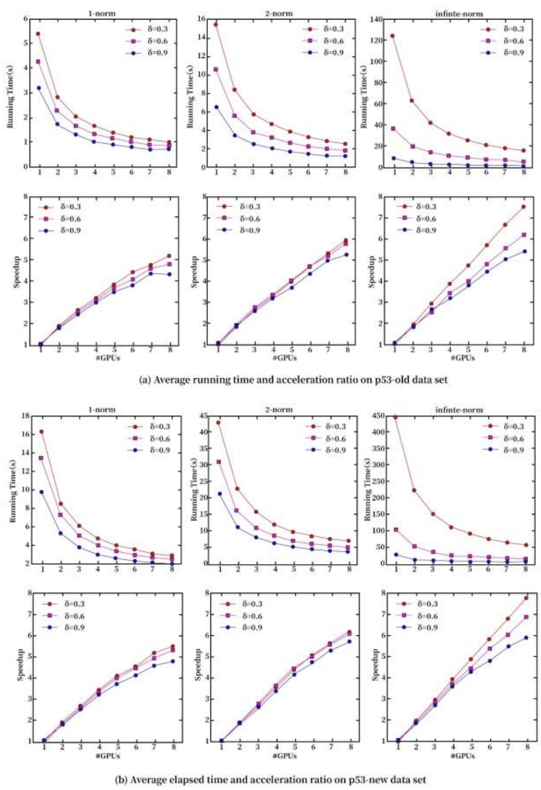

Fig. 3. GPU average running time and speedup ratio

The indistinguishable relationship on the domain U is defined as

$$\mathrm{IND}(B) = \{(x,y) \in U \times U \mid f(x,a) = f(y,a), \forall a \in B\} \quad (7)$$

S can be defined as a reduction of the information decision system, which satisfies:

$$(l)\mathrm{POS}_B(D) = \mathrm{POS}_C(D) \quad (8)$$

The distance often used in the calculation process is the Euclidean distance. In theory, other distances are also feasible to meet the requirements. In the 1-dimensional space, the Minkowski distance between any two points is defined as:

$$\Delta^{p}(x,y) = \left(\sum_{j=1}^{l} f(x,a_j) - f(y,a_j)^{p}\right)^{1/P} \quad (9)$$

When p=1, it is called the Manhattan distance, that is

$$\Delta^{l}(x,y) = \sum_{j=1}^{l} f(x,a_j) - f(y,a_j) \quad (10)$$

When p=2, it is called Euclidean distance, that is

$$\Delta^{l}(x,y) = \sum_{j=1}^{l} f(x,a_j) - f(y,a_j) \quad (11)$$

When P= ∞ , it is called Chebyshev distance, namely

$$\Delta^{\infty}(x,y) = \max_{j=1}^{l} f(x,a_j) - f(y,a_j) \quad (12)$$

The set-valued rough set model gives the decision information system S=(UAVf) compatibility relationship is defined as:

$$T_B = (x,y) \in U \times U, \forall a \in B, f(x,a) \cap f(y,a) \neq 0 \quad (13)$$

$$L1(\varphi) = \sum_{i,j} W_{ij} + \sum_i b_i + \sum_i b_i' = \|W\|_{i1} + \|b\|_1 + \|b'\|_1 \quad (14)$$

$$L2(\varphi) = \sum_{i,j} W_{ij}^2 + \sum_i b_i^2 + \sum_i b_i'^2 = \|W\|_F^2 + \|b\|_2^2 + \|b'\|_2^2 \quad (15)$$

The time complexity is

$$O(n \log m + n + n^2 \times B + n^2 m + n^2 m) = O\left(n^2(B+m)\right) \quad (16)$$

The space complexity is

$$O(nm + n^2 + nm + nm) = O\left(n(n+m)\right) \quad (17)$$

The time complexity of the whole process is

$$O\left((n \log m + n) + (n \times nB) + 2 \times (n \times nm)\right) = O\left(n^2(B+m)\right) \quad (18)$$

The space complexity is

$$O(nm + Tn + nm + nm) = O\left(n(T+m)\right) \quad (19)$$

The hidden layer representation mapping is reconstructed:

$$z = f(Wz + b) \quad (20)$$

The characteristic function is defined as:

$$g_i = \begin{cases} 1, x_i \in X \\ 0, x_i \notin X \end{cases} \quad (21)$$

The data matrix of B on U is expressed as:

$$U_B = |x_1, x_2, \dots, x_n| \quad (22)$$

The induced diagonal matrix is defined as follows:

$$A_{C_B} = diag\left(\frac{1}{\lambda_1}, \frac{1}{\lambda_2} \cdots \frac{1}{\lambda_n}\right) \quad (23)$$

The n-dimensional column vector is represented as H(X), which is called the basic vector, and is defined as follows:

$$H(X) = \Lambda_B R_B X \quad (24)$$

The n-dimensional column vector of the following approximate set:

$$C_B(X) = R_B \otimes X \quad (25)$$

B.2 Fundamentals of the Internet of Things

In order to allow physical objects and real objects to be better connected to provide better services, it is necessary to use the Internet of Things to allow communication between machines, data transmission and decision-making, autonomous organization of networks, security and personal information A variety of advanced technologies such as protection, cloud computing, sensing and triggering have been integrated. The reference model of the Internet of Things is briefly summarized as shown in Figure 4.

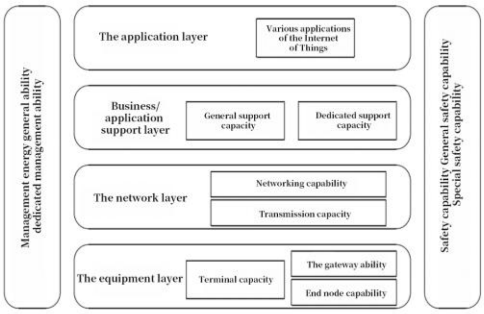

Fig. 4. Reference model of the Internet of Things

IV. DESIGN AND IMPLEMENTATION OF URBAN FIRE SAFETY MANAGEMENT SERVICE PLATFORM BASED ON BIG DATA OF INTERNET OF THINGS

A. Overall design of urban fire safety management service platform

This article mainly introduces the overall design of the system. In the system development business, the overall design of the system belongs to the core part of the system. The related design of the system is based on the analysis results of the system requirements, including system design, software design, functional structure design, etc. This chapter gives a detailed explanation of these contents and makes related charts. The application hierarchy here refers to the network platform of the city fire safety management service system center. The default framework it displays is shown in Figure 5:

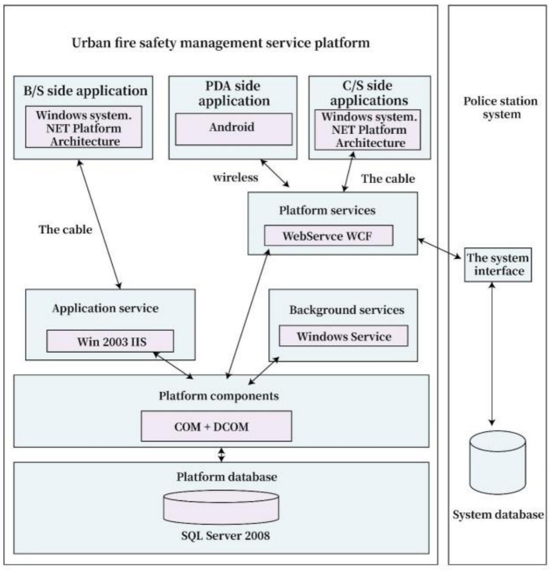

Fig. 5. Overall design of urban fire safety management service system

B. Detailed design and implementation of urban fire safety management service platform

Figure 6 shows the software design of the fire protection information system. According to the actual situation, the urban fire safety management service platform can cut off the connected parts of the system, cancel some unused cores, and make the system as small as possible during the development process. Make the kernel occupy a better position in the system, and at the same time improve the operating performance of the system. Among them, the core of the operating system includes upgrading the BSP card and configuring and executing the image presented by the operating system. BSP is developed on the basis of the airborne hardware platform and is a fundamental part of the transplantation process of the operating system. The initialization of BSP is closely related to hardware ports such as network and serial port. Only after BSP is initialized, the operating system can run normally. The design of DM9000 network card communication application software and the design of RS232 communication software can be carried out on the basis of the normal operation of the system. The development of application software, including the procurement interface, is based on the onboard operating system.

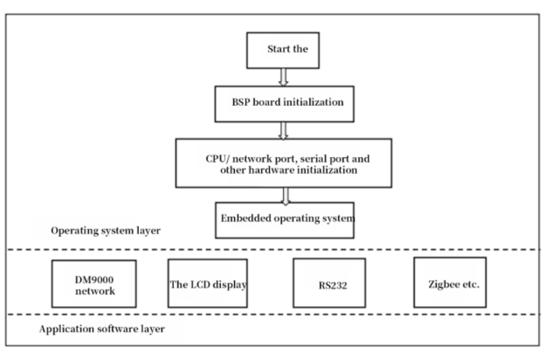

Fig. 6. The overall architecture of the information acquisition system software

C. System test

With the rapid development of information technology and the Internet, people are generating more and more data, and the rapid growth of data has brought opportunities and crises to people. The opportunity is because the data has a huge scale and there is a high degree of heterogeneity between the information, and this information is of inestimable value; and the crisis is because it is difficult for people to filter out the information that is useful to them among these complex information. . In order to solve the crisis that information is difficult to use efficiently, scientists have begun to study continuously. At present, professional data and indexes such as traditional web applications, portal websites, search engines, etc. have been unable to meet people's expanding demand for personalized information. Because they are essentially to help customers filter data and provide customers with some preferred information, but they cannot meet customers' one-to-one needs, traditional applications are difficult to solve the problem of excessive information.

The recommendation system can provide great help to solve the problem of excessive information. It models the user's interest based on the user's historical behavior and other documents, and then uses the user's interest model to make customized recommendations, and recommends the information and products they are interested in to the user. Compared with search engines, the recommendation system can take into account the user's interests and hobbies, make customized calculations, and determine the user's hobbies through the results of the system research, and users can meet their information needs based on these recommendations.

In fact, the recommendation system has made a lot of contributions to satisfy the user's requirements in the excessive amount of information. The research value of recommender systems becomes more and more important with the growth of data. People can feel the power of this technology in people's daily life. It has achieved great success in business, especially e-commerce. The shopping platform will infer the user's preferences based on the user's browsing history, and recommend products on the homepage. Collaborative filtering is the most widely used recommendation technology in recommendation systems. However, collaborative filtering recommendations have many problems, such as cold start problems, low evolution and other problems. Faced with the influx of large amounts of data, the existing collaborative filtering algorithms are insufficient to meet people's demand for information. In previous studies, most researchers chose collaborative filtering algorithm as a means to help users obtain information, but it did not take into account that users also have personalized information needs, so this method cannot be produced in this era of information explosion.

After the system design is completed, the performance and specific parameters of the system need to be tested and debugged to improve the system's shortcomings. Perform system acquisition test, content hardware platform debugging test and node test respectively according to different functional modules to obtain fire protection information. During the operation of each functional module, it is necessary to ensure that the system can correctly present accurate data and post-processing operation results, so that the implementation of the system can help users solve practical problems. The terminal information collection software is responsible for real-time collection of all the parameters of the fire-fighting sensors of each node, and transmission of the data collected by the ZigBee network. The software part of the main control platform mainly receives the information of the coordination node, analyzes the various parameters collected by the collection terminal, and finally switches from the Internet to the Web data platform through the integrated mobile device. The specific functional flow of the terminal collection node data collection program is shown in Figure 7.

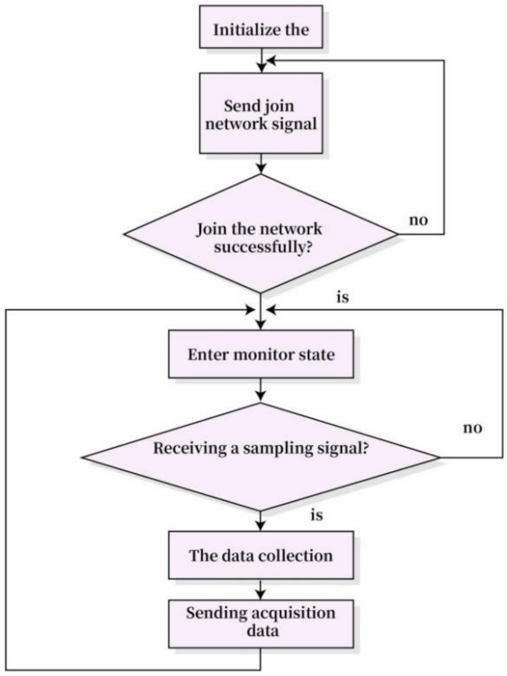

Fig. 7. The functional flow of the data collection program of the terminal collection node

This article is based on the Internet technology service platform, with the technical support of the big data Internet of Things, and proposes a relatively complete plan for the design of the fire safety monitoring system. It combines a high-frequency technical service management system, uses computer and telecommunications networks, network technologies, and databases, and cooperates with fire safety protection units to improve the information management capabilities of fire fighting equipment. The management of fire information can assist the grassroots police station to monitor the fire safety of the fire fighting unit and collect the safety information of the fire fighting unit. The firefighting authority will monitor the fire safety information collected by the grassroots police station in real time, and at the same time improve the ability of information tracking and management, and provide timely warning of hidden fire safety hazards discovered by the system. The system makes full use of computer network technology and the latest cutting-edge technology of the Internet of Things. And combined with the fire safety monitoring and intelligent management of the fire fighting unit. Table 1 is the test environment parameters of the urban fire safety management service platform based on the Internet of Things.

Table 1

System function test environment

Configuration type	Program server configuration	Database server configuration	Client configuration
Hardware configuration	Zhengrui 121S1-4584H; Processor: XeonE5620 Memory: 4G DDR3 REG ECC Hard Disk: SAS 500G	Zhengrui 121S1-4584H; Processor: XeonE5620 Memory: 4G DDR3 REG ECC Hard Disk: SAS 500G	ASUS brand CPU series: AMD; CPU frequency: 3.2GHz; Memory capacity: 3GB; Memory type; DDR3 8G
Software configuration	Operating System: Windows Server 2003HS7.0.NET Framework4.0	Operating system: Windows Server 2003; Database Management System: SQL Server 2008	Operating system: Windows XP/Windows 7 Browser: IE8.0, IE9.0, 360
Broadband configuration	200M bandwidth	200M bandwidth	2M bandwidth

After the test environment is selected, a test case must be designed before the test. From the target system of the network server, the function module for debugging the fire safety protection device to locate anomalies, the management module of the basic user information of the fire equipment statistical function module, and finally to the fire equipment information management function module, check whether these modules meet the requirements of the target system. The specific conditions are as follows Table 2 and Table 3.

Table 2

Test case table of statistical function module of abnormal fire protection equipment of fire protection unit

Project/software	Urban fire safety management service platform based on the Internet of Things (Web layer)	Program version: v3.2
Function module name	Statistics of abnormal fire fighting equipment	
Related use cases	No	
Features	Statistics of various types of abnormal fire-fighting equipment	
The purpose of the test	Verify whether it can accurately count all kinds of abnormal fire equipment	
Reference Information	Requirements description About the function description of this module	
Test Data	Change the original abnormal data of various fire-fighting equipment	

Performance measurement plays an important role in software quality assurance. The aspects included in the software performance measurement are not only rich, but also very comprehensive. The goals of performance testing usually include clients, network systems, and servers. The specific content of the test mainly includes the following three aspects: first, use software to test the performance of the client; second, test the performance of the software system during Internet transmission; third, test the performance of the server software. Use Gtmetrix to measure the speed and completeness of the target system's loading of web pages, and use Webkaka to test the pressure generated by the system platform.

Table 3

Test case table of the geographic location search and positioning function module of the fire safety protection unit

Project/software	City fire safety management service platform based on the Internet of Things (Web layer)	Program version: v3.2
Function module name	Position search and location of fire safety protection units	
Features	Explore and locate the geographic location of the fire safety protection unit and mark it on the map	
The purpose of the test	Verify that the geographic location of the searched fire safety protection unit can be accurately located	
Reference Information	Requirements description About the function description of this module	
Test Data	Enter the names of several fire safety protection units that need to be searched to search and locate	

From the current situation, it is still a good research direction to improve the ability of the recommendation system to process big data to improve the traditional recommendation algorithm. This paper establishes an approximate algorithm of the traditional recommendation algorithm to facilitate parallel computing. Although the distributed matrix factorization algorithm of Hadoop in this article is not very successful, this research direction still has a good development prospect and will not be abandoned. For further work, consider using the MPI framework to realize the distributed recommendation algorithm.

Gtmetrix is a foreign free webpage loading speed evaluation service. It can provide detailed reports on webpage loading speed information and keep records of each website, making it easier to view the historical changes in website loading speed, as shown in Table 4. The report shows that the overall loading speed of the page is quite good, at a level B, but what is less satisfactory is the low usage rate of the browser cache.

Table 4

Test case table of information input function module

Project/software	Urban fire safety management service platform based on the Internet of Things (Web layer)	Program version: v3.2
Function module name	Enterprise Information Entry	
Related use cases	no	
Features	Enter the information of the fire safety protection unit (enterprise)	
The purpose of the test	Check whether it is possible to quickly and accurately input relevant information and data	
Reference Information	Requirements description About the function description of this module	
Test Data	Unit code, unit name, unit address, postal code, number of employees, date of establishment	

If you want to check whether the quality of the software meets the standard, software testing is an indispensable part. As shown in Table 5, this chapter mainly introduces two parts of the test, namely, the test to obtain the information collection layer and the software test on the system platform network. The test to obtain the information collection layer is subdivided into the test to obtain the information node and the test to obtain the information system network. The functional test is carried out in the network layer software of the target system, and the performance test will require the operation of the system to be carried out in accordance with the requirements. After systematic testing, this article found that all the functions of the system platform have reached the expected indicators, and found that the web page loading speed of the network layer is relatively fast, which can make the concurrency pressure of the platform reach the expected indicators.

Table 5

Test case table of the function module of fire equipment information input

Project/software	Urban fire safety management service platform based on the Internet of Things (Web layer)	Program version: v3.2
Function module name	Enterprise fire equipment information entry	
Related use cases	no	
Features	Enter enterprise fire equipment information	
The purpose of the test	Verify whether the company’s fire equipment information can be entered quickly and accurately, especially equipment pictures	
Reference Information	Requirements description About the function description of this module	
Test Data	Equipment NFID number, equipment picture	

At present, various developments to achieve economic benefits have achieved good results based on the continuous promotion of Internet of Things technology and applications in various fields, but many problems have also arisen: First, there are many hardware manufacturers and their level of skill. Inconsistent, a unified standard and quality supervision system has not been formed, resulting in poor hardware compatibility and low product quality. This actually increases the application cost invisibly and restricts the application and development of the Internet of Things technology. The second issue is the security protection of the personal information of the management object, that is, how to protect the personal information in the system from being intercepted by others. In addition, the main reason that affects the application and development of the Internet of Things technology is that the current domestic communication network is composed of multiple network platforms such as China Mobile and China Unicom. How to conduct communication management and resource allocation is a complex issue. For the specifications and standards for constructing the network, we have put forward many proposals. In addition, during the design and development of the system, whether the fire-fighting equipment is operating normally is also related to whether the inspection work can be carried out normally. There are problems with fire-fighting equipment, but if the problem is not fully exposed, information on changes in fire-fighting settings cannot be collected. In the information management capacity requirements, in order to strengthen the prevention of malicious and false information attacks, the network service center management platform of the jurisdictional authority needs to further strengthen the construction of the system. The synchronization of RFID storage information, the synchronization of the information stored in the background management and the information stored in the database, the ability to process information in a timely manner, and whether the data has strong integrity and accuracy during the transmission process, these problems need to be gradually resolved and improve.

The urban fire safety management and service system based on the Internet of Things technology is an important basic information platform for the construction of an informatized city, as well as an important foundation for the construction of a digital and informatized city. However, the fire safety monitoring and management system contains a variety of technical content, including data storage management and analysis, network information security transmission, cryptographic technology and other content. Therefore, this paper only designs the overall structure of the system platform and tests the functional modules of some subsystems. At present, the system platform is still in its infancy and is not stable. There are still many areas that need to be modified and improved in order to collect and reflect the stability of the fire protection information system platform, the accuracy and timeliness of the fire information transmission process. With the further application and upgrade of the system platform, other functions and performance of the system are gradually improved, truly realizing the integration of urban fire safety management and monitoring information.

V. CONCLUSION

This article mainly studies the application of speech recognition system and big data Internet of Things technology in urban fire protection. In this article, to enhance the reliability of the fire protection system, starting from the hardware and software aspects of the system, the system can enable fire safety maintenance personnel and service robots. The behavior that generates voice interaction between the staff can voice control the robot, so that the robot also has the ability to communicate, and finally achieve the effect of communicating with the robot. In this article, a multi-channel voice input circuit is also designed. With the support of this circuit, the robot can receive the user’s voice commands in different positions. The hardware circuit of the system is small in size but high in cost. The use of dynamic time distortion algorithm can realize the speech recognition of robot sentences.

In this article, the voice control system has been trained many times, and the storage software has been improved many times, so that the voice resources can be scheduled and stored in the voice interaction and serial communication at any time, and finally the user’s voice to the robot is realized. Control and smoother communication between the user and the computer. Make the robot receive the user’s voice and understand the meaning of human language, and use voice to communicate with humans. This paper designs and implements a write cache system for hiding small batch write operation files. Once the files are saved, they will be merged into other files according to different requirements. When files are logically connected to a large file, they are packaged into the underlying HDFS, but the writing speed of small files in HDFS is not as fast as the parallel writing mechanism in the cache. In this article, an integrated file system is designed to organize files more efficiently through a parallel structure. Running parallel write integration tasks can increase the speed of writing files. Urban fire safety management uses the Internet of Things technology to satisfy the city’s growing fire safety monitoring needs. The development of the urban fire safety supervision and management service system integrates radio frequency technology, communication technology, Web technology and database technology to carry out fire safety monitoring. Supervise and collect fire safety information from fire fighting units. Firefighters monitor the fire safety information collected by the local police station in real time, and use the monitoring equipment based on the Internet of Things technology and the system for collecting fire equipment safety information so that various information can be better monitored, and fire safety issues can be early-warned. Intelligent cluster management of fire safety control and fire unit.

Conflict of interest

The author has declared to have no competing interests.

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