

Application Effect Evaluation of Intelligent Community Service Platform in Grassroots Governance

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Abstract: The purpose of this study is to design an intelligent community service platform applied in grassroots governance. First of all, this paper uses a distributed framework to build a service platform to provide data services for the intelligent community. Secondly, intelligent machine learning models are used to accelerate network training for community data classification tasks. At the same time, the high-precision association mechanism based on multi-source heterogeneous big data is introduced to store different types of topic data into the corresponding topic database, so as to realize the fusion processing of structured, semi-structured and unstructured data. Four kinds of account information are set up, including platform administrators, community administrators, community service units and community residents, to meet the diverse needs of community residents. The simulation test shows that the intelligent community service platform passes the function test, and the maximum change of response time is less than 1%, which proves the feasibility of applying the intelligent community service platform in grass-roots governance.

Keywords: Community Service Platform; Distributed Framework; Machine Learning; Data Classification; Response Time

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Introduction

Community is the basic unit of a city and the source and fulcrum of community business and government services. Community management directly affects the economic and management level of the whole city, and also profoundly affects the living conditions of each community resident. Whether the social security situation is good or not is directly related to the stability and tranquility of people's lives, closely related to the smooth progress of socialist modernization, and has a far-reaching impact on the long-term stability of the country [1]. With the increase of the number of communities, more and more people are willing to participate in this relatively closed social circle. Residents of any age group are eager to build friendships and relationships in the community. Being in the same community can not only enhance the sense of identity with each other, but also have more common language, making it easier to meet new people [2-3]. At present, there are many websites similar to community service platforms in the market, but their functions are too monotonous, their designs are too simple, and they do not have the ability and conditions to virtualize the community on the network [4].

In this study, a distributed framework is used to provide data services for intelligent communities. Considering the characteristics of community size and heterogeneous data, the design uses an intelligent machine learning model to accelerate the training of the network and store different types of topic data into the corresponding topic database. At the same time, four kinds of account information, including platform administrators, community administrators, community service units and community residents, are set up to provide services for community residents. The design provides an effective solution for the grass-roots governance of intelligent community, and has certain reference value for the modernization and intellectualization of community governance.

1. Construction of Intelligent Community Service Platform

1.1 Platform Construction Principle

By introducing modern information technology to build community service

information platform, we can realize the organic integration of old infrastructure with IT, network and software, and create a diversified community service platform. By skillfully combining the communication of community residents with online services, residents can easily enjoy personalized community services by simply clicking the mouse or dialing the phone. At the same time, by building a friendly community service information platform, the community construction will gradually integrate into the online community, share public resources, achieve a higher level of interaction, so that the community can fully realize the sharing and exchange of resources. Smart community service platform represents a new concept of community management. The design makes full use of Internet and Internet of Things technology, including smart buildings, artificial intelligence, community property, public rental housing management and other aspects. It is an advanced model of social management innovation in the new era. This platform will form a neural network of information collection based on streets, communities, buildings and families. From the functional point of view, the smart community takes the community residents as the core, provides safe, efficient and convenient intelligent services for residents, and meets the survival and development needs of residents.

1.2 Overall Framework Design of the Platform

Intelligent community service platform [5] divides the whole system into several subsystems, and the sum of the functions of the subsystems is the overall function of the whole system. At the same time, each subsystem is divided into different functional modules to achieve different functions. On this basis, this study proposes a top-down design method, which can effectively grasp the framework content and function of the whole system [6]. The overall framework of the intelligent community service platform. The resource layer provides software and hardware support for the development of the intelligent community service platform, which is divided into public cloud and private cloud for managers and community residents. The data persistence layer divides the data into 12 categories, such as community characters, organizations, community ground components, and community geomorphology database, and stores the data in

the corresponding database according to different types. In the data processing layer, by means of statistical aggregation, dimension agreement, data reduction, index specification and definition level, the residents' faces are used as data markers, the community fundamental data, key person information and performance data are associated, the knowledge map of key population performance is established, and the monitoring and prediction of public security risks are realized by combining in-depth learning technology.

1.3 Deep Learning Model

The essence of deep learning model is to simulate the behavioral characteristics of animal neural network, which is often used as an algorithmic mathematical model for distributed and parallel information processing, and contains several hidden layers for input and output [8-9]. The result matrix of each hidden layer is the input matrix of the next layer, and the prediction result is provided by the output matrix of the last layer. This structure enables the deep learning model to extract and understand the abstract features in the input data layer by layer, thus achieving a higher level of semantic understanding and decision-making. By adjusting the connection strength between each layer, the model is able to generate corresponding values in the resulting matrix. When the weight of each layer converges to a certain value, the deep learning process is over, and the generated model can be used to perform specific tasks, such as data analysis and decision support process in community governance. The formula is as follows:

$$f(x) = f^{(3)}(f^{(2)}f^{(1)}(x)) \quad (1)$$

x is the sample feature, w is the weight, b is the bias, through matrix multiplication, the x input is multiplied by a weight matrix w , representing the output of the model.

When the network has only one output layer, the network is a single-layer neural network. When a network contains one or more hidden layers and an output layer, it is called a multilayer neural network or a deep feed-forward neural network. Deep feedforward neural network is an efficient nonlinear function approximator. The number of layers of the network is the depth of the model. In essence, different

functions form a chain structure through composition. The formula is $f(x) = f^{(3)}(f^{(2)}f^{(1)}(x))$. Through deep feed-forward neural network, community management can analyze community data more finely, extract key features, and make more intelligent and personalized decisions to optimize the effect of grass-roots governance. The transformation relationship between input and output in the network is as follows:

$$s_i^{(q)} = \sum_{j=0}^{n_{q-1}} w_{ij}^{(q)} x_j^{(q-1)}, (x_0^{(q-1)} =, w_{i0}^{(q-1)} = -1) \tag{2}$$

$$x_i^{(q)} = f(s_i^{(q)}) = \begin{cases} 1, & s_i^{(q)} \geq 0 \\ -1, & s_i^{(q)} < 0 \end{cases} \tag{3}$$

When multiple layers are connected together, more complex problems can be solved. At $x \leq 0$ that time, the output is 0, and at $x > 0$ that time, the output is x to prevent the gradient from disappearing and accelerate the training of the network, which is suitable for community data classification tasks. The discrete probability of classifying the object to be classified into different categories is expressed by the formula:

$$P_i = \frac{e^{g_i}}{\sum_k^m e^{g_k}} \tag{4}$$

$$\sum_{i=0}^{m-1} P_i = 1 \tag{5}$$

The sum of probabilities is 1, which m is the number of categories, $k \in (0, m]$ i and represents k a category in, which g_i represents the probability of the classification.

By dividing the input data into i groups and introducing the learnable piecewise bar parameters, the model can achieve the maximum threshold for transmitting each group of data, which provides an effective means to improve the accuracy and efficiency of data processing, and this process is of great significance in the grass-roots governance of intelligent community service platform. By grouping the input data and setting the maximum learnable threshold, the system can adapt to different data characteristics and

changes more flexibly, so as to optimize the performance of the model. This mechanism of intelligent division and dynamic adjustment helps community management to understand and respond to governance needs in different situations more accurately, and further improves the application effect of intelligent community service platform in grass-roots governance. By making full use of in-depth learning model, community management can understand the needs, dynamics and behaviors of community members more comprehensively and accurately, and provide scientific basis for grass-roots governance.

1.4 Community Information Management

Community information is divided into two parts: basic community information and dynamic community information. Among them, community basic information [7] is further divided into community cultural information and community dynamic information. The basic information of the community is mainly located in the main page or header of the community service platform website, including the basic information such as the name and address of the community. Community cultural information is displayed through independent channels, and WYSIWYG editing is carried out in the form of editors. In addition, community cultural information provides sorting operation, so that maintenance personnel can more flexibly adjust the order of cultural information to meet different display needs. Community dynamic information is divided into dynamic type information and dynamic detail information. Community dynamic information allows multiple records to be added and is designed to provide instant notification or the ability to publish information. Dynamic type information is a necessary attribute of dynamic information, so when deleting type information, you need to pay attention to whether there is corresponding dynamic detail information. Community cultural information and community dynamic details are audit information, which can only be displayed on the platform after approval. With the setting of this function and the permission function, the staff can add or edit the community dynamic details or cultural information at will. The information can only be displayed by the operation user with approval right, that is, the user with approval right can decide

whether to display a certain information. This avoids the error information of the service platform caused by the mistakes of the bottom staff. Community information management structure helps to better manage and present community information, and enhance the user experience of community service platform.

1.5 Multi-source Heterogeneous Big Data Precise Correlation Technology

The intelligent community service platform [8] aims to deal with the precise correlation of multi-source heterogeneous big data in the community environment. The application of the joint technology model in grassroots governance. In the test and evaluation, the intelligent community service platform shows significant advantages. Firstly, through the accurate association of multi-source heterogeneous big data, community management can more comprehensively understand the needs and dynamics of community members, and provide strong data support for grass-roots governance. Secondly, the integration of structured, semi-structured and unstructured data enables community management to integrate information and make decisions more efficiently, and improves the scientificity and accuracy of grass-roots governance. In addition, by introducing face recognition and other technologies, the intelligent community service platform can achieve accurate association of data in the community environment, thereby improving the security and governance effect of the community. This comprehensive and accurate data association mechanism effectively breaks the original data island structure, enabling community management to better grasp the overall picture of the community and respond to various governance challenges in a more timely manner.

1.6 Establishment of Business Functions

Intelligent community service platform has four types of accounts, including platform administrator, community administrator, community service unit and community resident. The platform administrator maintains the website information of the community service platform, and has the authority of all accounts in the service platform and the authority to set other account types. The community can have one or

more community administrators, who can theoretically have all the permissions, but need to be granted by the platform administrator. The service unit account has the authority to maintain its own information and interact with other users, such as the operation of orders. Community residents have the right to view community information and interact with other users, such as purchase orders.

In the intelligent community service platform, the project responsibilities of government officials are different, the authority is numerous, and there is the possibility of cross-authority responsibilities, which leads to the ever-changing combination of operation authority. In order to provide a convenient use experience, the permission function is specially designed in this study. Different government authority accounts will have different combinations of authority functions, and government officials can choose one or more combinations of authority functions at will. This design aims to facilitate the office operation of government officials, while clarifying the division of responsibilities, in line with the characteristics of humanized service platform. Building an intelligent community on the basis of real life can provide convenient services for community residents and show the image of the community to other visitors. The business functions of the intelligent community service platform.

The functional modules of the intelligent community service platform designed in this study are divided into three categories. The first is platform information management, which manages the information displayed on the platform, including platform parameters, information settings, community news, announcements and platform advertisements. The second is account information management, which manages the login account information of the platform, including administrator account, owner account, government personnel account, service unit account and so on. Finally, the interactive information management manages the interactive information between the platform accounts, including order information, address book module, short message information, opinions and so on.

2. Application Analysis of Intelligent Community Service Platform in Grass-roots Governance

2.1 Functional Test

The function test is mainly carried out from the aspect of automatic expansion of service capability of the intelligent community service platform, covering various tests such as coordination service, resource management service, file-based storage service, document-based storage service, computing service, cache service and message queue service. In the scenario of simulating multiple users connecting cooperative services, this study detects the number of cooperative nodes in the cooperative service, and evaluates the number of service nodes by executing memory-consuming programs. At the same time, in the context of simulating multiple user access services, this study examines the number of data nodes provided and the change in the number of nodes when the number of users reaches a specified read value. By observing the stress on the computer where a particular node is running, it is possible to speculate on the growth of the service node. In addition, the number of cache nodes in the cache is checked to see whether the number of cache nodes increases with the increase of the number of users by simulating a plurality of user connection cache services. Finally, in the service platform simulating multiple user connections, it is checked whether the number of nodes in the message queue increases when the number of users reaches a certain critical value.

The functional test results of the intelligent community service platform are shown in Table 1. The function test results of coordination service, resource management service, file storage service, document storage service, calculation service, cache service and message queue service all show that the test passes. The platform can expand the resource manager node to expand the service capacity. In addition, when the computer pressure of the task execution node reaches a critical value, the number of computing service nodes and caching service nodes can be increased, which indicates that the intelligent community service platform not only meets the actual needs of community users, but also meets the requirements of the design platform.

Table 1 Function Test Results of Intelligent Community Service Platform

Table 1 Functional test results of the intelligent community service platform

Test function	Test results
Coordinate service expansion	The node can be added, and the test passes.
Resource Management Service Extension	The service can extend the resource manager node, and the test passes.
File-based storage service extension	The service can increase the number of data storage nodes and expand the service capability. The test passes.
Document-based storage service extension	The number of nodes can be expanded when the threshold is reached, and the test passes.
Computing Services Extension	The number of nodes of the computing service can be increased, and the test passes.
Caching service extension	Memory node is added for cache service, and the test passes.
Message Queuing Service Extension	The Message Queuing service has been extended and passed the test

2.2 Performance Test

In order to further evaluate the application effect of the intelligent community service platform, this study conducts a comparative test on the response time of the platform service. In the process of monitoring the operation status of the intelligent community service platform, it is found that the service response time has not decreased significantly, and the maximum change is not more than 1%. Therefore, using this design to maintain and manage the platform services can greatly reduce the maintenance time of maintenance personnel and improve the efficiency of maintenance work. When the business capability of the platform cannot meet the business requirements, the maintenance personnel need to manually expand the platform without

using the system, which is a heavy task for the operation personnel, and they also need to have a good understanding of the configuration and management of the platform services, so that they can expand the platform without affecting the normal operation of the original services. The application of this system greatly reduces the time cost of maintenance personnel, and can well adapt to the growth of business capacity. The test results show that the system can be applied to the business operation and management of the intelligent community service platform, and can effectively improve the work efficiency of software operators.

3. Conclusion

In the construction and application analysis of the intelligent community service platform, this study has successfully built a diversified community service platform by introducing modern information technology. The platform takes community residents as the core, and provides strong support for community governance by integrating resources, providing personalized services and realizing information sharing. Through the introduction of in-depth learning model, a comprehensive and accurate understanding of the needs, dynamics and behaviors of community members is achieved, which provides a scientific basis for grass-roots governance. The application of precise correlation technology of multi-source heterogeneous big data enables community management to have a more comprehensive insight into the needs and dynamics of community members, and improves the scientificity and accuracy of grass-roots governance. At the same time, through the introduction of face recognition and other technologies, the accurate association of data in the community environment is realized, which helps to improve community security and governance effect. In the establishment of business functions, through the flexible design of authority functions, government officials can choose different combinations of authority functions according to their responsibilities, which improves the convenience and flexibility of operation. The results show that all the functional tests have passed, and the response time has not been greatly affected after the operation status monitoring, and the change value is within 5ms. The stability and reliability of the intelligent community service

platform are proved in coordination service, resource management service, file storage service, document storage service, computing service, cache service and message queue service. The automatic expansion of the service capability of the platform performs well, meets the actual needs of community users, and also meets the requirements of the design platform.

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