Computing Discourse Connections with Lexical Information:
The Case of Light Have

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Abstract: The aim of this paper is to investigate the enterprise of exploiting lexical semantic knowledge for discourse purposes. In the first part of the paper, I demonstrate that event-based approaches are unable to explain the ambiguous behavior of light verb have with a verbal complement. Asher and Lascarides (2003) present a promising account of lexicalized causation that shows the dependence of verbs on the discourse context. In the second part of the paper, I use the main tools of Segmented Discourse Representation Theory (henceforth SDRT) to deal with the phenomena, improve SDRT’s strategy to deal with lexical knowledge and avoid the previous pitfalls of the usual event-based theories.

Keywords: light verb have, lexicon-discourse interface, SDRT.

1. Light Verb have
1.1 The Basic Phenomenon and Analysis
The English light verb have with a verbal complement is ambiguous.

(1a) John (causer/experiencer) had his students walk out of class.
(1b) The CIA director (experien cer) had an agent die on him.
(1c) The CIA director (causer) had the agent killed.

In (1b) and (1c) the interpretation of the subject of have is clear whereas in (1a) John could either cause the event denoted by the complement, or undergo its consequences as an experiencer. Most of the existing approaches (Bevlin 1993, Cowper 1989, Ritter and Rosen 1991, 1993, 1997, Harley 1998, McIntyre 2005) claim cases like (1a) are ambiguous and that the inherent meaning of have, if any, is not able to specify the semantics of its argument. Instead, the interpretation depends on the contextual material within the clause.

Ritter and Rosen (1993), for example, propose a complex predicate analysis. They see have as a light verb which lacks an event specification and combines with the eventuality denoted by the embedded predicate and which is able to contribute an argument to the complex predicate. However, being light, have does not possess any inherent meaning and its only role is, according to them, to add one more participant to the event brought by the complement. The syntactic context is sufficient to specify its meaningful contribution to the construct. In that sense, the causer and experiencer readings of have are effects of the role the argument of have can play in the event. Ritter and Rosen (1993, 1997) also suggest that in the causative reading of the subject of have, the single event is extended backwards in time, since the indirect causer acts in advance to initiate the event denoted by the complement. In the experiencer interpretation the event is extended forwards reflecting the way the subject of have is influenced by the event denoted by the complement. For (1b) in the causer reading and (1c) in the experiencer one, the analysis would look as in (2a) and (2b), respectively.
1.2 Make vs. Have

In its causative reading, have shows similarities with analytic causative verbs like make with a verbal complement. Ritter and Rosen’s analysis of light have in the causative reading looks very similar to analyses proposed for other periphrastic causative verbs like make. However, Ritter and Rosen (1993, 1997) assume a one-event analysis for the complex predicate of have. Make is assumed to contribute its own event independently of the event denoted by the complement. Reasons for this are, for example, that in (3a), the negation has scope over the distinct event brought by make, whereas the resulting event could also be left out of its scope. That means that the making is negated but not necessarily the writing. Therefore, the following but-clause is perfectly acceptable and able to convey the contrast to the matrix clause. In (3b) on the other hand, the negation is addressed to the single event of the complex predicate. When the causing–of–the–writing is negated, the writing is also negated and, thus, the example is unacceptable with the contrasting clause.

(3a) The teacher didn’t make Bill write the article, but he did it anyway.
(3b) #The teacher didn’t have Bill write the article, but he did it anyway.

In (4a) the stopped smoking lasts only as long as the subject of have has the control over it. In a driving context, the state of the cessation of the smoking ends by the time the context changes. Such interpretation involves a number of extralinguistic inferences; namely, it is tacitly assumed or inferred that Sue does not allow smokers to enter in the same car with her and that this is why the smoking cannot take place while she is in the control of what is happening inside the car. The disruption of the smoking is a state that is caused because of the specific context and it ends by the time the context ceases to exist.

(4a) Sue had Mary stop smoking.
(4b) Sue made Mary stop smoking.

On the other hand, make obtains a second reading apart from the one mentioned for have. According to this second reading, Mary becomes a non-smoker. The reason why in (4a) one cannot take the second acceptable interpretation for (4b) is that there is a single complex event with specific spatiotemporal restrictions that do not allow its causing and resulting parts to occur independently. However, in (4b) the causing event is considered to be independent and to not affect the temporal contour of the resulting state. Linguistically, then, make has its own properties that do not determine and interfere with the denotation of the state in the complement. In the former case, the stopping of smoking is tightly connected to Sue’s causing action and in the later one it lasts from that point on forever with Sue causing its initiation but not determining its ending point. As a side-effect, in the first common reading for both have and make, Sue is considered the controller of the cessation state.

2. Towards a New Account

Notwithstanding the appeal of the arguments of Ritter and Rosen (1993), I suggest that they are not conclusive for a single event analysis of the complex predicate of have and that a more subtle study of the data will prove that it is not enough to invalidate the
assumption about two events; it just contributes to a refined analysis of the kind of causation brought about by *have*.

The objection against a single event analysis for the complex predicate of *have*+V is illustrated by the following argument. If we accept, at all, such things as events in our ontological quiver then one should be able to refer to such entities explicitly with anaphoric means like pronouns. In (5) the pronoun *it* clearly does not refer to any individual entity but to an event-like or abstract object (in terms of Asher (1993)) of the previous sentence. However, it is not the event of *walking out of class* that the pronoun refers to, but the causing action by the subject of *have*. Therefore, since we are able to talk about the causing part of the complex predicate and build anaphora with it in the same way that we could do with any other analytic causative verb as in (6) that denotes a causing and a resulting event, it should be reasonable to argue that the complex predicate with *have* introduces two events and not one as all the previous analyses assume.

(5) I had John walk out of class. It was the only thing that was left to do.
(6) I made John walk out of class. It was the only thing that was left to do.

This point is further illustrated by the discourse in (7). There are six events preceding the *fighting* in (7). The interpretation of this small passage is that these six events result in the event of *fighting* in the last sentence. The coherence of the interpretation depends on the right inference about the connection between the two sentences. Under the single event analysis of *have* by Ritter and Rosen (1993, 1997), the relevant inference cannot be done. If there is only one event that has *fight* as its main predication, then it is not possible to explain how humans interpret the causal relation between the six events of the context and the resulting *fighting*.

(7) John went to pick Mary up for the dance (e1). When he met her at her place (e2) she was still washing the dishes (e3). He became angry (e4) and when they reached the place where the dance was taking place (e5), he insulted her very badly (e6). Finally, he had her fight with him.

The above data reflect a more general problem present in event-based accounts, as already noticed in the literature (Asher (1993) a.o.). Lexical semanticists following Link (1983) have used different kinds of algebras of events to explain different linguistic phenomena. For example, Krifka (1989), driven by data regarding the denotational mapping properties of creation/consumption verbs and their mass or count noun objects, proposed an algebraic approach extending the axiomatic principles of Link (1983) and provided valuable insights as to under what operations the domain of events should be closed. A number of other approaches for different linguistic concerns have emerged after these first algebraic formulations. Like Link (1983) and Krifka (1989), all the new approaches presuppose the existence of events as a structured domain, since an axiomatic method is developed most of the times. That means that specific operations should be able to contain all and only the truths regarding the behavior of events in a well-defined domain.

Asher (1993) and Tantos (2006) provide a detailed and useful discussion about the deficiencies of algebras of events and their weaknesses by observing simple cases of very small texts or even sentences with more than one clause. Although I will not present the relevant discussion due to space limits, one can prove that any algebraic method of event computation is doomed to fail if one considers the semantics of verbs...
in a larger context; following Asher (1993) and Tantos (2006), it is the way that we use language that plays the most important role most of the times in connecting happenings in the world rather than the nature of the happenings themselves. It has been noticed, mainly by philosophers, that natural language admits the existence of a number of objects other than events covering a wide spectrum in the scale of abstractness, events being only one of them. Moreover, there is no clear empirically defined principle that could identify events. At best, only a context-sensitive approach is viable for these semi-concrete or purely abstract objects appeared in natural language. If the context of the utterance plays such a big role, then why should we seek an explanation of ambiguities like that of light have only in terms of events and the relations of their sub-events?

As next section shows, it turns out that the context is actually the most important factor in determining the semantic contribution of causative verbs and the complex predicate of have and not their event denotation. Before considering any discourse-sensitive analysis of the complex predicate of have, though, it is essential to establish a framework that would allow such an interaction.

3. The Lexicon-Discourse Interface

Context plays a large role in the interpretation of light have. This may not seem like startling news, as most of lexical semanticists would concur with this idea. However, their analyses leave out the contextual factor. A central part of Ritter and Rosen’s and Harley’s analysis is the identification of conditions of the clause that could serve to license/specify either only a causative, or only an experiencer reading. My analysis, in contrast, assumes that light have along with other causative verbs is a discourse active element, which indicate that a particular kind of discoursal connection between bits of texts should be established via rhetorical relations. At the same time, any seeming difficulties regarding the denotational properties of the complex predicate fade away, since the account is not event-related. Pieces of structural lexical semantic information correspond to discourse-related entities -and not events- that allow for anaphora and connectivity at the discourse level. The lexical specification of have thus interacts directly with the discourse structure and this, in turn, serves to specify the predication of light have plus the main verb.

Asher and Lascarides (2003) follow the same strategy for exploiting lexical semantic knowledge for discourse inference within SDRT. Lets us revisit some points of the last mentioned authors for the representation of a simple causative verb.

Structures of SDRT, SDRSs, are labeled by πs, which then become arguments of rhetorical relations like Narration, Elaboration, Explanation among others. Labeling becomes then an essential part for the first task of a discourse dynamic theory; namely the construction of the logical form of the discourse. The mapping of the logical form to a model is the second step of the interpretation and goes along with the argumentation that a number of types of linguistic information exist but only have a partial relation to types of real world information and make inferences more convenient for humans. SDRT, then, provides us with the necessary flexibility to deal with the problems related to lexically predicated events. Although the basic ideas about the lexicon-discourse interface developed by Asher and Lascarides (2003) provide the basis for a solution to the event-related paradoxes noted by Tantos (2006), their representation does not take full advantage of the labeling scheme and do not avoid the problems of the event-based approaches.

Despite the fact that Asher and Lascarides (2003) adopt lexical πs in their approaches, their analyses still appeal to predications of events entering again the
problems explicated above. These labels are containers of coherent bits of information that is available for anaphora by other bits of information in the context.

\[ \lambda e \lambda y \lambda x \left( \pi \pi_1 \begin{array}{c} \pi \\
\pi \\
\pi_1 \end{array} \begin{array}{c} e' \\
?^{\text{Act-on}}(e',x,y) \\
sink(e,x,y) \\
abuts(e',e) \\
\text{Result}(\pi, \pi_1) \end{array} \right) \]

Figure 1: The lexical representation of sink from Asher and Lascarides (2003)

The representation of the causative verb sink in Figure 1 is used in Asher and Lascarides (2003). Parts of event and argument structure are dealt within \( \pi \)'s. The complex SDRS in Figure (1) is triggered by the lexical predicate sink, is bound under the lambda operators and is available for composition inside and outside the sentence. Two utterance tokens represent the causing and the resulting part of the denotation. The relation between them is Result and is of the same kind as the rhetorical relations, inferred between textual parts.

There are two events distributed in the two different \( \pi \)'s. One of them, the causing event, is not predicated of by any linguistic predicate from the clausal context. Instead, its predication is filled in with a question mark that indicates underspecification. Although Asher and Lascarides (2003) do not explicate their algorithm, it should involve essentially two steps. The underspecified predicate of the causing denotation of sink is resolved if a predicate from the anaphorically accessible context is typed as an Act-on predicate in accordance with the typed underspecified predicate of the lexical entry for sink. If that is the case, the questioned event predication is replaced by the linguistic predicate provide by the context and their event variables are identified as well. Else the underspecified predicate remains as it is.\(^1\)

This means that the context of the utterance provides event descriptions to resolve the underspecification implied by such questioned predications. These event descriptions or utterance tokens may contribute information about the event of the causing part of the denotation of sink. In (8) the causing-of-the-sinking is identified with the torpedoing and the lexically triggered complex SDRSs is integrated in the rhetorical structure of the text smoothly in a process that reminds of anaphora resolution. Based exclusively on lexical semantic knowledge, the connection between the two sentences is Result.

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\(^1\) The theory allows for the possibility that underspecified information remains underspecified if there is no way to resolve it. However, the reasoning is based on the preference that underspecification, wherever it is found, should be resolved if possible.
(8) (π₁) The enemy sank the boat. (π₂) They torpedoed it.

This idea of separating the reference to πₖ and to events renders discourse inference extremely flexible and explains a number of confusing phenomena. However, a problem with the resolution of underspecified questioned predicates emerges with sentences with more than one predicate that describe the causing part of the denotation of a causative verb. In (9), the torpedoing and the burning occurred in different times and places. However, both refer to the causing part of the denotation of sink. There is no contradiction as to what caused the sunk state as both of the temporally preceding event descriptions serve as describing parts of the utterance token that describes a bigger event. The temporal boundaries of the causing-of-sinking are specified on the basis of the events of the surrounding utterances. Its beginning is identified with the beginning of the exploding and its ending point is the end of the burning. There is again an event predicated of by a linguistic predicate and further described by predications of two events creating inconsistencies in the motivation of the underspecified questioned predicates.

(9) The enemy sank the boat. They torpedoed the stern and burned the forward half an hour later.

Let us assume that the underspecification expressed by the question mark in sink is resolved by a single predicate. Then, one would be forced to conclude that only one of these predicates correspond to the causing-of-the-sinking event and this is not correct, since both of them play an independent and essential role for bringing about the sunk state.

4. Proposal

The real novelty of the idea of including πₖs in lexical semantic representations as containers of event descriptions is only exploited when computation is not based exclusively on the events they express but on the way they express them. A single event may be described in more than one πᵢ or the other way around. This idea is not clear in the existing framework of SDRT and in the case of causative verbs above each πᵢ expresses its own event.

The first step is to assume that there is not any kind of anaphora resolution of an underspecified predicate involved in the inference of the relevant discourse connections between sentences of a discourse in which at least one of these sentences contains complex SDRSs with lexical rhetorical relations. This is done in order to avoid the difficulty that emerges from the event-based account of Asher and Lascarides (2003) explicated above. The level of utterance tokens—and not of events—becomes the right place to seek the relevant connection between the causing denotation of the causative verb and the explicit segment of the context. The analysis of event structure is not at the same level with the level of descriptions of events as mentioned often above. There is no one-to-one correspondence between events and πₖs.

The second step is to establish the framework that ensures smooth integration of lexical complex SDRSs in the segmentation process of SDRT. This means that various kinds of redundancies and inconveniences should be avoided without violating general principles of the theory. I demonstrate both of these steps in the analysis of the light verb have.
I believe that the confusing behavior of *have* is explained if one assumes that the object that this lexical item denotes is a linguistic construct of the kind SDRT assumes. Under the new framework, the lexical representation of *have* in its causative reading is depicted in Figure 2. For the above representation, I assume a compositional version of SDRT for assembling semantic information in a similar fashion to Asher and Lascarides’ (2003) approach. Some comments about the compositional properties of the lexical entry are necessary to also grasp the intuitiveness of this approach. First of all, I assume that there should be no mention about underspecified predicates in the lexical entry of the verb in order to avoid the problem of identifying more than one event in the context with the causing part of the denotation of *have*. The lexical information contributes to discourse inference, and linguistic clues about the nature of its subject argument may be exploited in order to allow the right rhetorical connection of the sentence it contains it with others in the context.

Moving towards the second step mentioned above, I adopt a different status for lexical ($\pi^l$) and discourse ($\pi^d$) tokens. In favor of the lexically-sensitive analysis and the distinction between lexical and discourse $\pi$s that motivate the necessary technical changes to the theory, there is one more motivating argument with respect to a discourse constraint, called the Right Frontier Constraint. This constraint demonstrates the hierarchical structure of the discourse and the different effects of coordinating and subordinating relations in the resolution of various sorts of anaphora. Coordinating relations reflect the binary connections between bits of text information that support a common topic. Both of the rhetorical arguments offer some new information in a common direction without suggesting any asymmetry between them. On the other hand, subordinating connections are developed between segments, when some of these segments play a subordinate role relative to the others.

The lexical SDRSs are packaged in a single lexical item. Therefore, lexically-triggered relations do not provide the interpreter with any clue as to whether they should be considered as symmetric in the relevant sense or not and they are not defined as either coordinating or subordinating. In my opinion, the structure of the text determines

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2 Due to space limits a full-fledged example of semantic composition for a sentence with the complex predicate of *have* is not provided, but I think it is obvious how it would be done.
the coordinating or subordinating nature of the rhetorical relations and the lexically-triggered ones do not participate in this distinction with all the relevant effects in the resolution of various kinds of discourse anaphora.

Moving back to the light verb *have* in its V+V construction, in the above lexical semantic representation *have* determines only one formal part of the complex predicate. The λ function operator ranges over the information that comes from the verbal complement. The semantics of the verbal complement labeled by some other $\pi_i$ takes its place as the Result of $\pi_1$ after the conversion.

Lambda reduction becomes then the operation that signals the elimination of the lexical $\pi_i$. As it was argued above, this is a desirable change for our theory that reflects the lexical nature of the constituents that are lexically triggered and are available for discourse purposes. The advantages of representing the meaning of the complex predicate this way can be illustrated with the help of an example.

![Discourse Graph](image)

Figure 3: Discourse graph based on coreference of lexical $\pi_i$s with discourse $\pi_j$s in (9).

The structure of the discourse in (10) is illustrated in Figure 3 and needs some comment. $\pi_5$ is the discourse $\pi_i$ that derives from the embedded complement and results after the lambda reduction mentioned above and the elimination of the lexical $\pi_i$ of the lexical entry of light *have*. At the same time, the identification of $(\pi_3)$ with $(\pi_4)$ is necessary and shows that the coordinating structure of the previous two clauses serves as the causing denotation that *results* in the event denoted by the complement.

(10) $\pi_6((\pi_3)((\pi_1))$The bartender took a crate of beer and $(\pi_2)$threw it at the head of the drunk haunter]. He $(\pi_4)(\pi_5)$ had him go to the hospital].

From the example above, one can see that the right discourse relations are built between the three constituents with the help of the lexically triggered information in a way that was not possible in the previous standard SDRT. There is no one-to-one correspondence between lexical $\pi_i$s and events and that is why one can avoid the difficulties of using directly the internal structure of events. At the same time, a single event may be described by more than one lexical $\pi_i$.

5. Conclusion
The paper aimed at showing the need to use discourse-motivated entities of lexical nature with respect to the light verb *have* in its verbal complement construction. Intermediate entities that serve discourse connectedness in the form of lexical $\pi_i$s are necessary in order to determine the semantic contribution of light *have* and, more generally, they play an important role in the discourse inference. I also demonstrated the need for incorporating lexically-triggered $\pi_i$s in SDRT and presented the lexical entry of
*have* in its causative reading along with the analysis of a real example.

References