Construction of Information Service System for the Elderly Based on Cloud Computing

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Abstract. With the advent of an aging society, the absolute number of the elderly has accounted for a considerable proportion of the social population. With the development and listing of Internet technology and mobile devices, it has become a social trend to send and receive information through handheld terminals, servers, personal computers and other platforms, and mobile information came into being. However, due to their physical conditions, the elderly in vulnerable groups can not easily access information and participate in social communication better. Obtaining mobile information with real-time efficiency through mobile devices just solves this problem and meets their needs to a large extent. Based on cloud computing and big data, this paper investigates the information services of many large communities, analyzes and summarizes the problems in the information services of the elderly in the community by synthesizing the information needs of 500 elderly people. According to the analysis results, an information service model for the elderly is proposed. The calculation results show that the general information service architecture based on cloud computing can reduce the payment cost of information services by about 31.22%.

Keywords: Cloud computing; The elderly; Information service; System construction.

1. Introduction

The emergence of cloud computing has greatly improved the quality and efficiency of related services, greatly strengthened the network capacity, optimized a variety of functions, and greatly changed the mode of information services [1]. With the support of cloud computing, users can better apply online services, operate effectively on the network side, and reduce operating costs very effectively. At the same time, users can also obtain more software applications with less expenditure, achieving direct communication between users and developers, reducing operating costs and improving software application efficiency [2]. Building a set of elderly information service system with the help of cloud computing and mobile network business operation platform will reveal the trend of technology development in terms of system network, hardware platform, system software platform and other value-added business service technologies, and fully prove the practicality and operational stability of the elderly information service platform system when it is put into commercial operation in the future [3]. Considering the goal of componentization, the common modules are designed uniformly, and different parts are designed as independent functional entity modules. Realize the specific needs of the elderly platform business through flexible combination [4]. The functional modules usually use a multi-level structure, which fundamentally provides a stable framework for the elderly information platform and facilitates the implementation and update of business processes [5]. The system mainly carries daily consultation and emergency assistance services for the elderly, including telephone traffic control, life information retrieval management, information release and other functions [6]. At the same time, a positioning platform is built to realize remote positioning business management. Children can remotely locate the elderly through web, short message and multimedia message [7].

2. Demand analysis of information service for the elderly

Information service mainly collects, evaluates, selects, organizes, and stores scattered information, makes it regular and convenient for users, and studies users and information needs in order to provide them with valuable information [8]. With the acceleration of global aging and the advent of the era of information explosion, the information needs of the elderly involve all areas of life. The

information needs of the elderly include the stages of information consumption by the elderly, acquisition and possession of information by the elderly, absorption and processing of information by the elderly, and information creation stages [9]. It includes four aspects: requirements for the content and form of information, requirements for information sources, requirements for information acquisition methods, and requirements for information acquisition methods. It involves aspects such as physiology, safety, social interaction, esteem, and self-actualization [10].

Most of the elderly can't take care of themselves in their lives because of the decline of their physical functions. At the same time, with the rapid pace of life, the children of the elderly are not around for a long time, which leads to the phenomenon of "empty nest families". In order to provide better and more targeted information services to the elderly, a special group, researchers conducted in-depth field understanding of the information needs and information services of the elderly in 10 large communities in urban and rural areas by means of interview surveys and questionnaires. Through comprehensive analysis of the questionnaire, face-to-face interview and interview notes, we come to the problems in the existing information service mode of urban communities and put forward opinions on them (see Figure 1).

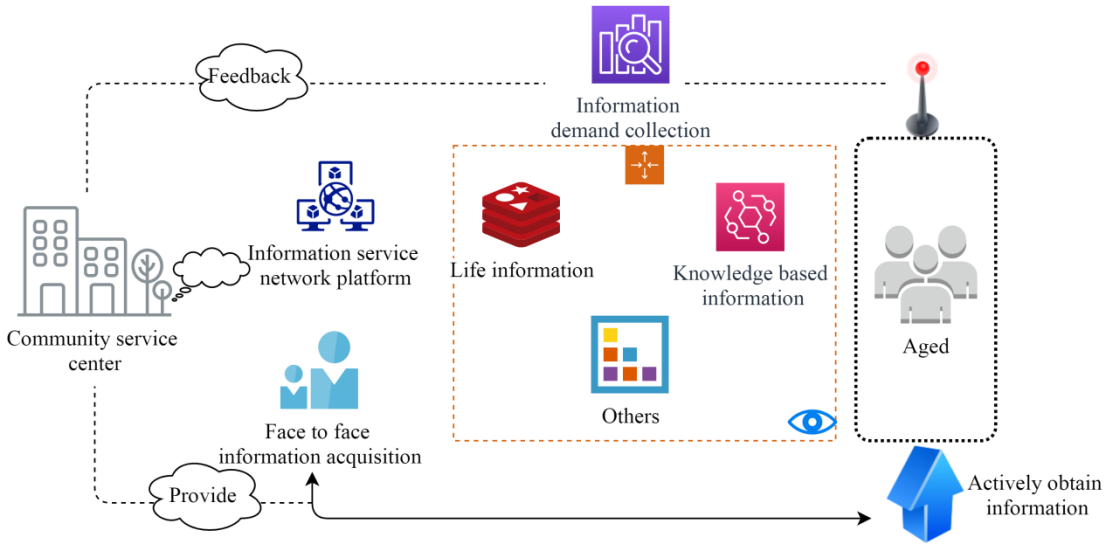

Figure 1 General community information service model

According to the information demand data of the elderly obtained from our survey, it can be seen that there are many types and varying degrees of information demand of the elderly. At the same time, their access to information is selective, and they will selectively find the information they really need. It can be seen from Figure 1 that the community information service system mainly includes two parts, namely, the community information service platform and the face-to-face consultation service. When the information services provided by the community through the information service platform can not meet the information needs of the elderly, they can go to the community service center for face-to-face manual consultation, and give information feedback through the Internet and the consultation center to put forward their needs and suggestions. However, before the implementation of information services in the community, there is little research and analysis on the information needs of the elderly, and some information content that the elderly need very much is ignored. The types and sources of information needs of the elderly are summarized in Table 1 and Table 2 below, which provide an application basis for the construction of information systems.

Table 1 Information acquisition channels for the elderly

Project	Number	Proportion
Television broadcasting	124	24.80%
Books and magazines	36	7.20%
Friends and neighbors	115	23%

Community activities	174	34.20%
Internet	51	10.20%

It can be seen from Table 1 that the urban elderly have a wide range of information access channels and have certain applications to the network. The elderly in rural areas still mainly obtain information through traditional media such as TV and radio, and they also obtain information from other populations. Most of the elderly in cities use mobile phones and TVs, and they also have some applications for smart products. Most of the elderly in rural areas use TV or village run organizations. Most of the urban and rural elderly will not get information through the network, but the acceptance ability of the urban elderly is relatively strong.

Table 2 Types of information that the elderly pay attention to in daily life

Project	City	Countryside
Weather forecast	73.60%	76.36^%
News report	69.12%	71.36%
Health information	54.14%	25.78%
Entertainment information	15.26%	67.25%
Traffic information	10.26%	1.33%
Social welfare	29.51%	9.14%
Shopping information	21.74%	0.36%
Daily leisure	19.36%	7.58%
Others	12.47%	5.11%

It can be seen that the health awareness of the elderly is weak. The state, government and other institutions should publicize health information through various means to enhance the health awareness of the elderly. Elderly people are not keeping pace with the times, so their ability to use mobile devices to obtain information needs to be improved. The attention rules of the cognitive process of the elderly are affected by the information needs of the elderly. In more cases, they will intentionally and actively seek information according to their own information needs, or unintentionally shift their attention to the direction of information they need. In short, their access to information is still relatively traditional, without the application of new technologies and the Internet environment.

In view of the above analysis, this paper intends to use cloud computing to innovate and build the information service system for the elderly. Cloud computing, an emerging technology, is developing at an amazing speed with its excellent computing power, strong storage capacity and extremely low cost. Its principle is to connect a large number of personal computers and servers through the network, and users can use network services to perform supercomputing and obtain super large capacity storage space. More powerful computing power can be obtained by making full use of existing resources through cloud computing. In the process of market-oriented cloud computing design, we must take into account the diverse needs of these users, so that cloud computing can provide universal and efficient services for all or most of the user groups.

3. Information service system based on cloud computing

3.1 General model of information service

The biggest feature of the general model of information services based on cloud computing is that it services are dynamically provided through virtual machines. According to the strength of the service load, the cloud system can dynamically increase or decrease the number of virtual machines providing services, so as to achieve a dynamic balance between internal supply and external load, optimize resource allocation, and thus reduce energy consumption. The architecture can effectively support resource allocation and service provision of multiple applications. The general mode is

mainly divided into knowledge service mode and user experience information service mode. With the change of Internet resource allocation. The concept of cloud computing center is gradually taking shape. The cloud computing center has the following characteristics: elastic scalability, dynamic allocation of resources, weakening the dependence between resources at different levels, self fault tolerance and self management. Cloud computing can provide intimate personalized services according to the actual use time and needs of users, making service items increasingly refined, and thus promoting the diversification of service items. The on-demand use of cloud computing makes cloud services more refined. The network supported by cloud computing provides self-service, which turns routine human activities into self-service interaction through the network. The low-cost client makes the information services provided by cloud computing more popular, so that more people can enjoy high-performance computing applications. These characteristics of cloud services will expand the breadth of information services, deepen the depth of information services, and improve the popularity of information services, thus speeding up the process of informatization of the whole society.

3.2 Algorithm Analysis

In the process of establishing the cloud model, the communication mechanism and data exchange mechanism between each component should be realized, the functional interface and service interface of each component should be connected, and finally a web data mining system based on cloud computing should be established. Suppose there is a training set A with n records, and they belong to m different classes, then the Gini coefficient of this training set is defined as follows.

$$Gini(A) = 1 - \sum_{i=1}^{m} \theta_i^{\ 2} \tag{1}$$

Cloud computing is used to store and manage data resources. Taking data as the center, computing tasks are scheduled to run at data storage nodes, forming a model from web to users. Users can access various data processing services provided by cloud computing system through the Internet. Virtualization technology realizes the separation of software and hardware. Users only need to run their own software in the virtual layer without considering the realization process of background hardware. Virtualization technology realizes the migration of resources on servers. When one server is overloaded, it will migrate to another server. When determining the optimal partition point of discrete attributes, repeated calculations and irrelevant operations should be deleted. Assuming that the discrete attribute has a different value of t, when t is an even number, the number of calculations of Gini coefficient is defined as formula (2). When t is an odd number, the calculation times of Gini coefficient are defined as formula (3):

$$C_t^1 + C_t^2 + \cdots + C_t^{\delta^2} = Eventimes \tag{2}$$

$$C_t^1 + C_t^2 + \cdots + C_t^{\delta^2 - 1} = Oddtimes \tag{3}$$

The calculation results show that the general information service architecture based on cloud computing can reduce the payment cost of information services by about 31.22%. Although the cost can be reduced by reducing the startup time of locally deployed physical servers, the shutdown and startup of a large number of servers will lead to a waste of time. The more troublesome problem is that if the server is shut down, the current running state of the application is difficult to save and restore, so the running mode based on the cloud computing platform will reduce many management and maintenance difficulties.

3.3 Comparative analysis

There may be great differences between the "operating systems" of different service platforms. Socialized, intensive and professional cloud computing centers need corresponding "operating systems" to shield multiple physical servers, while cloud computing does not require a network operating system with thousands of people. In view of the characteristics of the current information service market and the wide range of potential cloud computing users, a general information service architecture based on cloud computing is proposed. On the one hand, this architecture can give full play to the performance and cost advantages of cloud computing, and on the other hand, it realizes excellent adaptability to a variety of user groups through virtualization technology. Cloud computing makes massive data storage no longer the bottleneck of the system, greatly improving the speed and accuracy of data management and use. By transplanting the traditional data mining algorithm into the distributed algorithm architecture, it can effectively improve the efficiency of the algorithm, shorten the time of data mining, and quickly respond to users' requests (see Figure 2).

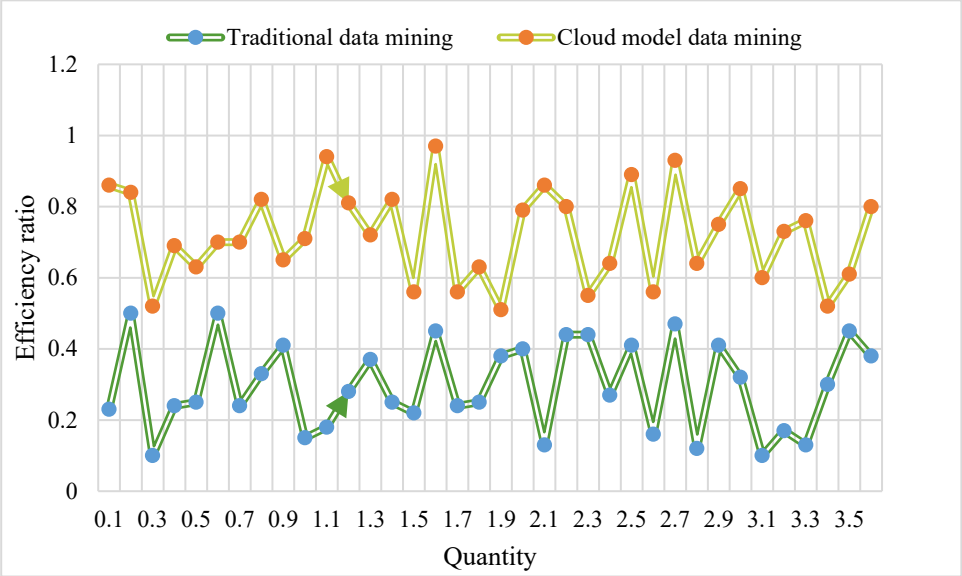

Figure 2 Comparison of traditional data mining and cloud model data mining

The hardware construction of the information service platform for the elderly should not only take full advantage of the existing network resources, but also be based on the principle of economic applicability. Therefore, it is necessary to scientifically and reasonably estimate the hardware configuration according to business needs and development expectations. In order to avoid single point of failure, two load balancers are configured. Web access portal is provided. According to laboratory test experience and data, a single board supports 100 concurrency, meeting business requirements. Two atae boards are configured as active and standby. According to the user access trend, the active resources in the virtualization cluster are pre adjusted to meet the concurrent access requirements. Cloud computing gathers the existing computer resources, and also creates a new mode of computing to effectively manage and control the construction of parallel work nodes, which can assign work tasks to appropriate hosts through intelligent means (see Fig. 3).

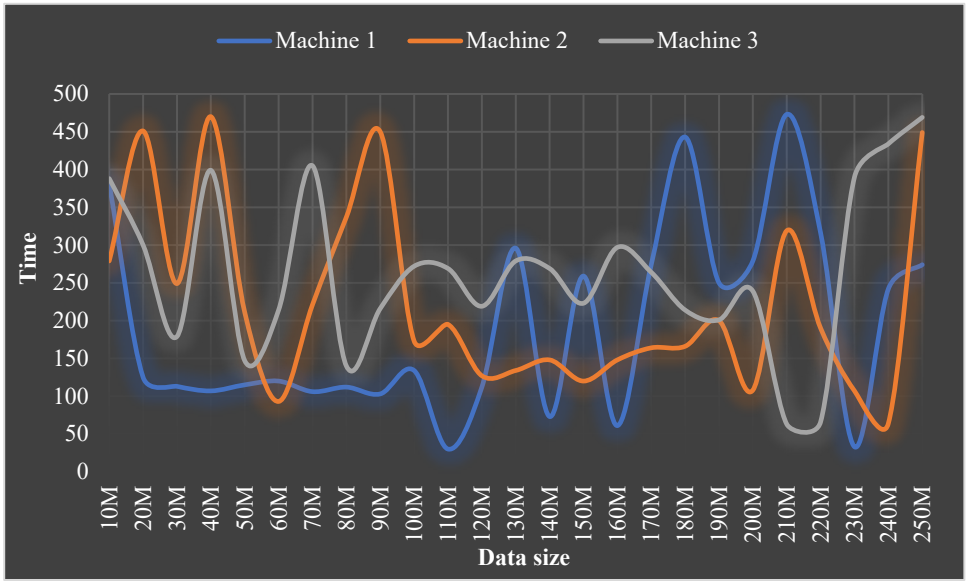

Figure 3 The running time statistics of the algorithm in each virtual machine

In view of the large amount of data that needs to be transmitted through the network in the traditional management mode, the simplified data is submitted to the server through the form method through the protocol, and then encapsulated by the server and transmitted to the virtual cluster, reducing the amount of network data transmission. Design a work interface similar to application software and compatible with traditional user habits. The protocol is used to collect physical machine information, monitor the operation of the cluster, and realize real-time resource scheduling. Each subsystem in cloud computing shares resources, but some subsystems bear more responsibilities. Compensating them can solve the unfair situation of information services in cloud computing. Through the improvement of relevant technologies, actively build a compensation system to promote the harmonious development of all aspects of cloud computing information services.

Cloud computing can indeed enable users to obtain supercomputing services at a low cost, but hackers can obtain the information of any computer as long as they break into the "cloud", and the cost of hackers has been reduced. Once these "clouds" are used to break all kinds of passwords and carry out various attacks, it will cause great danger to the user's data security. Although there are some problems at this stage, it is not the technical problems and defects of cloud computing itself. The development of cloud computing will be vigorously promoted. In the process of Public Cloud Application in the future, we should pay attention to strengthening the management of network security, actively formulate systematic and perfect security transmission protocols, and effectively ensure the integrity of data information transmitted through the Internet.

4. Conclusions

To ensure the smooth progress of information service for the elderly, we must follow a certain mechanism. The market mechanism in the urban information service guarantee system for the elderly can effectively mobilize the enthusiasm of all participants, make up for the shortage of government information service for the elderly, and keep the balance between supply and demand of information resources. Through the provision of multi-level services, the degree of optimal allocation and utilization of information resources can be improved. The group mechanism promotes the behavior imitation of the information behavior of the elderly and the improvement of the information literacy of the elderly through the interpersonal information exchange and sharing of the elderly in the family and informal organizations. The emergence of cloud computing has changed the information service mode for the elderly. Its outstanding computing power, storage capacity and low cost of use have rapidly set off a "cloud era". Cloud computing integrates existing software and hardware resources and allocates them reasonably. This is a breakthrough and changes the mode of information service.

Cloud computing is not a new weapon to solve the problem of information security. Its most important technological progress is the networked change of storage mode, computing mode and interaction mode, as well as the idea of software as a service. With the continuous evolution of mobile network technology, the coverage of 5G network will continue to deepen. The elderly information service platform will also gradually introduce new functions with the continuous improvement of data service bandwidth and downlink rate, and the real-time smooth video assistance information display and activity instruction information industry will be introduced into the system. The new generation of cloud computing mobile network will further improve the system positioning accuracy and real-time information display.

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