

Using prepositions to tell the time

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Whereas tense and aspect have been much studied, the use of prepositions to indicate time have not, even though the latter convey considerably more temporal information than the former. Two steps to remedy this omission are reported: an analysis of the temporal use of prepositions in the Brown corpus and a means for distinguishing between the different temporal uses which a prepositional phrase can serve. The results of this analysis are being used to build a computer program designed to understand temporal features of English using a specially developed temporal logic (Pratt and Brée, 1995).

Some previous work. There are two main classes of preposition: universals, such as FOR, THROUGH(OUT), generally used with temporal states (in which the proposition holds in each of its sub intervals), and existentials, such as IN, ON, BY, for temporal events.

There are two temporal features of interest: how long something took and in which interval it occurred. Three prepositions can be used to specify either a duration (with an indefinite NP) or an interval (with a definite NP): IN for existential and FOR for universal quantification and BY, which, with a indefinite NP, indicates the length of time between two events. The rest can only be used to indicate an interval.

What is interesting is the different ways in which this interval can be indicated. From our previous work these have been shown to be: by directly naming the interval, by naming one end of the interval and leaving the other end to be constrained by the context, by specifying both its ends, by taking the time of reference (TOR, in the sense of Reichenbach) as one end and either directly naming the other end or specifying duration of the interval from the TOR, and finally by indicating a moment (a short interval) as being a duration away from the TOR.

Data. Every sentence in the Brown corpus, containing an occurrence of one of the 18 prepositions that can be used temporally, was read. Of the 75,909 such sentences, those in which the preposition phrase indicated temporal use were extracted. These 10,639 sentences were coded for the type of meaning, the determiner, the head noun, any quantifying or qualifying adjectives, any post modifying phrase and any modifiers of the preposition itself.

Some findings. In the case of prepositions which can also be used spatially, the prepositional noun has to indicate the temporal meaning. The nouns found with such prepositions number only just over a 100 (counting all clock times, dates, days of the week, holidays, months and seasons each as one noun) making it easy to distinguish their temporal from their non-temporal use. They come in 5 classes. Some of the classes can only be taken by some prepositions, eg life nouns, such as *adolescence*, are not used with temporal FOR.

With prepositions which can be used both for duration and for intervals, the determiner generally distinguishes between the two uses, as expected. However, occasionally a definite determiner indicates a duration rather than an interval, eg *cook in the shortest time possible*, and more frequently an indefinite can indicate a recurring interval, eg *some pastors have two sessions IN one evening*.

It is easy to distinguish when a duration is being used to indicate the interval ending at the TOR: the verb in the matrix clause has a perfect aspect. Heuristics were found capable of distinguishing between their use to indicate a pure duration and an interval following the TOR with about 80 % reliability.

There are many results concerning individual prepositions. For example, IN was expected to be used existentially, but it is often used universally. This is perhaps because FOR turns out to be highly restricted in the context in which it can be used to indicate an interval, namely when the matrix is itself a noun phrase, or when the matrix verb is related to planning, and THROUGHOUT, used for universal quantification over a named interval, occurred very rarely (only 38 times).

Finally, these and other findings are being incorporated into a temporal logic capable of showing how these uses of each preposition can be combined with quantifiers and with each other to give the correct temporal meaning of most English sentences. A PROLOG implementation will be available.

References

- Pratt, I.E., & Brée, D.S. (1995). An approach to the semantics of some English temporal constructions. *Proceedings of the Seventeenth Annual Conference of the Cognitive Science Society* (pp. 118–123). Hillsdale, NJ: Lawrence Erlbaum Associates.