

Multi-Rooted Vines in Semantic Representation

by

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The purpose of this paper is to argue that a single connected tree headed by a performative verb is not the best semantic representation for sentences containing sentential predicates. It is argued that the identification of the participants cannot be embedded within the main performative verb and may not even be associated with any particular sentence. Multi-rooted vines — equivalent to disconnected trees with indices — are advanced as an efficient formal structure for representing such sentences. Vine-like structures also appear to underlie presuppositions.

I. Performatives

Performatives are sentences whose utterance in the proper circumstance is itself the performance of an act. The theory of performative speech acts was originally developed (Austin 1946) to counteract the philosophical emphasis on statements as true or false descriptions of some state of affairs. Performatives are not true or false and do not report or describe. For example, to utter the sentences

- (1) Let's call it Harry.
- (2) I promise to take my pills.

in the proper circumstances would be to perform the actions of naming and promising respectively. For explicit performatives such as (2), the main verb names the act performed in uttering the sentence. The conditions necessary for the successful use of a performative are called its felicity conditions.

In his latter work, Austin (1962) noticed that all utterances require felicity conditions and are in some sense "doing something." The different ways in which to utter a sentence is to do something provided Austin with his locutionary, illocutionary, and perlocutionary taxonomy. In the simplest case, for a speaker to utter a sentence to a listener at a particular time and place and with a particular sense and reference is to perform an act of "saying", a locutionary act.

Illocutionary acts, such as reporting, requesting, thanking, admitting, predicting, suggesting, opposing, agreeing, choosing, condoling, protesting, etc., are acts performed in saying something in the proper circumstances. The illocutionary force of an utterance is the illocutionary act performed in making that utterance. The force may be made explicit as in (2) by the use of an illocutionary or performative verb, or it may be left vague.

Most illocutionary verbs such as promise, state, report, claim, question, and order take an object or oblique complement. These verbs make explicit the illocutionary act which could also be performed by uttering the embedded sentence alone. Other illocutionary verbs such as thank, apologize, resign, and protest

against do not take an embedded locutionary complement. For verbs of this second class, the relationship between an explicit illocutionary act and other locutions which could be used to perform the same illocutionary act is far more complex than for verbs of the first class.

- (3) I hereby claim that determiners are verbs.
- (4) Determiners are verbs.
- (5) I hereby apologize for discussing linguistic universals.
- (6) I didn't mean to mention linguistic universals.

Another important aspect of a speech act is its effect on the hearer. By uttering a sentence, a speaker often performs a perlocutionary act such as embarrassing, deceiving, persuading, inspiring, boring, encouraging, frightening, impressing, etc. A speaker has control over the illocutionary act he performs but not over the perlocutionary act. A native speaker hearing only the utterance could not decide what perlocutionary act had been performed.

Perlocutionary verbs can take embedded subject complements headed by illocutionary verbs.

- (7) John's thanking Bill for the trip amused the judge.
- (8) John's argument persuaded Bill that eight is prime.

Unlike locutions embedded in illocutionary verbs, however, there are no selectional restrictions between the perlocutionary verb and the embedded illocutionary verb. The perlocutionary verb describes the result or the effect of the illocutionary act on the listener. Illocutionary and perlocutionary verbs are two important classes of sentential predicates which make explicit the role of an utterance in the total speech act.

There are two other classes of words whose semantic function is quite similar to that of illocutionary or performative verbs. Parenthetical verbs (Urmson 1952) are verbs such as believe, suppose, remember, regret, assume, maintain, know, and certain which take complements, can be used parenthetically, and which indicate the emotional significance, logical relevance, or reliability of the embedded sentence. Verbs such as claim, regret, propose, and conclude are both parenthetical and illocutionary. However, believe, know, think, and probable are only parenthetical while thank, challenge, describe, and permit are only illocutionary. Epistemic quantifiers (Caton 1966) such as remember, know, possible, probable, and think are a subclass of parenthetical verbs which can be used to indicate the strength or type of evidence which the speaker has concerning the embedded sentence.

Nouns such as fact, idea, rumor, news, hunch, thought, and belief, which take embedded complements, are also sentential predicates which make the role of the embedded sentence explicit. Some of these abstract nouns such as promise, claim, and vow are also illocutionary verbs while others such as belief, thought, and possibility are parenthetical verbs. Other nouns such as fact, idea, and hunch are not obviously parenthetical or illocutionary.

Ross (1968) has proposed that an explicit performative is the main verb in the deep structure of every sentence. Such a view is consistent with Austin (1962) in which it was suggested that the relationship between an utterance and its illocutionary force is rule-governed. Ross actually presents arguments for only a few of the more "locutionary" performatives; it remains an open question of whether any one of the several thousand illocutionary verbs--in particular thank, apologize or resign--could be the underlying performative. In this paper, however, it will be assumed that some explicit performative does underlie every utterance.

II. An Overwhelming Argument for Disconnected Trees in Semantic Representation

It has recently been observed¹ that in the sentence

- (9) John said he saw the woman who lives at 219 Main Street

the identification of the object of see as the woman who lives at 219 Main Street may be ascribed either to John or to the speaker. If it is argued that a locutionary verb such as say should head the deep structure of every declarative sentence, then the structure for two of the readings of (9) might be represented² as

- (10)
- ```

 say
 / \
 I you
 / \
 and \
 / \ \
say and called
 / \ \
x1 and x1 John
 / \
 see is
 / \ / \
x1 x2 x2 the woman who lives at 219 Main St.

```
- (11)
- ```

      say
     /  \
    I    you
   /      \
  and      \
 /  \      \
say  and    called    is
 /  \      \          /  \
x2 see    x1 John  x2 the woman who lives
 /  \          at 219 Main St.
x1 x2

```

In (10), x_2 is identified within an opaque context and the truth of the sentence depends upon John actually identifying the woman as living at 219 Main Street. The difficulties with (10) as a representation of this identification become apparent when another opaque sentential predicate such as promise or hope is substituted for say.

- (12) John hoped to see Mary
 (13) John promised to see Mary

Postulating a structure for (12) or (13) which is parallel to (10)

would incorrectly embed the identification of x_2 as Mary within the predicate hope or promise. Furthermore, a sentence which negates and contrastively stresses the illocutionary verb

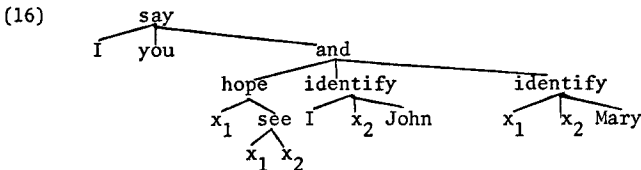
(14) John didn't promise to see Mary

retains the opaque reading in which John identifies Mary. Clearly, while a subtree dominating a sentence such as

(15) John identifies x_2 as Mary

must be an essential component of the semantic representation for these sentences, but it cannot be embedded within the verb.

So, if it can't be inserted within the embedded sentential predicate hope or promise, where can the subtree of (15) be inserted? It might be embedded in the main locutionary verb say, but this would produce a structure



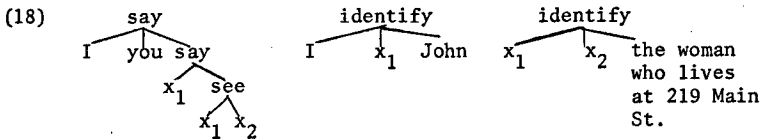
which is semantically misleading. Furthermore, the same argument can apply again. If the main performative verb say is changed to order, then it is clear that identify cannot be embedded within the performative. The solution suggested here is to make the verb identify parallel to the main performative say.

If say and identify are not embedded, should they be conjoined under a single S node? In the utterance

(17) John said he saw Mary. He thinks she is a lexicalist.

it would be redundant to conjoin the structure underlying (15) to both sentences. Furthermore, the person who identifies Mary must be the same for both sentences and any ambiguity about the identifier of Mary may be resolved in a later sentence. Thus, John's identification of Mary should be included only once in the utterance and should not be conjoined to the performative verb of any particular sentence.

The correct structure for reading (10) should be something such as



It thus appears that in at least one case, the structure underlying a sentence is not dominated by a single node. Such a

structure is called a disconnected tree. It also might be considered a set of trees.

III. Trees, Vines, and Variables

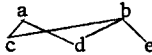
A tree may be defined as a finite set of nodes N and two relations H (hierarchical order) and L (linear order) such that

- A1 L is a total order and H is a partial order.
- A2 If $(a,c), (b,c) \in H$, then $a=b$
- A3 If $a, b, c, d \in N$ and $(a,b) \in L$ and $(c,a), (b,d) \in H$, then $(c,d) \in L$

An element of N without a successor under H is a terminal node and an element without a predecessor under H is a root of the tree. If N is finite, then there is at least one root. A disconnected tree is a tree with more than one root.

Deleting axioms A2 and A3 generalizes the definition of a tree so as to permit more than one node to dominate a single node. Such a structure is a type of directed graph without cycles and will be called a vine. A vine is a set of nodes N with relations H and L such that L is a total order and H is a partial order. The following are three examples of vines:

(19)



Vines offer certain economies in the representation of linguistic structures. In order to indicate multiple relationships such as being the subject or object of different verbs, it is necessary for a word or variable to appear on more than one node of a tree. Vines, however, can express multiple relationships by having many different nodes dominate a single word or variable. Vines may thus be used to eliminate multiple occurrences of a node within a tree. Conversely, variables may be used to represent vines as disconnected trees.

The use of trees in semantic representation, rather than elements from some other class of formal objects, may well have been an historical accident. There is probably no theoretical reason to prefer trees with variables to vines; vines, however, are confusing and cannot always be drawn in two dimensions without crossing lines.

IV. Presupposition and Multi-rooted Vines

For certain sentences, it appears that the semantic representation requires at least a multi-rooted tree. Replacing multiple occurrences of individual variables in this tree by a vine structure results in a further simplification. In this section it will be argued that many presuppositions contain propositional indices which are best represented by multi-rooted vines.

Presuppositions are conditions which are necessary for the proper use of a sentence.³ For example,

- (20) My brother is seven feet tall.
- (21) I advise you to go.
- (22) I accuse you of mailing the letter.
- (23) I intend to catch a fish.
- (24) I bent my handkerchief.

presuppose, among other things, that

- (20a) I have a brother.
- (21a) I think you should go.
- (22a) It was bad for you to mail the letter.
- (23a) I think it is possible to catch a fish.
- (24a) My handkerchief is stiff.

Sentences which violate their own presuppositions

- (20b) My brother is seven feet tall, but I don't have a brother.
- (21b) I advise you to go, but I don't think you should.
- (22b) I accuse you of mailing the letter, but I don't think it was bad.
- (23b) I intend to catch a fish, but I don't think it is possible.
- (24b) I bent my handkerchief, but it wasn't stiff.

are anomalous and are treated as conundrums. A discourse which violates the presuppositions of one of its sentences would also, of course, be treated as anomalous.

The speaker assumes or takes responsibility for the presupposition of a discourse. Thus the presuppositions might be embedded in some type of epistemic verb such as assume. The fact that presuppositions are not changed under negation and the fact that they are not literally "said" suggests that they are not embedded in the main performative verb. The structure for a sentence such as 22 would thus be

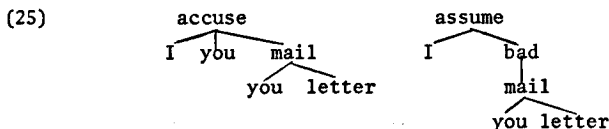
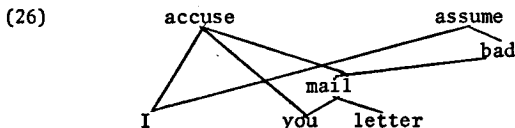


Diagram (25) illustrates a common property of the presuppositions associated with sentential predicates: the embedded sentence is also embedded in the presupposition. Such a structure would require indices on propositions. However, it would seem more parsimonious to propose a structure such as

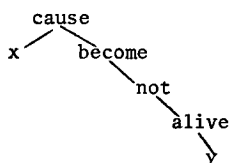


Cases in which a single proposition is embedded within several different predicates are quite common. However, a tree which represents such a structure must contain redundant occurrences of a subtree. Furthermore, it is difficult to state naturally the formation conditions on a tree which contains a lexical item requiring identical subtrees. Vines appear to offer advantages over trees for stating identity conditions. Since vines and trees are interconvertible, however, the choice between them can only rest on the over-all simplicity of the system.

FOOTNOTES

¹Sentences such as (9) were used in philosophy examinations at Oxford during the early 1950's (R. M. Hare, personal communication). The present analysis is based on McCawley (1967).

²Dependency trees are used in this paper not only because they are more compact than the equivalent phrase structure tree but also because they do not require unmotivated intermediate nodes. The well known expansion of the predicate "kill(x,y)" as "cause(x, become(not(alive(y))))" is just the linear representation for the dependency tree.



No excessive grouping of the predicate is introduced, and a predicate raising transformation is not required. The reader who believes that dependency trees are incompatible with our almost complete knowledge of the format for the transformational component of a grammar may consider dependency trees as abbreviations for phrase structure trees. Some readers may not need to be able to reject one or the other notion in order to preserve their psychic health

³Presuppositions were originally intended to be necessary conditions for the interpretation of an utterance. "The present King of France is bald" is meaningless if there is no present King of France. Austin (1962) generalized the notion to include felicity conditions of speech acts. However, relations such as the one between "I bent the string" and the string's being stiff are much weaker and should, perhaps, be called by another name.

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