Preposition Senses: Generalized Disambiguation Model

Chutima Boonthum, Shunichi Toida, and Irwin Levinstein

Department of Computer Science, Old Dominion University
Norfolk, Virginia 23529 USA
{cboont, toida, ibl}@cs.odu.edu

Abstract. Our previous study on disambiguating the preposition "with" (using WordNet for hypernym and meronym relations, LCS for verb and preposition lexical information, and features of head and complement) looked promising enough to warrant study for other prepositions. Through investigation of ten frequently used prepositions, this paper describes general senses of prepositions and sense-case definitions, introduces a novel generalized sense disambiguation model, and demonstrates how this benefits a paraphrase recognition system.

1   Introduction

Why is preposition sense disambiguation important in a paraphrase recognition system? When two expressions describe the same situation, each is considered to be a paraphrase of the other. Various authorities have mentioned the following paraphrase patterns: using synonyms, changing part-of-speech, reordering ideas, breaking a sentence into smaller ones, substituting a word with its definition, and using different sentence structures. Prepositions play a significant role in changing sentence structures more than other paraphrase patterns. Consider the following sentences:

(a) "John builds a house *with* a hammer."
(b) "John *uses* a hammer *to* build a house."
(c) "John builds a house *by using* a hammer."
(d) "A house is built *by* John who *uses* a hammer."
(e) "A house is built *by* John *using* a hammer."

Although these sentences convey the same meaning, they have different syntactic structures and use different prepositions. Sentence (a) uses 'with' to indicate an instrument used to complete an action while (b), (c), (d), and (e) have the verb 'use' to indicate a use of an instrument. Sentences (d) and (e) are in the passive voice and they use the preposition 'by' to indicate an agent (who performs the action.) Sentence (c) uses 'by' to indicate a secondary action of this agent in completing the primary action. 'By' can be omitted in (c) and the sentence still has the same meaning.

(f) "John builds a house *with* a kitchen."
(g) "John builds a house *that has* a kitchen."
(h) "John builds a house *having* a kitchen."
(i) "A house is built *by* John *with* a kitchen."