Preface

This book is based on my doctoral dissertation at Brown University, submitted in December 1983. I have revised it extensively; in particular, I have kept the literature reviews up to date, and tried to take account of related work on the same topic that has been published since the original dissertation.

The work herein is interdisciplinary, and is perhaps best described as being in cognitive science. It takes in artificial intelligence, computational linguistics, and psycholinguistics, and I believe that it will be of interest to researchers in all three areas. Accordingly, I have tried to make it comprehensible to all by not assuming too much knowledge on the reader's part about any field. The incorporation of complete introductory courses was, however, impractical, and the reader may wish to occasionally consult introductory texts outside his or her main research area.[1]

Organization of the book

Chapter 1 is an introductory chapter that sets out the topic of the work and the general approach. The problems of semantic interpretation, lexical disambiguation, and structural disambiguation are explained. For readers who haven't come across them before, there are also brief overviews of frame systems and case theories of language; people who already know it all can skip this. I then describe the research, and in particular the Frail frame language and the Paragram parser, that was the starting point for the present work.

Chapters 2 and 3 form Part I, on semantic interpretation. Chapter 2 is a detailed examination of past research on the topic, and discusses properties desirable in a semantic interpreter. Chapter 3 describes Absity, a compositional semantic interpreter whose output is expressions in the frame language Frail and which has many of the desirable properties discussed in chapter 2.

[1] Here is a non-exhaustive list: Good introductions to artificial intelligence are Boden 1977 and Charniak and McDermott 1985. For frames and knowledge representation, see Brachman and Levesque 1985, or, for a short introduction, the paper by Fikes and Kehler 1985. An introduction to transformational syntax may be had from Akmajian and Heny 1975 or Baker 1978. I don't know of a good non-partisan introduction to semantics, but JD Fodor 1977 or Kempson 1977 and Dowty, Wall, and Peters 1981 may be read for separate introductions to each side. For psycholinguistics see Foss and Hakes 1978 or Clark and Clark 1977.

Chapters 4 and 5 comprise Part II, on lexical disambiguation. Chapter 4 describes what is necessary for lexical disambiguation and the approaches that have previously been taken to the problem. The chapter also reviews current psycholinguistic research on lexical disambiguation. Chapter 5 describes my lexical disambiguation system, which has two cooperating processes: marker passing in a network of frames and Polaroid Word procedures, one per word, that gather and apply disambiguating information. The system works in concert with the Absity system described in chapter 3.

Chapters 6 and 7, Part III, are on structural disambiguation. Chapter 6 reviews the problem, and catalogues the different types of structural ambiguity that a language-understanding system has to deal with. It also presents previous approaches to structural disambiguation, and current linguistic theories. Chapter 7 is on the Semantic Enquiry Desk, a mechanism that helps a parser choose among the possible parses of a structurally ambiguous sentence. Like Polaroid Words, the Semantic Enquiry Desk works in concert with Absity.

Part IV, chapter 8, recapitulates the main points of the work, emphasizing the operation of the approaches developed in the previous parts as an integrated system. The work is compared with other current research in the same area. The book closes with the usual "problems for future research" (chapter 9), including a number of random thoughts and half-baked ideas that I hope will interest others.

Subject and name indexes and an extensive bibliography are provided for the comfort and convenience of the reader.

> Persons attempting to find a motive in this narrative will be prosecuted; persons attempting to find a moral in it will be banished; persons attempting to find a plot in it will be shot.
> —Mark Twain[2]

Notation

Although I often talk about "natural language", this book is primarily about English, though of course I hope that most of the general principles I put forward will be true of all languages. In both the example sentences and the language of the book itself, I have tried to remain independent of any particular dialect of English (an interesting task for an Australian revising in Canada for a British publisher a manuscript originally written in the north-eastern U.S.). On those occasions where a dialect choice had to be made (in particular, in the case of spelling), I have usually chosen American English, which was the language of the university to which the original dissertation was submitted.

A few totally conventional abbreviations are employed. *AI* means *artificial intelligence* and *NLU* means *natural language understanding*. Table 0.1 shows the

[2] TWAIN, Mark. *The Adventures of Huckleberry Finn*. 1884.

Table 0.1. *Abbreviations for syntactic categories*

ABBREV	MEANING	ABBREV	MEANING
ADJ	adjective	NP	noun phrase
ADJP	adjective phrase	PP	prepositional phrase
ADV	adverb	PREP	preposition
AUX	auxiliary	S	sentence
DET	determiner	V	verb
N	noun	VP	verb phrase

abbreviations used for syntactic categories. A superscript asterisk on a symbol means that the symbol may be repeated zero or more times; thus *ADJ** represents as many adjectives as you like—or possibly none at all.

Italics are used in the usual metalinguistic manner and boldface is used to give names to meanings; thus, I might write "the **badly-made-car** meaning of *lemon*". Case names appear in small caps. Roman small caps are also used for emphasis, and when a new term is being defined. A "typewriter" font is used for the Frail frame language and for frame objects in general; it is also used occasionally for other computer input and output. Underlining is used in examples to draw attention to the important word or words. An asterisk in front of an example text means that it is syntactically ill-formed, and a hash mark ("#") means that it is syntactically well-formed but semantically anomalous. For instance:

(0-1) *Ross and Nadia is the main actors of these chronicle.

(0-2) #My toothbrush sings five-part madrigals.

By *I*, I mean myself, Graeme Hirst, and by *you* I mean you, the reader. When I say *we*, as when I say "we see that . . . ", I mean you and me together.

When a string of citations is offered to bolster a point, the intent is usually that the reader wishing to consult the literature need find but one of them, not all of them; by offering a long list, I am thoughtfully maximizing the reader's chances of physically obtaining a relevant publication.

Acknowledgements

This work grew out of many discussions with my dissertation advisor, Eugene Charniak, and many of the ideas herein are from seeds that he planted and fertilized. I am grateful to him for the time, patience, and thought that he gave me throughout my stay at Brown University.

I am grateful also to my external examiner, James Allen of the University of Rochester, and to Trina Avery for her expert copyediting of the dissertation.

Many other people also read and commented on some or all of the manuscript in its various stages, helped me in discussions to develop and clarify my ideas,

pointed me to relevant work, or gave me other valuable advice during the course of the research. I am indebted to Robert Amsler, Emmon Bach, Barb Brunson, Penny Carter, Carole Chaski, Gennaro Chierchia, Robin Cohen, Stephen Crain, Meredyth Daneman, Marilyn Ford, Mike Gavin, Tom Grossi, Phil Hayes, Jim Hendler, Jennifer Holbrook, Susan Hudson, Polly Jacobson, Margery Lucas, Stephen Lupker, Tony Maida, Susan McRoy, Amy Rakowsky, Anonymous Referee, Stu Shieber, Nadia Talent, Yuriy (George) Tarnawsky, and Doug Wong.

The Brown University Department of Computer Science was my home for four and a half years. The excitement of just being in the department was due in no small way to the then-chairman, Andy van Dam, who turned the department from a neonate to one of the leading U.S. computer science departments in an amazingly short time. I also appreciate the work of those who really ran the department: Trina Avery, Mary Agren, Ginny Desmond, Gail Farias, and Jennet Kirschenbaum. My fellow inmates in 018, Steve Feiner and Jim Hendler, were a constant source of inspiration and humor throughout the writing of the dissertation.

At the University of Toronto, where I turned the dissertation into a book, Ralph Hill and Jean-François Lamy helped to revise a large package of TEX macros, and Jean-François made TEX talk to a PostScript™ typesetter. Joanne Mager typed new sections faster than I ever could, and helped in innumerable ways.

At Cambridge University Press, Penny Carter, my editor, put up with my tendencies to lateness and perfectionism with good grace, and Philip Riley skillfully copyedited the final manuscript.

At Brown University, financial support for this work was provided in part by the U.S. Office of Naval Research under contract number N00014–79–C–0592 (Eugene Charniak, Principal Investigator). At the University of Toronto, I was supported by grants from the University and from the Natural Sciences and Engineering Research Council of Canada.

I am grateful to my parents for encouraging and supporting me throughout my education, to Robin Stanton for convincing me that I too could be a graduate student, and to my best friend, Nadia Talent, for putting up with all this silliness.

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