

The Semantics of temporal prepositions: the case of IN

David S. Brée (bree@cs.man.ac.uk)

Computer Science Department, University of Manchester
Oxford Road, Manchester M13 9PL, U.K.

This poster presents an analysis of the different ways that the preposition IN is used to convey temporal information. IN is the most frequent preposition and so a solution to its semantics will be a good guide to the semantics of other prepositions that are used temporally.

The analysis is based on all 1,980 temporal uses of IN occurring in the Brown corpus (Kučera & Frances, 1967). The temporal use was recognized by the presence of temporal nouns in the IN phrase (Brée & Pratt, 1997). Each occurrence was coded by hand for various features of the phrase, such as determiner, number, qualifier, type of noun, and also for features of the verb in the matrix in which the phrase was embedded such as tense, aspect, modality, negation, superlatives, cardinal and ordinal nouns.

The different possible types of temporal information that IN can convey were found to be:

- a duration (207 occurrences) v. an interval (1,653), eg. *in a minute* v. *in 1960*. Almost all (203/207) of the durations were signalled by an indefinite determiner (or no determiner in the case of plural nouns) with a measure type noun, provided the noun was not a qualified plural, nor the noun *time* post-modified. The only other nouns which occurred with an indefinite determiner were life nouns, eg. *youth*, and seasons of the year, but these always indicated an interval.
- a pure duration (58) v. a duration attached to the time of reference (114), eg. *was built in a day* v. *for the first time in 30 years; will report in a day*. Some durations were pure, others were attached to the time of reference. A duration was attached to before the time of reference (39/114) if and only if there was an ordinal, a negative or a superlative in the matrix, generally with a perfect aspect. This is not surprising as the matrix holds for every subinterval in the interval preceding the time of reference but this is not permitted with IN plus a pure duration, FOR being required instead. Generally, a duration was attached to after the time of reference (75/114) if the IN phrase was topicalized (Hitzeman, 1997), if there was a modal in the matrix or if the matrix was a state or achievement rather than an accomplishment.
- an interval attached to a noun phrase v. a verb phrase, eg. *spending in the Sixties* v. *spent in the Sixties*. NP

attachment (322) occurred whenever the IN phrase was before the verb, when the matrix was a superlative, when there was some other temporal adverbial, etc.

- measurement (104) v. quantification over an interval (1,226), eg. *sold 7 tractors in August* v. *died in August*. For measure use, the matrix must be either a repeatable event or an activity with repeated outcomes.
- universal (260) v. existential (966) quantification, eg. *accepted in the Fifties* v. *born in the Fifties*. As IN cannot be used for giving the duration of a state or activity, it is surprising for it be used when a matrix state or activity was lasting the whole of an **interval**.
- unique (1,272) v. generic (152) durations and intervals, eg. *made in the 1940s* v. *would come home in the morning*. A generic use was indicated by a quantifying determiner, a season with no determiner, a plural part-of-day noun and sometimes when the tense in the matrix was the simple present, unless this tense was being used to describe a current attitude to a future event, or in the context of art criticism or history, etcetera.

The last four distinctions depend on general features of the matrix and not on the IN phrase at all.

These heuristics provide a means for extracting the temporal semantics of IN phrases that could be implemented in a natural language computer system used, for example, either to understand natural language, or to give deep machine translation into another language. They will generalize to temporal uses of other prepositions, eg. FOR, and also to other uses of IN, in particular spatial uses, which closely parallel the temporal use.

References

Brée, D.S. & Pratt, I.E. (1997). Using prepositions to tell the time. *Proceedings of the Nineteenth Cognitive Science Conference* (pp. 873). Hillsdale, NJ: Erlbaum.

Hitzeman, J. (1997). Semantic partition and the ambiguity of sentences containing temporal adverbials. *Journal of natural language semantics*, 5, 87-100.

Kučera, H. & Frances, W.N. (1967). *Computational analysis of present-day American English*. Providence, RI: Brown University Press.