Jennifer Cole, Georgia M. Green and Jerry L. Morgan, editors. *Linguistics and Computation.* CSLI Lecture Notes no. 52. Stanford, California: CSLI. 1995. ISBN 1 881526 81 X. Price U.K. Pounds 14.95 (softcover). xi + 296 pages.

This book consists of the papers that were presented at a workshop held in June 1991 at the University of Illinois at Urbana-Champaign to celebrate the twenty-fifth anniversary of the UIUC Department of Linguistics. The purpose of the workshop was to bring together both computational and more traditional linguists, e.g., syntacticians, morphologists, and phonologists, to discuss important issues of common interest. The ten papers in this book are split over three areas: syntax, automated parsing and generation, and phonology. Though the areas of linguistic research addressed in these papers are diverse, the editors note in the Preface that these papers are nonetheless united by the notion that the principles of grammatical well-formedness and language processing are interdependent, and that research in theoretical and computational linguistics should thus proceed hand in hand.

I will say up front that I enjoyed this book very much, and think that the papers therein make a good case for such a joint research effort. Below I will give brief summaries of the papers in each section, followed by a very short list of the book's flaws and a much longer list of its strengths.

The first section of the book focuses on syntax and how it is represented and manipulated within various formal frameworks. Annie Zaenen & Ronald M. Kaplan's "Formal devices for linguistic generalizations: West Germanic word order in LFG" (3–27) shows how non-local dependencies in the infinitival patterns of Dutch and Swiss German can be described within Lexical Functional Grammar (LFG) by invoking two mechanisms (the principles of functional uncertainty and functional precedence) that were originally developed for very different purposes. David E. Johnson & Lawrence S. Moss's "Stratified feature structures for multistratal relational analyses" (29–84) gives a self-contained overview of Stratified Feature Grammar (SFG), a logic-based extension of relational and metagraph grammar which generalizes the notion of an atomic feature to a sequence of "stratified" features, each of which encodes a distinct primitive syntactic relation, e.g., direct object. This paper also describes restricted versions of SFG whose weak generative capacities are more appropriate than unrestricted SFG for describing natural languages. The final paper in this section is Alan M. Frisch's "Feature-based grammars as constraint grammars" (85–100), which shows that the parsing of feature-based grammars can be simplified by specifying feature-structures implicitly via collections of constraints, and proves the correctness of a generalized context-free parsing strategy for feature-based grammars that operates directly on these collections of constraints.

The second section of the book is concerned with various approaches to the parsing and generation of natural language. The first half of Robert C. Berwick & Sandiway Fong's "A quarter century of computation with transformational grammar" (103–143) is a concise historical overview of the technical reasons behind the late 1960's decline in and subsequent 1980's resurgence of research on transformational generative grammar (TGG) parsers. The second half of this paper describes both a parameterized TGG parser developed by the authors and how this parser has been configured to handle English and Japanese. Steven Abney's "Chunks and dependencies: Bringing processing evidence to bear on syntax" (145–164) suggests how the apparent mismatch of prosodic and syntactic structures in utterances may be reconciled by basing prosodic structure on a decomposition of the full syntactic structure into clause subtrees (chunks), and shows that this scheme accounts for various experimental results in the psycholinguistic literature. Dale Gerdemann & Erhard Hinrichs's "Some open problems in head-driven generation" (165–197) shows how the problems caused by non-canonical, e.g., empty, heads when unification grammars are used generate speech under a head-driven control strategy can be resolved by distinguishing carefully between the metalanguage and the object language variables in logical forms. The final paper in this section, Tsuneko Nakazawa's "Construction of LR parsing tables for grammars using feature-based syntactic categories" (199–219), describes in detail how Tomita's extended LR parsing algorithm can be adapted to handle grammars with complex feature-value systems.

The third and final section of the book focuses on phonological computations. John Coleman's "Phonology and computational linguistics – a personal overview" (223–254) has two independent parts: the first half is a selective but fascinating overview of various systems and theories that have been developed over the last thirty years to parse and generate phonological structures, and the second half is a description of YorkTalk, a text-to-speech system based on declarative constraints which has been able to avoid much of the computational and technical complexity underlying rule-based phonological systems by using non-segmental phonological representations. Jennifer S. Cole's "Eliminating cyclicity as a source of complexity in phonology" (255–279) shows how the same complexity associated with cyclic rule application in rule-based solutions for word stress placement in Chamorro and English can be avoided in the declarative framework by an ordering of the types of domains in which the constraints apply. This solution is also of historical interest, as it independently proposes elements of the constraint ranking strategy underlying another declarative grammatical framework, Optimality Theory (Prince & Smolensky (1993)). This section and the book concludes with Julia Hirschberg & Richard Sproat's "Pitch accent prediction from text analysis" (281–296), which discusses the technical problems associated with reconstructing pitch accents, i.e., discourse-motivated emphasis and de-emphasis of particular words in an utterance, from text. The paper describes how these problems are being handled in the Bell Laboratories Text-to-Speech (TTS) system via an algorithm that consults a hierarchical representation of the attentional structure of the discourse in addition to purely syntactic information.

Three possible criticisms of this book are that many of the articles are not introductory reviews, that many of the papers are out-of-date (the full versions having since appeared elsewhere), and that the list of topics treated is not comprehensive. These criticisms are unwarranted; this book is, after all, a collection of papers from a meeting that occurred five years ago, not a cutting-edge handbook on computation and linguistics as the whole. Moreover, given the implicit limitations of such workshop volumes, it is a very well-constructed one. Though the papers therein are not on the whole either introductory or as cutting-edge as when they were originally presented at the workshop, they are clearly written with good literature reviews and bibliographies which should be adequate starting points for those wanting leads to more recent work. Though the list of topics covered is not comprehensive, those that are covered are covered well. Until a handbook of computation and linguistics does appear, those looking for a wide variety of papers on computational linguistics could do much worse than read this book (whose weaknesses, oddly enough, are complemented by the papers in Ristad (1993), which focus on computational aspects of the phonetics/phonology interface and morphology (see (Wareham (1996) for details)).

The last remark above highlights the main strength of this book – namely, that the variety of papers contained in this book is successful on three levels. First, there is a good balance in the contributors between computational linguists and grammar theorists, and the papers by each group take care to address the concerns of the other. Second, there is a good mix in the approaches to problems, from theory to experiments to algorithms to working systems, which shows the full range of research methodologies at work in the computational linguistics community. Third, and perhaps most important, there is a good assortment of research topics covered in this book that one might not typically see grouped together, but whose inter-relationships become apparent when they are placed next to one another. Perhaps the most intriguing relations so formed will be those with areas familiar to the reader but not addressed in this book. Two such connections noticed by this reviewer are the uncanny manner in which current efforts at implementing parsers based on Optimality Theory seem to be recapitulating early work on TGG parsers (as described by Fong & Berwick), and the similarity between the chunking strategy proposed by Abney to account for the prosodic / syntactic disparity in adult speech and various chunk-based strategies that seem to be used by children acquiring language (Peters (1983)). Readers with other interests will undoubtably notice other relationships. Such serendipitous discoveries and the new research that they suggest may, in the long run, be one of the greatest benefits one can derive from reading this book.

In conclusion, then, this is an attractive reasonably-priced book whose content and spirit should be useful to researchers of all levels and kinds of expertise within computational linguistics, from grammatical theorists to systems engineers. In the Preface, the editors say that the original workshop was highly successful in its goal of bringing people together for an exchange of ideas, and that it was their hope that this book would extend that opportunity to a wider audience. That it most certainly has; hopefully, many computational linguists will take advantage of this opportunity.

References

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