

Task-Oriented Dialogues

Jim Cowie and Sergei Nirenburg
Computing Research Lab
New Mexico State University

It might be fair to say that the Bellagio workshops have grown out of the work by several groups on the Loebner Competition. This naturally led to some constraints on the types of human-computer dialogues studied. We would like to discuss a dialogue environment which is narrower than the general Loebner Competition case. We downplay the requirement for the computer interlocutor to emulate human conversation. Instead, we stress human-quality performance on an information processing task.

The task, or rather, a set of tasks on which we have been concentrating our work over the past five to seven years includes the computational applications of information retrieval and extraction and text summarization. One additional persistent theme in our work has been multilinguality, that is, performing all the above operations over document collections in a variety of languages and, possibly, using different languages for human-computer dialogue. We have recently put together a proof of concept system that nicely combines vestiges of all of the above capabilities. This system (see an architecture diagram in Figure 1) generates answers to questions posed by the human user by finding a relevant passage in a document and summarizing it for presentation to the user.

We view this system as the core of a more comprehensive and intelligent task-oriented dialogue system. We are currently working on the transition to such an expanded version of the system. Figure 2 illustrates the control architecture and the enhanced capabilities in this new version, specifically, the facility for dialogues between the user and the system. Dialogue in the system will be largely devoted to the system attempting to clarify the content and purpose of user queries. Additionally, the system may ask the user for help in performing actual information processing tasks, for example, asking for help in establishing the preferences and priorities under which the system will operate for a particular query set. In fact, at most stages of the information gathering process the system may encounter unexpected ambiguities or missing information. In such cases, the best strategy may well be to ask the user for guidance and help in disambiguation. Finally, an important purpose of dialogue is for the system to ascertain that the results it produced are satisfactory.

Let us consider a simple example. Suppose the user submits a query "Where is the Taj Mahal?" The system finds two quite disjoint sets of references to Taj Mahal, one being the famous structure in Agra, India, the other, a casino in Atlantic City, NJ. The system attempts to fill a single formal template for the answer (we use an extension of the text meaning representation formalism developed in Mikrokosmos [Mahesh et al., 1995]), and detects two candidates for the filler of the location slot in a frame of the type "building." The original query does not contain any information to help in this choice. So, the system resorts to forming a question to the user. The resulting question will be produced in a combination of natural language text and any tables or other material as the system may see fit. Note that if the original query is "Tell me about Washington," then the nature of the ambiguity will be different: in the former case, it is between two potential values of a property (location), whereas in the latter, it is among at least three different kinds of objects --- a person, a city or a state. At the workshop, we intend to demonstrate some minimal capability in this area.

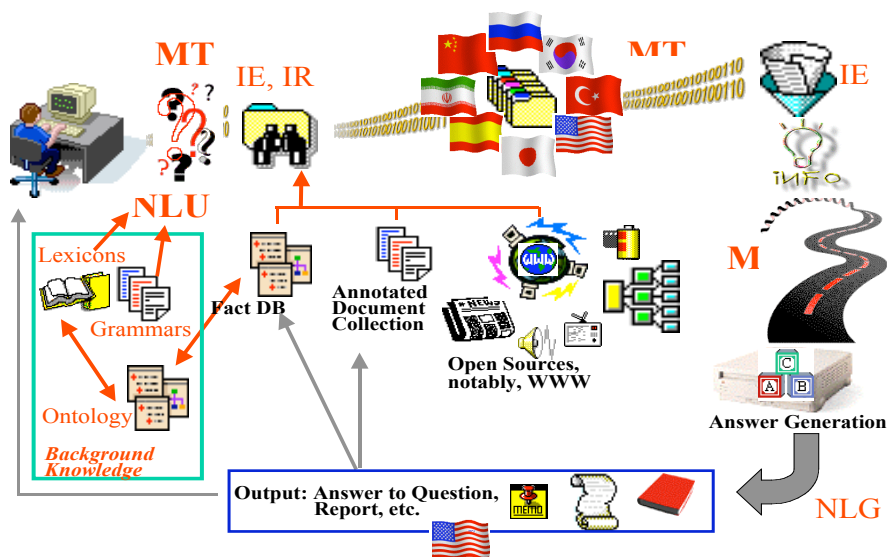


Figure 1. The throughput and the background knowledge for a question answering system. Note that search for information takes place not only in open sources but also in a Fact DB and a collection of preprocessed and annotated documents. The queries and the documents may be in any of a variety of languages. Augmentation of the Fact DB and the document collection are side effects of the system's operation.

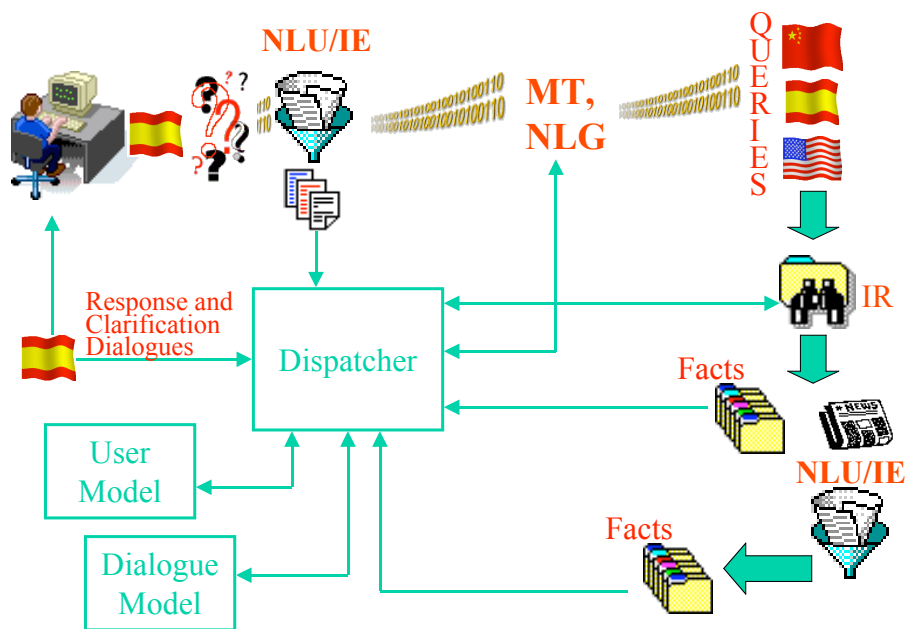


Figure 2. The control structure for dialogue in the system. The dispatcher manipulates knowledge in the TMR format and controls the production NL elements both for user dialogue and for information retrieval needs. Machine translation is an auxiliary component in the architecture, called as needed. The dialog model relies on specialized knowledge stored in the ontology and is driven by lacunae and ambiguities in the knowledge structures describing both the content and the control of the information gathering process.

References

Tri Mahesh and Sergei Nirenburg. 1995. A Situated Ontology for Practical NLP. In Proceedings of the Workshop on Basic Ontological Issues in Knowledge Sharing, International Joint Conference on Artificial Intelligence (IJCAI-95), Aug. 19-20, 1995. Montreal, Canada.

Cowie, Evgeny Ludovik, Hugo Molina-Salgado, Sergei Nirenburg and Svetlana Sheremetyeva. 2000. Automatic Question Answering. Proceedings of RIAO 2000, Paris, April.

Cowie, Evgeny Ludovik, Hugo Molina-Salgado, Sergei Nirenburg and Svetlana Sheremetyeva. 2000. The Book at a Glance - Cross-language Cross-document Information Extraction and Translation. Proceedings of LING 2000. Saarbrueken, August.