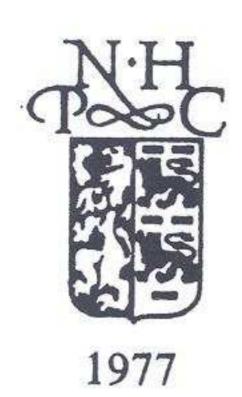# Linguistic Structures Processing

edited by

ANTONIO ZAMPOLLI

Director of Linguistics Division,
CNUCE - Institute of Italian National Research Council (CNR)

PREFACE

In August-September 1974, the Third International Summer School on Computational and Mathematical Linguistics held at Pisa brought together lecturers and participants from various European and American linguistic schools and from the areas of computational linguistics, artificial intelligence, cognitive and experimental psychology, logics, philosophy, and others. The principal aim was that of discussing, from the different points of view of the various schools and disciplines represented, the theoretical and applied problems of modelling and constructing systems which aim at the extraction and representation of the meaning of natural language sentences or of whole discourses.

For almost a month, the School provided the opportunity for scholars from different backgrounds, in particular theoretical linguists, computational linguists, and people working in the field of artificial intelligence, to exchange ideas and experiences. The School thus appears to have made a major contribution to the process of moving towards interdisciplinary co-operation in the study of language as a means of understanding and communication, and of the abilities and knowledge which enable us to use it. It is now possible to see clear evidence of this, an example being the creation of research groups both in Europe and America in which workers in linguistic semantics, anthropological semantics, cognitive psychology, computational linguistics, artificial intelligence, and language philosophy are beginning to talk to each other using more or less the same language and thinking about more or less the same problems.

It seemed, therefore, appropriate to publish this volume to which each of the lecturers present at the School has contributed an article, and which, we hope, will clearly highlight those aspects of linguistic problems which are at the center of this interdisciplinary effort. Naturally, the articles do not correspond to the lectures given in 1974: instead they reflect the research activity of the author in the period following the School. They do not thus exhibit that characteristic of the School which aimed at covering the different sectors in a systematic way. Side by side with papers providing a survey and a critical evaluation of the state of the art in a certain sector, appear articles in which specific problems are examined in detail.

E. BACH, in discussing the position of embedding transformations in a

grammar, takes up a number of respects in which the 1963 Fillmore theory on the general organization of grammar and ordering of rules is more restrictive than the standard theory of *Aspects*, which is known to be too powerful. He asserts that the ways in which the Fillmore theory is more restrictive are important and interesting, stronger claims being made concerning human language.

B. HALL PARTEE, after a brief introduction to 'Montague's grammar' and her re-formulation of it, discusses the possibilities offered by a combined transformational-Montague system and gives a detailed examination of the treatment, within such a framework, of constructions of the type 'John is easy to please' (the well-known topic of the 'tough-movement'). She emphasizes how the system forces one to consider syntactic and semantic data together, by requesting a direct semantic interpretation for each syntactic rule.

E. HAJICOVA first gives a brief survey of the treatment of negation in linguistic studies of the last two decades and then examines the semantics of negation with relation to the functional generative grammar of the Prague school. She takes into consideration the boundary, contextual boundness, the position of the verb, and the position of the operator of negation relative to the verb. The negation is used as an operational test to distinguish among assertion, presupposition, and allegation.

J. LYONS analyses the characteristic illocutionary force of statements, questions and commands. He examines not only the conditions, conversational implicatures and presuppositions of the different forms, but also the linguistic material used in their expression and their historical origins.

F. KIEFER uses the difference between co-ordinated sentences ('bound' text) and those which are not bound by co-ordination (but which nevertheless form a text) as a means of delimiting the proper scope of a text theory. Examining the concept of coherence, one of the most crucial in text grammar, he shows that the whole problem of text interpretation 'seems to be — to a large extent at least — a matter of pragmatics rather than semantics', and he underlines the role of conversational implicatures.

CH. FILLMORE characterizes the current *Zeitgeist* in interdisciplinary language research by means of three principal elements: the idea of a 'prototype theory of meaning', the current interest in 'text analysis' and the

growing diffusion of 'text linguistics', and also with the notions of 'frame' and 'scene'. He shows how he intends to seek a solution to certain main problems in linguistics within the framework of a 'scenes and frames' semantics.

D. HAYS analyses the components of the psycholinguistic system within the framework of a linguistic approach to cognition. He describes them showing clearly the relationship between the contributions of psycholinguistics and of computational linguistics.

J. ALLEN is working on the production of speech output by computer from unrestricted input texts, using a structural model of the vocal tract to produce output speech waveforms from a small, slowly varying set of input parameters. He describes the linguistic process which converts the input text into a narrow phonetic transcription which may be thought of as being analogous to commands to the vocal tract musculature.

M. KAY describes a conceptual framework centred on the chart and claims it suggests an immediate solution to most of the problems, if not all, which are related to the handling and use of morphological and syntactic information in automatic parsing; thus, once the programs that implement this framework have been written, the bulk of the remaining work is essentially linguistic in character.

W. WOODS describes the various components of LUNAR, the well-known question-answering system which processes English queries in order to represent their meaning (the data base, dictionary, retrieval segment, formal query language, parsing system), giving a particularly detailed description of the semantic interpreter which produces the formal representation of the meaning. He evaluates some of the characteristics and capabilities of the system from the point of view of the completeness and naturalness of the subset of English accepted and from the correctness of the replies.

T. WINOGRAD first describes the development of natural language understanding systems and gives details of the characteristics and inadequacies of his SHRDLU system. He then reviews a number of the methods which have been explored for the representation of knowledge in a computer, as a background for understanding current problems in natural language research, illustrated by specific examples with particular reference to the

concept of frames. In the last part of the paper he presents some ideas for conceptual programming systems which are closely allied to the problem of the representation of knowledge. This problem, together with increasing emphasis on practical applications to real problems, characterises the actual trend in the field of artificial intelligence.

Y. WILKS surveys the major projects on the understanding of natural language that fall within what may now be called the artificial intelligence paradigm for natural language systems. He argues that the paradigm is different in several significant respects from the generative paradigm in present-day linguistics. The comparisons between systems centre round questions concerning the level, centrality, and 'phenomological plausibility' of the knowledge and inferences that must be available to a system that is to understand everyday language.

S. PETRICK considers the pros and cons of the use of natural language for facilitating human interaction with machines. In this context he evaluates some current question-answering systems which are based on natural language, examining the extent of the syntactic and semantic coverage of English provided and the different structural and semantic representations of input sentences.

ACKNOWLEDGMENTS