Ontology-based Question Answering System

Sheen-Mok Lee, Pummo Ryu, Key-Sun Choi

Korea Advanced Institute of Science and Technology, 335 Gwahangno
(373-1 Guseong-dong), Yuseong-gu, Daejeon 305-701, Republic of Korea
{smlee, pmryu}@world.kaist.ac.kr, kschoi@cs.kaist.ac.kr

Abstract. In this paper, we construct IT-domain question-answering system as an application system of the IT-domain ontology. We defined 16 types of questions based on question type definition by DARPA. For each of the question type, an inferencing method is designed and implemented. We demonstrate the user interface which can connect users with the QA system and the ontology.

Keywords: question-answering(QA), ontology, question type

1 Introduction

Question answering has been vividly researched since 1999 when TREC(Text Retrieval Conference) started to construct QA test collection and evaluate systems. As a new approach for QA, ontology-based QA system has following advantages other than improved performance. i) offering additional information about an answer, ii) providing measures of reliability, iii) explaining how the answer was derived[3].

In order to deal with various kinds of inferencing scheme, we used a taxonomy of 16 question types, which was defined by Graesser and Peterson(1994) and introduced by DARPA QA white paper[1]. We implemented ontology lookup method for each of the 16 question type. We also constructed user interface that will make it easy for users to interact with QA system and show how our ontology works for the question.

2 QA Processing Unit: Triplet

In our approach, the unit for I/O and internal processing is not a NL sentence but a triplet, which can be directly applied to ontology lookup, shown in table 1.

<table>
<thead>
<tr>
<th>Type</th>
<th>lexical triplet</th>
<th>ontological triplet</th>
</tr>
</thead>
<tbody>
<tr>
<td>question-type</td>
<td>(“is used”, “time division switch”, “why”)</td>
<td>GOAL_ORIENTATION(isUsedFor, time_division_switch, ?X)</td>
</tr>
<tr>
<td>answer-type</td>
<td>(“is used”, “time division switch”, “multiplexing”)</td>
<td>GOAL_ORIENTATION(isUsedFor, time_division_switch, multiplexing)</td>
</tr>
</tbody>
</table>
In table1, we showed triplets which are necessary to answer “Why is time division switch used?”. After question-type lexical triplet is input to the system, it is converted to question-type ontological triplet. Through ontology lookup, we get answer-type ontological triplet, which is converted to answer-type lexical triplet output to user.

3 Architecture

In figure1, we show the path for ontology lookup for 4 types(concept completion, example, enablement, and goal orientation). For each of the type, we can see diverse search paths. For example, after searching a class for questioned entity, three kinds of paths are possible. The path selection is determined by query type.

In determining search path, we should also consider the type of questioned entity(class/instance). In figure1, we can see that the path for concept completion type is divided with two paths according to the result of class/instance discrimination. If user is asking about an instance like “Samsung Electronics”, we should search the instance in the next step, while if he is asking about a class like “DMB service”, we should search the class in the next step.

Figure1. Architecture of QA system

References

Demo Script for Ontology-based QA System

1. Functionalities of User Interface for Ontology-based QA System
   A. Our user interface consists of following two windows.
   B. Question Answering window
      i. Providing users with the queries that users can get the response from ontology-based QA system
      ii. Supporting the user process of question and answering
   C. Ontology Search Path window
      i. Graphically visualizing the search path of a query

2. Demo Sequence
   A. Select a question type of the query to ask (selecting “WHAT”).
   B. Select a lexical form relation of the query to ask (selecting “jiwi(position)”).
   C. By clicking “Search Query List” button, get the possible query list.
   D. Select a query to ask (selecting “[PyeongMoo Park, jiwi(position), WHAT]” which means “What is the position of PyeongMoo Park?”).
   E. By clicking “Get Answer” button, get the answer and graphically observe the search path in the ontology. (Figure 2)
   F. There are many additional functionalities that users can get additional information of ontology in the ontology search path window.

Figure 2. User interface after receiving answers from QA system