Extending Q&A systems to dialogue systems

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We are gradually entering a society where multiple electronic information sources, located both globally and locally, are available to support the performance of everyday activities. Being able to access the information does, however, not necessarily mean that it is easy to find the relevant information for a certain task in a given situation. Furthermore, most of the information will be found in text or in semi-structured documents, and not in databases.

Our research aims at developing means and techniques for easy access to such information and also techniques for pinpointing specific and relevant information. This involves new issues in the area of interaction design where documents must be analysed and structured before allowing the information system to act appropriately. It also includes means allowing the user and system to take part in a task-oriented dialogue where various pieces of information have to be provided by the user for the system to arrive at a satisfactory formulation of the information problem.

We present four projects, with different focus, where we have developed systems allowing users' access to public information in a more usable form.

The first project, Ask-RSV (Merkel, Petterstedt & Jönsson, 2002), explored the prospects of using a simple ontology in order to enrich public electronic documents with domain-specific information to allow for simple question-answering. A simple Q&A system was developed to the brochure describing the tax account for citizens in Sweden. Several standard techniques were applied, from document conversions to morphosyntactic analyses. The documents were converted to XML, and domain-specific lexicons were built using Conexor's Swedish FDG parser. A question corpus was also compiled, mainly from FAQs from the web site and by manual inspections of the documents.

The second project, TV-Guide (Ibrahim and Johansson, 2002; Johansson, Degerstedt & Jönsson, 2002), started from the interaction perspective and investigated means for utilising a multimodal dialogue system to access public information. Finding the program, or programs, to watch is a tedious task using the normal means available. A dialogue system, on the other hand allows the user to vaguely specify a request for a TV program and gradually refine that request in a dialogue. It is also possible to request further information about a TV program. TV-Guide, was implemented for a box for digital TV, Internet access, etc. The context-of-use is a relaxed household living room environment, and the user interacts via a microphone on the remote control.

The third project, BirdQuest (Jönsson & Merkel, 2002), combined the two previous approaches by applying dialogue capabilities with information extraction on an extensive text book. BirdQuest was developed for a web site where people, watching

nature programs on TV, can ask questions related to the TV program, in this case questions on Nordic birds. A corpus of 329 information requests was collected from users asking questions on a web page hosted by the Swedish National Television.

The information in BirdQuest is based on a bird encyclopaedia which was marked up with ontological information in a way similar to that done for Ask-RSV. This resulted in an XML database, and the first version of BirdQuest used this. One early observation, however, was that the search algorithms for retrieving information from the XML database were not as efficient as, for instance, those utilised in a database system. Database systems also allow for more advanced information search. Consequently, we transformed the XML database into an SQL database, which in turn is used by the dialogue system.

The BirdQuest database depends very much on the text extraction components. The more advanced they are, the more features from the text documents can be accessed. Currently we have many of the texts stored in the database as texts and they are, thus, presented to the user as such. To be able to respond properly to questions where features in the texts are involved, such as *Show all owls eating mice* assuming that food is stored as text fragments, requires search in the texts stored in the database, given that the concepts are in the lexicon.

The next step to take is to refine the analysis, which in turn requires a more advanced ontology. A starting point for this is the bird encyclopaedia that must be further analysed. One problem here is that for certain aspects there is no agreed upon vocabulary and consequently the concepts vary between properties. Another issue is that most users utilise other concepts from those used in the encyclopaedia, especially concerning bird anatomy, such as the various types of feathers on a bird. Thus, further development of the ontology must also have means for combining two different ontologies, one based on the user corpus and another from the text sources.

In the fourth and on-going project in cooperation with Ida Infront and the trade union Kommunalarbetareförbundet we are designing a dialogue front-end to a document collection on trade union agreements. The objective is to provide trade union members with specific information from the document base that is of interest to individual members. As in the other projects this involved collection and analysis of a question corpus, as well as construction of a domain-specific ontology covering concepts such as salary, holidays, benefits, over time compensation, etc. The Kommunal documents are not as consistent as the documents used in Ask-RSV and BirdQuest. The higher degree of variation requires efficient means to extract the required information and therefore a multi-level pattern extraction tool has been developed. The tool is user-driven in that it lets the user specify multi-level patterns that can be tested incrementally on the document base. The multi-level facilities mean that it is possible to combine different levels of linguistic and ontological information in the extraction patterns. Furthermore, patterns can be constructed in an incremental way making it possible to encapsulate primitive objects initially and later reuse these objects as input to more complex patterns, which, for instance, extract event descriptions from the documents.

References

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