Research at the Artificial Intelligence Corp.

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The Artificial Intelligence Corporation was formed in 1975 to develop and market a commercial natural language database query product. The company currently employs 30 people to enhance, support and market its product known as INTELLECT, which is the productization of the earlier prototype system known as ROBOT.

INTELLECT runs on IBM and compatible mainframes and interfaces to IDMS, ADABAS and VSAM database systems as well as INTELLECT's own retrieval component. In each of thse cases INTELLECT parses the natural language request, determines the navigation among the files required to access the data, optimizes the access pattern, retrieves the data and displays the answer.

INTELLECT is currently installed at 15 end-user sites, where in some cases as many as 50 non-technical people make daily, productive use of the system. In addition, INTELLECT is sold on an OEM basis by Cullinane Corporation, Honeywell Information Systems and Information Sciences Corporation. Indirect sales through these vendors more than doubles the installed base of the product.

The current research and development activities of the company are centered around the following areas:

Enhancement of the analysis of natural language queries

Interfaces to additional database systems

Performing more general and abstract processing of the retrieval data

Interfaces to more sophisticated commercial packages such as modeling and forecasting systems

Reducing the labor intensity of defining the discourse domain for each application

Making use of additional semantic information stored in the database, the database schema, and the data dictionary

Updating databases in natural language

References:

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ILIAD -- Language Generation for Instruction Bolt, Beranek, and Newman

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Summary:

The ILIAD system is an intelligent CAI system developed to give instruction and practice in English to children and adults who have language-delaying handicaps such as deafness or who are not native speakers of English. The student specifies grammatical or functional language topics and exercises are produced which contain sentences generated by the system. In order to provide highly personalized exercises and very specific tutorial guidance it is necessary for the system to have a deep understanding of the linguistic relationships in the sentences it generates.

The ILIAD language generation system is based on the paradigm of transformational grammar, blending some aspects of standard transformational theory with the extended standard theory. More than 350 rules have been developed to generate not only most of the common (and many not-so-common) English structures but also ungrammatical sentences which are typical of those produced by people with language handicaps. ILIAD can produce such structures as transitive and intransitive sentences, indirect objects, passives, predicate adjectives, predicate nominals, predicate adverbs, comparative and superlative structures, complex verb auxillaries, modals, yes-no questions, wh-questions, indirect questions, relative clauses of all types, sentential complements, negatives, extraposed noun phrases,and simple conjunctions, quantifiers, pronouns, and any grammatical combination of these forms.

The following example is typical of the exercises presented by the ILIAD system, and illustrates a few of the ways in which the system's knowledge of the sentence structure can be used to help a student along. Underlining indicates input typed by the user.

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Here is a sentence with a singular subject:

  The cat has been stolen by the boy who
  chased Mary.

Now type it with a plural subject:

>hint

  The subject is: the cat

>help

  To pluralize "the cat", add an "s".

>The cats has been stolen

>The cats hint

  The verb "has been stolen" may also have to
  be changed.

>The cats have been stolen by the boy who
   chased Mary.
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To control the operation of the generator, several layers of control structures have been developed, including constraints, implications and synspecs (syntactic specifications). The constraints specify the characteristics of the base structure and the transformational rules to be applied during each cycle. The implications ensure that the constraints remain consistent (e.g. if a sentence is to be passive it must have a direct object and a transitive verb). The synspecs allow the user and the system to determine the syntactic form of the sentences at a very high level.

Because the emphasis of the system is on syntactic form, the interface to semantic information has been deliberately limited to the process of lexical insertion. Several different semantic components have been used, and a KL-ONE interface is being designed.

ILIAD has been used with deaf children and adults during its development and has shown promise for broader application to foreign language instruction and English literacy training.

References:

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Research in Knowledge Representation for Natural Language Understanding Bolt, Beranek, and Newman

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Summary:

BBN's project in Knowledge Representation for Natural Language Understanding is developing techniques for computer assistance to a decision maker who is collecting information about and making choices in a complex situation. In particular, we are designing a system for natural language control of an intelligent graphics display. This system is intended for use in situation assessment and information management. We believe that the decision maker needs an extremely flexible system, capable of manipulating large amounts of data and presenting it on a graphical display in a variety of ways until he feels satisfied that he has a grasp of his situation.

Our work on this project is concentrated in the development of fundamental techniques for knowledge representation and language understanding. Specifically we are working on advanced parsing techniques, syntactic/semantic interaction, recognition of speaker intent, anaphora and deixis, fundamental knowledge representation techniques, and parallel algorithms and techniques for knowledge-based inference.

The major accomplishment of our work so far is the development of the knowledge representation system KL-ONE. Another accomplishment is a prototype display system that understands requests, assertions, and questions about display manipulation. The language understanding prototype is based upon several general tools, including the RUS parser, a lexical acquisition system, the PSI-KLONE interface (detailed separately below), and a model of a speaker-meaning recognizer. In addition, we have pursued research on an abstract parallel machine for marker passing, and implementations of knowledge-based inference algorithms.