Result Stages and the Lexicon : The Proper Treatment of Event Structure

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Abstract

I will argue in this paper that the standard notions of *affectedness*, *change-of-state* and *result state* are too coarse-grained, and will revise and enrich substantially their content, increasing their role in a compositional aspect construal procedure. I will claim in particular that a proper theory of event structure requires that enriched *result states* should be lexically represented, and will base on them a computational treatment of event structure within a feature-structure-based lexicon.

Introduction

Event structure is traditionally accounted for using two sets of notions : change-of-state / affectedness and incrementality. I will examine both in this paper, determining their respective limitations, before proposing an alternative approach and the formal specifications for a computational implementation.

1 From affectedness to result states : how can we account for event structure ?

1.1 Affectedness, change-of-state and telicity

Telic events are generally viewed as an opposition between a previously holding state and a new one, called a *result state* (e.g. *dead*(y) for *x kills y*). They trigger a *change-of-state* (CoS, henceforth), result states (RSs, henceforth) being entailments of CoSs. Moens and Steedman (1988), Smith (1991), Pustejovsky (1995), and others argue that it is a defining property of telic events. They should therefore include an 'undergoer' argument, whose CoS determines the telicity of the event (i.e., it acts as a *measuring-out* argument). Tenny (1987) thus claims that telic events require such an argument, which she calls an *affected* argument. Consider for instance *John reviewed the paper* : as the event reaches its culimation, the affected argument undergoes a CoS (from *¬reviewed(paper)* to *reviewed(paper)*), producing a RS. To put it short, the standard theory of event structure says that telicity implies affectedness (and conversely), and that affectedness implies a CoS/RS (and conversely), associating tightly all those notions.

Unfortunately, not all measuring-out arguments are affected arguments :

(1) *Two men carried Hirsch on the deck.*

Jackendoff (1996:309) observed that (implicit) paths such as *on the deck* in (1) are not affected arguments, so that the telicity of such motion events cannot be explained using affectedness, ruling out a unified affectedness-based account of telicity[1]. It follows from this objection that the standard theory should be at least amended. Jackendoff's solution is a general mapping function from measuring-out arguments (seen as paths) to events. It is related to *incrementality*, which I am discussing below.

1.2 Result states and incrementality

Event-object mapping functions, as proposed in Krifka (1992) and Dowty (1991), are another key approach to the treatment of event structure. Dowty (1991) calls an *incremental theme* any argument

[1] Yet motion verbs could be attributed an affected argument, i.e., their agents, so that Jackendoff's point against affectedness does not seem to be decisive.

capable of measuring-out an event. For instance, the drinking event in (2) can be measured along the quantity of beer contained in the glass through functions mapping the latter onto the former.

(2) *John drank a glass of beer.*

The glass of beer in (2) undergoes an incremental CoS, and is therefore an incremental theme. Path-objects (cf. *Mary walked the Appalachian trail* ; Tenny 1994), can be treated as some special kind of incremental themes, and Jackendoff's solution could thus be reformulated using incrementality[2].

Let us turn now to the treatment of so-called *achievement* verbs (cf. Vendler 1957). Most authors do not grant them incremental themes. Dowty (1991), for instance, argues that incremental themes must be able to undergo an incremental CoS :

(3a) ??*The horse finished crossing the line.*
(OK in slow motion)
(3b) *The horses finished crossing the line.*

(3a) shows indeed that *cross the line* lacks proper subevents, and that no incremental CoS occurs. But Dowty never considered examples such as (3b), which receive an incremental reading (albeit of a different kind, since the subevents construed in (3) involve *individual parts of a set of objects* rather than *non-individual parts of an individual object*, as in (2)). Therefore, I will conclude that the kind of affected arguments which *achievement* verbs possess can also be regarded as incremental themes. It seems at this point that all kinds of telic events can be analysed in terms of incrementality. However, I will show in the following section that this is not the case. Generally speaking, relying on incrementality alone would mean relegating CoSs and RSs to the backstage of aspect construal[3] : in order to account for telicity without affectedness, one should deny a central role to CoSs, and regard telicity primarily as a matter of measure. I will propose an alternative solution in the following sections preserving the centrality of CoS, yet departing from the standard approach to affectedness and CoS, and justified by data falling outside the scope of incrementality.

2. A richer conception of result states for a proper treatment of event structure

2.1 RSs with and without change-of-state

I will argue here that different types of affectedness and RSs (e.g., entailing a CoS for telic events, and not entailing a CoS for atelic ones) should be distinguished, going against the predominant position. Few authors mention the possibility for atelic events to receive RSs, or do it incidentally (e.g., Parsons 1990). But consider the following data :

(4) *Look! Mona has been very sick!*
(5) *Mona has already sailed.*

(4) and (5) denote a present state-of-affairs (Mona's poor looks in (4) / sailing expertise in (5)) following a past fact – yet no CoS is involved. Let us now turn to verbs of *gradual* CoS :

(6) *Mona cooked this chicken in / for two hours.*
(7) *Mona has only slightly / not too much cooked her chicken.*
(8) ??*John has only slightly / not too much drunk his glass of beer.*

(6) can be read as telic or atelic, and although its internal argument is undergoing a CoS, it is not an incremental CoS, since the *whole* of the chicken is gradually affected (and not its subparts ; compare (2)). It seems rather that the progression of the cooking event depends on the internal structure of the associated RS : the event develops as the chicken is more and more *cooked* (see Ramchand (1997) for a similar analysis[4]). The types of RSs and affectedness involved differ clearly from those of the incremental telic events considered so far. Such RSs as that of

[2] See Jackendoff (1996) for some syntactic provisos.

[3] At least in the case of path-movement verbs, cf. (1).

[4] Jackendoff (1996) also proposes RSs as paths for such events. But the impact on event structure of the difference between the scalar CoS in (6) and the incremental one in (2) cannot be motivated in such works, since it is related to a difference in the associated RSs. The incrementality approach misses this point, so that RS-based paths are rather *ad hoc* devices.

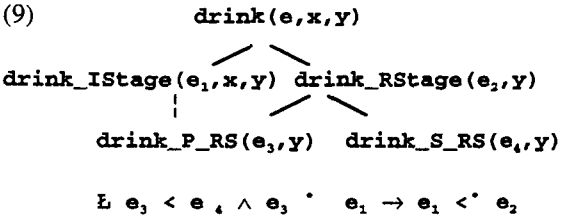
cook are *scalar*, i.e., can vary in terms of degrees (see (7)), so that a 'final' degree may or may not be reached. Contrariwise, incremental events are not endowed with scalar RSs / affectedness (cf. (8)) : one does not drink something 'to a certain degree / intensity'. It appears now that a proper treatment of event structure requires a richer conception of RSs, CoSs and affectedness, and cannot be exclusively based on incrementality.

2.2 RStages as sets of sorted RSs

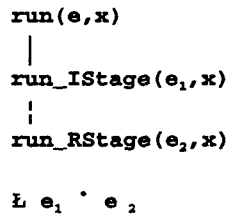
To formulate an alternative treatment of event structure accounting for the data presented above, I will introduce *result stages* (RStages henceforth), consisting of one or several RSs. I am moreover assuming here that semantic features and categories are treated within a multi-sortal logic, possessing a hierarchy of sorts organized as an inheritance-based lattice structure (see White 1994).

Legend : x°y : x overlaps with y ; x<y : x precedes y ; x<°y : x left overlaps with y
——— : ordered part-of relationship between events ; ------ : overlap relationship between events

(9)



(10)



I assume that events canonically break down into at least two stages : RStages and Inner Stages (noted IStages), the latter describing an events' *development* – e.g., the drinking process assumed to precede the end of a drinking event.

Briefly, telic events will receive a *binary* RStage (cf (10)) consisting of a *primary* RS and a *secondary* RS, the former being related to the development of the event (cf. *John has been drinking beer*) and the latter to its culmination (i.e., to the state of affairs arising from the event's final completion ; cf. *John has drunk a beer*). Moreover, the secondary RS should be the complementary of the primary RS, so as to cause a definite CoS[5]. The diagrams (9) and (10) indicate that the primary RSs of *drink* and *run* overlap with their respective IStages, and that the Secondary RS of *drink* abuts with both its primary RS and IStage. Moreover, the sortal opposition between primary and secondary RSs should be viewed as a *transition function*. I assume here that transition functions (i.e., functions allowing for CoSs) require such binary sortal domains, in the spirit of Pustejovsky (forthcoming). Some kind of causal relationship is also assumed to hold between IStages and RStages in the case of telic events.

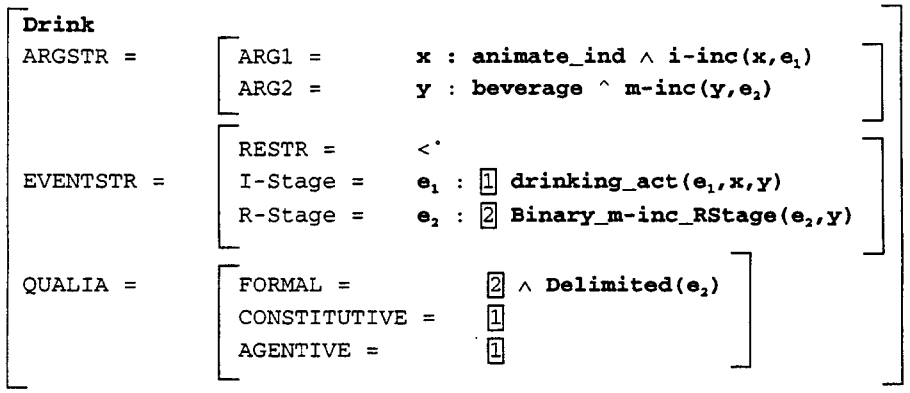
Telic scalar verbs like *cook* will receive binary RStages with *scalar primary RSs*. *Scalar RSs* will be defined through *scalar sortal domains*, so as to account for the behaviour of those verbs. I will not study here their atelic readings for want of space to do so. Finally, since atelic events do not entail a CoS, I will assign them *unary RStages*, devoid of primary RSs, so that no opposition between two RSs (and therefore no CoS) arises – see (10).

3. Encoding RStages in the lexicon

I will now propose the formal specifications for a lexical computational implementation of the above treatment. Each verb will be assigned a sorted RStage, sorts being used as well-formedness conditions. I am proposing in figure 1 a lexical entry for *drink* within the *Generative Lexicon* framework (cf. Pustejovsky (1995)). It can be adapted to any type of feature-structure-based computational lexicon, though. Note that the `m-inc` and `i-inc` functions are homomorphic aspectual roles relating events to the individual vs. material subparts of objects (see Caudal (1999) for further details).

[5] Path-object verbs as in (1) can also be analysed in terms of RStages. I will not discuss here the treatment of this and many other event types for want of space.

Figure 1. Lexical representation of *drink* within the *Generative Lexicon* framework



`I-Stage` / `R-Stage` describe the Inner and Result Stages. The `Delimited` sort indicates delimited events, while the `Binary_m-inc_RStage` sort bears the transition function (i.e., the binary sortal domain) attached to *drink*, thus allowing it to be read as an incremental telic event ; cf. (9).

Conclusion

The treatment proposed here receives indirect support from recent developments in the syntax-semantics interface underlining the importance of affectedness and CoS in argument structure and aspect construal ; cf. Ramchand (1998). Yet the novelty of this approach to event structure should be stressed w.r.t. the standard notions prevailing in the (even recent) literature, while it does not belittle the role of the usual apparatus about IStages, telicity and event-object mapping functions. It rather *pairs* them with RStages. Finally, the present account offers a more unified and explanatory treatment of event structure than those essentially based on incrementality, since they have to rely on RS-based paths to explain the telicity of scalar verbs and resultative constructions. To my knowledge, and although it has not been exposed here in detail, the RStage-based approach to event structure can be extended to all event types.

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