Thematic Underspecification and Manner-of-Motion Verbs*

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1. Introduction and assumptions

The purpose of this paper is to investigate further the theory of thematic underspecification proposed for the verb have in Cowper (1989), and to test it on another semantic field, namely the verbs of motion and manner-of-motion. The two main claims of the theory are given in (1).

(1) a. The lexical conceptual structure of a single lexical item contains no disjunctions and no optional elements. It may contain variables ranging over conceptual categories such as function, event, state, thing, path, place, etc.

b. General rules, referring not to specific lexical items, but rather to the structure and content of conceptual structures, instantiate variables and spell out additional conceptual structure.

I adopt the general framework proposed by Jackendoff (1983,1987) for the nature of lexical conceptual structure, but with a few modifications, which will be pointed out where they become relevant.

2. An analysis of motion verbs

Levin and Rappaport (1989) divide the motion verbs into three classes, as in (2).

(2)

<table>
<thead>
<tr>
<th>DIRECTION</th>
<th>MANNER</th>
</tr>
</thead>
<tbody>
<tr>
<td>'arrive' class</td>
<td>EXTERNAL CAUSE</td>
</tr>
<tr>
<td>come, go, depart</td>
<td>'roll' class</td>
</tr>
<tr>
<td>fall, return</td>
<td>slide, move, swing</td>
</tr>
<tr>
<td>descend</td>
<td>spin, rotate</td>
</tr>
<tr>
<td></td>
<td>PROTAGONIST CONTROL</td>
</tr>
<tr>
<td></td>
<td>'run' class</td>
</tr>
<tr>
<td></td>
<td>walk, gallop, jump</td>
</tr>
<tr>
<td></td>
<td>hop, skip, swim</td>
</tr>
</tbody>
</table>

The paper is organized as follows. The three classes of verbs are taken in turn, and in each case a single lexical conceptual structure is established for a representative verb. Then we look at the operations required to derive the various conceptual structures the verb may end up with. We then examine some of the consequences of the analysis, and develop a relatively simple semantically based account of the unaccusativity of motion verbs. We will also see how these representations suggest the existence of a fourth class of motion verbs, and show that this fourth class does, in fact, exist. Next, we will investigate whether the

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rules deriving the fully specified conceptual structures can be used to account for other phenomena -- in particular, resultative constructions. Finally, the implications of the analysis for the relation between lexical and syntactic structures will be noted.

3. Verbs of direct external cause — the roll class

The first thing to note is that contrary to the representation given for roll in Jackendoff (1987), the verbs in this class do not necessarily involve motion along a path. For clarity, I will henceforth use the term travel to refer to motion which traverses a path, and motion to refer to motion which does not necessarily involve travel. The sentences in (3) contain verbs of the 'roll' class, and do not entail travel; in fact, travel is explicitly excluded.

(3) a. The steel balls rolled smoothly inside the freshly-oiled bearing.
   b. The car kept sliding and wouldn't go anywhere.
   c. Judith stayed in her chair, but she didn't stop moving the whole time.
   d. The top spun crazily in the middle of the table.

These sentences contrast with those in (4), which contain direction verbs and are ungrammatical when travel is explicitly excluded.

(4) a. *The train departed, but it stayed exactly where it was.
   b. The students arrived in (≠ into) the classroom -- in fact, they'd been there all along.

The grammaticality of the sentences in (3), together with the principles stated in (1), mean that verbs of the 'roll' class cannot contain a path-function of any sort in their lexical conceptual structure.

Second, it is also clear from the sentences in (3) that volitionality is not required with these verbs (see (3) a, b and d), although it may be present, as in (3c). We can conclude from this that the function ACT is not present in the LCS of these verbs. It should be noted at this point that the use of the ACT function here differs somewhat from that in Jackendoff (1987). For Jackendoff, ACT does not imply volitionality, but merely action. Volitionality is indicated by the feature VOL which subspecifies the ACT function. In this paper, ACT always and only expresses volitionality.

Finally, I follow Levin and Rappaport in assuming that verbs of the 'roll' class express direct external cause.

The above observations are accounted for by the representation in (5), which I propose as the LCS for verbs of the 'roll' class.

(5) \[ \text{CAUSE ( [THING X] , [MOVE\_MANNER (THING) ] )} \]

In (5), X is a variable ranging over things. MOVE is the function which expresses motion (NOT travel), and is subspecified by manner features.

In (6) are given the conceptual structures for the various clause-types in which 'roll' verbs may occur.

(6) a. Ruth slid.
\[ \text{CAUSE (Ruth , [MOVE\_SLIDING (Ruth)])} \]
\[ \text{ACT (Ruth)} \]

b. The ball rolled into the closet.
\[ \text{AND([CAUSE(X,[MOVE\_ROLLING(ball)])],[GO(ball,[TO([IN(closet)])])])} \]
c. Ruth rolled the ball into the closet.
AND([CAUSE(Ruth,[MOVE\_ROLLING(ball)])],[GO(ball,[TO([IN(closet)])])])
ACT(Ruth)

The question now is, how are the representations in (6) to be derived? Looking first at (6a), we see that two things must happen: Ruth must link, not only to the argument position of MOVE, but also to the first argument position of CAUSE. In addition, the ACT function must be spelled out, and Ruth must link to its argument position. Both of these operations must be triggered by the Conceptual Structure associated with Ruth, since a sentence such as (7) exhibits neither of them.

(7) The chair slid.
CAUSE (X,[MOVE\_SLIDING(the chair)])

Let us assume that the first argument of the predicate CAUSE must be what I shall call 'effectual'. This property distinguishes animate beings, forces of nature, etc., from inert objects. If we further assume that linking from PAS to CS takes place whenever possible, then we can say that if the sole argument of a 'roll' type verb is effectual, it will also link to the first argument of CAUSE.

The second operation involves saying that ACT may be projected if the first argument of CAUSE is animate, or capable of volition. Thus we have the two operations stated in (8).

(8) a. Link PAS to LCS wherever possible.

b. CAUSE (thing\_ANIMATE, X) $\Rightarrow$ CAUSE (thing$^{\alpha}$, X)
ACT ($\alpha$)

Looking now at (6b), we see that the presence of the path expression into the closet has engendered a whole new proposition headed by the function GO, which expresses travel. It seems reasonable to suppose that a path expression must occur as an argument of GO, and that an operation such as the one in (9) might be responsible.

(9) PATH $\Rightarrow$ GO(THING,PATH)

This operation takes us from (10) to (11).

(10) CAUSE (X,[MOVE(ball)]) TO([IN(closet)])

(11) CAUSE (X,[MOVE(ball)]) GO(THING,[TO([IN(closet)])])

An application of principle (8a) will give ball as the first argument of GO in (11). What remains to be done is to combine the two structures in (11) in such a way that they can represent a single event. I propose a simple rule of composition such as the one given in (12).

(12) X Y $\Rightarrow$ Z(X,Y)
where Z is a variable ranging over functions, and X and Y range over complete functional complexes -- in other words propositions and things.

I also suggest that AND is the default value for a function variable whose arguments are of the same type.
Turning now to (6c) we see that this time there is a distinct NP linking to the first argument of CAUSE. The ACT function is projected as in (6a), and the path expression triggers the building of the superstructure with AND and GO. An interesting possibility is raised by the fact that ACT is placed on a separate tier from GO. Since the structure-building is taking place on the thematic tier, the action tier is unaffected. Nothing forces the subordination of the agentivity of Ruth with respect to the event as a whole. The question of how the LCS tiers are associated with each other is an interesting one, but time does not permit me to explore it here.

4. Verbs of protagonist control — the run class

Let us move on to verbs of protagonist control — the 'run' class. Here again, we see that travel is not a necessary part of the meaning of these verbs, as shown by (13).

(13)  
   a. Katie can dance for an hour in a phone booth.  
   b. Judith hopped in one place for three minutes.

Volitionality is required, however. In fact volitionality is one of the defining features of protagonist control verbs. Unlike with the 'roll' verbs, there is no external cause. This gives (14) as the LCS for 'run' verbs.

(14) \( \text{MOVE}_{\text{MANNER}} (\text{THING}_\alpha) \) 
   \( \text{ACT} (\alpha) \)

When a path expression occurs, the conceptual structure is composed, as before, giving (15).

(15) \( \text{AND}([\text{MOVE}_{\text{RUNNING}}(\text{Michael})],[\text{GO}(\text{Michael},[\text{TO}([\text{AT}(\text{store})])]])]) \) 
   \( \text{ACT} (\text{Michael}) \)

Now consider (16).

(16) She walked the letter to the embassy.

Here we have a direct object in the syntax which has no role to play in the basic CS of the verb. The composed structure, however, provides a slot for this NP and, I believe, gives the correct interpretation.

(17) \( \text{AND}([\text{MOVE}(\text{she})],[\text{GO}(\text{letter},[\text{TO}([\text{AT}(\text{embassy})])]])]) \)

Let us now turn to verbs of direction. These verbs, as Levin and Rappaport point out, never specify a manner of motion, and always involve travel. They may or may not exhibit volitionality, and have no external cause. Their LCS thus looks like (18).

(18) \( \text{GO}(\text{THING}, \text{PATH}) \) 

Different verbs in this class will differ as to how their paths are specified.

The only alternation we need to account for here is the possible presence of volitionality. It appears that not only CAUSE, but also GO, allows its first argument to project an ACT function.
Let me now sum up the rules and representations I have proposed. The LCS representations are given in (19) and the rules as they now stand are given in (20).

(19)  
\[a. 'arrive' \quad \text{GO(THING,PATH)}\]  
\[b. 'roll' \quad \text{CAUSE(X,[MOVE_{MANNER}(THING)])}\]  
\[c. 'run' \quad \text{MOVE_{MANNER}(THING^\alpha)}\]  
\[\quad \text{ACT(\alpha)}\]

(20)  
\[a. \text{Link PAS positions to LCS positions wherever possible}\]
\[b. X(THING_{ANIMATE},Y) \quad \Rightarrow \quad X(THING^\alpha,Y)\]  
\[\quad \text{ACT(\alpha)}\]  
\[c. X \quad Y \Rightarrow Z(X,Y)\]  
\[d. \text{PATH} \Rightarrow \text{GO(THING,PATH)}\]  
\[e. Z(X,Y) \Rightarrow \text{AND(X,Y)} \quad \text{if X and Y are of the same conceptual type.}\]

5. Consequences

A number of things follow from this analysis. First, it accounts for the impossibility of causative-inchoative versions of 'arrive' type verbs. Let us consider what would happen in such a case.

(21)  
\[\ast \text{The postman arrived the letter on the porch.}\]  
\[\text{GO(letter,[TO([ON(porch)])])} \quad \text{[postman]}\]

The only rule that could apply here is (20b), but that rule only applies if the first argument of some CS predicate is animate. Since postman is not an argument of any LCS predicate, rule (20b) fails. There is no way both postman and letter can be incorporated into the conceptual structure.

A second consequence of the analysis is that it is possible to provide an explicit, semantically based account of unaccusativity. Levin and Rappaport offer the following generalizations:

(22)  
\[a. \text{Verbs whose meaning includes a specification of inherent direction are found in the unaccusative syntactic configuration.}\]  
\[b. \text{If the meaning of the verb specifies a direct external cause, then the verb is unaccusative, and otherwise it is unergative.}\]

These generalizations clash in the case of 'run' verbs taking a path expression, as Levin and Rappaport point out. In Italian, the facts are made particularly clear by auxiliary selection, as illustrated in (23).
(23) a. Ugo ha corso meglio ieri  \( \text{U. ran better yesterday} \)  
   (unergative, auxiliary avere) 

b. Ugo è corso a casa  \( \text{U. ran home} \)  
   (unaccusative, auxiliary essere) 

Levin and Rappaport propose to account for this by the process of lexical subordination, whereby the proposition headed by the manner-of-motion is subordinated to the proposition expressing travel. I would suggest that this is not necessary - that the generalization simply be that the first argument of GO must link to an internal argument position. This correctly predicts that 'arrive' verbs are always unaccusative, and that 'run' verbs are unaccusative if and only if they have an explicit path. It also predicts that 'roll' verbs are unaccusative when they have an explicit path. It says nothing about 'roll' verbs with no path expression. These verbs are commonly held to be unaccusative, but Levin and Rappaport point out in a footnote that more work is needed on the question. In Italian, rotolare 'roll' selects essere primarily when it takes an overt directional phrase, while scivolare 'slide' takes essere regardless of the presence of a direction phrase. The locative inversion test used by Levin and Rappaport gives mixed results for this class, as shown in (24).

(24) a. *?In the middle of the stage spun the dancer. 
   b. In the middle of the floor spun the little top. 
   c. ?In the bearing rolled hundreds of little balls.

Levin and Rappaport also use resultatives as a diagnostic for unaccusativity, since it has been shown that resultatives can only be predicated of internal arguments. Again, the results are mixed. To the extent that the resultative phrase describes a path, so that the verb expresses travel, the sentence is grammatical, but non-path resultatives are clearly less grammatical. Consider (25).

(25) a. The door rolled open. 
   c. *Judith rolled clean (in the bathtub). 

The data in (24) and (25) suggest that agentivity is involved to some extent in whether or not a 'roll' verb without a path expression is unaccusative. This can be expressed by a linking convention such as the one given in (26).

(26) The first argument of ACT, if unlinked, links to an external argument position.

Assuming that this convention applies after the one linking the first argument of GO to the internal argument position, the following predictions are made:

(27) a. 'arrive' verbs are always unaccusative. 
   b. 'run' verbs are unaccusative when they take a path, unergative otherwise. 
   c. 'roll' verbs are unaccusative when they take a path. 
   d. 'roll' verbs are unergative when they are volitional and do not take a path.

The unaccusativity of 'roll' verbs is underdetermined by the theory, in that when they have neither volition nor a path expression, no prediction is made. It seems to me that this is not a bad result, given the variability of judgments on such sentences.
A third consequence of this analysis is that it raises the possibility of another class of motion verbs. What is missing in the inventory of representations given in (19) is a class of verbs whose LCS consists simply of the predicate MOVE, possibly subspecialized by manner features, but lacking both CAUSE and ACT. Are there verbs whose LCS is like (28)?

(28) MOVE$_{MANNER}$(THING)

If such verbs exist, they should have the following properties: They should not necessarily involve travel, they should not require protagonist control, and they should crucially not have grammatical causative-inchoative counterparts. It appears that there are verbs of this sort. Consider the sentences in (29) and (30).

(29) a. The statue wobbled.
    b. *Madeline wobbled the statue.
    c. The drunkard wobbled out the door.

(30) a. The glue is so hot it actually flows.
    b. *I flowed the sauce over the fish.
    c. The water flowed under the bathroom door.

Other verbs in this class are swerve, veer, teeter, totter, undulate and reel.

In searching for these verbs, I came upon another set, which partially fit the specifications. Consider the sentences in (31).

(31) a. The leaves trembled.
    b. *The wind trembled the leaves.
    c. *The terrified child trembled up to her room.

Tremble, and its classmates quiver, shiver, oscillate, shudder, vibrate and waver, differ from the previous group in that they cannot take a path function. What seems to distinguish these from the others is that the motion they describe is periodic rather than random. If periodic motion is in fact represented by a particular type of path function, then the inability of these verbs to take paths is accounted for.

6. An extension to resultative constructions

Carrier and Randall (1989) propose an approach to resultative constructions which is very similar in form to what I have here. A version of their resultative formation rule is given in (32).

(32) CAUSE ([base verb's LCS], [INC BE (y, [PLACE AT (z)])])

This can be seen as a special case of the rule given in (20c) above, repeated here as (33).

(33) X Y --> Z(X,Y)

Since I am assuming that such rules operate, not in the lexicon per se, but rather on syntactic structures, I would suggest a derivation along the following lines:

The sentence in (34) can be a resultative — John rolled the log in such a way that it became clean — or it can be a depictive — John rolled the log while it was clean. The derivation for the depictive is given in (35).
(34) John rolled the log clean.

(35)  a. \text{CAUSE}(\text{John}, [\text{MOVE (the log)]}, [\text{State CLEAN (X)]}) \\
      \text{ACT}(\text{John}) \\

  b. \text{AND}([\text{CAUSE}(\text{John}, [\text{MOVE (the log)]}, [\text{State CLEAN (X)]})]) \\
      \text{ACT}(\text{John})

Depending on the nature of the adjective (\textit{nude} vs. \textit{clean}), \textit{X} will be coindexed either with \textit{John} or with \textit{the log}. Resultative interpretations arise when \text{CAUSE} rather than \text{AND} is supplied as the predicate variable. Since \text{CAUSE} requires an event as its second argument, when \text{CAUSE} is filled in as the predicate, the second argument acquires the least marked predicate taking a state to an event, namely \text{INC BE}. This gives the representation in (36).

(36) \text{CAUSE}([\text{CAUSE}(\text{John}, [\text{MOVE (the log)]}, [\text{INC BE (\text{CLEAN (X)})}])]) \\
      \text{ACT}(\text{John})

The fact that with resultatives, the secondary predicate can only be predicated of the internal argument remains a stipulation at this point.

7. Speculations on the relation between the lexicon and the syntax

The foregoing raises a serious question about exactly how the lexicon and the syntax interact with each other. Two assumptions - one made by most people working in this area, and another which I am proposing, are apparently contradictory. The first is the notion that syntactic structures arise by projection from lexical entries, and that, for example, an object NP will not be generated unless the lexical entry of the verb allows for it. The second assumption is that complex conceptual structures are derived from basic lexical conceptual structures by rules that combine separate pieces of structure. These separate pieces of structure are the conceptual structures of elements found in the syntactic representation. The question is, where did these separate pieces of structure come from if they must be composed with each other by rule? I would like to suggest that this contradiction is not devastating, and in fact is only apparent, if we take the right view of projection. Suppose that syntactic structures are not generated by projection from the lexicon, but rather generated freely according to the principles of X-bar theory. The projection principle would then simply be a requirement that conceptual structures be well-formed. Taken together with the principle of full interpretation, which would exclude extraneous bits of structure that don’t fit into the conceptual structure of the sentence, I believe that the facts can be accounted for. Given this view, the way is open to drawing broader generalizations than would be possible if operations such as resultative formation operated within the lexicon.

References

Levin, B., and M. Rappaport. 1989. 'Unaccusative Mismatches'. NELS 19