Research on the Application of Data Statistics Technology in the Training Course of Service and Management for the Elderly

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Abstract. With the significant improvement of living standards and medical conditions, the elderly service robot has become an important research direction of service robot and has broad application prospects. This paper introduces the development status of the elderly service robot at home and abroad, and introduces the key technologies of the elderly service robot: autonomous mobile technology, perception technology, intelligent control technology and communication technology. The main problems and solutions are summarized.

Keywords: Old clothing major · Core curriculum · Teaching reform

1 Introduction

The survey shows that many developed countries are facing the problem of aging population. With the significant improvement of people's living standards and the continuous improvement of medical conditions, a variety of service robots for the elderly have appeared in our lives. In the face of empty nest elderly families and single elderly residents, how to use the home service robot to carry out rehabilitation training, psychological care, life support and daily monitoring for the sick or disabled elderly has become the focus of the current research on the elderly service robot.

2 Research Status at Home and Abroad

2.1 Current Situation Abroad

Based on the research of traditional service robots, service robots for the elderly are gradually developed, which take the elderly as the service object. Shigeki sugano, a professor at Waseda University in Japan, has developed twindy-0, a robot for the elderly. The service robot can bend down to pick up objects and lift 35 kg with both hands. The skin of the robot is soft and it can handle objects of various shapes. ROBOSOFT, a French robot company, has launched a robot called kompal, which is mainly used to help the elderly and the disabled. Robots can speak, understand conversations, and navigate autonomously [1]. South Korea launches Robot Companion for the elderly. South Korea has developed the robot to provide a playmate for the elderly and prevent dementia.

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2.2 Domestic Situation

In China, the research of elderly service robot started late. But in recent years, there has been a certain development. For example, the service robot researched by Harbin Institute of technology of China can recognize drugs, tea cups and other objects, and can sing. The Chinese Academy of Sciences has launched the subject of "robot for the elderly service" in the knowledge innovation project "robot for thousands of households". And in 2012, a life size "service robot for the elderly" was displayed. Generally speaking, the development of domestic elderly service robots started late, and there is still a certain gap with developed countries, and most of them are low-end products.

3 Key Technology

3.1 Autonomous Mobile Technology

Autonomous mobile technology is one of the key technologies of service robot. Robot navigation technology is an important aspect of autonomous mobile technology. The mobile robot can sense the environment and its own state through sensors, and realize the target oriented autonomous motion (navigation) in the environment with obstacles. The current indoor robot navigation technology mainly includes: RFID navigation, magnetic navigation, ultrasonic and radar navigation, voice navigation and visual navigation. Tong Feng et al. [2]. Designed a mobile robot ultrasonic navigation system for indoor structure environment. Berns proposed a navigation technology based on RFID. Hu Zhijun and others designed a visual guidance service robot for the elderly. Li Xinde proposed a robot vision navigation method based on general object recognition and GPU acceleration technology algorithm, and studied the vision navigation algorithm of service robot.

3.2 Perception Technology

The elderly service robot is a special service robot for the elderly. Its sensing system is a sensor network composed of various sensors. It includes pressure sensor, which is used to sense touch on the elderly accompany robot; smoke and harmful gas sensor, which is used to sense the indoor environment; photoelectric sensor, which is used to sense the intensity of indoor light, speed sensor, which is used to measure the moving speed and distance; proximity sensor, which is used for short-distance accurate mobile positioning; voice sensor, which is used to realize man-machine dialogue, and complete voice instructions: visual sensor, Perception of indoor space environment, better complete the object recognition, positioning and grasping.

3.3 Intelligent Decision Control Technology

Intelligent decision-making and control is an automatic decision-making and control technology that can drive intelligent machine to make intelligent decision and achieve control objectives without human intervention. The intelligent decision-making and control of the elderly service robot includes automatic and intelligent decision-making and control in the process of autonomous movement, accurate positioning, recognition and

grasping objects, human-computer interaction, network control and so on. Intelligent decision control includes: fuzzy control, neural network control, artificial intelligence control, humanoid control, chaos control and so on. Intelligent decision-making and control is mainly used to solve the complex control problem that the control object can not be accurately modeled, which has the characteristics of nonlinearity. In the navigation trajectory control, Zhang Lixun and others studied the sliding mode trajectory tracking control of service robot based on global vision.

4 The Pain Points of Traditional Expansion Methods

4.1 Value Evaluation System

Due to the increasing demand of network quality and network development, the pressure of network operation is increasing. However, due to the limited investment in network development and the adoption of user perceived capacity guarantee scheme in network construction, high-value users and high-value scenarios can not get better network quality, which leads to the low efficiency of network development, It can't maximize the investment benefit. The expansion cycle is long, and the expansion lags behind, which affects users' perception. The method of daily expansion is early construction and late evaluation [3]. Although multi-dimensional analysis can be carried out by optimization means, the expansion work is late.

4.2 User Perception

That is to say, after finding out the capacity problems or poor user perception problems, the soft expansion or supplementary expansion of the site will take a long time from the expansion application to the equipment distribution and the completion of the expansion, which will affect the user experience. Moreover, due to personnel flow and other reasons, the area after expansion is not a hot spot area, and the expansion can not achieve the ideal effect, and the user perception is poor, so the unified expansion standard is adopted, The traditional expansion method of high value scenario classification and expansion standard is one size fits all, without considering the different business model of different scenarios and different network quality, resulting in the different critical point of each cell traffic suppression. Adopting the same standard will lead to the situation of no expansion, wrong expansion and no expansion.

5 Identification of Cell Traffic Depression based on Clustering Algorithm

There are many factors that lead to traffic depression, such as different social scenarios, different number of people, different wireless environment, different time periods, different business types, different user behaviors, etc. How to comprehensively consider these factors and predict the suppressed traffic has become the business pain point of wireless network operators. This paper studies machine learning algorithms such as clustering algorithm, linear regression and association rules, and uses four steps of classification,

fitting, suppression identification and suppression prediction to complete the suppression traffic prediction for each cell, So that operators in the new station, expansion station can complete the site planning and expansion according to the actual user needs.

5.1 Cell Scene Clustering based on Kmeans Algorithm

5.1.1 Brief Introduction of Kmeans Clustering Algorithm

The so-called clustering algorithm refers to the method of automatically dividing a pile of unlabeled data into several categories, which belongs to the unsupervised learning method. This method should ensure that the data of the same category have similar characteristics [4]. According to the distance or similarity (affinity) between samples, the more similar and less different samples are clustered into one class (cluster), and finally multiple clusters are formed, so that the samples within the same cluster have high similarity and the differences between different clusters are high. The algorithm steps are as follows: a) randomly select k sample points as the initial starting point; b) calculate the distance from all points to the initial point, And the closest point set is regarded as the same class. C) recalculate the center of gravity of the same class (using Euclidean distance) d) recalculate the distance from all points to the new classification center, and take the center of gravity as the new starting point. E) go back to step b) to re divide the classification and the center of gravity.

5.1.2 Effect Evaluation of Community Clustering

There are two elbow methods to choose the best number k of kmeans clustering: elbow method and contour coefficient method. Elbow method measures the rationality of clustering number k according to the sum of square error, and its definition is as follows:

$$SSE = \sum_{p \in C_i} |p - m_i|^2 \tag{1}$$

The contour coefficient of a sample point x is defined as follows:

$$S = \frac{b - a}{\max(a, b)} \tag{2}$$

Is the average distance between sample point X and other samples in the nearest cluster. The nearest cluster is defined as follows:

$$C_i = \arg\min_{c_k} \frac{1}{n} \sum_{p \in c_k} |p - x_i|^2 \tag{3}$$

Using the above principle, the visualization of the sum of square error contour coefficient under different K values is realized, as shown in Fig. 1. From the SSE curve (blue) of various k values in the clustering of traffic and user number in Fig. 1, it can be found that the curvature is the highest when k = 3, and the contour coefficient (red dot) is the second largest when k = 3. According to elbow analysis method, the best value k of this clustering number is 3.

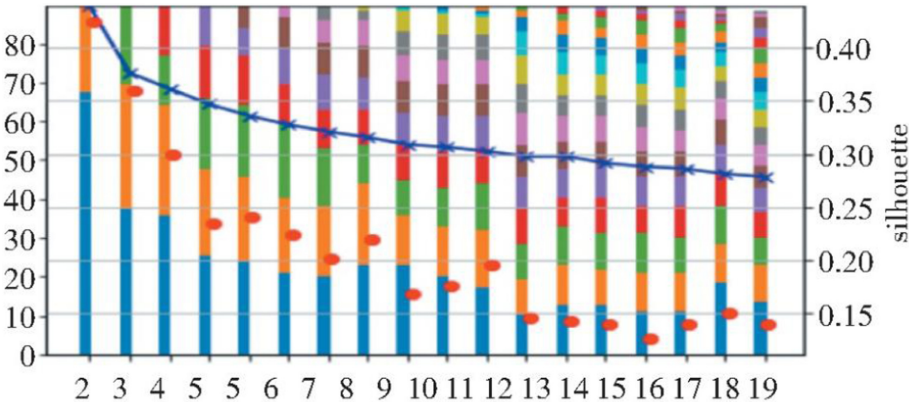

Fig. 1. Selection of optimal K according to elbow method and contour coefficient method(Color figure online)

5.2 Identification and Calculation of Flow Depression

Overview of fpgrowth algorithm the motivation of association rules is shopping basket analysis. By finding the relationship between different products that customers put into the "shopping basket", this paper analyzes customers' shopping habits. The discovery of this association can help retailers to understand which products are frequently purchased by customers at the same time, so as to help them make better marketing strategies. Fpgroftl algorithm consists of an FP Tree and an item head table. Each item points to its position in the tree through a node chain. The process of establishing FP Tree is as follows: a) the start node is empty. b) First, insert the first row of keywords. C) insert the second row of keywords. If there is a duplicate prefix path, the nodes on the path + 1D) after inserting all the data, the FP Tree and linked list are also built.

6 The Current Situation and Reform Significance of the Core Curriculum of the Elderly Service Major

6.1 The Current Situation of Core Curriculum Setting for Senior Service Major

The development of enterprises in the field of old clothes is in its infancy, and the industry lacks a unified standardized management system, which can be used for reference, There is also a lack of uniform talent training standards and core curriculum system in Colleges and universities to divide the courses involved in the major of old clothes into six categories: physical health service, mental health service, leisure and entertainment service, elderly service management, social work and other six categories. Among these courses, more than 80% of the professionals believe that "16 courses such as life care for the elderly" are the core courses of the elderly service and management major. Among them, 9 courses belong to the category of physical health services, 3 courses belong to the category of elderly service management, 2 courses belong to the category of mental health services, and 2 courses belong to the category of leisure and entertainment

services. These courses mainly cover nutrition diet, life care, disease care, rehabilitation services, exercise guidance and many other services for the elderly. This is consistent with the first three contents of the meals, nursing, rehabilitation and psychological services clearly stipulated in the basic standard for the social welfare of the elderly.

6.2 The Significance of the Core Curriculum Reform of the Elderly Service Major

The professional education of elderly service is one of the most important contents of vocational education, and it is an important way to cultivate skilled talents of elderly service management and service technology. The purpose of the core curriculum reform of the elderly clothing specialty is to "deepen the cooperation between industry and education, the combination of school and enterprise, the combination of education and training, and improve the education mechanism of combining morality and technology, and the combination of work and study". Guided by the systematization of the working process, the carrier and effective path of the professional technical skills training are explored through the matching of the professional post group needs and the actual service work, so as to build and extend the students' professional core competence. With the purpose of strengthening the technical skills training, the teaching content is reorganized, the learning situation and task unit are orderly, and the teaching module design and project system simulation exercise are carried out, Focus on the organic integration of the core curriculum content and the actual service management technology to achieve seamless docking.

7 Conclusion and Prospect

With the development of society and science and technology, the technology of service robot is constantly improving, and people's requirements for the quality of life are constantly improving, which promotes the rise and development of elderly service robot for the elderly group, and will eventually form an industry. In order to better develop the elderly service robot, and finally apply it to the family, researchers on the one hand will apply the latest technology to the project, at the same time continue to strengthen the contact with potential customer groups, and finally develop intelligent, modular, networked, low-cost and lightweight elderly service robot, and integrate it into our society as soon as possible. To solve the aging population, improve the quality of life of the elderly and other social problems, better serve mankind.

References

1. Feng, D., Gong, D., Sheng, L.: Problems in modern apprenticeship system of elderly service and management specialty in Private Higher Vocational Colleges -- Taking Zhejiang Dongfang vocational and Technical College as an example. Educ. Modernization **7**(02), 122–124 (2020)
2. Yan, C.: Exploration and practice of talent training mode of "school enterprise joint education" for elderly service and management major -- Taking the construction of elderly service and management major of Shaanxi national defense industry vocational and Technical College as an example. J. Shaanxi Nat. Defense Ind. VocaT. Tech. Coll. **29**(01), 3–5 + 35 (2019)

3. Qi, C., Ying, S.: Exploration and practice of university government enterprise cooperation in building the specialty of elderly service and management – Taking Tianjin Sino German University of applied technology as an example. J. Tianjin Sino Ger. Univ. Appl. Technol. **03**, 106–109 (2018)
4. Guangjun, X.: On the innovation of training mode of elderly service and management talents in Liaoning Province – Taking the elderly service and management specialty of Liaoyang vocational and Technical College as an example. J. Liaoning Teach. Coll. (Soc. Sci. Edn.) **05**, 131–132 (2017)