XXIV. MECHANICAL TRANSLATION*

Dr. V. H. Yngve   Carol M. Bosch   A. D. Maaleuf
Prof. E. S. Klima   Elinor K. Charney   T. More
Dr. J. J. Viertel   J. L. Darlington   W. K. Percival
M. P. Barnett   D. A. Dinneen   A. C. Satterthwait
                          K. C. Knowlton

RESEARCH OBJECTIVES

The primary objective of our research program is to find out how languages can be translated by machine.   Secondary objectives are concerned with evaluating the fidelity that can be achieved with different approaches to mechanical translation, the usefulness of the translations for various purposes, and their costs.   A further objective is to add to the general knowledge of noncomputational uses of digital computing machinery and to a basic understanding of human communication.

We have always stressed a basic, long-range approach to the problems of mechanical translation.   We are placing emphasis on completeness, when completeness is possible, and on finding out how to do a complete job if one is not now possible.   This emphasis has led us into the study of many of the fundamental questions of language and translation.   We are not looking for short-cut methods that might yield partially adequate translations at an early date — an important goal that is being pursued by other groups. We are seeking definitive solutions that will be permanent advances in the field rather than ad hoc or temporary solutions that may eventually have to be discarded because they are not compatible with improved systems.

V. H. Yngve

A.   STATUS OF RESEARCH

During the past year considerable work has been done on grammar and syntax.   Our understanding of the sentence structures of English, German, French,   and Arabic has so advanced that we have running computer programs for producing grammatical sentences at random in each of these languages.   The programs represent, of course, only a modest first step in achieving the degree of understanding and in collecting the wealth of detail that will ultimately be required.   The syntactic work has not been confined to the writing of these programs, however.   There have been separate studies of such topics as the impersonal construction in German, the order of adjectives in German and English, the German inseperable prefixes,   and various topics on word order.

In the theory of translation, there have been several investigations of the possibility of setting up structural correspondences between two languages on a formal syntactic basis at the lexical level and at the transformational level.   In addition, we have a running computer program that will translate from a restricted set of Arabic sentences into English.

In the area of semantics, interesting results have been obtained in the analysis of those features of natural language which function as the analogue of the free variable

in logical and mathematical systems.   The analysis includes an investigation of some of the cases in which time order and tense structure are involved.   Work is also progressing on the problem of generating meaningful or significant sentences, as opposed to sentences that are legitimate merely in the sense of satisfying a set of syntactical criteria.   This work has led to the need for a mechanical proof procedure.   For this purpose, the Davis-Putnam method has been programmed.   Extensive investigations are also being carried out in procedures of proof in implicationally ordered formal systems.   In these investigations, the computer is being used in an essential way as a research tool.

Another   investigation   is   concerned with methods of efficient recognition of the grammatical structure of a sentence.   Efficient recognition is being sought by appropriate utilization of information abstracted from actually observed sentences.

The rapid development of computer programs in these various areas has been made possible by the completion of the COMIT system, which makes available a high-level programming language that is convenient to use and that minimizes the time required for writing and checking out programs.   The COMIT system has been distributed through the SHARE organization and is available to all users of IBM 709 or 7090 computers.

V. H. Yngve