Research and Application of Question Answering System Based on Subject Knowledge Base

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Abstract: The intelligent subject knowledge base question-and-answer system has a positive effect on improving the self-learning ability of the students, and designs a subject knowledge base question-and-answer system based on man-machine interaction. The system design includes the design of the question and answer algorithm of the subject knowledge base and the software development and design of the system. The semantic ontology structure mapping method is adopted to control the semantic information in the question-and-answer process of the subject knowledge base, and the expert subject knowledge base is constructed. The semantic concept tree analysis is carried out in combination with the feature construction method of the subject word feature, the human-computer interaction design of a subject knowledge base question-and-answer system is carried out by adopting a networked information interaction mode, and a corpus of words, phrases and sentences of a subject knowledge base question-and-answer system is constructed, in that concept of the semantic subject word, the sentence division of the question and answer of the subject knowledge base is realized, and the subject word characteristic matching method is adopted to realize the algorithm design of the network subject knowledge base question and answer, and the intelligence of the question and answer of the subject knowledge base is improved. In the embedded industrial control host, the system development and human-computer interaction design of the subject knowledge base are carried out, and the system is mainly composed of an information processing module, a subject knowledge base information acquisition module, a DMA controller, an output module and the like. The test results show that the system can effectively realize the question-and-answer of the network subject knowledge base and improve the reliability and intelligence of the subject-and-answer system of the subject knowledge base.

1. Introduction

In the course teaching, the question-and-answer of the subject knowledge base is an important content of the course study, and the question-and-answer ability of the subject knowledge base and the training of the self-learning ability are carried out by the question-and-answer software of the subject knowledge base, and the self-learning and the sustainable development ability of the course are promoted. The question-and-answer system of the subject knowledge base has a remarkable effect on the self-learning ability of the students and the sustainable development of the students[1]. With the question-and-answer system of the subject knowledge base, the self-learning interest of the students can be improved, and under the guidance of the subject knowledge base question-and-answer system, the enthusiasm of the students' learning course is improved[2], the self-learning ability of the students is learned through the subject knowledge base question-and-answer system, the reading strategy of the students, the cultivation of the reading method and the learning of the knowledge in the course are
carried out under the adjustment of the question-and-answer system of the subject knowledge base, So as to improve the interest of the students' learning, and to study the optimization design method of the subject knowledge base question-and-answer system, which is of great significance in improving the self-learning ability of the students[3].

The design of the question answering system of the subject knowledge base is based on the design of the question answering algorithm of the subject knowledge base, combining with the artificial intelligence algorithm, the question answering software of the network subject knowledge base is designed. Under the embedded environment, the cross-compiling control and program loading of automatic subject knowledge base question answering are carried out, the combination test of phrase and translation is realized, and the question answering ability of intelligent subject knowledge base is improved. In reference [4], a question answering algorithm based on semantic correlation fusion for networked subject knowledge base is proposed, which performs semantic synthesis feature scheduling and realizes automatic question answering for phrase and translation knowledge base. However, the calculation of this method is large, and the real-time performance of the method is not good. In reference [5], a question answering algorithm based on multi-fuzzy semantic automatic judgment is proposed. The algorithm design of network subject knowledge base question answering is based on semantic editing and probabilistic reasoning. However, the intelligence of this method is not good and the semantic ambiguity is large. In order to solve the above problems, a question answering system of subject knowledge base based on human-computer interaction is designed in this paper. The system design includes two parts: the question answering algorithm design of the subject knowledge base and the software development design of the system. The semantic ontology structure mapping method is used to select and control the semantic information in the course of the question answering process of the discipline knowledge base, and the expert subject knowledge base is constructed. In this paper, the sentence division of subject knowledge base question answering is realized in the semantic topic term concept, and the algorithm design of network chemistry knowledge base question answering is realized by using the feature matching method of subject words, and the intelligence of subject knowledge base question answering is improved. The question answering system of subject knowledge base and the design of human-computer interaction are developed in the embedded industrial control mainframe, and the software development of the system is realized. Finally, the experimental test is carried out and the conclusion of validity is drawn.

2. Function of the question answering system of subject knowledge base on the cultivation of students' autonomous learning ability

With the development of artificial intelligence technology, the intelligence of various subject knowledge base question answering software becomes stronger and stronger. The subject knowledge base question answering system plays a positive role in promoting students' autonomous learning ability, and through the artificial intelligence subject knowledge base question answering system, to solve the question-and-answer problem of the knowledge base of basic subjects that students encounter in the course of learning, to improve the efficiency and enthusiasm of the study course, to cultivate the ability of listening, speaking, reading and writing, to improve the knowledge area of the students' study course and to expand the quantity of reading. The role of subject-based question and answer system in promoting self-regulated learning ability and sustainable development of learning courses is mainly reflected in the following aspects:

First, the question-and-answer system of the subject knowledge base can promote the cultivation of students' reading ability. In combination with the intelligent networked subject knowledge base question-and-answer system, foreign language learning can be carried out, the learning ability of the students can be improved, the foreign language learning can be carried out under the guidance of the subject knowledge base question-and-answer system, and the learning of the ductility of the knowledge in the course and the outside-class knowledge can be carried out, so that the reading ability of the students is improved. Under the guidance of the question-and-answer system of the subject knowledge base, the mastery degree of the new words is greatly improved, the reading ability and the
self-learning ability of the students are effectively cultivated, the learning method is optimized, and the independent learning and the sustainable development are promoted[6].

The second is that the question answering system of subject knowledge base can expand students' vocabulary quickly. With the help of the question answering system of the subject knowledge base, the students have a higher and higher grip on the new words, and the reading is no longer restricted by time and space, so the extracurricular reading is carried out through the question answering system of the subject knowledge base based on the network. Improve oral expression and listening, speaking, reading and writing skills. Making use of intelligent network subject knowledge base question answering system to connect new words, subject knowledge base question answering system avoids students from checking dictionaries frequently, improves reading efficiency, and thus enhances students' interest in foreign language learning.

Third, the question-and-answer system of the subject knowledge base can effectively use the habit of cultivating the students' learning language and play the self-learning ability of the language. The network-based question-and-answer system of the subject knowledge base is used as the main line in the language practice, so that the ability and the habit of the student to learn the language are organized, the ability and the habit of the student to learn the language are cultivated, the self-learning ability of the course is carried out in the network intelligent subject knowledge base question-and-answer system, The variable "single thinking" is the "multi-directional expansion" of thinking and can improve the ability of the sustainable development.

3. Algorithm design of subject knowledge base question answering system

3.1. Semantic analysis of the question and answer of subject knowledge base

In order to realize the subject knowledge base question answering system based on human-computer interaction, firstly, the software development and design of the subject knowledge base question answering system are carried out, and the intelligent semantic screening control is carried out by combining the semantic association rule mining method. It is assumed that the sentence text distribution matrix BN×1:, BN×1 can effectively reflect the semantic mapping between ontology, and the similarity feature analysis method is used to analyze the semantic heterogeneity. The calculated similarity $Sim(X,Y)$ results are expressed as follows:

$$Sim(X,Y) = E_{re}(l) + IE_{ele}$$

Where, $d$ is the correlation dimension information in ontology mapping, considering the distribution repetition factor of the sentence, taking $X$ as the reliability confidence factor of the question answering in the network chemistry knowledge base, adopting the semantic structure reengineering method of the word subject knowledge base question answering. Through the analysis of ontology structure[7], the definition of ontology mapping is $E_{ele}, D, D = \{S_{i,j}(t), T_{i,j}(t), U_{i,j}(t)\}$, the name information of subject knowledge base question answering system, and the similarity of data type information is described as:

$$S_{i,j}(t) = \frac{p_{i,j}(t) - sp_{i,j}(t)}{p_{i,j}(t)}$$

(2)

The $T_{i,j}(t)$ is defined as the structural information in the question answering process of the sentence knowledge base. The graph model of the question answering process of the subject knowledge base is analyzed by using the method of text semantic topic word recombination, and the semantic similarity feature of the whole ontology mapping process is constructed as:

$$T_{i,j}(t) = \frac{|p_{i,j}(t) - \Delta p(t)|}{p_{i,j}(t)}$$

(3)

$U_{i,j}(t)$ is defined as the similarity of word context. By using frequent item mining method, the text
structure grouping of subject knowledge is carried out, which is expressed as follows:

$$U_{i,j}(t) = \exp \left[ -b \left( z_i(t) - z_j(t) \right)^2 \right]$$  \hspace{1cm} (4)

According to the mapping relationship between the models, the fuzzy association rule set in the neighborhood of the similarity text is obtained. In the non-classification relation set, the concept set of topic words is obtained as:

$$(\delta)$$

The equivalent semantic mapping relation is established. The result of estimating the concept set of subject words is expressed as follows:

$$VariantSim(X,Y) = \alpha \cdot Sim(X,Y) + \delta \cdot WebDice(X,Y)$$  \hspace{1cm} (6)

Based on the results of semantic characteristics of question and answer of discipline knowledge base, the irregular inter-class evaluation is carried out. It is assumed that the language evaluation set of subject knowledge base $S$ system $\beta \in [0,T]$ is to satisfy the rule vector set $S$. The semantic Eigenvectors $\beta$ of the tags in the two ontology fragments in the number of elements in the evaluation set $M: C \times C' \rightarrow rel$ can be represented by the following functions: the semantic Eigenvectors $\beta$ in the rel of the $\Delta$ set:

$$\Delta(\beta) = \left\{ \begin{array}{ll}
s_i, K = \text{round}(\beta) \\
q_i = \beta - k, a_i \in [-0.5,0.5]
\end{array} \right.\hspace{1cm} \hspace{1cm} (7)$$

Where, round is the attribute set of semantic mapping between ontologies, which is represented as a BinarySplits vector. The semantic ontology structure mapping method is used to filter and control the semantic information in the course of question answering of subject knowledge base, and the expert subject knowledge base is constructed. The semantic concept tree analysis is carried out based on the feature construction method of topic words.

3.2. Ontology model design of subject knowledge base question and answer

The semantic generalization mapping relationship is constructed by using word knowledge extraction method.

Definition 1, the formal concept (formAl concept): sets the semantic feature distribution set $E$ between ontologies to satisfy the finite domain convergence. In the finite data set $O$, there exists a subset satisfying $f(E) = \{AE, oR A\}$ (representing semantic disjoint mapping in $g(I) = \{o / oR A\}$). Accordingly, let $I$ be the topic thesaurus of semantic mapping SM-Contex, and define the concept of $E \subseteq O, I \subseteq A$ representation form. In the question answering system of networked subject knowledge base, the formal features of semantic concept set are expressed by cross-compiling method.

If $(E_1, I_1), (E_2, I_2)$ is the domain knowledge related to the meaning and concept of the question and answer sentences in the discipline knowledge base, the procedural set of questions and answers in the linguistic knowledge base is $K = (O, A, R)$, in the formal two concept sets, When the semantic concept $C_2 \leq C_1$, the association rule set is distributed sorted within the directed edge, and the similarity clustering feature is obtained to satisfy $C_2 \leq C_3 \leq C_1$, and the correlation order is based on the semantic identification process, the semantic concept $C_2 \leq C_1$, and the distributed ranking of association rule set within the directed edge. The connection attributes with the same semantic distance are segmented, the directed edges $C_1$ to $C_2$ are ruled, and there is one edge. The decision tree model is used for semantic filtering of $(E, I)$, in the concept, the decision tree model of intelligent subject knowledge base $Q & A$ is given as shown in figure 1. The feature selection is carried out in the case and attribute set.
4. Construction of the Knowledge base of the subject

An expert subject knowledge base is constructed in a given mapping set, and the concept set of subject words in a thesaurus is calculated. If $C_{\text{Intra}}(n_i)$ is used to represent the set of association rules between two nodes $i$ in a compound word, let $X$, $Y$ is the topology distributed vocabulary of the ontology model. The usage $t(n)$, of the words in the computational semantic word library in $U_i(n)$ is expressed as:

$$U_i(n) = \alpha C_{\text{Intra}}(n_i) + (1 - \alpha) C_{\text{Inter}}(n), \quad \alpha \in (0, 1)$$  \hfill (8)$$

The fuzzy association rule mapping method is used to design the human-computer interaction, and a networked subject knowledge base question answering system is constructed. The $E \subseteq E'$ subnet $E'$ is a set of relations between concepts in $n'$, and makes $A = \{a_1, a_2, \ldots, a_n\}$ a semantic relation attribute set. $B = \{b_1, b_2, \ldots, b_m\}$ is the semantic equivalence relation class set, $\{c_1, c_2, \ldots, c_k\}$ represents the question answering feature set of human-computer interactive network subject knowledge base, constructs the topic word list, the fuzzy structure of the subject knowledge base question and answer is constructed, and the association rule set is obtained as follows:

$$\text{Info}(B) = -\sum_{i=1}^{N} p_i \times \log_2 p_i$$  \hfill (9)$$

$$\text{Info}_A(B) = \sum \frac{|B_j|}{|B|} \times \text{Info}(B_j)$$  \hfill (10)$$

$$\text{Gain}(A) = \text{Info}(B) - \text{Info}_A(B)$$  \hfill (11)$$

The semantic ontology feature distribution set is constructed by normalized mapping, and the association rule vector set of two groups of question and answer vocabulary in subject knowledge base is calculated by using regularized vocabulary knowledge base question and answer technique:

$$\text{Cos}(X, Y) = \frac{C(X) \cdot C(Y)}{|C(X)| \cdot |C(Y)|}$$  \hfill (12)$$

The semantic mapping relationship between concept A and B is analyzed, and the eigenvalues of vector words are analyzed. In the Google AJAX seArch AP system, the question answering system of subject knowledge base based on network is designed. The complete concept lattice of the network chemistry knowledge base question and answer is constructed as shown in figure 2.
5. Development and design of system and analysis of experimental test
The system is composed of information processing module, subject knowledge base information collection module, DMA controller and output module, etc. The system is mainly composed of information processing module, subject knowledge base information collection module, DMA controller and output module. The hardware composition of the question answering system of subject knowledge base is shown in figure 3.

Figure 2. Complete concept lattice of question and answer for networked subject knowledge base.

Figure 3. Hardware design and implementation of the system.

6. Experimental test
Aiming to test the accuracy of this system in realizing the intelligent question and answer of subject knowledge, the experiment adopts Matlab design. The minimum sampling value of information sampling is 3kHz, the maximum value is 24kHz, the word structure check word structure is 101001100, The instruction is loaded with 5 bytes, and the time cost of intelligent Q & A is tested, and the test results are shown in figure 4. The bit error rate comparison is shown in figure 5.
The analysis of figs. 4 and 5 shows that the time cost and bit error rate of using this system for intelligent question-answering of subject knowledge are smaller.

7. Conclusions
In this paper, a question answering system of subject knowledge base based on human-computer interaction is designed. The system design includes two parts: the question answering algorithm design of the subject knowledge base and the software development design of the system. The semantic ontology structure mapping method is used to select and control the semantic information in the course of the question answering process of the discipline knowledge base, and the expert subject knowledge base is constructed. The semantic concept tree analysis is carried out based on the feature construction method of topic words, and the human-computer interaction design of the question answering system of the subject knowledge base is carried out by using the network information interaction mode, and the corpus of the words, phrases and sentences of the subject knowledge base is constructed. In this paper, the sentence division of subject knowledge base question answering is realized in the semantic topic term concept, and the algorithm design of network chemistry knowledge base question answering is realized by using the feature matching method of subject words, and the intelligence of subject knowledge base question answering is improved. The system is composed of information processing module, subject knowledge base information collection module, DMA controller and output module, etc. The system is mainly composed of information processing module, subject knowledge base information collection module, DMA controller and output module. The test results show that the system can effectively realize the question answering of the network chemistry knowledge base, improve the reliability and intelligence of the subject knowledge base, it has good
application value in the construction of subject knowledge base and the design of question answering system.

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