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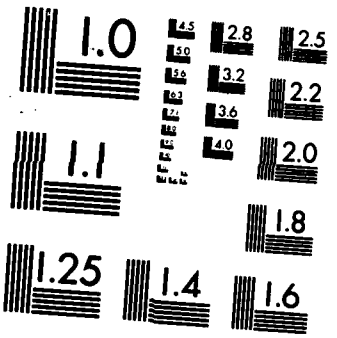

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Goal and Plan Knowledge in Software Comprehension

Final Report

Scott Robertson

The Catholic University of America

Department of Psychology

Washington, DC 20064

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Research program is to be transferred by PI to Rutgers University, New Brunswick, NJ

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An experimental program was initiated to develop a cognitive model of task comprehension, using the task of revising software code, that emphasizes the role of language constructs and syntax, the organization of planning knowledge, and the understanding of goal knowledge. The theory and models that are produced shall be useful to other investigators as a basis for understanding the elements and functions that are operative in task representation, such as the modification of military software code.

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Introduction

The following report is prepared to terminate ONR contract number N00014-86-K-0271, work unit number NR 4424198, entitled "Goal and plan knowledge in software comprehension and modification," at The Catholic University of America. The reason for the termination is that the principal investigator is transferring to Rutgers University on September 1, 1986. This report summarizes progress during the period from March 1, 1986 - August 1, 1986.

Project Purpose

The purpose of this project was to study the cognitive factors involved in the modification of software. It was hypothesized that a programmer generates a goal-based representation of code during an initial comprehension phase. The programmer then operates on this representation to make conceptual modifications in the program's function. Finally the programmer executes programming plans that are language-specific in order to make changes in code. This procedure will be repeated many times when major modifications are required.

Several experiments were designed to uncover the structure and content of knowledge representations used in the software modification process. The information gained in this study will be useful in the development of theory about the execution of complex cognitive tasks. Practically, the study will provide guidelines for the design of cognitively-based software modification tools.

Progress

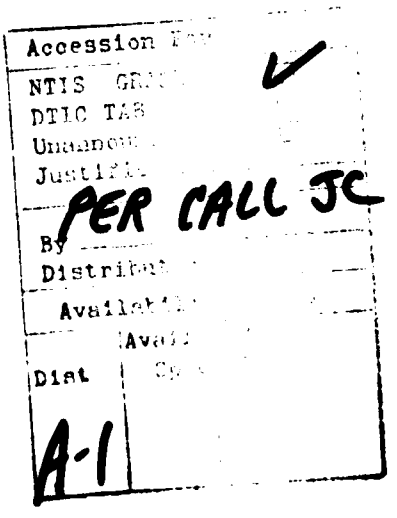
The project was funded for only five months and so insufficient time was available to complete any of the experiments. However, considerable effort went into preparation of experimental materials and software to control the experiments. A graduate student, David Koizumi, was funded during the summer to assist in preparations.

Experimental materials. The stimuli in all of the experiments consisted of computer programs. Specifically, the same eighteen programs, nine FORTRAN programs and nine PASCAL programs, were to be used across all experiments. Three subsets of three programs each were required within each language group for these studies. Each subset embodied a different programming plan. Because of these rigid specifications and repeated use of the same materials across several experiments, development of these programs was the initial priority.

The eighteen programs for the three plan groups were developed and debugged. We decided that it was important to pretest these materials before beginning data collection. Thus, the programs were given to FORTRAN and PASCAL programmers and they were asked to "describe in a few sentences what each program does." A sorting task on these summaries will be performed and we will require that the three plan groups emerge from the sorting task before commencing the experiments. If they do not, we will modify the materials accordingly.

Proficiency tests. All programmers will be required to take a brief programming skill test before participation in the experiments. Development of this test is critical to the success of the experiments. We have prepared short, multiple choice FORTRAN and PASCAL tests which measure recognition of all of the keywords used in the stimuli and basic programming concepts like variables, assignment, equivalency testing, and looping.

Software development. Some of the experiments will require the presentation of code on a computer screen and the collection of reading-time and line-reading data. We have written the programs to control these functions.



Personnel

Dr. Scott Paul Robertson
Principal Investigator

Mr. David Koizumi
Graduate Research Assistant

Bibliography

No publications

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Dr. Deborah A. Boehm-Davis
George Mason University
Department of Psychology
4400 University Drive
Fairfax, VA 22030

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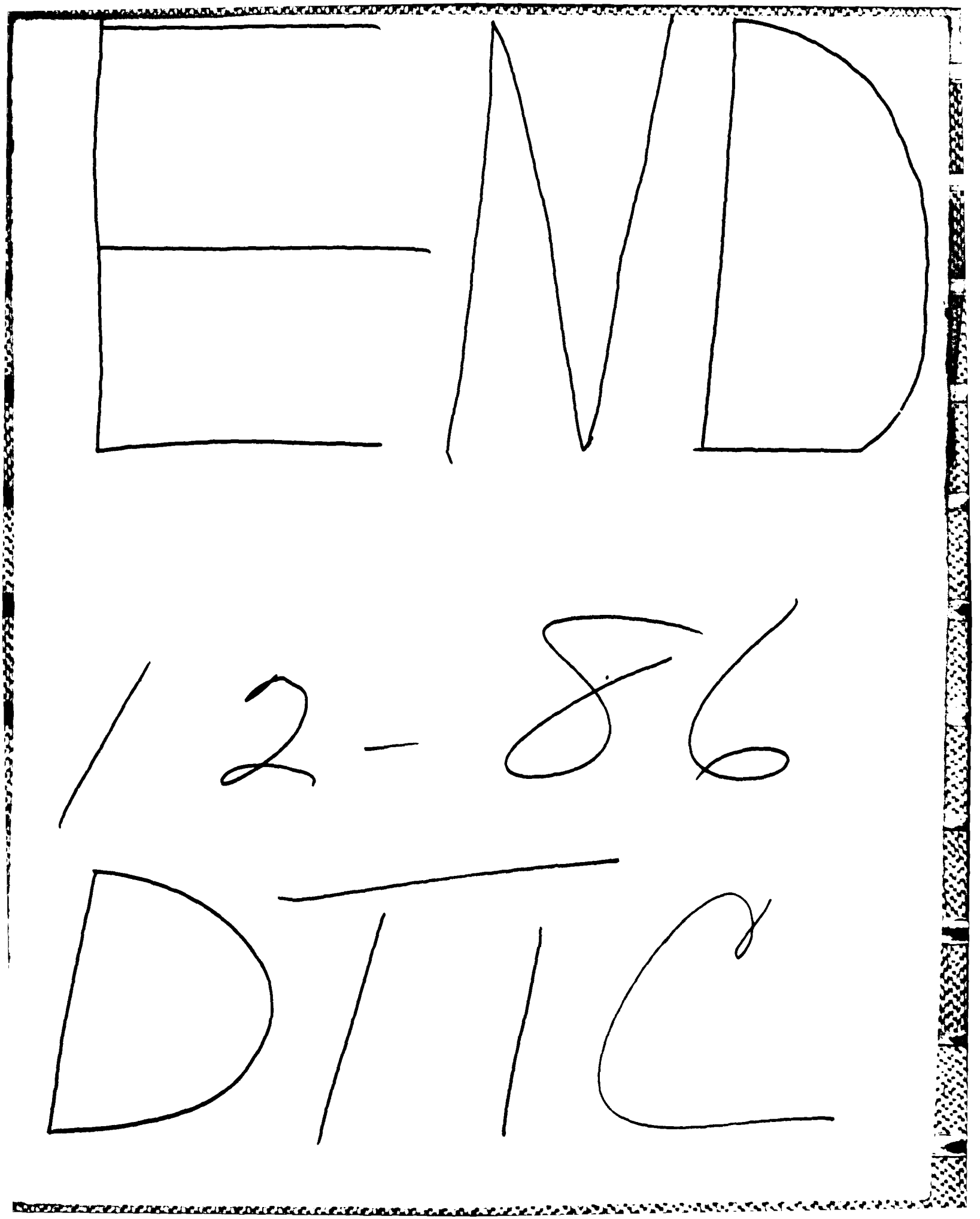
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