

## SOME REMARKS ON CASE RELATIONS

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### ABSTRACT

The topic of the paper is the problem how to define case relations by semantic predicates. A general principle is outlined, which renders it possible to "calculate" case relations for a given representation of a (verb-)sememe by means of expressions. This principle is based on an assignment of case relations to primitive predicates and modification rules for nested expressions. Contrary to the traditional case grammar it turns out that one needs mixed case relations, especially for two reasons: Arguments occur at "too different" places in an expression or arguments have combined case relations. The consequence is that case relations don't form a set of isolated elements but a structured system.

#### 1. Introduction

The paper is not intended for defending case relations in general. I want to sketch only some problems connected with the definition of case relations and will demonstrate consequences, which seem partly a bit "unconventional".

I will not enter into the terminological discussion on deep cases, case relations etc. and subsume all these variants under the label "case relation". This is justified by the obvious fact that there are more proposals and systems than authors. So one will not overcome this chaos by neat terminological distinctions. It is rather typical for publications on deep cases that proposals are presented without sufficient motivation or justification (e. g. Nilsen 1973).

It has turned out that in the matter of case relations as a field of linguistic and fundamental research intuition and language competence cannot show the right way how to solve the problems of defining them. This is my first conclusion from the general scene. Without doubt it is inevitable to work out some principles on the basis of which case relations may be defined. This would enable us

- to discuss a rather "clear" object (some principles instead of tens (or hundreds) of proposals),

- to evaluate and compare existing proposals,
- to connect case relations with other essential notions.

Quite another question is "What are case relations good for?". One cannot ignore the fact that a lot of serious objections against case relations have been advanced, covering a whole range from "they are redundant" till "the swamp of lacking plausible (or even formal) definitions" resulting in the conclusion that case relations are useless especially for computational linguistics (Mellema 1974, Luckhardt 1985). On the other hand many authors are advocates pro case relations, even in MT (e. g. Nagao 1986, Somers 1986). Here the character of case relations as a link (or pivot) is stressed - between surface and deep level or between languages. For such situations one can accept the use of case relations without exact definitions having an experimental system as a touchstone.

Case relations are considered here as names or labels of arguments in semantic predicates used for the description of (verb-)sememes. This is only one side of the coin! The second important aspect are the means by which deep cases are expressed at the surface (grammatical cases, prepositions, linear order, ...). They have to be taken into account as well, and only both aspects together will yield an adequate picture.

#### 2. Case relations and semantic predicates

One possibility to grasp the whole problem seems to be the definition of case relations on the basis of semantic predicates. Sememes (of verb-lexemes) are represented by expressions containing primitive semantic predicates. The following expression may be assigned to a verb like "to convey": (a conveys b from c to d)

(1) MOVE-ACTION(a,b,c,d)  
=ACAUSE(a,CHANGE-POSITION(b,c,d))

(cf. Allen 1984). I will not discuss the question whether ACAUSE (= "agent causation") and CHANGE-POSITION are indeed

primitive predicates. I consider them here as that. Furthermore one may discuss whether (5) sufficiently describes the meaning of "to convey".

The idea of extracting case relations from representations like (1) can be based on the following principles:

- (A) For each primitive predicate P there is an assignment of exactly one case relation to every argument place<sub>i</sub>:  
 $z_i(P) = r_i$  (i-th argument of P has case relation  $r_i$ )
- (B) There are modification rules for case relations which render it possible to "calculate" the case relations for nested expressions.

(A) means e. g. that for a primitive predicate like CHANGE-POSITION we know the case relations of the argument places b, c and d:

$$(2) z_i(\text{CHANGE-POSITION}) = r_i \text{ for } 1 \leq i \leq 3$$

In this sense one can state without doubt

$$(3) z_1(\text{ACAUSE}) = \text{agent}$$

$$(4) z_3(\text{CHANGE-POSITION}) = \text{goal}$$

(B) may be interpreted in the following way: If we know

- MOVE-ACTION has the form given in (1),
- the value of  $z_2(\text{ACAUSE})$ ,
- second place of ACAUSE is filled in by CHANGE-POSITION,
- the value of  $z_1(\text{CHANGE-POSITION})$ ,

then we know

- the value of  $z_2(\text{MOVE-ACTION})$ , i. e. the case relation of b in the whole expression (1).

Formally this may be expressed by a four-place "modification mapping" m:

$$(5) z_2(\text{MOVE-ACTION}) = m(\text{ACAUSE}, z_2(\text{ACAUSE}), \text{CHANGE-POSITION}, z_1(\text{CHANGE-POSITION}))$$

One may speculate whether all four arguments are indeed necessary, they are surely not. A similar idea is presented in Thiel 1982 (p. 84 ff.), where the mechanism of modification is applied, too.

A general scheme for (B) is the following: Assume one has

$$(6) Q(\dots, x, \dots) = R(\dots, S(\dots, x, \dots), \dots)$$

where x is the j-th argument in Q, S(...) the k-th argument in R and x the l-th argument in S. Then  $z_j(Q)$  is a function of R,  $z_k(R)$ , S and  $z_l(S)$ . Thiel's proposal, namely  $z_j(Q) = m(R, z_l(S))$ , would cause some difficulties, if R is a many place predicate and there are in R

arguments S' and S'' with  $z_l(S') = z_l(S'')$  (cf. the FEED-example below). Thiel himself excludes this case explicitly.

The principles (A) and (B) form a recursive scheme: (A) provides the results for certain predicates, (B) renders it possible to determine the results for (verb-)sememes in general.

At any rate one would get a nice formalism for calculating case frames if (A) and (B) are fulfilled. Unfortunately, there are some additional problems I will deal with below. But at first I take an example:

$$(7) \text{SET}(a, b, c) = \text{ACAUSE}(a, \text{BECOME}(\text{SIT}(b, c)))$$

$$(8) z_2(\text{SIT}) = \text{locative}$$

By a simplification of the general scheme (four-place function m as in (5)) to the special variant one would obtain for (7-8):

$$(9) z_3(\text{SET}) = m(\text{ACAUSE}, m(\text{BECOME}, \text{locative})) = m(\text{ACAUSE}, \text{directive}) = \text{directive}$$

There are arguments for the assumption that BECOME (and not ACAUSE) modifies locative to directive (or goal): The description of "to get to a place" contains the expression

$$(10) \text{BECOME}(\text{BE}(b, c)) \quad (\text{as in (7)})$$

Here one has the same modification of locative to directive. This is in accordance with Thiel 1982.

Instead of (7) one could take another expression, e. g. by using the predicate ECAUSE (event causation) with the interpretation that "an activity of a causes BECOME(SIT(b,c))":

$$(11) \text{SET}(a, b, c) = \text{ECAUSE}(\text{ACT}(a), \text{BECOME}(\text{SIT}(b, c)))$$

Here the application of (A) and (B) is not quite the same, one has here instead of

$$(12) z_1(\text{SET}) = z_1(\text{ACAUSE}) \quad \text{for (7)}$$

a modification

$$(13) z_1(\text{SET}) = m(\text{ECAUSE}, z_1(\text{ACT})) = m(\text{ECAUSE}, \text{agentiv}) = \text{"causator" ?}$$

These simple examples illustrate some connections between the formal definition of case relations and semantic predicates.

### 3. Expected complications

Now I turn to some unpleasant questions that depress a bit the hope in this elegant solution. But they are disagreeable only if one

- maintains the principle "one instance per simple clause" for case relations (cf. Fillmore 1968, Starosta 1981) and
- considers case relations as a rather small set without internal structure.

For a verb like "to swim" in a sentence like "a swims from b to c" it is reasonable to assume a representation

(14) SWIM(a) & CHANGE-POSITION(a,b,c)

What to do if in this example (or another of the same type) one detects that

(15)  $z_1(\text{SWIM}) \neq z_1(\text{CHANGE-POSITION})$ ?

Secondly, one needs new rules for handling an example like

(16) ASCERTAIN(a,b)  
= ACAUSE(a,BECOME(KNOW(a,b)))

where a appears twice and at two rather different places. One surely cannot assume that  $z_1(\text{ACAUSE})$  is the same relation as

(17)  $m(\text{ACAUSE}, m(\text{BECOME}, z_1(\text{KNOW})))$

if one makes the same simplification as for (7). Another question appears in

(18) FEED(a,b,c) = ACAUSE(a,EAT(b,c))

This time one has two agents (a and b).

The next question is due to reflexive verbs. If we take German examples, we have e. g.

(19) Er wäscht sich ≠ Er wäscht ihn

as in English, too (himself ≠ him). Here the case relation of "Er" should be a mixture between agent and something like experiencer or patiens (cf. Thiel 1982, p. 104 f.). The second components may not be left out because of the reflexive verbs proper in German as "sich fürchten" (to be afraid, "sich schämen" (to be ashamed). Here the appropriate case relation is not agent: A "semantic paraphrase" for these verbs is "Etwas macht mich fürchten" (Something makes me afraid) etc. In my opinion there is no sharp boundary between the two types of reflexive verbs: Such a critical case is e. g. "sich aufregen" (to get excited).

The fifth question is connected with "plastered up" case relations. It does not make sense to discuss whether one has in (20) either the case relation instrumental or locative (cf. Thiel 1982, p. 104 f.):

(20) I warmed the foot on the stove.

The same applies for temporal and causal relations in other examples.

#### 4. Some conclusions

From the questions and lacking answers one may draw some conclusions:

I. If one defines case relations by means of semantic predicates as explained above, one needs in addition at least one of these two things:

- a two-place relation " $\leq$ " within the set of case relations in order to compare them according to their "specificity": For certain pairs of case relations  $r_1, r_2$  one has then " $r_1 \leq r_2$ " with the meaning " $r_1$  is equal to or more specific than  $r_2$ " (cf. the SWIM example). In this sense one may say that e. g. objective is "the semantical most neutral case" (Cook 1971), i. e. one could establish case relations that are more specific than the case relation objective.

- a two-place operation " $\bullet$ " for mixing case relations: For certain pairs of case relations  $r_1, r_2$  there is a case relation  $r$  with  $r = r_1 \bullet r_2$  (cf. the example (20)).

So the set of all case relations becomes a structured system: Every case relation stands no longer for itself alone.

II. One cannot derive case relations from semantic predicates without presupposing a synonymy relation between sememes: If one assumes that the two sentences

(21) John sells Jim a car.

(22) Jim buys a car from John.

are synonymous, i. e.

(23) SELL(a,b,c) and

(24) BUY(b,a,c)

have the same representation, then the case relations have to be the same:

(25)  $z_1(\text{SELL}) = z_2(\text{BUY})$  (of a)  
 $z_2(\text{SELL}) = z_1(\text{BUY})$  (of b)

If one admits that (21) and (22) are not synonymous one may have different case relations.

This aspect is in a sense independent of the approach proposed here: The same question may be put without reference to semantic predicates. One needs such a synonymy relation at any rate for case relations. Obviously the different intuitive use of the synonymy is one reason for the rather chaotic situation.

III. A discussion of (23-24) and (18) shows furthermore that a relation or operation mentioned in I. provides the means for a distinction of different agents as John and Jim in (21-22) or the two agents in (18): In the latter case b is an "influenced agent". This has to be expressed precisely by the modification rules.

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