Implementation of the Intelligent Question Answering System Based on Remote Service Framework

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Abstract

Remote answering system of modern distance education system is an indispensable component. However, the current system is based on answering user input on the exam questions simple keyword matching, accuracy and query the user interface cannot meet the needs of users. We have designed a semantic network theory to build up intelligent answering system. We analyzed the necessity of establishing intelligent answering system, and presents a model of intelligent question answering system based on its technology defined areas, and two university computer courses as a source of knowledge to achieve the function of the system. The results show that the proposed method can improve the accuracy of the query, user-friendly and convenient. System Based on J2EE three-tier system, in the middle layer of the advanced MVC design pattern thought to achieve page display and business logic separation, improve system maintainability.

Keywords: Remote service, intelligent systems, answering, intelligence research, human-computer interaction.

Introduction

With the development of computer technology, multimedia technology and Internet technology, more and more to distance education network, virtualization, intelligence and personality development. Remote service is an important direction of development of distance education, which overcomes the limitations of traditional distance education, educational teaching resource sharing, information exchange, intelligent answering functions, breaking the limitations of traditional teaching time and space, so that students can get better learning results.

Currently, remote answering divided into two categories. Simple answering system such systems are not designed specifically for intelligent question answering system, teachers and students to communicate via Email, message boards or use a simple Q & A, but also some with WEB-based BBS or chat room for teachers and students in real-time or non-real-time Q&A discussion. Initially with IQAS intelligent answering function as users can enter keywords to find relevant information in the existing database, if there are new questions and answers, can be added to the database.

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While the above types of remote answering system have played a significant role, but cannot meet the needs of large-scale online student cannot complete a real interaction with the students, in a sense, just a query system, there are the following shortcomings: ① question, the answer is not rich expression and existing answering system primarily text-based. ② Database management deficiencies. ③ Intelligent system deficiencies. First question on keyword matching, often irrelevant answers; second is the question and answer intelligent management is not perfect; again is the intelligent analysis, statistical functions weak, cannot make recommendations to teachers teaching according to the issues raised. ④ Standardization system deficiencies. The current system does not take a lot of design standardization problems, leading to important resources cannot be shared with each other, thus limiting the possibility of the user to find the right answer.

Based on the above discussion, on the basis of the realization of artificial Q, Q and increase joint intelligent answering function as artificial answering feature addresses real education issues such as time and space, and by the accumulation of questions and answers for the library to provide the feasibility of intelligent answering. Intelligent answering appears not only reduce the burden on the teacher's teaching, but also to better mobilize the enthusiasm of students. Q can be further combined with multiple systems to solve the problem of resource sharing to be shared between classes online Q libraries and teachers and other resources.

Figure 1. J2EE.
The Proposed Methodology

**J2EE-based systems.** Three-tier architecture using J2EE architecture to achieve remote answering system and with the traditional C/S model compared to the three-tier J2EE application model, improve system scalability, security and it will apply logic and the user interface and data access with the release, this will make the system easier to maintain, and can through the use of component technology to reduce the burden on the database server, thereby increasing system performance.

Students, teachers and administrators are at the client level, it only provides a user interface for transfer to the top of the middle tier components interact with the user and user requests. Users use the browser via Internet, connect to the web server. Web server and application server are in the middle-tier web server after receiving a user request submitted by the client layer, call the relevant service module application server to perform specific business logic to the third floor (enterprise information system) database server presented data requests, such as questions submitted answers like, and return the results to the web server, web server and then transfers it to the user.

Client tier is a Web browser in the system. Using the J2EE distributed client technology. It handles complete user interaction with the application and display the page. The system can use a Web browser and access to common applications in two ways. In a J2EE environment, this part can be JSP or Java technology and they are running in the Web container in response to a request by the client Web container. The intermediate layer is formed using J2EE components and technology to build a container remote answering system function of each part, which is an application server, mainly composed of three parts:

Web Container: This is an important part of the intermediate layer as all of the user interfaces are reflected here. Taking into account the JSP can be embedded in HTML, developers easy and flexible user interface generated, etc., so the system can use a JSP user interface. The main user interface generated includes user log in and authentication user interface and learn interface, user feedback interface.

EJB Container: EJB container management major J2EE EJB application execution. EJB is responsible for receiving data directly from the client application or from a web container they make the necessary conversions, and send it to the data tier for storage and processing. Sent to the client after the EJB can also get data from the data layer and processed. Most of the business logic and rules of the system are realized here and these EJB components to achieve the main business logic including user authentication and registration, keyword extraction, answering library inquiries.

Database Connectivity: Entity EJB Container is to connect and interact with a database management system information through a database for the different database systems, which form of access is different, but the interface to access the database via standard JDBC-ODBC
connections can require database access heterogeneous database service program, so that the system has strong scalability.

**Mashup Data.** Mashup is based on data from the plurality of API data content providers together, its manifestations are diverse, and may be a single server or individual client Mashup, it can be a combination of two methods, that is, it may be a polymer formed by the new data in the form of different data server-side resources, and in some way transmission and demonstrate to the client browser. It may be directly polymerized different data resources and services to the client through script code. But no matter what kind of way, or a combination of both, which forms on the page they are the same, after all the data integration on the same page as a whole to show up in some form of interface.

![Figure 2. Intelligent Question Answering System.](image)

**Mashup page-based.** Mashup page is put together by a plurality of Widget together, a Web page often contains a plurality of rectangular regions, then it could spell a plurality of rectangular regions into one Web page, and thus constitute a Web application, these pages contain the rectangular area is Widget. Widget is a special Web applications, can be video, maps, news and other forms presented. Users can refer to personal preference in accordance with a plurality widget users want to see the re-appearance of permutations and combinations, and then complete their own network environment.

Unlike data Mashup, Mashup form pages based only reflected in the browser's Web page, and its polymerization process is split assembling a plurality Widget on Web pages carried forming process. These Widget on the Internet, you can achieve data aggregation, publishing and sharing. Therefore, this answering system is composed of a plurality Widget, users can manage the system tracks all kinds of Widget applications, combined to form their own Q&A environment.
**Matching algorithm.** Intelligent answering system uses natural language search database text retrieval method. Also known as natural language search text retrieval system by means of text retrieval and understanding of the statement, calculate their similarity, and sort search results, showing the highest similarity search results to the user. Text retrieval matching objects may be the entire text, it can also be a part of, such as title, keywords, etc.

Match the object of this system is mainly keyword courses for different types of problems, choose a different type of database, and then enter the problem, but in the corresponding library by keywords match, showing the highest similarity matching answers.

Dividing the total number of word strings are: \( (1 + 2 + ... + S) = (S + S^2) / 2 \)

Find the number is: \( n \times (1 + 2 + ... + S) = (S + S^2) / 2 \)

We can use the following formula to calculate the degree of matching problem:

\[
MG(Q_i) = \alpha K_i + \gamma \frac{\sum_{j=1}^{m} w_j}{n - m + 1} + \delta \left( \frac{\sum_{j=1}^{k} f_j}{k} \right) / \sum_{j=1}^{k} f_j
\]

**Work Process.** Intelligent answering general workflow: Answering System users from the student at first get to answer questions or keywords, and the formation of a text string, then this text is processed to generate natural language understanding can be applied in the form of use natural language search technology found in full compliance with the answer, and the answer is returned to the student after processing the user. If you do not meet the conditions of the answers, the students returned to the user the appropriate message.

We built directly on the IQAS API interface module, connected to the network of other relevant learning resources and associate the server through Mashup integration, the contents consolidated directly presented to students. In this way, by Mashup provides value-added, innovative services and resource use, but also for developers to save development time and improve development efficiency.

**Key modules.** Artificial Q module. Q is the traditional manual remote answering mode, divided into synchronous and asynchronous Q&Q. Q&A that is capable of real-time synchronous communication between teachers and students to ask questions to get the teacher's immediate response. We use IRC chat room to achieve this function; that is asynchronous answering to discuss the course of an issue through the BBS forum, even if only students to participate, but other students will benefit from it.

Synchronous AC IRC modules. IRC chat room provides a real-time exchange of teachers’ and students’ ways and places. In order to optimize access to data, using a database connection pool technology and connection pool basic idea is to connect multiplexing, when the need to
establish a database connection, simply take a free connection instead of using the new from memory. When finished, simply connect back into memory instead of being closed. By using a connection pool, greatly improving the efficiency of the database access.

Asynchronous discussion BBS module. Establish a remote answering system BBS forum provides a place for students and teachers an asynchronous discussion, exchange and synchronization of complementary advantages, to better facilitate the exchange between teachers and students.

Intelligent answering module. Intelligent question answering system integrated use of knowledge representation, information retrieval, natural language processing technology. It is possible to input natural language question, rather than a combination of keywords. And returned to the user is simple, accurate answer, not some relevant pages.

Conclusion

By analyzing the characteristics and system architecture model remote answering system application system, combined with the current status of research and application of remote answering system, designed and implemented a three-tier architecture based on J2EE remote answering system, the paper design and realization of made detailed introduction. The system provides the user with a synchronous and asynchronous communication, artificial, intelligence and joint Q combined with considerable integration, convenience and practicality of remote answering environment. Question and answering system synchronization methods such as real-time chat room exchanges between persons, answering asynchronous mode and online discussion forums, while as well as intelligent answering seamlessly integrated together to provide a variety of exchanges of answering mode, so that each ways complementary advantages that fully meet the needs of the general answering.

References


