Power Intelligent Customer Service Robot Based on Artificial Intelligence

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Abstract. With the rapid development of speech recognition technology, voice chat robot has become a breakthrough of artificial intelligence. Voice chat robot should be a typical application field of customer service, providing customers with efficient and convenient service all day. The traditional customer service center is mainly based on telephone service, facing the problems of large number of customers, high maintenance cost, slow knowledge update, limited service time, low training cost and so on. So, at the same time, the use habits of customers have also changed fundamentally. The vast majority of services and transactions can be carried out through the Internet, such as Taobao and Jingdong. However, the quality and cost of voice services can be greatly reduced through the interaction between robots and channelization voice service centers. Through the research and development of natural language technology, an intelligent and centralized mobile communication service application platform is constructed by using we-chat platform. Through natural language processing, machine learning, big data computing and other technological innovation, we focus on the use of online robot recognition to understand customer problems and timely feedback customer needs. The results show that in the statistics of customer service machine problems, the highest proportion of consumers' problems about payment is 37%, and the lowest is 29%.

Keywords: Artificial Intelligence, Intelligent Customer Service, Robot, Customer Service System

1. Introduction
As people increasingly use voice and gesture controlled machines to interact, they hope that machines can recognize different emotions and understand other advanced communication functions, such as humor, irony and content. To make this kind of communication possible, the machine needs a module that can extract emotions from human language and behavior. Mobile robot path planning is an important part of the combination of artificial intelligence and robot technology. Its task is to make the robot move independently from the starting point to the target point under certain constraints, so that the robot can move in its working environment.

With the continuous development of information technology, many experts have studied intelligent customer service robot. For example, some domestic teams have studied intelligent customer service robot. For example, some domestic teams have studied the research of mobile online
customer service based on artificial intelligence, put forward the design scheme of intelligent reasoning expert system for online customer service, and conducted in-depth research on key technologies such as knowledge representation method. The reasoning mechanism and interpretation mechanism of intelligent reasoning expert system for online customer service are based on the customer behavior attribute, interest attribute, importance attribute and attribute. According to the characteristics of social attributes, this paper constructs a customer model and proposes an intelligent problem matching method based on Association recommendation. A new sensor system for human motion modeling, tracking and prediction in robot workspace is introduced. This paper designs and implements a low-cost service robot for service industry. Aiming at the existence of human in robot workspace, a reactive control scheme is proposed. In order to achieve this goal, a kind of neural network based on the basic function of SOMs (artificial neural network) is used. Using the BOT framework released by Microsoft, an intelligent voice chat robot for customer service is developed. The use of robots has greatly improved work efficiency and customer satisfaction [1]. Some experts studied the design and implementation of the server side of the customer service robot system, analyzed the system requirements, designed the system through the overall architecture diagram and execution flow chart, stored knowledge information through mys, and designed the system through E-R diagram and database table. In the construction process of power customer service platform, the micro service architecture of loosely coupled distributed deployment of service providers and service users is adopted. Through the combination of template matching, Bayesian classification, word vector technology and space vector model, the weighted total score of problem similarity is obtained. The input question guidance module mainly recommends questions to users according to part of the user's input, reduces the user's input cost, and guides users to make clear their intention. The function, performance and data of the system are tested to check whether the system runs to the expected standard. This paper analyzes the common problems and defects of the key links in the development process of chat robot, and puts forward the improvement methods. Zookeeper cluster is used as a service registry, which avoids the configuration of complex service dependencies in the case of large-scale cluster and multiple services [2]. In addition, some experts have studied the customer purchase intention recognition method based on intelligent customer service learning, customer purchase intention recognition method based on intelligent customer service, customer purchase intention recognition method based on intelligent customer service, and proposed a customer purchase intention recognition method based on intelligent customer service, consumption intention strength calculation model. Based on the statistics of the chat features of the corpus, the stop word list is established, and the word2vec word vector training model is used to train the sorted corpus data and extract the keywords of users' chat information. According to the time series of the users' forgetting intention, we construct a clustering algorithm based on the time series of the users' forgetting intention. An intelligent reasoning interpreter for online customer service is designed by combining preset text method and tracking interpretation method. This paper analyzes the business requirements, designs the functional modules, studies the system technology integration scheme, and defines the system application process. This paper first analyzes the background and significance of the development of the intelligent customer service system, then makes a detailed demand analysis of the intelligent customer service system, and designs the functional modules of the system. Referring to the current popular neural network model, this paper designs a semantic matching model according to the actual business situation [3]. Although the research results of artificial intelligence are quite abundant, there are still some deficiencies in the research of electric intelligent customer service robot based on artificial intelligence.

This paper takes the power intelligent customer service robot based on artificial intelligence as the research object. Through the research of artificial intelligence, the language model of power intelligent customer service robot is established. The results show that artificial intelligence technology is conducive to the realization of intelligent customer service robot.
2. Method

2.1 Artificial Intelligence

(1) Artificial intelligence

Artificial intelligence, that is, the machine automatically improves the algorithm through experience. This paper focuses on the integration of human brain and machine learning, and puts forward the method of integrating human brain and machine learning[4]. In the early application, artificial intelligence can only complete the task in the specified program, and then directly process simple information, such as obtaining the information of the operating object and working environment, commanding and processing the robot's action through the computer operating system in the robot body, and so on[5]. Now we can set high sensitive sensors in the robot, which can not only enhance the robot's touch, smell and hearing ability, but also adjust their behavior according to the perceived information, and deal with the changes of the environment, and finally complete the task[6].

(2) Online intelligent customer service system

Intelligent customer service system is an industry oriented intelligent customer service system developed on the basis of large-scale knowledge processing[7]. This is a complex involving a variety of advanced technologies[8]. We-chat customer service and QQ customer service are directly connected with the internal system of the bank. Customers can easily use a variety of services, which are supported by huge data in the background[9]. Therefore, when the intelligent customer service can not solve the problem temporarily, the system will automatically guide the cardholder to conduct manual customer service to realize the full-service closed-loop service mode[10]. When users interact with robots through robot carriers such as web or IM, the intelligent processing engine uses natural language processing technologies such as Chinese word segmentation, part of speech tagging and named entity recognition to judge whether the user's problem is within the scope of the constructed knowledge base, and carries out text classification, full-text retrieval and semantic analysis according to the user's input; if the user's input is beyond the scope of the knowledge base, the intelligent processing engine will be able to detect the user's problem around, the robot will give the default answer with guidance or seamlessly transfer to manual online customer service[11]. Question answering system is considered as an intelligent search engine, which can return more accurate and concise answers. Question answering system tries to use natural language processing, information retrieval and information extraction technology to answer users' questions in a fully automated way without any artificial thinking.

2.2 Language Model

The language model of natural language processing technology is to judge whether it is consistent with human natural language expression by calculating the joint probability of sequences. It is the basis of natural language processing, semantic recognition, sentence segmentation, semantic analysis and semantic understanding. It is divided into Calvinistic model and n-airy model, also known as statistical language model. They are used to predict the probability of a given sequence and determine whether it is a complete and correct string. In the univariate model, the model assumes that the conditions are independent, so the final string probability is the probability product of each word, as shown in the following formula (1):

\[ P(w_1, w_2, ..., w_n) = P(w_1)P(w_2)...P(w_n) \]  \hspace{1cm} (1)

In the n-ary model, due to the correlation between words, the final string probability is the product of the conditional probability, as shown in the following equation (2):

\[ P(w_1, w_2, ..., w_n) = P(w_1)P(w_2 \mid w_1)...P(w_n \mid w_1...w_{n-1}) \]  \hspace{1cm} (2)
Gradient descent algorithm is used to update network weights and thresholds, and cross validation is used for training. Calculate the accuracy rate, recall rate and F1 value of the final output result, as shown in formula (3-5):

\[
\text{precision} = \frac{\text{TruePositives}}{\text{TruePositives} + \text{FalsePositives}}
\]

\[
\text{recall} = \frac{\text{TruePositives}}{\text{TruePositives} + \text{FalseNegatives}}
\]

\[
F1 = \frac{2 \times \text{precision} \times \text{recall}}{\text{precision} + \text{recall}} \times 100\%
\]

3. Experience

3.1 Experimental Object Extraction

Semantic matching is to match the customer's vocabulary with the question in the knowledge base, find the answer and return it to the customer. Semantic matching is the core of the whole system. The accuracy of semantic matching is directly related to whether the system can accurately return the correct answers to customers and improve customer experience. At the same time, accurate matching can reduce the jump times of manual customer service and improve work efficiency. The questionnaire is based on online electronic questionnaire. The questionnaire was established by Baidu questionnaire system, and the title of the questionnaire was edited according to the pre-designed questions and options. The delivery method is "Baidu Hi" group. First of all, according to the pre-designed sample, select the corresponding staff to form a survey group. Then, explain the purpose of the survey in the group, and publish the link of the electronic questionnaire. Background Baidu questionnaire system will automatically collect and Statistics survey results.

3.2 Experimental Analysis

In the script configuration module, the design of script configuration is introduced. Through the analysis of a large number of customer service dialogues in the process of system design, it is found that the basic framework of any business dialogue process is the same, but the difference is the dialogue content. Therefore, the system adopts a similar dialogue process framework for different businesses. The dialogue process is designed as a tree structure, jumping to different sub trees according to the customer's answers. For open-ended questions, the answers can be found from the existing knowledge base. The staff side questionnaire design mainly includes four parts: the first part: the diversity of consultation channels. At present, it customer service system provides consultation channels such as telephone, e-mail, intranet forum, etc. So many channels, whether employees often use them, whether they are necessary, and so on. The second part: the requirement of reaction time. Whether employees pay great attention to response time, whether they will accept it if they need to queue up, whether they need customer service on non-working days, etc., and whether response time is the key factor for employees to provide it customer service. The third part: the validity of the answer. Employees through the it customer service system to seek help, is to get accurate answers to help them solve problems. Whether the accuracy of answers and problem solving rate are the key factors affecting employee satisfaction. The fourth part: the convenience of use. Whether it is convenient for employees to solve it problems mainly through manual services, and whether they are willing to accept it in other ways.
4. Discussion

4.1 Data Testing

The client server standard problem test set document contains the user's problems. Aiming at the problems existing in the standard test set, the user's problems are divided into address problems, delivery price problems, payment problems, etc. We need to increase the proportion of out of Library problems in the test set and balance the number of problems in each problem category. As shown in Table 1.

| Question type   | Proportion |
|-----------------|------------|
| Address problem | 34%        |
| Starting price  | 29%        |
| Payment issues  | 37%        |

It can be seen from the above that the statistics of customer service machine problems account for 34% of address problems, 29% of delivery price problems and 37% of payment problems. The results are shown in Figure 1.

![Figure 1. Customer service machine standard problem test statistics](image)

As can be seen from the above, in the statistics of customer service machine problems, the highest proportion of consumers' questions about payment problems is 37%, and the lowest proportion is 29%.

4.2 User Module

This module is a front-end system function module for system personnel, which can be customized according to the needs of system personnel. Based on the research content of this paper, the user module of this system mainly includes team member management, team member data statistics and the calculation of specific user purchase intention strength. The calculation of purchase intention intensity is the main function of the front-end module of the system. Through the background calculation data module and intention recognition module, the chat record data information provided by users is analyzed, as shown in Table 2.

| type        | text | picture | voice | video | Red envelopes | transfer accounts |
|-------------|------|---------|-------|-------|---------------|------------------|
| Proportion  | 15%  | 13%     | 7%    | 21%   | 25%           | 19%              |

As can be seen from the above, according to the statistics of group members' messages, the proportion of text is 15%, the proportion of pictures is 13%, the proportion of voice is 7%, the
proportion of video is 21%, the proportion of red packets is 25%, and the proportion of transfer is 19%. The results are shown in Figure 2.

![Figure 2. Group member message data statistics](image)

As can be seen from the above, according to the group members' message statistics, the highest proportion of red packets is 25%, the lowest proportion of voice is 7%, and the proportion of text is 2% higher than that of pictures.

5. Conclusion
Traditional robot systems usually perform repetitive actions in a limited environment, and the interaction between people is often characterized by novel interaction modes, resulting in a constantly changing environment. Therefore, the traditional robot system methods and technologies are often difficult to be applied to the interaction plays a major role in the occasion and application. This paper introduces the application of intelligent service robot and the general situation of traditional information retrieval technology, establishes the corresponding mathematical theory model, and carries on the application. The application of artificial intelligence in chat robot system is more and more. Chat robot system is usually used in various practical conversation systems, including customer service or information acquisition. This paper designs the functional framework of chat robot system, introduces the working principle of Rasa NLU, and combines rasa NLU with neural network method to realize the entity extraction system based on intention recognition.

Acknowledgments
Research and application of key technologies of Intelligent Enhancement (IA) in channel application for tens of millions of customers

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