Back to events: More on the logic of verbal modification (Lucas Champollion, NYU)

Beaver and Condoravdi (2007, henceforth B&C) propose to move away from event semantics (Davidson, 1967) as a theory of verbal modification. B&C's system provides a clean and compositional account of the interaction of events and quantifiers, but their rejection of event semantics brings problems (see below). The main point of this talk is that we can have our cake and eat it too: we can reconcile B&C with Davidsonian event semantics and keep the strengths of both systems.

Problem 1: Argument reduction. In event semantics, verbal modifiers like *at noon* and *in the bathroom* are interpreted conjunctively, so that entailments like (1a) are modeled as logical entailments (1b). This is considered to be a very powerful argument in favor of event semantics (e.g. Landman, 2000, ch. 1). For B&C, verbs and their projections denote sets of partial functions called "role assignments" that map a small number of labels including ARG1, ARG2 and T (intuitively agent, theme, and time) to appropriate values. So in a model where John kicked Bill at 1pm, the sets denoted by *kick*, by *kick Bill* and by *John kick Bill* each contain at least the role assignment $g_1 = [\textsc{arg}1, j;\ \textsc{arg}2, b;\ \textsc{t}, 1pm]$. For B&C, the entailment in (1c) that translates (1a) is non-logical, ie. it no longer comes for free and needs to be enforced for each verb V via an "argument reduction" principle (2) that stipulates that if V holds of a role assignment R, it also holds of any restriction of R. Thus, a major motivation for event semantics does not carry over to B&C.

Problem 2: Overgeneration. B&C also resort to stipulation for their treatment of time. They represent the surface scope reading of a sentence like (3a) as in (3b). This would be too strong because it requires all the visits to happen simultaneously at time t. To avoid this, B&C stipulate a "temporal closure" principle (4): if a verb applies to a role assignment which maps T to a given interval t, then for each of its superintervals t', the verb also applies to an otherwise equal role assignment that maps T to t'. This hard-wired approach to temporal closure overgenerates: The invalid argument in (5a) is wrongly predicted valid since temporal closure makes (5b) entail (5c).

Solution: Back to events. The basic insight is that role assignments are very similar to sets of events. So g_1 above corresponds to the property of being an event whose agent is John, whose theme is Bill, and which takes place at 1pm. This property could in principle apply to more than one event, e.g. if John kicked and slapped Bill at the same time. So a role assignment corresponds to a set of events and not just to one event. Since B&C's verbal projections denote sets of role assignments, we need to move to an event semantics in which verbal projections denote sets of sets of events. The system in Champollion (2011, henceforth C) fits the bill, and does not require any of the formal devices that B&C see as problematic such as quantifying-in. I adopt it in the following. The B&C-style derivation shown in (6) translates to its C-style counterpart in (7). Here f, g range over role assignments, k over sets of events, L over sets of role assignments, V over sets of sets of events. Roughly, $f + [\textsc{arg}1, m]$ extends f by a new entry that maps ARG1 to m. In (7), I have deviated from B&C in distinguishing between the runtime of the event, $\tau(e)$, and the reference time interval of the sentence, t. Following standard practice, the morpheme *-ed* contributes both past tense and perfective aspect, so it relates $\tau(e)$ and t by temporal inclusion, written as $\subseteq$ (7c). This removes the need for B&C's temporal closure principle. I represent (3a) as in (8); the underlined bit requires that each visit is contained within the reference interval, but does not require all visits to take place at the same time. Unlike B&C, there is no overgeneration problem. I translate the matrix clauses of (5a) as in (9). The embedded clause does not have past tense, and therefore does not contribute $\subseteq$. The underlined parts of (10a) and (10b) block the undesired inference in (5a).

Conclusion. Verbal modification remains a strong motivation for Davidsonian event semantics.

(1) a. Jones buttered the toast at noon. $\Rightarrow$ Jones buttered the toast.
    b. $[\exists e.\text{b}(e) \wedge \text{ag}(e) = j \wedge \text{th}(e) = t \wedge \tau(e) = \text{noon}] \Rightarrow [\exists e.\text{b}(e) \wedge \text{ag}(e) = j \wedge \text{th}(e) = t]$
    c. $\text{butter}([\textsc{arg}1, j;\ \textsc{arg}2, \mathit{toast};\ \textsc{t}, \mathit{noon}]) \Rightarrow \text{butter}([\textsc{arg}1, j;\ \textsc{arg}2, \mathit{toast}])$

(2) **Argument reduction axiom.** For any verb V and model M, if $f \in \llbracket V \rrbracket_M$, $g \subset f$, and every argument of V is in dom(g), then $g \in \llbracket V \rrbracket_M$.

(3) a. A diplomat visited every country.
    b. $\exists t.t < \textsc{now} \wedge \exists x.\text{diplomat}(x) \wedge \forall y.\text{country}(y) \rightarrow \text{visit}([\textsc{arg}1, x; \textsc{arg}2, y; \textsc{t}, t])$

(4) **Temporal closure axiom.** For any verb V and model M, if $f \in \llbracket V \rrbracket_M$, $f(\textsc{t})$ is temporally included in $g(\textsc{t})$ and f differs from g at most with respect to the value it gives to $\textsc{t}$, then $g \in \llbracket V \rrbracket_M$.

(5) a. It took John five years to learn Russian. $\not\Rightarrow$ It took John ten years to learn Russian.
    b. $\exists t.t < \textsc{now} \wedge \text{years}(t) = 5 \wedge \text{learn}([\textsc{arg}1, j; \textsc{arg}2, r; \textsc{t}, t])$
    c. $\exists t.t < \textsc{now} \wedge \text{years}(t) = 10 \wedge \text{learn}([\textsc{arg}1, j; \textsc{arg}2, r; \textsc{t}, t])$

(6) a. $\llbracket \text{Mary} \rrbracket = \lambda P.P(m)$
    b. $\llbracket \text{Mary:}\textsc{arg}1 \rrbracket = \lambda L \lambda f.L(f + [\textsc{arg}1, m])]$
    c. $\llbracket \text{-ed} \rrbracket = \lambda L \lambda f.L(f) \wedge f(\textsc{t}) < \textsc{now}$
    d. $\llbracket \text{laugh -ed} \rrbracket = \lambda g.\text{laugh}(g) \wedge g(\textsc{t}) < \textsc{now}$
    e. $\llbracket \text{Mary:}\textsc{arg}1 \text{ laugh -ed} \rrbracket = \lambda f.\text{laugh}(f + [\textsc{arg}1, m]) \wedge f(\textsc{t}) < \textsc{now}$
    f. $M \models \text{Mary laughed iff } \exists t[\text{laugh}([\textsc{t}, t; \textsc{arg}1, m]) \wedge t < \textsc{now}]$

(7) a. $\llbracket \text{Mary} \rrbracket = \lambda P.P(m)$
    b. $\llbracket \text{[ag] Mary} \rrbracket = \lambda V \lambda k.V(\lambda e.[k(e) \wedge \textsc{ag}(e) = m])]$
    c. $\llbracket \text{-ed} \rrbracket = \lambda V \lambda k \exists t[t < \textsc{now} \wedge V(\lambda e[k(e) \wedge \tau(e) \subseteq t])]$
    d. $\llbracket \text{[closure]} \rrbracket = \lambda V.V(\lambda e.\top)$
    e. $\llbracket \text{laugh} \rrbracket = \lambda k \exists e[\text{laugh}(e) \wedge k(e)]$
    f. $\llbracket \text{[closure] [ag] M. laugh -ed} \rrbracket = \exists t[t < \textsc{now} \wedge \exists e[\text{laugh}(e) \wedge \textsc{ag}(e) = m \wedge \tau(e) \subseteq t]]$

(8) $\exists t.t < \textsc{now} \wedge \exists x.\text{d}(x) \wedge \forall y.\text{c}(y) \rightarrow \exists e.\text{v}(e) \wedge \text{ag}(e) = x \wedge \text{th}(e) = x \wedge \underline{\tau(e) \subseteq t}$

(9) $\llbracket \text{It took John } n \text{ years to} \rrbracket = \lambda V \exists t.t < \textsc{now} \wedge \text{years}(t) = n \wedge V(\lambda e.\text{ag}(e) = j \wedge \tau(e) = t)$

(10) a. $\exists t.t < \textsc{now} \wedge \underline{\text{years}(t) = 5} \wedge \exists e[\text{learn}(e) \wedge \text{ag}(e) = j \wedge \text{th}(e) = r \wedge \underline{\tau(e) = t}]$
     b. $\exists t.t < \textsc{now} \wedge \underline{\text{years}(t) = 10} \wedge \exists e[\text{learn}(e) \wedge \text{ag}(e) = j \wedge \text{th}(e) = r \wedge \underline{\tau(e) = t}]$

References

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