

## Tense, Adverbials and Quantification

This paper shows how to deal with quantified tPPs (temporal PPs, e.g. *during every meeting, on a Monday*) compositionally without introducing what Pratt and Francez (2001) (henceforth, PF) call context variables. The proposal defended here is based upon transparent LF structures as in von Stechow (2002) but contains one important innovation: any past tense sentence contains an overt or covert tPP *in the past*. I also contend that existential quantifiers over times are always introduced by adverbials, and this corrects the problems PF face with frequency adverbials such as *exactly twice* (von Stechow, 2002).

Note that (13a) does not mean (1b) or (1c) as shown by Ogihara (1994). The desired interpretation is given as in (1d), but it is not obvious how to obtain it compositionally.

- (1) a. John cried every Sunday.  
 b.  $\forall x[\text{Sunday}(x) \rightarrow \exists t [t < \text{now} \wedge t \subseteq \text{Time}(x) \wedge \text{John cries at } t]]$   
 c.  $\exists t [t < \text{now} \wedge \forall x[\text{Sunday}(x) \rightarrow t \subseteq \text{Time}(x) \wedge \text{John cries at } t]]$   
 d.  $\forall x[[\text{Sunday}(x) \wedge \text{Time}(x) \subseteq t_R \wedge t_R < \text{now}] \rightarrow \exists t [t \subseteq \text{Time}(x) \wedge \text{John cries at } t]]]$

PF show that by introducing a context variable into the lexical meaning of all time sensitive predicates (such as verbs and event/temporal nouns), one can account for their interpretation including quantified ones (e.g. *during every meeting*). PF analyze (2a) as in (2b), which deviates from its standard interpretations in (2c).

- (2) a. meeting  
 b.  $\lambda x . [\lambda i . x \text{ is a meeting and } \text{time}(x) \subseteq i]$   $i$  is a variable over intervals  
 c.  $\lambda x . [x \text{ is a meeting}]$  or  $\lambda x . [\lambda t . x \text{ is a meeting at } t]$

Intuitively, the inclusive relation between **time(x)** and **i** is supplied by prepositions such as *in, on, during* (see von Stechow 2002 for such an analysis). However, PF would need the inclusion relation in case the predicate has widest scope as in (3).

- (3) a. John cried during every meeting.  
 b.  $[[\text{during every meeting}]] = \lambda P \in D_{\langle i, t \rangle} . [\lambda i . \text{every meeting } x \text{ that occurs within } i \text{ is such that } P(\text{time}(x)) = 1]$   
 $[[\text{John cried}]] = \lambda i_1 . \text{there is an event } e \text{ of John's crying and } \text{time}(e) \subseteq i_1$   
 $[[\text{John cried during every meeting}]] = \lambda i . \text{every meeting } x \text{ that occurs within } i \text{ is such that there is an event } e \text{ of John's crying and } \text{time}(e) \subseteq \text{time}(x)$

(3b) then applies to a contextually salient past interval. To improve upon PF's proposal, we need to find a lexical source for the inclusion relation. As von Stechow suggests, it is best to assume that a temporal preposition provides such a source. Pushing this natural approach a little further, I posit a covert tPP *in the past* when it does not occur overtly. This tPP does occur in English as in (4) (found on the web), and such sentences must be interpretable.

- (4) **In the past**, sheet music **was** often considered ephemera by music libraries and seldom **formed** a part of their permanent collections.

The idea here is similar to what Bäuerle and von Stechow (1980) had regarding frequency adverbials such as *once* and *exactly twice*: since *in the past* does occur in actual English sentences as in (4) and it does give us the right semantic result, we should assume that any past tense sentence

contains it (covertly or overtly). The gist of the proposal is summarized as follows: (i) A sentence abstract (a tensed sentence with no temporal adverbials) is of type  $\langle i, t \rangle$  (set of intervals); (ii) A temporal preposition (e.g. *on*, *in*, *during*) is of type  $\langle e, \langle \langle i, t \rangle, \langle i, t \rangle \rangle \rangle$ , E.g.  $\llbracket \text{on} \rrbracket = \lambda x \in D_e . \llbracket \lambda P \in D_{\langle i, t \rangle} . [\text{there is } t \in D_i . P(t) \ \& \ t \subseteq \text{Time}(x)] \rrbracket$ ; (iii) A temporal PP (tPP) is of type  $\langle \langle i, t \rangle, \langle i, t \rangle \rangle$  —a temporal abstract modifier; (iv) A set of nested tPPs is always anchored by the tPP (overt or covert) *in the past*. (This could be preceded by a tPP indicating a contextually salient past interval such as *on Sunday*). Since this automatically supplies the part of relation between the contextually salient past time (or the entire past interval) and the event time in question, there is no need for a context variable. The past tense morpheme itself has no semantic import; it simply requires the tPP *in the past* co-occur in the same minimal clause.

My proposal differs from PF's in that: (i) the inclusion relation is not part of the lexical meaning of any verb or noun; (ii) all existential quantifiers are introduced by temporal adverbials. It also corrects some problems with PF's account pointed out by von Stechow. For example, the semantics of frequency adverbials like *exactly twice* is correctly accounted for since all quantifiers are introduced by adverbials. (6) shows how (5) is analyzed in my proposal.

- (5) a. Mary kissed John during every meeting (on) a Sunday (in the past)  
 b. LF:  $\llbracket S \llbracket \text{NP a Sunday in the past} \rrbracket_2 \llbracket S \llbracket \text{NP every meeting (on) } e_2 \rrbracket_1 \llbracket S \text{ Mary kissed John during } e_1 \rrbracket \rrbracket \rrbracket$
- (6) 1.  $\llbracket \llbracket S \llbracket \text{Mary kissed John during } e_1 \rrbracket \rrbracket = \text{there is a time } t \text{ Mary kisses John at } t \text{ and } t \subseteq t_1$   
 2.  $\llbracket \llbracket \text{every meeting (on) } e_2 \rrbracket \rrbracket = \lambda P \in D_{\langle i, t \rangle} . \text{every meeting } x \text{ such that } \text{time}(x) \subseteq t_2 \text{ is such that } P(\text{time}(x)) = 1$   
 3.  $\llbracket \llbracket S \llbracket \text{NP every meeting (on) } e_2 \rrbracket_1 \llbracket S \llbracket \text{Mary kissed John during } e_1 \rrbracket \rrbracket \rrbracket = \text{every meeting } x \text{ such that } \text{time}(x) \subseteq t_2 \text{ is such that there is a time } t \text{ Mary kisses John at } t \text{ and } t \subseteq (\text{time}(x))$   
 4.  $\llbracket \llbracket \text{a Sunday in the past} \rrbracket \rrbracket = \lambda P \in D_{\langle i, t \rangle} . \text{there is a Sunday } y \text{ such that } \text{time}(y) \subseteq \{t_3 \mid t_3 < \text{now}\} \text{ is such that } P(\text{time}(y)) = 1$   
 5.  $\llbracket \llbracket S \llbracket \text{NP a Sunday in the past} \rrbracket_2 \llbracket S \llbracket \text{NP every meeting (on) } e_2 \rrbracket_1 \llbracket S \llbracket \text{Mary kissed John during } e_1 \rrbracket \rrbracket \rrbracket \rrbracket = \text{there is a Sunday } y \text{ such that } \text{time}(y) \subseteq \{t_3 \mid t_3 < \text{now}\} \text{ and every meeting } x \text{ such that } \text{time}(x) \subseteq \text{time}(y) \text{ is such that there is a time } t \text{ Mary kisses John at } t \text{ and } t \subseteq (\text{time}(x))$

I shall also consider an alternative approach in which past tense contributes a presupposition rather than an assertion.

## Bibliography

- Bäuerle, Rainer and A. von Stechow. 1980, 'Finite and Non-finite Temporal Constructions in German' in *Time, Tense and Quantifiers*.
- Ogihara, Toshiyuki. 1994. Adverbs of Quantification and Sequence of Tense Phenomena. In *Proceedings from Semantics and Linguistic Theory IV*, eds. M. Harvey and L. Santelmann, 251-267. Cornell University: CLC Publications.
- Pratt, Jan, and Francez, Nissim. 2001. Temporal Generalized Quantifiers. *Linguistics and Philosophy* 24:187-222.
- Stechow, Arnim von. 2002. Temporal Prepositional Phrases with Quantifiers: Some Additions to Pratt and Francez (2001), *Linguistics and Philosophy* 25, 755–800.