A Knowledge Sharing and Managing System for Offshore Software Development Company

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Abstract: - This paper proposes a knowledge sharing and managing system in offshore software development company. The major features of the proposed system are a BBS style Q&A function, a management of Q&A results based on domain knowledge, an association retrieval function for coping with grammatical ambiguity including in the queries, and a display of Q&A texts on the plain for grasping the general distribution of knowledge and problems. The prototype system used in-house on trial is illustrated. Through the trial in-house, several improvement problems are clarified.

Key-Words: - knowledge sharing, knowledge management, question and answer system, association retrieval

1 Introduction

In most offshore software development companies in China, majority of employees have little experience in software development. In addition, employees have to understand the documents written in foreign language such as Japanese, and also have to write the documents in foreign language. Nevertheless, the foreign language level of the most employees is relatively low. Furthermore, because of the rapid improvement of the information technologies, employees have to continue learning.

To smoothly and effectively carry out their tasks in above described situation, a support system for the novice software engineers is desired.

A Chinese software company, "Jinan Ryouka Science & Technology Co., Ltd.", which the authors manage, planed the development a knowledge sharing and management system named "Ryouka KM System (RKMS)". The major features are a Bulletin Board System (BBS) style Q&A function, an association retrieval function for coping with grammatical ambiguity including in the queries, and a knowledge management function such as a display of Q&A texts on the plain for grasping the general distribution of knowledge and problems. A prototype system of the part of RKMS has been developed and used in-house on trial.

In this paper, firstly, the outline of RKMS is introduced. Then, two core subsystems are explained in detail. Finally, the prototype system and the result of trial are shown.

2 Outline of RKMA

An outline of the planning knowledge sharing and management system is shown in Fig.1. This system is consisted in three sub-systems, a BBS style Q&A system, an association retrieval system, and a knowledge management system.

A BBS style Q&A system is a typical BBS system. Though writing Q&A sentences in Japanese is encouraged to employees, Chinese sentences are also allowable. To preserve the leak of customer confidential information, the access control is carefully designed. For example, the information can be limited the range of disclosure.

An association retrieval system aims to reuse the existing Q&A database for self-education. The almost of all sentences in Q&A data stored in the offshore software development company are ungrammatical

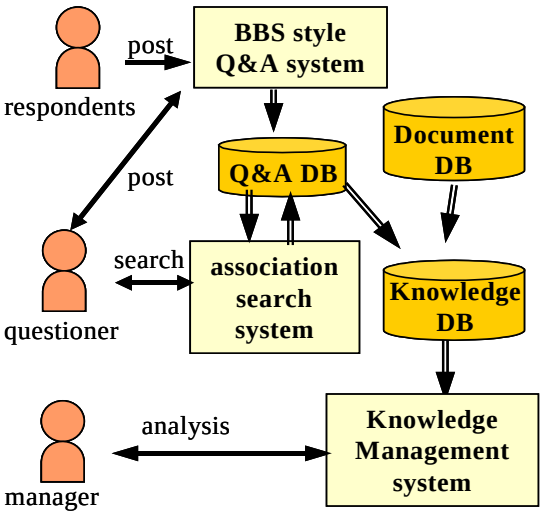

Fig. 1 Outline of KRMS

and are used wrong words because of the low ability of foreign language. Therefore, typical text search methods[1][2] are useless. To solve this problem, the association retrieval method of similar Q&A articles developed in Osaka University[3] is introduced.

A knowledge management system is developed for the managers to grasp the hot topics and weak points in the company. The threads of Q&A and the documents in the company such as daily reports are inputted. This subsystem has two types of user interfaces. The first one is a graphical trend display to understand the change of employees' typical interest. Another display is the user interface for analyzing atypical Q&A threads. Q&A threads are displayed on the 2-demensional plain in accordance with their attributes.

3 Association retrieval method

Web bulletin board in the BBS style Q&A system includes useful information for novice engineers. Users who want to obtain information generally retrieve by keyword or narrowly searched articles, judging whether an article includes necessary information by reading its title or first sentence. However, only by the keyword matching, users cannot find out the suitable articles effectively, because the sentences in the articles are often written in erroneous usage of characters and expressions. Furthermore, in some cases, Chinese sentences are mixed. Therefore, a method for retrieving similar question articles to a query by natural sentence input to improve retrieval

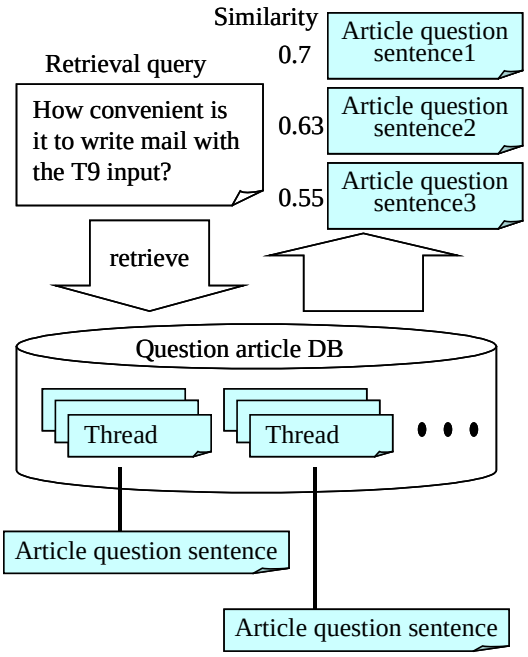

Fig. 2 Retrieval from Q&A DB by natural sentence

accuracy in an environment including the erroneous in characters and grammar is necessary.

To solve this problem, a association retrieval method [3] developed in Osaka University is introduced. Fig. 2 shows an outline of the association retrieval by natural sentence input. The flow of the retrieval procedure is shown below.

Step 1: A user inputs the retrieval query sentence.

Step 2: The input question sentence is analyzed in the morpheme, and the nouns are extracted.

Step 3: The articles, i.e. candidate articles, are retrieved from the question article database by using a set of extracted nouns.

Step 4: It is judged by using the modified cosine similarity index whether the question sentence in the candidate article is similar to the retrieval query sentence.

Step 5: As a result of the similarity judgment, users receive the article question sentence and question articles in order of their similarity to the question, with the most similar at the top. The order of articles is adjusted using the past users' evaluation.

The cosine similarity index is the one of the typical methods for judging the similarity between two sentences [4]. The modification of the cosine similarity index is done for coping with the erroneous usage of characters and expressions. The elements of the word vectors used in the cosine similarity index are

derived from a sentence structure from the viewpoints of common words and non-common words between a user's query sentence and article question sentences.

4 Knowledge management system

4.1 Outline of the KM system

The Q&A thread of the Q&A system or the information on other documents in the company is stored as "card" in the knowledge DB. A card is a set of sentences such as a pair of question and answers, the description of problem, and so on. The outline of the support system is shown in Fig. 3.

The main purpose of this subsystem is that the manager easily grasps the trends of interest areas and finds new problems or topics. The cards containing typical topics (called typical cards) need to be grouped to count the number of the cards. Therefore, the key function of this subsystem is to extract atypical cards, which contain atypical topics (called atypical cards), from all cards and to group typical topics by contents. As the result of the extraction, cards are divided into categorized typical cards and atypical cards. Different user interfaces are necessary, because the direction for use differs in atypical cards from typical cards.

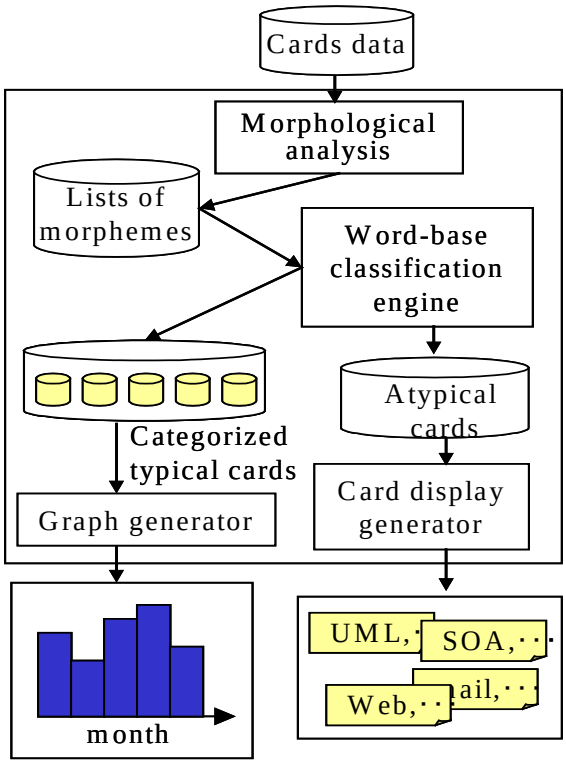

Fig. 3 Outline of Knowledge management system

Typical cards are graphed to show time series behavior of the numbers of cards that are grouped by the content categories. On the other hand, to grasp the trend of atypical cards, another type of display is needed. Thereupon, the result of the atypical card classified by the contents is placed on the screen by the attributes of cards. Based on selected coordinate, the card cards are displayed on the screen.

4.2 Atypical card Interface

Fig.4 shows the user interface for analyzing atypical cards. There are three window areas: Classified result area, Card cards area, and Text information area. In the classified result area, categories of classified atypical card are listed. In the end of the category name, the number of cards in the category is shown. When users select certain category by mouse operation, card cards are displayed by contents similarity in the card cards area. In this area, the card is displayed largely as it is recent and only characteristic keywords are shown in the cards. Viewpoint is changed by mouse operation. When one card is clicked, raw text card and personal information of the card writer are shown in the text information area. To cope with vague changeable borderline between the typical and the atypical, users can add definition of typical cards by dragging and dropping the card that users judge as the typical.

4.3 Outline of atypical card extraction [5] [6]

The cards have to be classified into several typical categories and an atypical card category. Fig. 5 shows the outline of the classification function. The meaning of cards with word units is judged by word, because there are so many grammatical errors and incorrect letters in the cards.

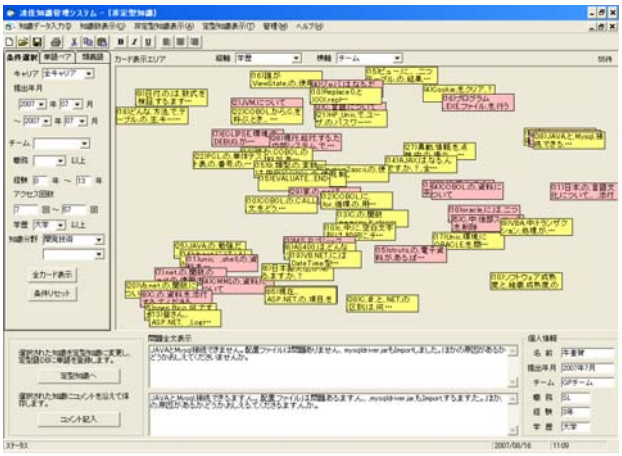

Fig. 4 Atypical cards display

Firstly, the card data is decomposed into word lists by morphological analysis with "ChaSen" [7], Japanese software. Then, from the word lists, nouns, independent adjectives, and independent verbs as the minimum words for understanding a sentence are extracted. In Japanese, nouns are roughly divided in to 14 kinds. There are also words that join keywords in context. Based on morpheme connection and extraction rules, morphemes are transformed to keywords. For example, "Web" and "service" are transformed to keyword "Web service" by the rules.

In the typical word database, the combinations of words are set up beforehand. System managers can maintains the typical word database. When they recognized a new category of the cards, they can add them to the typical word database.

A matching engine to extract atypical cards compares keywords of cards with the typical word database.

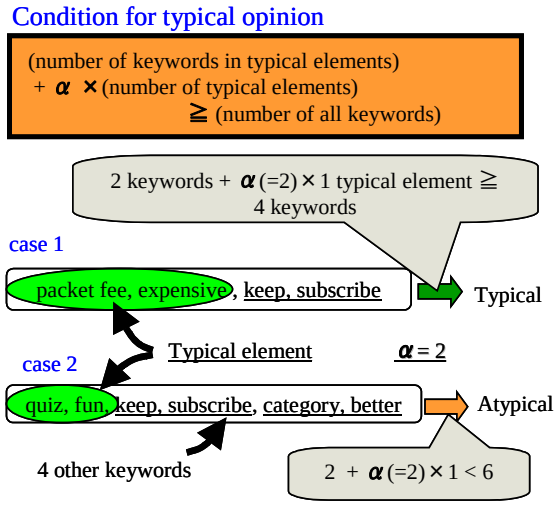

Fig. 5 atypical card extraction method

5 Conclusion

This paper described a knowledge sharing and managing system in the offshore software development company. The development project on the proposed system has started. A prototype system of the BBS style Q&A system and the Knowledge management system has been developed.

The prototype Q&A system is now tested in-house since the end of July. About 80 employees participated the experience, and more than 500 Q&A sets are exchanged. Through the trial test, we get the good evaluation on the basic functions as a Q&A system. However, it is necessary to improve the administrative functions.

The prototype knowledge management system was evaluated using about 200 man-made problem cards. Through the trail test of the basic method used in the system, it is cleared that a coordinate method of typical erroneous usage of characters is needed. Also, the improvement of the classification method is requested, because the length of sentences are long compared with the original application

Though the retrieval and analysis engines are important, the user interfaces are also essential for the actual business environment. Based of the user opinions, they will also improve.

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