

Position Paper: Event Reference

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1. Introduction

Developing a computational account of event reference requires solution to a number of difficult problems, not least of which is characterizing the phenomenon itself. From a listener's point of view, event reference encompasses both the task of building up a structured model of the events and situations underlying a given text and the task of interpreting subsequent references to these events and situations afterwards. A computational approach to these tasks requires at least (1) a characterization of the information that an individual clause may convey about an event or situation; (2) a characterization of explicit clues a text gives as to how the pieces described in individual clauses fit together (assuming, as I do, that this does not rely solely on world knowledge; (3) an account of what the listener does in processing an explicit event reference; (4) a characterization of what events and situations are available for explicit reference; and (5) a procedure for choosing among possible ways of resolving an explicit event reference.

What I have to say in this paper concerns only the third problem. (In [8], I discuss both the second and third problems in detail.) My position on event reference centers on something I'm calling event/situation structure or **e/s structure**. Along with building up a **discourse model** of the entities salient to the given text, the listener is also building up a model of the events and situations they participate in -- **e/s structure**. (I actually see **e/s structure** as representing a bit more than just the events and situations underlying the text: that is, I see it as representing the speaker's view of those events and situations. Hence **e/s structure** may also contain substructure corresponding to finer-grained descriptions of other events and situations in the structure, as well as substructure corresponding to the speaker's vantage point in describing an event or situation.

This paper is limited to a discussion of **e/s structure** and its role in explicit pronominal reference to events. My view of pronominal reference is that it involves reference to entities in a **discourse model** [7]. While **e/s structure** in the current view is separate from the listener's **discourse model**, there are important connections between them. Of particular importance is that certain entities in the **discourse model** may directly represent nodes or substructure in **e/s structure**. Essentially, a discourse entity is no more than a common locus of reference and information attachment. Semantically, it may correspond to any type of individual -- an object, a set of objects, a generic class, etc.

If and only if something is associated with a particular discourse entity, I will say that it is viewed as an **individual**. So, for example, if there are separate discourse entities corresponding to John and to Mary, but no discourse entity corresponding to the set comprising the two of them, I will say that that set is not (yet) viewed as an individual. Conversely, if a discourse entity corresponds to some set (say, one evoked by the phrase "three kangaroos") that set is viewed as an individual but the members may not be. The notion of being an individual -- that is, as having a separate, unique locus of reference and information attachment -- will become important shortly.

2. Individuating Reference

In my view, **e/s structure** is distinct from the listener's **discourse model**. Therefore, an event or situation in **e/s structure** is not automatically associated with a discourse entity. However, the speaker may do something to **individuate** a piece of **e/s structure** and tie it to a new discourse entity in the listener's **discourse model**. This new entity is intimately tied to that particular piece of **e/s structure**, but is not equivalent to it. **Individuation** is done by means of definite NP or pronominal reference, as in the following examples

Example 1

It's always been presumed that when the glaciers receded, the area got very hot. The Folsom men couldn't adapt, and they died out. *That's* what's supposed to have happened. It's the textbook dogma. But it's wrong. They were human and smart. They adapted their weapons and culture, and they survived.

Example 2

"My friend," Valdez told him, "when you accept help, you must be prepared to take what one is capable of giving, not what you would like to receive. I have never denied my human limitations; but it is ungrateful of you to refer to them."

Marvin had to be content with *that*, since he didn't think he could find his way back to the city unaided.

In each of these examples, what I will call the **individuating reference** - the first, explicit reference to a node or larger piece of **e/s structure** - is italicized. (Example 1 also contains additional anaphoric references, which I'll get to shortly.)

It should be clear that **individuating reference**, as presented here, involves special processing. In response to an individuating reference interpretable as referring to an event or situation, the listener goes to his/her evolving **e/s structure**, **circumscribes** an appropriate node or substructure, possibly **coerces** it into something of a different semantic type¹, and then **evokes** a new discourse entity corresponding to this new "individuated" event or situation. Figure 1 illustrates this relationship. The dashed ovals indicate circumscribed pieces of **e/s structure** or circumscribed sets of discourse entities. (See next page.) The arrows indicate the links between the new discourse entities and the newly individuated structure or sets they correspond to.

I believe that individuating reference may not have been seen before as a distinct mechanism because the most common form of individuating reference - i.e., via a pronoun - is the same (at least in English) as that used for subsequent reference to entities already in the discourse model. Of course, this may not be truly accidental since that part of **e/s structure** which can be individuated is probably, in some sense, in "focus" in a way similar to the discourse entities which can be referenced pronominally. (Another obvious question which I have not attended to yet concerns the relationship of the **temporal focus** and other potential temporal foci to what part of **e/s structure** can be circumscribed via an individuating reference.)

Individuation, as I conceive it, is not limited to **e/s structure**. It can be applied to the **discourse model**,

¹Coercion is commonly required in anaphoric/deictic reference to existing discourse entities. One open question concerning coercion is whether coercion of an existing discourse entity into one of another type results in the creation of a new discourse entity associated with the new type or whether the same discourse entity can support multiple descriptions of itself viewed as different types.

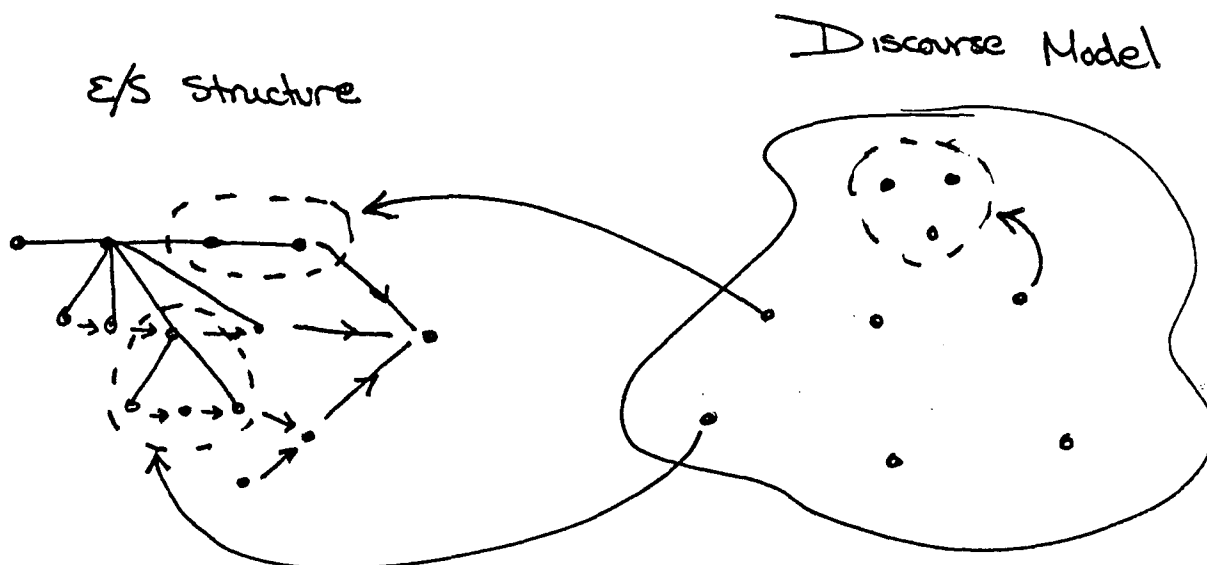


Figure 2-1: Individuating Reference

to circumscribe several entities already in the model and individuate a new set. I see this happening twice in the following example.

Example 3

It was time to go to the airport to fetch John.
 Marcia went into the living room, where she found Albert, while
 Simon she found in the back yard catching frogs.
 She told *them* to get cleaned up immediately.
 Ten minutes later, *they* met in the garage, got in the car and drove off.

The first "them" individuates the new set consisting of Simon and Albert, associating a new discourse entity with it. The second "they" individuates the distinct set consisting of Marcia, Simon and Albert, associating a separate discourse entity with that set. (From example 2, where an explanation is individuated, it should also be clear that either the listener is building up **e/s structure** for rhetorical and expository text as well, or that individuation also operates on the distinct structure the listener is building up for them. If one wants to keep **e/s structure** as something organized primarily by temporal relations, built up through the interpretation of tense and relative temporal adverbials, the latter is probably preferable. Hence, individuation should be possible on any discourse structure.)

The obvious question to ask is why one may want to individuate parts of **e/s structure**, when it is unnecessary for its construction. I believe the reason is that one cannot attribute features to something without pointing or referring to it, and one cannot point or refer to something without its being considered a distinct individual. In example 1, the narrative account in the first two sentences is individuated via "that" in the third sentence, in order to attribute to the account as a whole the status of "current guess". In example 2, Valdez's explanation is individuated, so as to establish it as the object of Marvin's acceptance.

The account I'm giving here of individuating reference as being distinct from regular subsequent reference is born out by its different effect on **discourse focus**. That is, it has already been shown [1, 5, 2] that regular pronominal reference to another individual can move the listener's attention to that individual, making it more difficult to refer successfully to the first individual with a pronoun. (The first

individual often has to be reintroduced with the aid of a definite noun phrase.) But now consider the following two examples, one containing an instance of individuating reference to a new set and the other, an instance of individuating reference to a part of **e/s structure**.

Example 4

- S1. John called Fred to see if he wanted to go sailing on the Chesapeake.
- S2. Fred said fine but only if he could be the skipper.
- S3. He didn't trust John's sailing abilities.
- S4. *They* argued for awhile.
- S5. But eventually he agreed to take three watches and let John take one.
- *S5'. But eventually he agreed to take one watch and let Fred take the other three.

Example 5

- S1. John asked Fred for a guava.
- S2. Fred refused:
- S3. He hated the smell of guavas.
- S4a. *This* led to an argument.
- b. *That* led to an argument.
- c. *It* led to an argument.
- S5. But eventually he agreed to give John a guava, if he'd eat it elsewhere.
- *S5'. But eventually he agreed to stop bothering Fred for pieces of fruit.

In both examples, Fred is the focus of the third clause (S3). Sidner's focus movement algorithm predicts it as the most likely focus of the next clause. That is, if S5 (either example) were to follow directly on S3, Fred would be assumed *a priori* the referent of "he". Hence the anomaly of S5', where the referent of "he" must be John. However, the insertion of a sentence containing an **individuating reference** like S4 in example 4 or any of S4a-c in example 5 does not disturb this: the same *a priori* expectations continue to hold.

This makes sense if one treats **individuating reference** as introducing a new entity, even though its surface appearance makes it look like an instance of subsequent reference. In this way, it will not immediately affect the focus tracking process until the speaker makes another pronominal reference to it, which is now a real instance of subsequent reference that may indicate a real shift of focus off the previously focussed individual and onto the entity corresponding to the event, situation or set.

Note that Sidner's focus movement algorithm [5] makes the same predictions as here about the effect of initial event/situation reference (although her account is limited to the event/situation set up by a single clause). What is different is that Sidner's predictions do not follow from a particular view of event/situation reference: rather, they follow from a particular way of using her regular focus mechanisms. In particular, using 'it' or 'this' to refer to an event/situation resets the current **discourse focus** (DF) of the text, pushing the previous one onto a separate **focus stack** whose entries are still available for pronominal reference. If the current DF is rejected, and the potential DFs (if any) are rejected as well, the previous DF would be popped off the stack and reset as the current DF. On the other hand, event/situation reference via 'that' has no effect on the current DF, which remains the preferred referent of an anaphoric expression in the next clause. Sidner's algorithm also makes the same predictions for elaborated sets, which she calls *focus sets*. Reference to a focus set resets the DF, and stacking the previous DF. Again that previous DF is still available for pronominal reference, whereupon it would be popped off the stack and reset as the current DF.

The difference between the account given in this paper and Sidner's account is that here the behavior is specifically attributable to a different mechanism -- **individuating reference**. The different pronouns (it, this, that) may perhaps differ in what they can individuate, but the individuation operation is still the same and has the same effect on the discourse: it introduces a new entity into the **discourse model** which, like any other entity, is a potential focus for the next utterance. But until it is actually taken to be the focus of the next utterance, it has no effect on the current focus.

3. Conclusion

I have shown here how a notion of **e/s structure**, separate from the listener's **discourse model** can form the basis of an account of explicit reference to events via a process of **individuating reference**. In [8], I show how **e/s structure** can also be used as a basis for the anaphoric interpretation of clause-level tense and relative temporal adverbials (which in turn extends **e/s structure** through the attachment of the clause's interpretation. That **e/s structure** can be seen to participate in these two quite different linguistic phenomena gives credence to its value in our pursuit of a complete theory of discourse understanding. Next steps include (1) integrating this with current work on the representation of events and situations [6, 3], (2) developing an account of what **individuating reference** has access to in **e/s structure**, and (3) developing a procedure for identifying and choosing among possible ways of resolving an individuating reference [4].

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