

The objective of our intelligent language systems work is to conduct basic research in the areas of language understanding, common-sense inference, and knowledge representation. For specifically, we are interested in:

- (1) Producing better user interfaces.
- (2) Enabling the automatic processing of natural language text by computer.
- (3) Building autonomous planning agents that can operate in complex environments.

Much of our work has focused on the design and implementation of a Unix Consultant (UC) program. This system carries out a dialog in English to answer user's queries about the UNIX operating system. UC comprises a natural language parsing and generation system, a goal analyzer that hypothesizes user's goals in different contexts, a user model component that allows UC to tailor answers to the user's level of expertise, a conversational planner that allows flexible reaction to user requests, a response formation mechanism that enables from of response to be concise and appropriate, and (iv) a knowledge-intensive planner that allows UC produce complex plans and warnings of potential plan failures

We have also been interested in developing a general theory of inference for text understanding. Our previous work involved the development of a theory of inference for text understanding which identifies six classes of inference, and uses a highly-parallel marker-passing mechanism to identify potential inferences. We designed and implemented a system which uses this theory to correctly make inferences which were previously possible only with a much larger number of highly-specialized rules.

#### Recent Accomplishments

- Developed the details of a theory of the incremental acquisition of new metaphoric word senses. Two distinct kinds of learning were explored: the first is based on a theory of metaphorical similarity, the second on a theory of the hierarchical preservation of structure from the source to the target domains of conventional metaphors. Implemented sixteen distinct metaphor types with several hundred senses for 22 of the most common verbs.
- Started implementation of a knowledge acquisition system that can augment UC's knowledge base by reading the on-line UNIX man pages.
- Developed extensions to the KODIAK representation language and incorporated learning techniques into UC Teacher, the knowledge acquisition component of our UNIX Consultant (UC) system.
- Addressed the principle theoretical issues necessary to advance our theory of inference, in particular a notion of sufficient explanation and focus.
- Implemented a new grammar of a portion of English, which emphasizes the relation between grammar and meaning. The grammar extends commonly-used unification techniques for parsing and representing grammatical rules.
- Analyzed how various properties of "operationality" theories may effect the efficiency of Explanation Based Learning algorithms. Focused on problems relating to the behaviors of operationality boundary conditions. Developed and implemented polynomial-time algorithm for EBL, where previous algorithms were exponential.

## Plans

Over the next year, we anticipate working on the following problems:

- Augment the capabilities of our knowledge representation system to better handle problems of change over time, quantified statements, and hypothetical statements.
- Build prototype version of a new language understanding system that combines inference, interpretation, and parsing.
- Introduce a notion of level of importance into our inference algorithm, enabling the understander to focus attention.
- Begin reimplementing UC to better integrate components and take advantage of new technology.