

Language Understanding Research at Paramax

*Deborah A. Dahl, Carl Weir, Suzanne Liebowitz Taylor,
Lewis M. Norton, Marcia C. Linebarger and Mark Lipshutz **

Paramax Systems Corporation, a Unisys Company
P.O. Box 517
Paoli, PA, 19301

ABSTRACT

Language understanding work at Paramax focuses on applying general-purpose language understanding technology to spoken language understanding, text understanding, and document processing, integrating language understanding with speech recognition, knowledge-based information retrieval and image understanding.

1. INTRODUCTION

The basic language understanding technology in the Paramax language understanding architecture has been designed to be both independent of the language input modality (e.g. spoken input vs. scanned OCR input) as well as independent of the end application (e.g. command and control vs. data extraction). This architecture is shown in Figure 1.

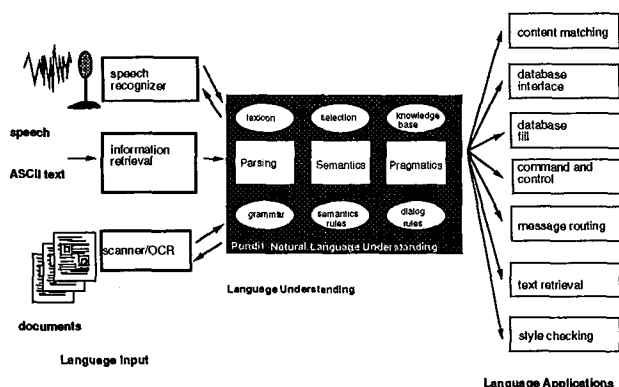


Figure 1: Paramax Language Understanding Inputs and Applications

2. SPOKEN LANGUAGE UNDERSTANDING

The focus of our spoken language understanding work is the development of a domain- and application- independent dialog processing architecture which can be coupled

with a variety of speech recognizers. Some of our recent achievements include:

- a non-monotonic reasoning capability, which will support "what if?" exploratory dialogs
- a query paraphrase component to enhance user-friendliness
- enhanced reference resolution capabilities to support additional types of context-dependent references
- automated training techniques for semantics

Figure 2 illustrates the integration of a speech recognizer, language understanding component, and a dialog manager (VFE) into a modular spoken language architecture interacting with the user and the application. A

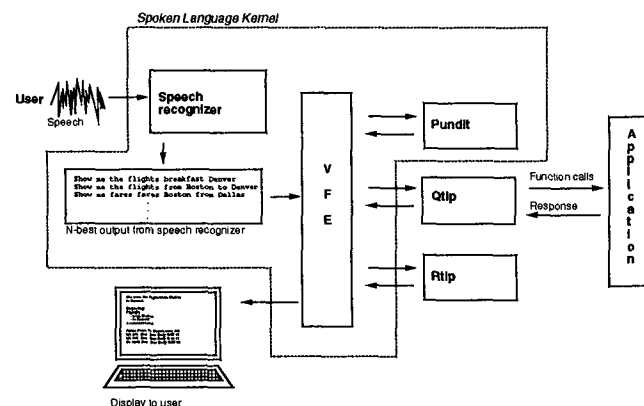


Figure 2: Paramax spoken language system architecture

more detailed description of this work can be found in [1].

3. TEXT UNDERSTANDING

In text understanding we emphasize an architecture in which a variety of components cooperate to produce

*This paper was partially supported by DARPA contract N000014-89-C0171, administered by the Office of Naval Research, and by internal funding from Paramax Systems Corporation (formerly Unisys Defense Systems).

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 1992		2. REPORT TYPE		3. DATES COVERED 00-00-1992 to 00-00-1992	
4. TITLE AND SUBTITLE Language Understanding Research at Paramax				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Unisys Corporation,Center for Advanced Information Technology,PO Box 517,Paoli,PA,19301				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 2	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

an analysis of texts. Not all components may be required for any one particular application – they can be intermixed in various ways to suit each application's needs. This architecture, shown in Figure 3 includes keyword-based information retrieval, for message routing. A knowledge-based information retrieval component (KBIRD) extracts text information which is accessible without a detailed natural language analysis. If an application requires detailed natural language processing, a natural language processing system is available. Finally, a database record generator formats the extracted information for database generation. This approach is described in [2].

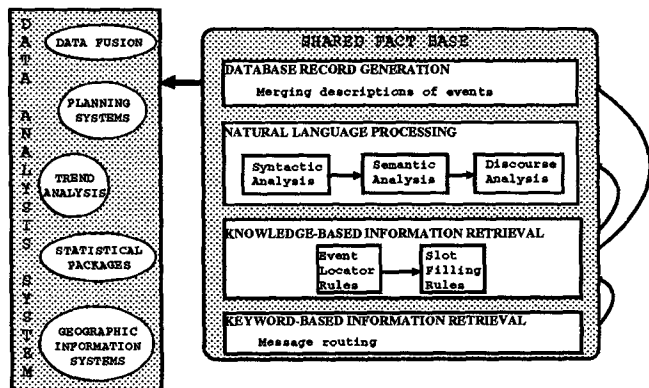


Figure 3: Paramax text understanding architecture

4. DOCUMENT UNDERSTANDING

The object of Paramax document understanding research is to develop novel knowledge-based approaches to the processing of document images. Starting with the scanned image(s) of a document's pages, our goal is to determine the document's functional and physical organization and to extract the key ideas from the ASCII representation of its text. Our current focus is on producing the structural interpretation of the document and the accompanying ASCII text for each component. The ASCII text would then be analyzed by a text-understanding system, as discussed in Section 2.

An intelligent document understanding system is shown in Figure 4 with the scope of our project falling in the shaded region.

This work is discussed in detail in [3].

References

1. L. M. Norton, D. A. Dahl, and M. C. Linebarger, "Recent improvements and benchmark results for the Paramax ATIS system," in *Proceedings of the DARPA Speech and Language Workshop*, (Harriman, New York), February 1992.

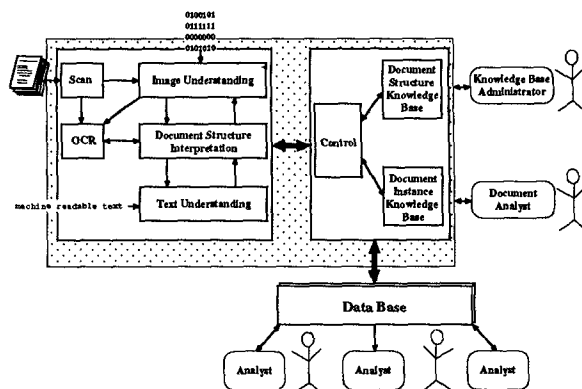


Figure 4: Multiple sources of knowledge are integrated in this document processing architecture.

2. T. Finin, R. McEntire, C. Weir, and B. Silk, "A three-tiered approach to natural language text retrieval," July 1991. AAAI-91 Workshop Program.
3. S. Liebowitz Taylor, M. Lipshutz, and C. Weir, "Document structure interpretation by integrating multiple knowledge sources," in *Proceedings of the Symposium on Document Analysis and Information Retrieval*, March 1992.