

## Intentions, Plans and their Execution: Turning Objects of Thought into Entities of the External World.

Hans Kamp; 1999 - 2007<sup>1</sup>

**Abstract:** The central target of this paper is the conceptual continuity which often exists between things we intend to find or do or make and the events and things in the external world which result when we try to realise those plans and intentions. This continuity is reflected in the thoughts we entertain while we are engaged in executing our plans or intentions and focus on what we are doing, and also in those thoughts which result when we are done - thoughts like: "Yes, this is the thing I wanted to find/make/do". I will present formal devices that can be used to represent such intentional activities and the thoughts accompanying and resulting from them. These devices can also be used in semantic representations of the descriptions of such activities and the thoughts accompanying them that we often give of them in natural language; an essential part of this application is the use of the formalism in the specification of the lexical entries of words that are essential for the description of such thoughts and actions. Prominent among these are the verbs *try*, *fail* and *succeed*; but as we will see, the special resources that the devices provide are needed also in the entries of a great many other "intentional" verbs and intention-related adverbs. I will proceed mostly by example. What I will say about the examples motivates the formal devices I will introduce. The general formalism in which the devices will be embedded is the DRT-based representation formalism developed in (Kamp, 1995) and (Kamp, 2001). The note concludes with a brief discussion of how the model theory for the older formalism can be extended to cover the proposed extensions.

### 1. Afferent and efferent Connections between Mind and World

The topic of this paper is how our plans and intentions are connected with the real world through the actions we perform in our attempts to realise them. This is one of the two kinds of direct connections which exist between thought and reality. It is the "efferent" kind, as it might be called. The other, "afferent" kind is the one that gets established through perception. As a matter of fact, acting according to plan typically involves connections of both kinds: On the one hand there are the actions that the agent performs as intended realisations of his intentions; these constitute the efferent side of the connection. But in

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<sup>1</sup> As far as I have been able to reconstruct, a first draft of this note was written in 1999. Since then I have made occasional attempts to turn that draft into something that I could at least put on my web page. 2007 is the year of this version. Section 3 is almost completely new (as of August, 2007).

order to make sure that his actions are conform to what he wants, the agent must watch what he is doing, and what he observes – the feedback he obtains that way – is the afferent counterpart to the efferent connection that his acting produces.

Afferent connections between world and mind are not really the subject of this paper. The treatment of them on which the present paper builds has been presented in a number of other places.<sup>2</sup> However, in order to keep this note reasonably self-contained I will briefly rehearse the main features of that treatment. Those who want to know more about its syntax and model-theoretic semantics should consult one of (Kamp, 2001) and (Genabith et al., forthc.).

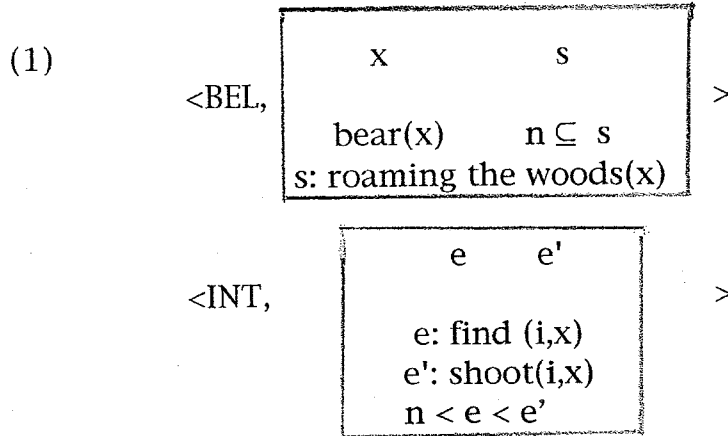
The first of the two central issues that the treatment was developed to account for is that mental states are typically compounded of multitudes of distinct attitudes, which differ from each other not only in content but also in ,mode', in that some of them are beliefs, others desires, yet others intentions. etc.; and that, furthermore, the contents of those attitudes are often *referentially connected* in the sense of being ,about' the same individual, irrespective of whether the individual is real (i.e. exists in the outside world) or merely imagined. For an example, consider the case of an amateur hunter A who has picked up the rumour that a bear has been sighted in the nearby woods and who intends to go after it. A has a belief and an intention about one and the same individual – a belief that this individual is a bear that is somewhere around in the woods nearby and the intention to shoot it and bring it home as a trophy. It is this combination of belief and intention that guides A's action – his going out into the woods with his hunting rifle, in the hope of finding the bear and finishing it off. And evidently, the combination will lead him to do this whether the bear really exists or the rumour is no more than just a rumour.

A proper representation of this part of A's mental state, consisting of the belief and the intention, must succeed in accounting for their 'coreferentiality', in that internal sense of the term in which it is relevant to the mechanisms of practical reasoning (which in this particular case leads A to go after the putative bear). The treatment captures this by representing the contents of the belief and the intention as sharing a discourse referent. Thus the relevant part of A's

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<sup>2</sup> (Kamp, 1990), (Kamp, 1997), (Kamp, 2001), Also used in (Kamp, 2005) and (Kamp & Bende-Farkas, forthc.)

mind shortly before he sets off on his bear hunt can be represented in first approximation as in (1).



Legenda:

(i)  $x$  is the discourse referent representing the rumoured bear. Note that  $x$  is introduced in the content representation of the belief - where it is a member of the DRS universe - but recurs in the representation of the intention as argument in its conditions. This implies that the intention 'lives on' the belief: it presupposes that the belief is true and it loses, or would lose, all significance as soon as the belief is or would be given up.

(ii)  $i$  represents the "self" of the agent whose mental state is being represented. Thus in (1)  $i$  represents A, as seen from his own internal perspective. (When A expresses any of his thoughts in words, it is only the occurrences of  $i$  in his representations of those thoughts that he will express by using the pronoun *I*.)

(iii) any occurrence of the discourse referent  $n$  stands for the 'psychological now', i.e. for the time at which the subject is in the mental state in whose representation it occurs. So the condition " $n \subseteq s$ " in the representation of the belief content in (1) means that the state  $s$  of  $x$  roaming the woods obtains at the time when A entertains the represented belief. In other words, were A to express this belief, he

would use a present tense sentence, like, say, "That bear is roaming the woods."<sup>3</sup>

The second main concern of the treatment is to give an account of direct reference and attitudes *de re*. (This account is to serve also as the basis for the semantic representation of *de re* reports. To explain the treatment of this problem I will focus on what I see as the paradigmatic source of direct reference in thought (and thus of the afferent connections mentioned in the opening paragraph), viz. direct perception.

In an act of direct perception the perceiver makes direct contact with what he perceives, and that which he perceives imprints itself on his mind, leaving a trace that from then on serves as a representation of it. In the DRT-based formalism of which (1) has been our first instance this representing trace is assumed to take the form of a discourse referent  $\alpha$  together with conditions which capture some of the properties that the perceiver assigns to the thing perceived in the act of perception - conditions which reflect *as what* the perceiver perceives the thing he perceives, as well as the nature of the perception (e.g. the sensory mode involved) or the circumstances under which it takes place. (I am assuming that there is no perceiving that isn't *ipso facto* a perceiving *as*.) The discourse referent  $\alpha$  is said to be *externally anchored* to the thing perceived, and thing to be the *external anchor* of the discourse referent. In other words, an externally anchored discourse referent represents its external anchor.

The account also incorporates an assumption that many see as more controversial, viz. that each discourse referent that results from an act

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<sup>3</sup> One may wonder if the conditions " $n < e$ " and " $n < e$ " that occur as part of the content of the intention are really necessary. For after all, intending to perform an event of a certain kind is *ipso facto* intending a proposition to the effect that there will be such an event in the future. In that sense the conditions are pleonastic. As a matter of fact one could also leave these conditions out (and retain only " $e < e$ "). There is little to choose between these two ways of characterising the content of intentions and other future-directed attitudes. There is no mention of  $n$  in the representation of the intention. The choice I have made here has no deeper significance.

Of course, there are many intentions of which it is part that that which is intended will come to pass at or before a certain time. In such cases the temporal location of the intended events or states that will have to be part of the representation of the content of the intention, and in such cases it may be useful to make use of  $n$  as part of those specifications.

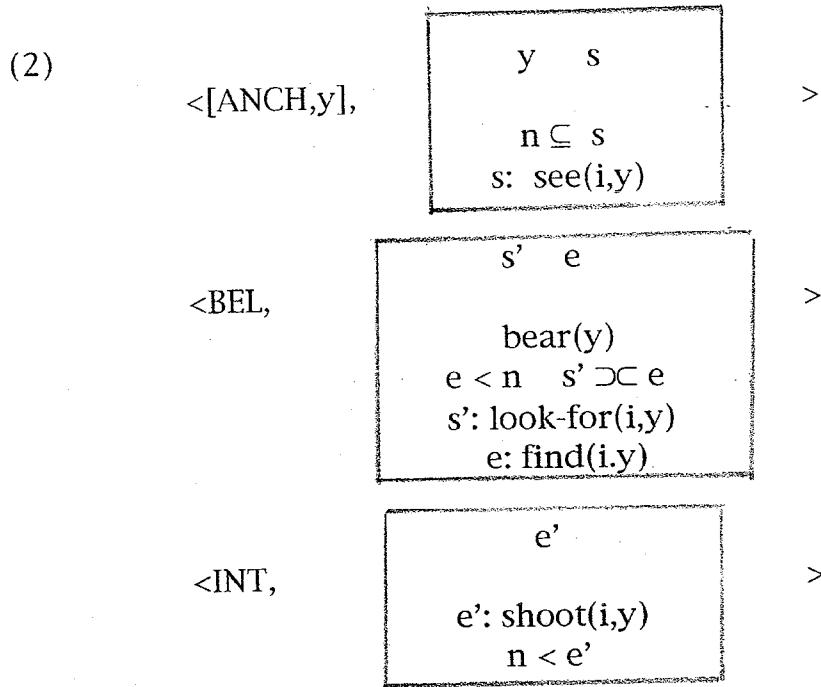


of direct perception bears witness to its origin at the level of mental representation itself. In the present treatment this testimony takes the form of an *internal anchor*, a formal marking of the discourse referent  $\alpha$  as the result of some process that licences direct reference, accompanied by a set of one or more conditions which describe that process. (In the case we are discussing they describe  $\alpha$  as the result of a current visual perception of the thing it represents.)

Let me, before I say more about external and internal anchors, first give an idea of how they are formally represented. Suppose that our hunter A has set off on his quest for the bear, that he is in the middle of the woods and has just noticed something at a moderate distance that he takes to be the bear he has been looking for. He still has the belief and the intention represented in (1), but now he has in addition an anchored representation of the thing he sees - or thinks he sees. Let's suppose that this representation involves the internally anchored discourse referent  $y$ . Furthermore it is reasonable to assume that A's perception has led to a new mental state in which  $y$  has been identified with the discourse referent  $x$ , with the effect that the earlier belief and intention have now become attitudes 'about' what A is currently perceiving. A representation which captures this in our formalism is given in (2).<sup>4</sup>

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<sup>4</sup> One might wonder why the condition „bear( $y$ )” has been inserted as part of the content of the belief and not of the internal anchor. In fact, either placement is a possible option, but with different connotations. That the condition is placed where it can be found in (2) means that it was not part of the perception as such. In other words, what is being perceived by A is not perceived as a bear; rather, that it is a bear results as an inference which A draws, partly on the basis of what he sees and partly on the strength of other information he has (presumably, in this case, his antecedent belief that there is a bear in the woods).



The representation in (2) only deals with aspects of A's mental state that are "psychologically relevant". In such a representation there is no room for external anchors. Whether the object representation given by the internal anchor in (2) is properly anchored to the external world - whether it is the result of a *veridical* perception, i.e. of the proper perception of an actual thing - is in last analysis beyond A's judgement; the internal anchor is already testimony to *his* judgement on this matter, viz. that the perception *was* veridical. If we, who are describing A's mental state, are of the opinion that this is not so - that A's putative perception of what he took to be the bear he had been looking for was an illusion, and that therefore there is no external anchor corresponding to the internal anchor in (2) -, then we have to express that on a different level, as an additional comment on (2). Similarly, if it is our opinion that A's experience *was* the perception of some object *b*, so that *b* is the external anchor of *y*, then that too is something that must be stated at that other level. We will leave the question of how and where this additional information should be expressed for the moment, however, and first address a couple of questions concerning the general relations between internal and external anchors.

In the introductions to the treatment I have cited the possibility of external anchoring for discourse referents that lack a corresponding internal anchor is excluded. The motive for this assumption is that a discourse referent can play the role of a "direct" representation of an

external object only if it is *registered* by the agent as playing this role. Only when the representation of an entity bears such an internal mark of direct reference, so the view maintained in those publications, can that representation make a directly referential contribution to the propositional representations in which it occurs as constituent, i.e. convey upon these the status of singular propositions, which are *de re* with respect to the represented entity.

It is what the treatment has to say about anchors – in particular (i) that there can be no external anchor without a corresponding internal anchor the role and (ii) that internal anchors are indispensable to the internal representation of thoughts *de re* – which has encountered considerable resistance, and more so than other parts. In the light of that resistance it now seems important to me to distinguish between these two claims, which I repeat once more, and somewhat more explicitly:

- (i) the claim that there can be no external anchors without corresponding internal anchors; and
- (ii) the claim that the mental representation of a singular proposition – a proposition that attributes a certain property or relation to one or more external objects – requires representations of the object or objects that are both externally and internally anchored.

The two claims are logically independent. So for one thing it is possible to hold on to (ii) while dropping (i). This may be natural for someone who sees external anchoring as a purely causal phenomenon that need not have any psychological reflections at a conscious level: an agent may have formed an entity representation through direct perception even though he is not really aware that this is how he came by that representation. Arguably such a representation would be a case of a discourse referent that is externally anchored while not having an internal anchor. At the same time one would, by holding on to (ii), remain faithful to one of the intuitions behind the assumption of internal anchors, viz. that a mental representation determines a *de re* proposition only then, when the constituent of it that represents the entity with respect to which the proposition is *de re* is internally marked as picking out that entity “directly”.

But not everyone will be prepared to endorse this intuition. Some may

feel that external for a representation to count as representing a singular proposition anchoring is good enough by itself, whether it is accompanied by an internal anchor or not; in fact, the case just described as a potential example of an externally but not internally anchored discourse referent might just be such a case: a propositional representation containing such a discourse referent might be argued to constitute a case of *de re*, even though the agent is unaware of those features of the origin of the discourse referent it contains in virtue of which the representation qualifies as a *de re* representation. Someone of this persuasion would want to drop both (i) and (ii). Holding on to (i) while abandoning (ii), finally, is a logical option too, though, as far as I can see, it is not one with any obvious conceptual attractions. Perhaps there are arguments for wanting to allow for the possibility of representations of singular propositions, even though none of the discourse referents in the representation is externally anchored, but I cannot see what they could be.

All this is just to say that the role that anchors play in the theory I am reviewing could be modified in more than one way (or they could even be dripped altogether) without this upsetting the remainder of the theory. I myself, however, intend to stick to the account as it is described in my earlier expositions of it. And I will do so in particular in this note.

One important feature of that account is that while it rules out discourse referents with an external but internal anchor, it emphatically admits the possibility of internal anchors without a corresponding external anchor. One situation which gives rise to this possibility is that where an agent thinks he is perceiving something but is actually hallucinating, or is victim to an optical illusion. The psychological processes that are involved in such experiences are indistinguishable from cases of genuine perception. Thus it seems a natural assumption that if the latter give rise to internally anchored discourse referents, then so should the former. The occurrence of internal anchors without corresponding external anchor requires a separate comment. For instance, consider the case of our hunter. He thinks that he is seeing his longed-for bear, everything seems to him like he has. So from his internal point of view things are as (2) represents them. But suppose that he isn't perceiving a bear. What he see might some other hunter, who went on a quest for the bear on his own account. Or it might be the trunk of a dead tree. Or there might be

nothing there in particular A was perceiving – his visual experience may have been just a trick of the light. It is this last possibility here. In this case there is no external anchor at all, and the internal anchor that the experience gives rise to, and whose function is to bear witness to the existence of an external anchor, is a false witness.<sup>5</sup>

An internal anchor without a corresponding external anchor is a piece of false information. But it is false information of a special sort. It miscasts the discourse referent it anchors as standing in a certain causal relation to an entity which it represents in virtue of that relation. Since there is no such entity, the discourse referent fails to represent in the manner it should. Therefore, any propositional representation in which it occurs, and which purports to represent the proposition that the represented entity has the property expressed by the remainder of that representation, fails to represent the proposition it should represent and thus represents, strictly speaking, no proposition at all, much like a sentence with a definite description that fails to denote properly. So the misinformation presented by an internal anchor without an external anchor to match it can be seen as a case of presupposition failure, just as the failure of the descriptive content of a definite description to pick out a unique satisfier can be seen as a failure of presupposition.<sup>6</sup>

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<sup>5</sup> The cases where A perceives a real object but misidentifies it is a failure of a less dramatic sort. In such cases there is an external anchor, but the internal anchor doesn't tell the full truth about it. Here the question becomes important whether the properties which the perceiver attributes to the perceived object are part of the experience itself, and thus end up as part of the internal anchor, or whether they are to be analysed as the result of an inference from what is perceived and thus the subject of some derivative belief. See the next paragraph.

<sup>6</sup> There is of course a representation that is closely related to the one we have described; it is obtained by leaving the internal anchor out, while retaining the discourse referent it is the anchor of (which now has the status of a discourse referent that is neither externally nor internally anchored). This representation does not suffer from the presupposition failure caused by "false" internal anchors. It is a legitimate representation of a proposition. But the proposition it represents is not the singular proposition that the first representation tries to represent, but a general proposition, in which the truth-conditional contribution of the discourse referent is that of an existential quantifier.

## 1.2 Mental state descriptions as part of DRT-based Representation Language

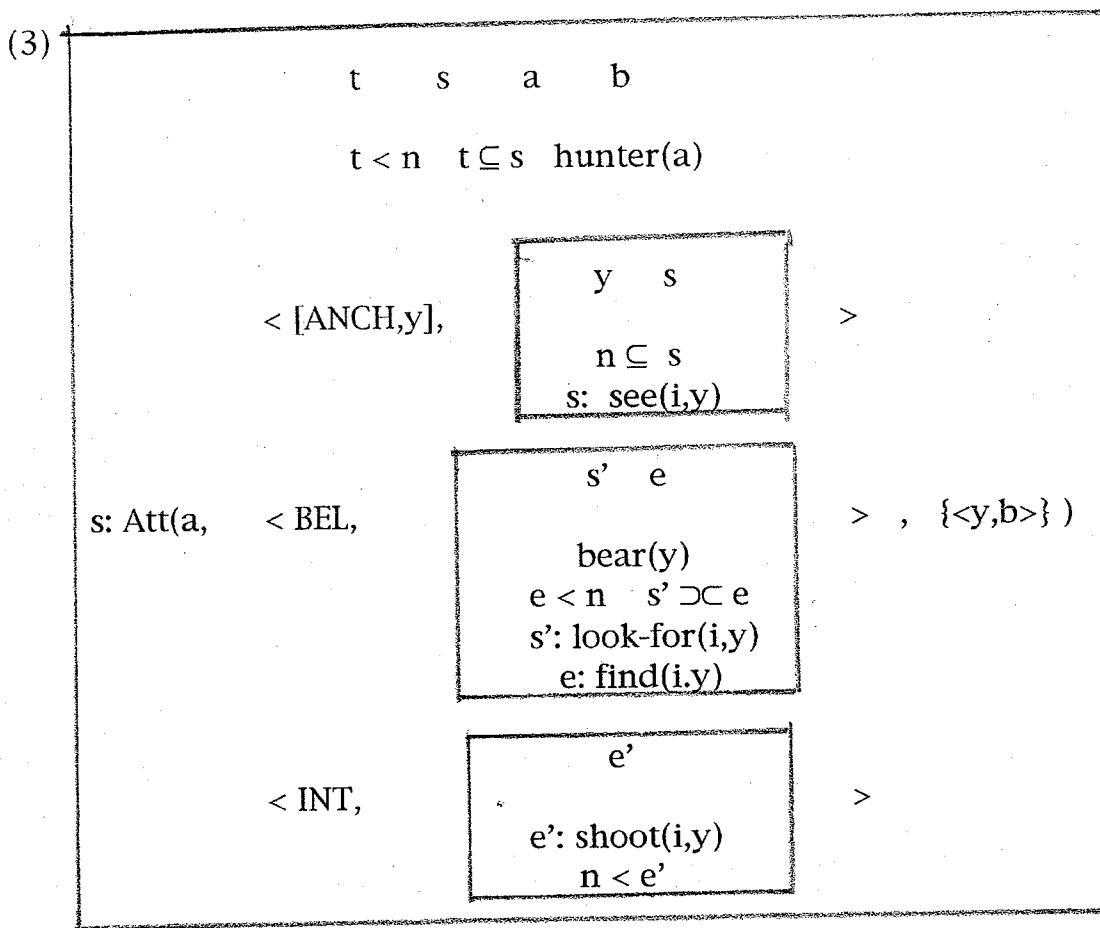
The general representational form of which the pairs in (1) and (2) are instances is that of a set of pairs  $\langle \text{MOD}, K \rangle$ , where

- (i)  $K$  is a DRS representing the content of the attitude, and
- (ii)  $\text{MOD}$  is either
  - (a) a *mode indicator*, such as BEL for belief or INT for intention, which indicates what kind of attitude the pair represents; or
  - (b) an internal anchor  $[\text{ANCH}, \alpha]$

Attitudes represented by pairs  $\langle \text{MOD}, K \rangle$  in which  $M$  is a mode indicator are *propositional attitudes*. Internal anchors are not propositional attitudes, they do not represent propositional contents as such, but rather impose conditions on the status of the discourse referents they are the anchors of.

Sets of pairs  $\langle \text{MOD}, K \rangle$  are not objects that belong to any of the syntactic categories from which the "formulas" of the standard DRT-formalisms, the DRSs, are built. (They are neither DRSs nor DRS-conditions nor discourse referents.) So to incorporate representations like (1) and (2) into existing DRT-formalisms we need something different. In the given treatment the incorporation is effected by a special predicate "Att" (for "attitudinal state"). Att has three argument slots, one for the agent (the possessor of the attitudinal state in question, one for a set of pairs  $\langle \text{MOD}, K \rangle$ , and one for a set of external anchors for internally anchored discourse referents that belong to pairs in the set occurring as second argument. (This last set may be empty, even when the second argument does contain internally anchored discourse referents; the internal anchors without corresponding external anchor then have the status of triggers with unsatisfied presuppositions.) Att is treated as a time-dependent stative predicate, i.e. it occurs invariably in DRS conditions of the form "s: Att(a, K, EA)" conditions which say that s is a state to the effect that the agent a is in a mental state which includes attitudes of the kinds described by the different members of  $K$ , and where all and only those internally anchored discourse referents  $x$  such that for some  $x'$   $\langle x, x' \rangle$  belongs to

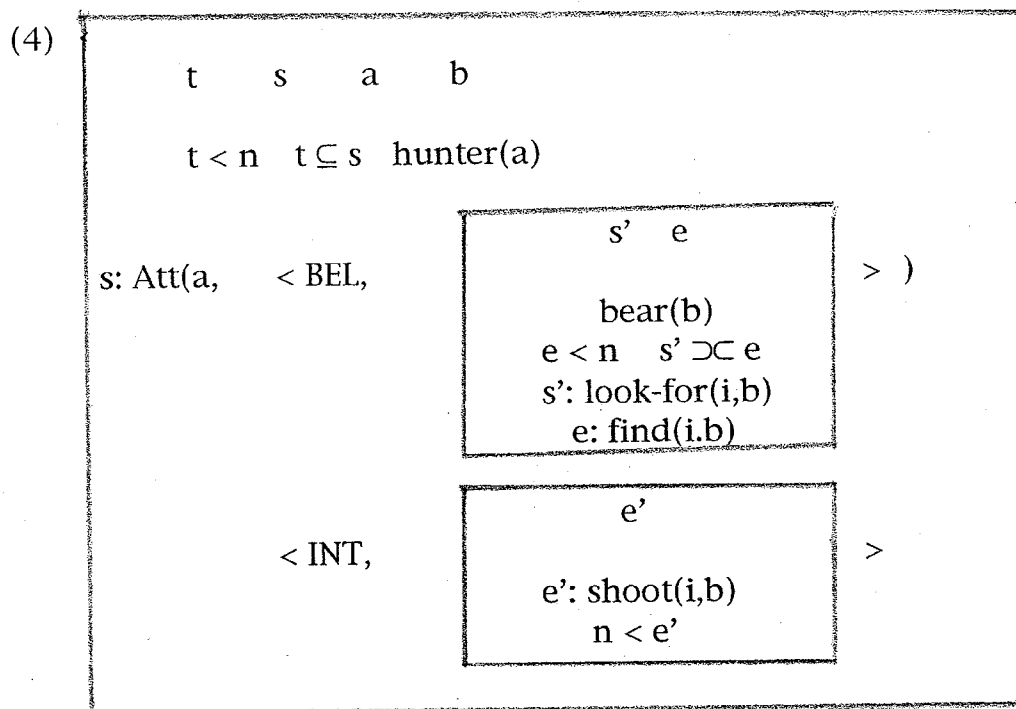
EA are anchored externally to the entities represented by the  $x'$ . For instance, (3) represents a past state of affairs to the effect of our hunter A being in the mental state described by (2), in part as a result of a veridical perception of the object b.



Note that the external anchor for the mind-internal representation involving the discourse referent  $y$  is given by the discourse referent  $b$  which is "declared" outside the attitude attribution represented with the help of Att. ( $b$  belongs to the universe of the DRS that contains the Att-condition as one of the conditions in its condition set.) And observe also that the entire DRS (3) might in its turn be part of the mental representation of some other agent, one of whose thoughts would attribute to a the thought complex described in the second argument of the Att condition. Alternatively such a representation might be the result of the interpretation of a sentence or discourse in which this thought complex is ascribed to  $a$ .<sup>7</sup>

<sup>7</sup> Also note that (3) is neutral with regard to the question what sort of entity  $b$  really is. For all that (3) says,  $b$  could be a bear, but it could just as well be some

It is often convenient to use an abridged notation in which internally anchored discourse referents are suppressed and their occurrences in argument positions have been replaced by their external anchors. The abridged notation for (3) is the representation in (4)



The occurrences of  $b$  in (4) indicate that (4) is a representation of attitudes that are with respect to the entity that represented by  $b$ :  $b$  occurs in argument positions of conditions inside the Att-condition, while being “declared” outside that condition. ( $b$  belongs to the universe of the main DRS of (4), whereas the Att-condition occurs inside its condition Set.)

But note well that (4) must be read as a (reduced) short hand for a representation in official form (such as (3)). The places where  $b$  occurs in (4) indicates the suppression of an internally anchored discourse referent, which has  $b$  as its external anchor. (4) is thus a *reduced* abbreviation, since it makes no mention of the internal anchor that

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other hunter, or some tree trunk looking somewhat like a bear from the distance. Of course, (3) could have been more explicit about  $b$ : the condition set of its main DRS could have included a condition to the effect that  $b$  is a bear, or a tree trunk, or whatever.



must be present in the representation which it abbreviates; and since it gives no clue about what that internal anchor would have been like, the non-abridged representation cannot be unambiguously recovered from it. For many purposes this is unproblematic. Moreover, there may be those who prefer "abridged" representations like (4) to those like (3), precisely because they do not mention internal anchors (cf. the discussion of the claims (i) and (ii) in the last section). For theorists of this persuasion, for whom internal anchors have no place in a theory of mental representation, the "abbreviated" representations would be just the right ones, containing the information they ought to contain and without information that shouldn't be there anyway.<sup>8</sup>

### 1.3 Self-Reflection.

By a *higher order attitude* we understand any attitude that is part of the mental state of some person *a* and which expresses a predication of one or more other components of that same mental state. Examples of such attitudes are (i) opinions that *a* may entertain about the source of one of his beliefs (or other attitudes), or about the time at which that belief was acquired, or about its ultimate reliability, or about who else holds the belief too, or about its factual or moral implications; (ii) judgements about the relationships between some of *a*'s attitudes, for instance which of them led to which - *a* may recall, and thus believe, that a certain intention of his resulted from a certain desire in combination with certain beliefs he holds about the current state of the world; or that one of his beliefs was inferred from a combination of two or more others. And in addition to higher order beliefs, there are also higher order attitudes of other modes, e.g. the longing to be rid of a certain belief that one has (such as the belief that God is dead), or the desire not to be delivered of a certain desire (like that for the next cigarette or the desire for intimate relations with sheep). I will refer to all higher order attitudes as cases of *self-reflection*. And I will say that a mental state *involves self-reflection* - or is *self-reflective* - as soon as some component of it is higher order. It is hard to overestimate the importance of self-reflection in our mental lives. Just try to imagine a mental state of a conscious human being or more than a three or four

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<sup>8</sup> This would however, require a somewhat different semantics for the representation formalism we are discussing than can be found in the cited presentations.

years old which isn't self-reflective by this definition, and you see how extremely unlikely such a state would be – there is something that is not right with such a person. Quite possibly self-reflection is the main feature of the mental life of human beings that distinguishes it as distinctly human.

Self-reference is known to lead easily into paradox, and self-reflection may be suspected for offering easy opportunities for self-reference. here is just one of many potential examples: a mental state with two higher order beliefs  $l_1$  and  $l_2$ , and where  $l_1$  is the belief that  $l_2$  is reliable, whereas  $l_2$  is the belief that  $l_1$  is not reliable. Then it follows straightforwardly that if both beliefs are indeed reliable then one of them must be false. This is admittedly not as radical a paradox as the liar paradox; but even so the case is “plenty strange”. But as it seems to me this case is no more than a figment of the theorist's imagination, and I believe that the same goes for others similarly paradoxical configurations. If the formalism permits their construction, then so much the worse for the formalism. as far as I can see, there is no way for such constructs to arise in any mind that is halfway sound and we will therefore simply exclude them. To this end we only admit mental states that are well-founded in the sense that those attitudes that are referred to in the content of an attitude of order  $n$  must all be of order less than  $n$ . thus, any state satisfying this well-foundedness condition will be composed of (i) first order attitudes, which do not refer to any attitude belonging to the same state; (ii) second attitudes, which refer only two first order attitudes from the state; third order attitudes which may refer only to attitudes of orders 1 and 2; and so on. (As far as actual states are concerned, it seems to me that even third order attitudes already represent a level of psychological sophistication that is beyond most of us.)

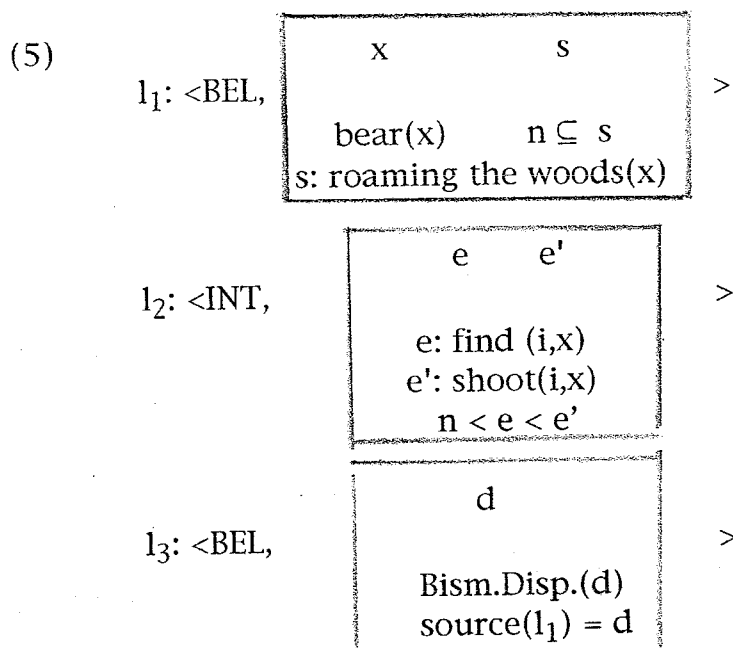
The term “higher order attitude” suggests a demarcation “first order attitudes”, attitudes whose content does not involve some other attitude or attitudes belonging to the same mental state. Indeed, we will assume this distinction and moreover that the structure of self-reflective mental states is hierarchical and well-founded: the foundation of any state is provided by its first order attitudes; its second order components are those attitudes which refer to some first order attitude(s) but not to any higher order attitudes; third order attitudes refer to at least one second order attitude, but to no attitudes of higher order than that, etc. This is not completely self-evident, one could imagine attitudes that are

themselves “self-reflective” in that they are part of their own content; or two attitudes that figure in each other’s content, and still more complicated variations of this. And this is not just a notion born from the automatism of a logician whose reflexes are conditioned by a tradition of work on circularity, non-well-foundedness and the paradoxes.<sup>9</sup>

To represent higher order attitudes we will resort to labelling of attitudinal components of mental states. The labelling notation we use is an obvious one, also employed in UDRT (Reyle, 1993): for any component  $\langle \text{MOD}, \text{K} \rangle$  of a complex attitudinal state we can introduce a distinct label  $l$ , writing “ $l: \langle \text{MOD}, \text{K} \rangle$ ” to indicate that  $l$  is the label of the component of the given state that is represented as  $\langle \text{MOD}, \text{K} \rangle$ . To represent the content of other components of the given state which are about the attitude represented as  $\langle \text{MOD}, \text{K} \rangle$  we can then refer to this attitude by means of  $l$ . For an example suppose that our hunter A connects with his belief that a bear is roaming the woods the second order belief that he got this information from last Thursday’s edition of his local paper, the Bismarck Dispatch. (5) is a representation – given in the same format as (1)– of a’s attitudinal state before the time of his putative discovery of the bear but in which this second order belief is now included.

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<sup>9</sup> I do not claim that restricting self-reflective mental states to those that are well-founded removes all danger of paradox in one go. On the other hand I think that a certain quite limited forms of self-reference in attitudes should be admitted, but also that those are harmless from the perspective of potential paradoxality. An example of a self-reflective mental state is the one that arises in direct perception as analysed by Searle (Searle, Intention). On this analysis the content of a direct perception is that what is perceived is the very thing that caused the experience whose content it is. This is in essence also what in the formalism we are discussing is captured by internal anchors for the representations of directly perceived external objects: the internal anchor for a discourse referent  $x$  expresses that the entity that  $x$  represents is the one which gave rise to  $x$  being established through a process of perception. The syntax and semantics of internal anchoring have been set up in such a way, however, that they cannot give rise to paradoxes.



(In (5) I have provided labels for all components. But there is no need for this. It is more practical to label just those components to which there are references in other components.)

Just as labelling is possible in mental state representations in the style of (5), we can also add labels to the components of the second arguments of “Att” in representations like those in (3) and (4).<sup>10</sup>

## 2. Efferent Connections and Intentional Verbs.

Our first exploration of the efferent connections between mind and world is focused on the verb *fetch*. The eventualities described by *fetch* are complex events which consist of three components, (i) an event of the fetcher going to the location of the thing that is to be fetched; (ii) an event of picking up this thing; and (iii) an event in which the fetcher takes this thing some other place (often, but not invariably, the place from which the fetcher set out). In the general format for lexical

<sup>10</sup> Evidently, adding the means to represent higher order attitudes is a significant extension of the formalism. Since I am not saying anything about the model-theoretic semantics of the formalism, it is not possible to say much about the model-theoretic consequences of this extension either. For details I must refer the reader to (Kamp, 1997;2007). Let it suffice to note here that the addition of conditions that contain labels of other state components as arguments does not lead to logical problems. (In particular it does not lead to paradox.)

entries of verbs that we have been using in earlier work (see in particular (Kamp & Roßdeutscher, 1994a,b), (Roßdeutscher, 1994), (Roßdeutscher, 2000)) these observations about the meaning of *fetch* can be represented as follows.

(6) *fetch*          Nom                  Acc                  (*from* +obl)  
           e                  x                  y                  l<sub>2</sub>

e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	l <sub>1</sub>	l <sub>3</sub>
e <sub>1</sub> : MOVE(x)	SLOC(e <sub>1</sub> ) = l <sub>1</sub>	ELOC(e <sub>1</sub> ) = l <sub>2</sub>		
e <sub>2</sub> : TAKE(x,y)	LOC(e <sub>2</sub> ) = l <sub>2</sub>			
e <sub>3</sub> : MOVE(x ⊕ y)	SLOC(e <sub>3</sub> ) = l <sub>2</sub>	ELOC(e <sub>3</sub> ) = l <sub>3</sub>		
e <sub>1</sub> < e <sub>2</sub> < e <sub>3</sub>				
e = e <sub>1</sub> ⊕ e <sub>2</sub> ⊕ e <sub>3</sub> <sup>11</sup>				

<sup>11</sup> We use  $\oplus$  to denote *mereological summation*. The use of  $\oplus$  within the domain of individuals, exemplified in the characterisation of e<sub>3</sub> - is conform to the mereological treatment of singulars and plurals due to Link and adopted in (Kamp and Reyle, 1993, Ch. 4). The use of  $\oplus$  as mereological summation of events is not part of the treatment of eventualities proposed in (Kamp and Reyle, 1993). There is however no difficulty in extending the structure of the domain of eventualities assumed there with the mereological structure that  $\oplus$  presupposes. One way to do this would be to introduce the part-whole relation  $\leq$  between elements of the set of eventualities (of any model for the DRS language at issue, as described in (KR, 1993, Ch. 5), together with, as a constraint on the set of admissible models, one of the standard axiomatisations of mereology, e.g. Guarino ??). In addition to  $\leq$  it is then possible to introduce (a) the relation  $O$  of overlap, by:  $e O e'$  iff there is an  $e''$  such that  $e'' \leq e$  and  $e'' \leq e'$ ; and (b) a partial operation  $\oplus$  on sets of eventualities defined as follows: suppose  $E$  is a set of eventualities,  $e$  an eventuality; then  $\oplus E = e$  iff (i) for each  $e' \in E$ ,  $e' \leq e$ ; and (ii) for all  $e''$ , if  $e'' O e$ , then there is an  $e' \leq E$  such that  $e'' O e'$ . " $e = e_1 \oplus e_2 \oplus e_3$ " is then short for " $e = \oplus\{e_1, e_2, e_3\}$ ". In the domain of eventualities the part-whole relation has intuitively obvious implications for temporal precedence and inclusion, which, however, cannot be deduced from the mereological axioms as such: If  $e' \leq e$ , then (a) if  $e \subseteq t$ , then  $e' \subseteq t$ , (b) if  $e < t$ , then  $e' < t$ , and (c) if  $t < e$ , then  $t < e'$ . Similarly, if  $e = \oplus E$ , then  $e \subseteq t$  iff for all  $e' \in E$   $e' \subseteq t$ , etc.

Legenda:

- (i) By the S(tart)LOC(ation) and the E(nd)LOC(ation) of a motion event we understand the locations at which the motion begins and at which it ends, respectively.
- (ii) The parentheses around the syntactic specification of the third nominal argument of *fetch* indicate that this argument is syntactically optional. In this regard the argument differs from the subject and direct object of *fetch*, which in any normal grammatical use of the verb must be realized by overt argument phrases (i.e. NPs)<sup>12</sup>.
- (iii) The predicate TAKE represents those events in which the agent takes possession of some object, but without taking the object *to* some place; (English *take* is ambiguous between a use in which it comes with a *to*-complement - in which it stands to the verb *bring* in the roughly the same way in which *go* stands to come - and one without it; TAKE corresponds to the second of these or, equivalently, to the German verb *nehmen*; whose only meaning is that of *take* in this second sense);
- (iv) The final condition of (6) says that the event *e* described by any given use of *fetch* is the sum event of three events *e*<sub>1</sub>, *e*<sub>2</sub>, *e*<sub>3</sub> of the specified types.

There is one respect in which (6) is seriously incomplete. Among the event complexes *e* which (6) admits there are those which consist of (i) a going by *x* to *l*<sub>2</sub>, (ii) a picking up by *x* of some object *y* at *l*<sub>2</sub> which *x* happened to find at *l*<sub>2</sub> and, finally (iii) a carrying of *y* by *x* to *l*<sub>3</sub>. But such event sequences do not fall under the concept expressed by *fetch*. In order that a complex event of the kind described in (6) qualify as a case of fetching, the agent *x* *must have been aware* of *y* being at *l*<sub>2</sub> before he set out from *l*<sub>1</sub>, and have had the intention to go to *l*<sub>2</sub> in order to collect *y* there and take it to *l*<sub>3</sub>. Verbs such as *fetch*, which can

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<sup>12</sup> But what is a „normal“ grammatical use of a verb? It is always possible to find occurrences of verbs in which any argument remains unrealised by an overt phrase, among them the authenticated cases of ellipsis. So, if the notion of a „normal grammatical occurrence“ is to define the line between obligatorily and optionally filled argument positions, it better be properly defined itself. We ourselves have been using the criterion informally, but that is not really satisfactory and a more precise characterisation is much needed.

only be used to describe actions that result from the execution of an intention or plan, we will call *inherently intentional*.

In fact, there are two points that the lexical meaning of *fetch* forces us to consider. The first is that sentences with *fetch* as main verb are understood as describing a complex intentional action; a proper formalism for the representation of the content and truth conditions of such sentences should enable us to represent this intentional dimension of their meaning. The second point is that in the case of *fetch* the intentionality is “hard-wired” into the meaning of the word itself. There are many verbs – often referred to as “action verbs” – which have the property that the events they describe are intentional actions (at least when the verb’s subject is an agent). But for most action verbs there is no requirement that the intention that led to the action coincides with the description that is provided by the verb itself, or by the VP into which the verb projects. Moreover, the discrepancy between intention and description can be made explicit by the addition of adverbials like *unintentionally*. With the verbs that are hard-wired for intentionality the situation is different. Here the intention whose execution led to the act that the verb is used to describe must coincide with the action description that is given. It is for this reason that a sentence like “He fetched such-and-such unintentionally.” doesn’t really have a coherent interpretation – *unintentionally* tries to drive a wedge between intention and description which *fetch* doesn’t permit.

We will look in some detail at the differences between action verbs that are hard-wired for intentionality and those that are not in Section 3. For the remainder of Section 2 I will take it for granted that *fetch* is of the former type, and we will set about to expand its lexical entry accordingly. To do this, however, we need an extension of our representation formalism that allows us to represent intentional actions – actions that result when agents try to make their intentions true.

A sequence of events  $e = e_1 \oplus e_2 \oplus e_3$  satisfying the conditions of (6) constitutes, we noted, a case of fetching only when these events were intended. This means in the first place that the agent must have had an intention of the right kind, i.e. an intention that there be a succession of three events of the kinds specified in (6); and he must have had this intention at the right time – that is, he must have had it for some time leading up to the time when the event sequence starts, and continuing, possibly in modified form, until the task has been completed. We can

use the formalism outlined in Section 1 to describe this intention, as in (7).

(7)

$\langle \text{INT},$	$e' \quad e'1 \quad e'2 \quad e'3$ $e'1 : \text{MOVE}(i) \quad \text{SLOC}(e'1) = l1 \quad \text{ELOC}(e'1) = l2$ $e'2 : \text{TAKE}(i,y) \quad \text{LOC}(e'2) = l2$ $e'3 : \text{MOVE}(i \oplus y) \quad \text{SLOC}(e'3) = l2 \quad \text{ELOC}(e'3) = l3$ $e'1 < e'2 < e'3$ $e' = e'1 \oplus e'2 \oplus e'3$ $n < e'$	$\rangle$
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The claim that the subject  $x$  has this intention up to the time when the actual sequence of events starts can be represented as in (8.a); the DRS labelled "K'7" in (8.a) is given in (8.b).<sup>13</sup>

(8) a.

$x$	$e$	$e1$	$e2$	$e3$	$y$	$l1$	$l2$	$l3$	$s$
$e1 : \text{MOVE}(x) \quad \text{SLOC}(e1) = l1 \quad \text{ELOC}(e1) = l2$ $e2 : \text{TAKE}(x,y) \quad \text{LOC}(e2) = l2$ $e3 : \text{MOVE}(x \oplus y) \quad \text{SLOC}(e3) = l2 \quad \text{ELOC}(e3) = l3$ $e1 < e2 < e3$ $e = e1 \oplus e2 \oplus e3$ $s : \text{Att}(x, \{l: \langle \text{INT}, K'7 \rangle\})$									

<sup>13</sup> The condition „  $s \supset e$  “ should be interpreted as saying that the state  $s$  lasts at least until the beginning of  $e$ ;  $s$  could last longer; or, put differently,  $s$ , while ending itself as  $e$  begins, could be a substate of some other state  $s'$  which also satisfies the condition that specifies  $s$  in (8) and goes on for longer.



b. (the DRS K'7)

$e'$      $e'1$     $e'2$     $e'3$

$e'1$  : MOVE(i)     $SLOC(e'1) = l1$     $ELOC(e'1) = l2$

$e'2$  : TAKE(i,y)     $LOC(e'2) = l2$

$e'3$  : MOVE(i  $\oplus$  y)     $SLOC(e'3) = l2$     $ELOC(e'3) = l3$

$e'1 < e'2 < e'3$

$e' = e'1 \oplus e'2 \oplus e'3$

$n < e'$

It should be clear, however, that (8.a) still isn't enough. For nothing in it tells us that the events  $e1$ ,  $e2$  and  $e3$  were in fact intentional actions, let alone that they had anything to do with the intention that is recorded in the last line of (8.a). Missing from (8.a) is a connection between that particular intention and those actual events. This connection - that the sequence of events  $e1$ ,  $e2$  and  $e3$  was the result of  $x$  *executing* this intention - is neither purely external nor purely psychological. Like external anchoring, execution is a relation between aspects of psychological states and entities in the external world. It hardly needs an argument that neither of these "thought-world" relations is reducible to the other. So we will have to add an execution predicate. EXEC, to our formalism as a new primitive.

EXEC has three arguments. Its first argument is an agent, the second argument a simple or complex event and the third argument is an intention that is part of the agent's mental state. We will allow ourselves two ways of filling the third argument slot. The first type of filler is a term denoting an eventuality type. The terms we will be using are obtained by intensional abstraction over an eventuality discourse referent  $e'$  which occurs in some DRS K. We will present such terms either in the form " $\wedge e'.K$ ", or in the equivalent form " $\hat{e}.K$ " (the abbreviation introduced by Montague). In applications of EXEC which agree with its intuitive purpose K should always be the description of the content of an intention on the part of the agent  $x$  (the first argument of EXEC) at the time when the eventuality  $e$  (its second argument) takes place.

The fillers of the second type for the second argument position of EXEC are labels of intentions (see Section 1.3). As can be seen in (9) below, this use of labels constitutes an extension of the use described in (1.3) in that the labels of a component of a given mental state may now occur also outside the description of that mental state itself. The need for this is an immediate consequence of the fact that execution is relation between (parts of) mental states and entities in the external world.

The last thing to note about EXEC is that it is timeless. It states a relationship between events and (mental) states. The terms of the relation each have their location in time, but the relation which EXEC expresses is one that either holds between these entities or doesn't, basta! - it is meaningless to even consider what it would mean for the relation to hold at one time but not at another. In this regard EXEC is like other predicates of temporal entities, such as " $<$ " and " $\subseteq$ ", as we find them in conditions " $e < e'$ ", " $e \text{ O } t$ ", " $n \subseteq s$ ", etc. So predications involving EXEC do not have an additional argument for times or states; that is, we have DRS-conditions of the form "EXEC(e,..)", and not of the form "s: EXEC(e,..)",

Some of the other new DRS predicates which we will introduce below will also be timeless, and for the same reason.; I will assume their timelessness without coming back to the point.

With the help of EXEC we can complete the semantic part of the entry for *fetch* by adding the last condition shown in (9):

(9)

x	e	e1	e2	e3	y	l1	l2	l3	s
e1 : MOVE(x) SLOC(e1) = l1 ELOC(e1) = l2									
e2 : TAKE(x,y) LOC(e2) = l2									
e3 : MOVE(x $\oplus$ y) SLOC(e3) = l2 ELOC(e3) = l3									
e1 < e2 < e3									
e = e1 $\oplus$ e2 $\oplus$ e3									
s: Att(x, {l: <INT, K'7>})									
EXEC(x, e, l)									

(9) can serve as the semantic component of the lexical entry for *fetch*. But a full-fledged entry must provide more information than just this. In particular, it must provide information about which of the arguments mentioned in the semantic component (those that are represented as discourse referents in the DRS-universe of (9)) can be realised syntactically, which of them must be realised, and what form their realisations can or must take. We will address these questions in Section 3, where we will deal with the lexical entry for *fetch*.

## 2.2 Trying, Succeeding and Failing.

For the representation of the lexical content of "success verbs" like *fetch* the predicate EXEC is just what we need. But in many other contexts the two concepts it combines - that of trying to realise a certain intention and that of succeeding with this attempt - must be kept distinct. To do this is straightforward. EXEC represents the conjunction of the concept of trying together with the claim that the result  $e$  that the trying produces does fit the intention that the agent tries to realise. We use TRY for the first concept and assume for it the same logical form that we have assumed for EXEC, viz. as a 3-place predicate whose argument slots are for (i) an individual, (ii) an event, and (iii) an eventuality property or the label of an intention. The second concept is trivially definable within the formalism as we have it. It simply amounts to the fact that the second argument  $e$  of TRY has the property in third argument position. We will use the predicate INST (for "instantiation") for this relation. But that is just syntactic sugar. We have:

$$(10) \quad \text{INST}(e, \hat{e}.K) \Leftrightarrow K(e)$$

EXEC, then, is equivalent to the conjunction of TRY and INST:

$$(11) \quad \text{EXEC}(x, e, \hat{e}.K) \Leftrightarrow (\text{TRY}(x, e, \hat{e}.K) \ \& \ \text{INST}(e, \hat{e}.K))^{14}$$

If we want to, we can extend our formalism further by adding the predicate FAIL with the meaning of "failed", or "unsuccessful"

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<sup>14</sup> Also, of course,  $\text{EXEC}(x, e, l) \Leftrightarrow (\text{TRY}(x, e, \hat{e}.K) \ \& \ \text{INST}(e, \hat{e}.K))$ , provided  $K$  described the content of the intention labeled by  $l$ .

execution. It can be defined as the conjunction of TRY and the negation of INST:

$$(12) \quad \text{FAIL}(x, e, \hat{e}.K) \Leftrightarrow (\text{TRY}(x, e, \hat{e}.K) \ \& \ \neg \text{INST}(e, \hat{e}.K))$$

The distinction between the successful execution of an intention and its attempted, but potentially unsuccessful execution, which we have made explicit in this section, will remain important throughout the remainder of this note. On the whole I will proceed accordingly, always distinguishing carefully between TRY and EXEC in formalisations. In informal discussions, however, I will use the term “execution” loosely, sometimes meaning it in the sense of successful execution (formalised here as EXEC), but more often as just execution, whether successful or not (the notion we have formalised as TRY).

### 2.3 The verbs *try*, *manage* and *fail*.

One would expect that the predicates we introduced in the last two sections can be used to state the semantics of verbs like *try*, *fail*, *manage* and *succeed*. In this section we will look at the entries of these verbs. In fact, there is not much that needs saying here. But before the entries can actually be written down, there is one more matter that needs attention. This is the way in which the semantic arguments of the verb, which will be represented as discourse referents in the semantic component of its entry, are realised syntactically.

First *try*. I will assume that its semantic is given by the predicate TRY and that it is the arguments of TRY that must be realised when *try* is used in a sentence. The question is how. Recall that TRY has three arguments, an event argument *e*, an agent argument *x* and a third argument that according to our stipulations can be either an intention or an event type. (But in either case the meaning is essentially the same, viz. that *e* is the attempted execution by *x* of an intention with a given content, which is to the effect that the result of execution be an event of a certain type.) For two of the three arguments of TRY the matter of realisation is straightforward. The event argument *e* is the referential argument of *try*, and this is not realised by a satellite phrase. and the agent argument *x* is realised by an NP which is the grammatical subject when the verb is used in the active mood.<sup>15</sup> But the matter isn't

<sup>15</sup> Here and subsequently the information about syntactic realisation of

quite as straightforward with the third argument. I will take as basic those uses of *try* in which it takes a *to*-infinitive as complement. In these cases the contribution of the *to*-infinitive is to describe the event type that can fill the third argument slot of TRY, and therewith the content of the intention of which *e* is the execution.

Let us state an entry for this use of *try* before we explore any of its other uses. There is one more matter that we must settle in order to be able to give the entry, viz. the separation of the semantic information provided by the verb into that which is presupposed and that which is not.

I take it that statements of the form “*x* tried to *E*” presuppose that *x* had, at the relevant time, the intention to *E*, and assert that *x* made an attempt to execute this intention. This means that the content of the *to*-infinitive figures both in the presuppositional and in the non-presuppositional part of the semantic component of the entry. But what exactly is it that *try* can be said to presuppose? The following example can help us to decide this question

- (13) a. Fred didn't solve the problem. He didn't even try.  
 b. Did you try to solve the problem?

The point that these examples have been designed to illustrate is that (a) *try* does come with a presupposition that has something to do with the mental state of the one did or did not try, but (b) that this presupposition is in general weaker than the having an actual intention to do what was or wasn't tried. For instance, consider the second sentence of (13.a). in the context of (13.a) this sentence would be very odd, if Fred knew nothing about the problem at all, or if the possibility of trying to solve it hadn't suggested itself in any way. But on the other hand it definitely does *not* suggest that Fred must have had the *intention* to solve the problem. (13.b) supports this conclusion.

I will assume that contemplating a certain task as a possible goal is a propositional attitude of a type in its own right, and I will use the mode indicator “CONGOA” (for “contemplate as a possible goal”) to denote this type. I will assume that this is a type of *propositional* attitude, i.e.

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arguments will be relate to what for this purpose we see as the basic use of verbsm viz. in simple main clauses in the active mood and with finite tense. (Cf. e.g. (Kamp, & Rossdeutscher, 1994).

that the second member of a representation of an instance this type will always be the representation K of some proposition: the contemplated goal is that of making the represented proposition true.

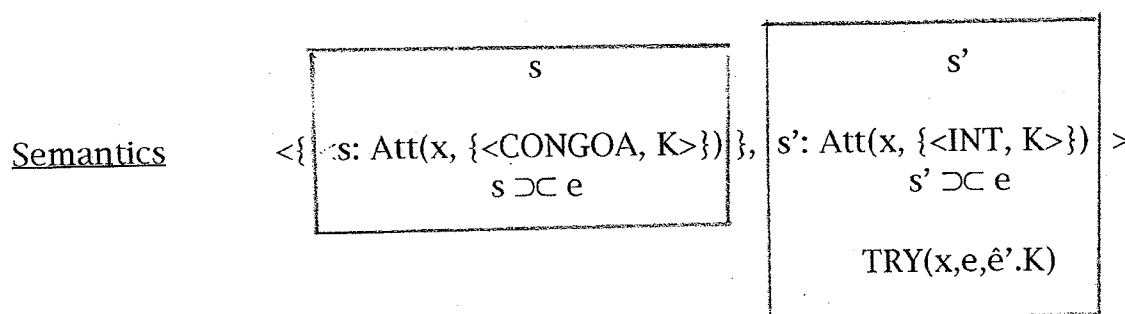
Attitudes whose mode is CONGOA are obviously entailed by intentions with the same content you cannot intend to do something without contemplating what you want to intend to do as a possible goal -, but not conversely. So we have, as a general principle, the one-way implication given in (14).

$$(14) \quad \langle \text{INT}, K \rangle \Rightarrow \langle \text{CONGOA}, K \rangle$$

If contemplation of the goal K is the presupposition of trying to perform an event of type  $\hat{e}.K$ , then the non-presuppositional part of the meaning of *try* should be a combination of forming the intention to realise that goal and then making an attempt at the execution of that intention. this entails that when the verb occurs negated, then the agent's contemplation of the goal will be there as much as it is when the verb occurs without negation, but what is denied is either that the agent ever formed the corresponding intention or that he did, but didn't actually follow up with it (a case of akrasia). And this seems to be just as it should be.

These considerations lead to an entry for the given use of *try* (in which it combines with a to-infinitive) that can be found in (15). The format in which the entry has been stated is that of (Kamp & Rossdeutscher, 1994) and subsequent work (see in particular (Rossdeutscher, 2000)). This is also the format we will use for all other verb entries in this note. Some explanation of how such entries should be interpreted is given below.

(15)	<i>try</i>	NP Nom	<i>to</i> -infin.
	e	x	$\hat{e}'$ .K
<u>Logical Type</u>	eventual.	individual	eventual.
<u>Select. Restr.</u>	event	agent	type



### Legenda

The *first tier* of the entry gives the morpho/phonological form of the verb (in the form of its infinitive) and syntactic specifications of the argument phrases through which the different semantic arguments can be realised. These arguments are listed in the *second tier*, directly underneath the information about their syntactic realisation in the first tier. (Note: the semantic status and roles of these arguments is shown by their occurrences in the representation of the semantic content of the lexical item that occurs in the fourth tier.)

The *third tier* specifies the ontological restrictions that are imposed on the different semantic arguments.<sup>16</sup> I have subdivided this information into (i) the logical type, of the argument in the sense of the classical typing that is part of the model-theoretic semantics and (ii) more detailed information that imposes some further selection within the domain determined by the logical type above.

The *fourth tier* gives the lexical semantics. Here K is a schematic letter for DRSS. It is assumed that the universe of K contains an occurrence of

<sup>16</sup> I am assuming here that the distinction between eventualities, times, and "ordinary individuals" is made at the level of logical typing. While this distinction is not part of the most general accounts of logical typing, it has become common practice in event semantics and in formal approaches to the theory of tense and aspect.

the discourse referent *e'* and that *e'* is the referential argument of the *to*-infinitive that realises the third argument of TRY.

So much for (15). But there are also other uses of *try*, in which it does not combine with a *to*-infinitive. Some of these – the main ones, if perhaps not all – are listed in (16).

- (16) a. You try spending a 12 hour day in front of a computer screen, six days a week, 50 weeks a year!
- b. Will you let me try driving this car around the block?
- c. You should try some of her poems!
- d. You should try some of her chocolate chip cookies!
- e. Before we meet again on Thursday I would like you to try problems 1 – 3.
- f. All morning John has been trying to walk on his hands. After watching him all this time I feel very much like trying it/that too.
- g. Shall we try to get to the top of that rock over there? If you will try, I'll try too.
- h. I have tried to send the manuscript off today, but I just didn't manage/manage it/manage to do so.
- i. I have tried to solve that problem, but I failed.
- j. I have tried problems 1 – 3, but I managed only the first one.

In (16.a,b) the complement of *try* is not a *to*-infinitive but a gerund. At first sight this use may look like a variant of the one where *try* is followed by an infinitive. But when we look more closely we can note a difference. *try* + *to*-infinitive carries a strong implication that the trying might not be successful; *try* + gerund does not carry such an implication (although it doesn't exclude it either). The difference seems especially clear in (16.b). This is what you say when you are contemplating buying a car and ask the person who is offering it for sale. If you had said instead: "Will you let me try to drive this car around the block?", that would have suggested that you weren't sure whether you could drive the vehicle, and he would probably have been reluctant to give you the keys. Generally speaking, the combination of *try* with a gerund suggests successful execution for the sake of finding out what doing that sort of thing, or having done it, is like, or feels like. We can also see this meaning aspect in (16.a), which has the flavour of an invitation to the addressee to imagine how he would feel when he



spent that much time behind a computer screen. In this regard *try* + gerund is much like the particle verb *try out*, which also means something like “try to see how the thing works out”, or *try on* as we use it in connection with clothing or jewelry.

In (16.c-e) *try* has what looks like a regular direct object, in the form of an ordinary NP. But the semantics is nevertheless much like that of the examples we have already considered. For instance, a paraphrase of (16.a) that captures what is presumably intended, is “You should try reading some of her poems!”. This is a case of coercion, as discussed at length in (Pustejovski, 1995): Verbs which take event types as semantic complements can often be combined syntactically with NPs with the implication that the semantic complement of *try* is an event description in which the denotation of the NP is the theme, and in which the relation between event and theme has to be inferred by default. One of the assumptions here is that the verb in question – here the verb *try* – is designed to take an event type as argument; however, it can be used in combination with phrases which we do not understand as denoting such entities nevertheless, so long as it is clear how that phrase can be reinterpreted as denoting an entity of the required type (or, to use Pustejovski’s term, so long as the phrase can be *coerced* into such an interpretation). In the case of (16.c) the natural inference is to “reading” for what else would you normally do with somebody else’s poems? In the case of (16.d) the relation is more likely to be that of eating or tasting, for that is what cookies are typically for, as opposed to literary texts. (Pustejovski suggests that these different defaults should be specified as part of the lexical entries for the nouns *poem*, *cookie*, etc.)

(16.e) is on the one hand just yet another example of the use of *try* with direct object NP. But it has been added to also illustrate another point. The apparently most natural full paraphrases of (16.c) and (16.d) involve the inferred transitive verb in gerundive form (as in the paraphrase I just gave for (16.c)). But this isn’t so in general. In the case of (16.e) the paraphrase “... I would like you to try to solve problems 1-3” is at least as natural as “... I would like you to try solving problems 1-3”. Here there need be no implication that the addressees should be able to solve the given problems if they try. Uses of *try* in which it combines with an NP are neutral with regard to the distinction between infinitival and gerundive complements.

The use illustrated by (16.c-e) must be distinguished from that which we find in the second sentence of (16.f), where *try* is followed by the pronoun *it* or demonstrative *that*. Here *it/that* is anaphoric to the *to*-infinitive of the first sentence. No coercion of the kind we observed in connection with (16.c-e) is involved here, but only the fact that the anaphoric pronoun *it*, *this* and *that* can pick up not only individuals that have been previously introduced by some other normal NP, but also all sorts of other denotation types (Asher, 1993).

Of much the same sort are pseudo-intransitive uses of *try* like the two we find in the second sentence of (16.g). These must both be interpreted as having an implicit complement or direct object, which has to be recovered from the context. In (16.g) the context is provided by the first sentence, and the recovery of the bit it provides - the infinitival "to walk on his hands" - is a case of tacit argument reconstruction that has close affinities with cases of grammatically controlled ellipsis, such a stripping. As far as I know, all such "transitive" occurrences of *try* require context-based reconstruction of the missing complement or argument.

(16.h-j) are pointers towards our next topic, the lexical entries for *manage* and *fail*. They show on the one hand that these verbs share with *try* many of the special features that distinguish it from most verbs with regard to argument structure and the syntax-semantics interface that goes with it. But they also draw attention to another point, viz. that these verbs are often and naturally used in contexts set by *try*. However, before we switch to those verbs, a concluding remark on the one with which we have been dealing.

Our entry (15) was given to cover just the cases where *try* combines with a *to*-infinitive. What more is needed at the level of the lexicon to cover the other cases as well? I think that the cases illustrated by (16.c-g) can be set aside. These are instances of more general mechanisms, which are not restricted to *try*, or to just a few verbs that share its special properties. I assume that these mechanisms can be formulated in such a way that the right predications follow for the case of *try*, when they are combined with (15) as given.

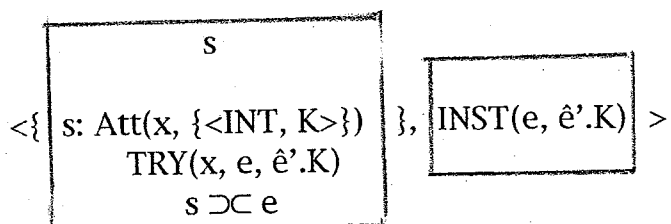
The difference between infinitival and gerundive complements is another matter. As we have seen the difference is a rather subtle one, and one that (15) does not address. ((15) doesn't have anything to say

about implications that the agent may have difficulties to realise the event type, so is underspecified with regard to what sets the two uses apart.) Here I will not try to improve on (15) so that the distinction between the infinitival and the gerundival use of *try* is correctly captured. So in the remainder of this note (15) will serve as our entry for *try*.

Entries for *manage* and *fail* can be designed along much the same lines as our entry for *try*. They too can be analysed as 3-place relations between an event, and agent and an event type. The burden of the semantics is again carried by TRY, this time in combination with INST. But the difference with *try* is that trying is now presupposed rather than part of the non-presuppositional content. (See eg. Karttunen, 1974, (Karttunen & Peters, 1979)). I take it that, after all that has been said at this point, the entries in (17) and (18) will speak for themselves.

(17)	<i>manage</i>	NP Nom	<i>to-infin.</i> anaph.pron or dem.
	e	x	$\hat{e}.K$
Logical Type	eventual.	individual	property
Select. Restr.	event	agent	eventu.

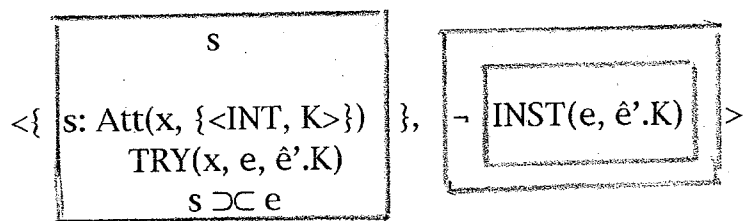
### Semantics



N.B. The presupposition of the semantic component could be reduced to just the condition “TRY(x, e,  $\hat{e}.K$ )”, since the truth of this condition entails the existence of the corresponding intention anyway. The same applies to the entry for *fail* given in (18) below.

(18)	<i>fail</i>	NP Nom	<i>to</i> -infin. anaph.pron or dem.
	e	x	$\hat{e}.K$
Logical Type	eventual.	individual	property
Select. Restr.	event	agent	eventu.

### Semantics



The last verb we consider in this section is *succeed*. *succeed* differs syntactically from *manage* in that it does not take *to*-infinitives for complements but rather gerunds governed by the preposition *in*, as in (19).

(19) John succeeded in solving the problem.

I take it, however, that the meaning of *succeed* is for all practical purposes identical to that of *manage*. So apart from the specification of the realisation of its complement the entry for *succeed* will be just like (17).

### 3. Hard-wired and wireless Intentionality

I noted in Section 2 that the verb *fetch* has intentionality hard-wired into its lexical meaning, but that for most action verbs this is not so. The examples in (20) – in which the verb *open* stands proxy for the vast majority of action verbs – and (21) illustrate the distinction.

- (20) a. John opened the door inadvertently.  
 b. John opened the door by mistake.  
 c. John opened the door without really wanting to.  
 d. Unwittingly John opened the door  
 e. Without realising what he was doing John opened the door.
- (21) a. ?? John fetched his daughter from the kindergarten inadvertently.  
 b. # John fetched his daughter from the kindergarten by mistake.  
 c. # John fetched his daughter from the kindergarten without really wanting to.  
 d. ?? Unwittingly John fetched his daughter from the kindergarten.  
 e. # Without realising what he was doing John fetched his daughter from the kindergarten.

We will have a good deal to say about these differences between the sentences in (20) and the corresponding sentences in (21) as we go along. For the moment the following commentary should suffice. In the sentences in (20) the adverbials can be understood as saying that the act of opening the door was inadvertent, done by mistake, etc. – the agent wanted to do something else, but this is the way things turned out. Such interpretations are not possible for the sentences in (21). First, (21.a) seems incoherent; there is no such thing as inadvertent fetching in the sense in which there are inadvertent openings of doors. (21.b) does allow for a coherent interpretation, but only one according to which there is a conflict between the action as the sentence describes it and some intention, expectation, request of whatever that the action was meant to answer to, but not with the agent's own intention of which the action was the execution. For instance, (21.b) could be used in a situation where John has been rung up by his wife at his office with the request to fetch their son from his kindergarten, but he misunderstands her, thinks she wants him to pick up their daughter and acts according to what he has understood. His action perfectly matches his own immediate intention, but there is a problem "higher up", and that is what *by mistake* can be understood to refer to.

I assume that the reader will be able to detect similar differences between the remaining pairs of sentence from (20) and (21). And in going through this exercise he will note that the difference between

*fetch* and *open* is not that the events described by *fetch* are always intentional actions, actions that the agent performs intentionally, i.e. for which there is *some* intention of which the event is the execution, whereas *open* can also be used to describe events that are not (intentional) actions. The difference is rather that, roughly speaking, all actions that are described by *fetch* must be actions that the agent *intended as* fetchings, whereas an action described by *open* can be an action that the agent didn't to be an opening. This is the general difference between what I am calling "hard-wired" action verbs and the others. Verbs of either category are used to describe actions. (I will be using the term "action" as entailing that they result a executions of intentions.) What distinguishes the hard-wired ones from the others is that the verb describes the intention as well as the result. Therefore intention-denying or intention-questioning adverbials like those in (20) and (21) cannot drive a wedge between intention and action in the case of hard-wired verb, where it can when the verb is not hard-wired.

The distinction between what we have called "hard-wired" action verbs and action verbs that are not "hard-wired" presents us problems at two different levels. First, there is a question that concerns the lexical entries of action verbs. In fact, there are two questions here: (i) Must intentionality be explicitly encoded as part of the meanings of individual action verbs, and if so, in what way? (ii) Must we encode the distinction between hard-wired action verbs and those that are not hard-wired, and if so and how is that to be done?

As to the first of these questions: I have a gut feeling that it should be possible to analyse the semantics of event verbs in such a way that it should be possible to read off from the entry of any such verb whether it describes are actions (in those cases where the verb's subject is an agent). However, I do not know of a verb semantics that is able to deliver this. So, lacking such a semantics, the only option is to specify for each individual event verb separately whether it is an action verb or not.

This does not mean, however, that the entry needs too specify what kind of intention leads to the events it can be used to describe. For the verbs that are not "hard-wired" the intention need not fit the description provided by the verb itself, and as far as I can tell there are no clear constraints on what the intention could be, at least no constraints of a linguistic nature. If we assume this then marking a verb

as action verb simply means that the events it describes are actions that were the executions of *some* intention or other, leaving it open whether there is any connection between the content of the intention and the meaning of the verb. With the hard-wired verbs the matter is different; here, as stated above, the intention must fit the description provided by the verb. So in this case it is also possible to reconstruct the possible contents of the intention from the mere information that the verb in question is a hard-wired one.

The way in which I put the last point suggested that hard-wiredness should also be handled as a feature of the entries of individual verbs. Is it possible to better in this case? My best answer to this right now is: perhaps somewhat, but the possibility of a general, non-circular analysis of what makes an action verb into a hard-wired one is still in doubt. One category of hard-wired verbs consists of those verbs which describe complex events, consisting of two or more part events which must be executed one after the other – verbs that are lexicalisations, one might say, of complex, articulated plans. (For more on these see Section 4.) *fetch* is one such verb, Another example is the verb *visit*, in the sense of paying someone a visit, and its German equivalent *besuchen*. (Rossdeutscher, 2000). *visit/besuchen* also describes a complex event, consisting of going to some other place B followed by the event of spending some time with some person y at B. But here too in order that such a succession of events counts as a case of *visit*, the going to B must be *in order to* spend time with y. A case of the agent x going to B for some unrelated reason, there chancing upon y and then deciding to spend time with y in the spot isn't good enough to make a case of *visiting*. But as far as I can see, verbs describing such complexes of events are not the only ones that qualify as hard-wired. But not all hard-wired action verbs are complex in this sense, Speech act verbs such as *assert, claim, question, order, beseech, complain* are fairly clear cases. I don't think it makes sense to describe someone as having asserted something, but without wanting to do that or realising that that was what he was doing. Another example is *arrest*. I don't think someone can be arrested without it being the agent's intention to arrest him. But I suspect that this is only the tip of the iceberg. For me the few examples we have considered reinforce the feeling that there ought to be some general principles that should enable us to determine from the semantic characterisation of a verb in a non-circular way whether or not it is hard-wired for intention. But even if that is so, I don't know what these principles are like. Therefore I see for the time being no

what these principles are like. Therefore I see for the time being no other option than to treat hard-wiredness also as a feature that needs to be added to the entries of individual verbs.

In Section 2.1 we presented all the pieces that we argued are needed for a lexical entry for *fetch*. In (22) these pieces have been together once more to yield an entry in the general format of (6) and those of the last section. One point that may be worth mentioning is the way in which the handling of the discourse referents that occur in the universe of the DRS in (9) that was our final proposal for the semantic component of the entry for *fetch*. Of these discourse referents *e* is the referential argument of the verb, *x* and *y* are arguments of the verb that must be realised - as subject and direct object, respectively - and *l2* is an argument that can be realised, by a PP whose preposition is *from*, but need not be. (As already practices in (6) we indicate the optionality of the *from*-PP by placing this realisation specification within parentheses. The remaining discourse referents from the universe of the DRS in (9) aren't cannot be realised by any kind of argument or adjunct phrase in clauses in which *fetch* is the main verb, so these stay within the universe of the semantic component.<sup>17</sup>

(22) *fetch*    NP Nom            NP Acc            (*from* +NP obl)  
           *e*            *x*                    *y*                    *l2*

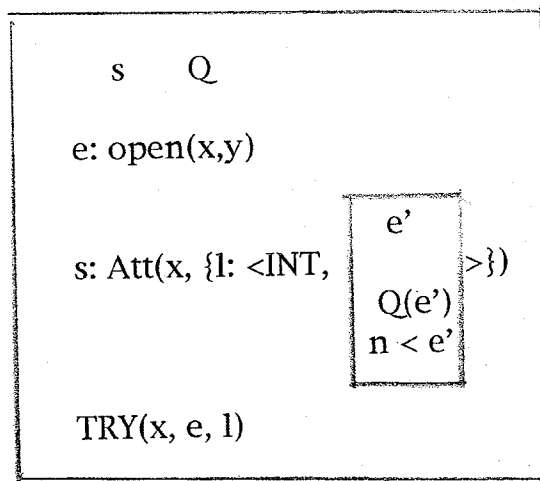
$e_1$	$e_2$	$e_3$	$l_1$	$l_3$	$s$
$e_1 : \text{MOVE}(x) \quad \text{SLOC}(e_1) = l_1 \quad \text{ELOC}(e_1) = l_2$ $e_2 : \text{TAKE}(x,y) \quad \text{LOC}(e_2) = l_2$ $e_3 : \text{MOVE}(x \oplus y) \quad \text{SLOC}(e_3) = l_2 \quad \text{ELOC}(e_3) = l_3$					
$e_1 < e_2 < e_3$ $e = e_1 \oplus e_2 \oplus e_3$					
$s: \text{Att}(x, \{l: \langle \text{INT}, K'7 \rangle\})$					
$\text{EXEC}(x, e, l)$					

<sup>17</sup> (i) Recall that  $K'7$  us given in (8.b).



It may be useful to compare this entry with the entry for an action verb that is not hard-wired. Since our examples in (20) all involve the verb *open*, I'll take that verb. However, we simplify things by assuming that *open* has only one possibly argument frame, consisting of the subject and a direct object phrase denoting the thing that is being opened. Given this simplification the entry for *open* is as in (23).

(23) *open*    NP Nom            NP Acc  
           e            x                    y



Note the two differences between (23) and (22) that matter. First, in (22) the intention is fully specified, and it is given by the non-intentional part of the entry, and thus by the meaning of the verb; in contrast, the content of the intention in (23) is left unspecified. All that is given is that there is some property of events *Q* such that some future event *e'* satisfies it. Second, in (22) the event that results from executing the intention is said to be a successful execution, whereas the execution in (23) is merely said to be an attempt at one. These two differences capture the difference between hard-wired verbs like *fetch* and “mere” action verbs like *open* as it was described informally above.<sup>18</sup>

<sup>18</sup> Note that it isn't really necessary to use the predicate EXEC in (22): the content of the intention and the description of *e* coincide, and that means that *e* is a successful execution of the intention given that it is an execution at all. So in fact TRY would have done just as well in (22) as EXEC; and this holds for all entries of hard-wired verbs.

As noted above, we can simplify entries of action verbs by using uniform features for the two types. Assume that these features are “Action verb” and “Hard-wired”. That is, entries for action verbs are marked with the feature “Action verb” and the hard-wired ones in addition with the feature “Hard-wired”. The import of these features can be stated by rules that permit them to unfold to the information about intention and execution that distinguish the entries of these kinds of verbs from others. In this way the entry for open takes the shape in (24)

(24) *open*    NP Nom            NP Acc  
           e            x                    y

e: open(x,y)
--------------

Action verb

The expansion rule for “Action verb” then simply says that the DRS  $K_V$  which gives the semantics of the entry should be merged with the DRS

<p>s    Q</p> <p>s: Att(x, {l: &lt;INT, <table border="1" data-bbox="678 1299 798 1512"> <tr> <td>e'</td> </tr> <tr> <td>Q(e')</td> </tr> <tr> <td>n &lt; e'</td> </tr> </table> &gt;})</p> <p>TRY(x, e, l)</p>	e'	Q(e')	n < e'
e'			
Q(e')			
n < e'			

where e is the discourse referent that represents the referential argument of the verb.

The second group of questions – once again we are facing not just one but several questions – has to do with the construction of semantic representations of sentences containing action verbs with or without

intention-overriding additions. The simplest case, which needs no further discussion, is that of a verb with hard-wired intentionality which occurs without intention-denying additions. Here we simply use the full semantic entry of the verb. Thus sentence (25) yields the semantic representation in (26).

(25) John fetched Debbie from the kindergarten.

(26.a)

t	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	s	j	d	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
t < n	e ⊆ t	John(j)	Debbie(d)	"the kindergarten"(l <sub>2</sub> )						
e = e <sub>1</sub> ⊕ e <sub>2</sub> ⊕ e <sub>3</sub>	e <sub>1</sub> < e <sub>2</sub> < e <sub>3</sub>	s ⊃ Ce								
e <sub>1</sub> : MOVE(j)	SLOC(e <sub>1</sub> ) = l <sub>1</sub>	ELOC(e <sub>1</sub> ) = l <sub>2</sub>								
e <sub>2</sub> : TAKE(j,d)	LOC(e <sub>2</sub> ) = l <sub>2</sub>									
e <sub>3</sub> : MOVE(j ⊕ d)	SLOC(e <sub>3</sub> ) = l <sub>2</sub>	ELOC(e <sub>3</sub> ) = l <sub>3</sub>								
s : Att(j, {l: <INT,(K)>})										
EXEC(j, e, l)										

Here K is the DRS:

(26.b)

e'	e' <sub>1</sub>	e' <sub>2</sub>	e' <sub>3</sub>
e' <sub>1</sub> : MOVE(i)	SLOC(e' <sub>1</sub> ) = l <sub>1</sub>	ELOC(e' <sub>1</sub> ) = l <sub>2</sub>	
e' <sub>2</sub> : TAKE(i, d)	LOC(e' <sub>2</sub> ) = l <sub>2</sub>		
e' <sub>3</sub> : MOVE(i ⊕ d)	SLOC(e' <sub>3</sub> ) = l <sub>2</sub>	ELOC(e' <sub>3</sub> ) = l <sub>3</sub>	
n < e'	e' <sub>1</sub> < e' <sub>2</sub> < e' <sub>3</sub>	e' = e' <sub>1</sub> ⊕ e' <sub>2</sub> ⊕ e' <sub>3</sub>	

The default interpretation of a sentence like (27), in which the verb is the action verb *open*, which is not hard-wired, is like (26) in also identifying the content of the intention with the event description provided by the VP. But in this case the interpretation isn't just the result of applying the principles of DRS construction to the semantic components of the lexical entries for the words from which the

sentence is made up, but also involves a default principle, according to which the event property  $P$  figuring in the entry for *open* gets resolved to the description provided by the VP in the absence of contrary information. That is, in this case the results of the interpretation process can be divided into two stages, given in (28.a) and (28.b). The first is the result of applying the “hard” construction rules and the second results from the first by applying the mentioned default principle, which identifies  $Q$  with the “narrow” event description provided by the VP. (The *narrow event description* provided by the VP is the semantic representation provided by the VP without the parts that are contributed by the expansion of the feature “Action verb” in the lexical entry of *open*.)

(27) John opened the bathroom window.

(28.a)

t	e	j	b	s	Q
$t < n$	$e \subseteq t$	John(j)	“the bathroom window”(b)	$s \supset \supset c e$	
e: open(j,b)					
s: Att(j, {l: <INT, $\left. \begin{array}{c} e' \\ Q(e') \\ n < e' \end{array} \right\} > \}$ )					
TRY(j, e, l)					

(28.b)

t	e	j	b	s	
$t < n$	$e \subseteq t$	John(j)	“the bathroom window”(b)	$s \supset \supset c e$	
e: open(j,b)					
s: Att(j, {l: <INT, $\left. \begin{array}{c} e' \\ e': \text{open}(j,b) \\ n < e' \end{array} \right\} > \}$ )					
TRY(j, e, l)					

I will refer to interpretations of sentences with “wireless” action verbs like *open* in which the intention is aligned with the narrow description provided by the VP *fully intentional* interpretations. Thus (28.b) is a fully intentional interpretation, whereas (28.a) is not.

I must leave it as a question for further investigation exactly how the default principle that leads from (28.a) to (28.b) should be formalised. Intuitively the inference that an event described by a verb like *open* is the result of executing an intention to open whatever was opened feels like a form of Gricean implicature. But, as with so many other types of implicatures, this type seems to rest on a mixture of purely conversational principles and conventional aspects of meaning associated with particular words or constructions.

### 3.2 Interactions between action verbs and intention-denying adjuncts.

The difference between action verbs that are hard-wired for intentionality and those that are not shows up for real when we combine them with intention-denying adjuncts like those in (20) and (21). I won't deal with this issue in anything like the degree of detail it deserves. This is largely for want of a sufficiently worked-out lexical semantics for the different intention-denying phrases and clauses that can be found in a language like English. That is a topic in its own right, and not one I can take on properly in this note. I will restrict attention to just two from the range of such English words and constructions, viz. *inadvertent* and *by mistake*. In the course of our reflections on *inadvertent* I will have something to say about the similar, but not quite synonymous *unwittingly*.

First some preliminaries about the syntax and semantics of these adverbials. (i) I will assume that the adverbials with which we are dealing are syntactically VP adjuncts. (ii) I assume that they function as predicates of the referential argument of their adjunction site – that is, of the event that is described by the VP to which they are adjoined. (iii) I will assume that they are sensitive to the intension of the description that the VP provides of its referential argument. More explicitly, we will construe the meanings of these adverbials as relations between the

referential argument *e* of their adjunction site and the event type that it is given by the adjunction site's semantics.

We start with *inadvertently* and begin by focussing on (20.a) and (21.a), the sentences in (20) and (21) which contain occurrences of this adverb. First, what are the situations in which we (20.a), repeated to make the following discussion easier to follow, can be used felicitously?

(22) a. John opened the door inadvertently.

The arguably most prominent scenario for which (20.a) is good is that where the event the sentence describes is something that John does without realising that it has the implications that (22.a) attributes to it. For instance: John is sitting in front of a panel with buttons, he thinks that the button labelled "3" unlocks the door to the garage and pushes it. But he is wrong about the button labelled "3" and unwittingly unlocks the door to the cellar where the cut up murder victims have been hidden. Or - another possibility - he doesn't think that button number 3 opens any door at all, but that it does something quite different, such as activating the alarm system. In either case the following variant (28) of (20.a) seems a perfectly natural way of describing what happened; and so is (20.a) itself, if it is clear from the context that *the door* refers to the door to the cellar.

(29) Inadvertently John opened the door to the cellar.

Cases of this sort are easily multiplied: the man who tenses his friend the cup of which he doesn't know that it contains the deadly poison, the man who pulls the lever that causes the unpredictable electrocuting shortcut, the one who pulls at the wrong wire while trying to defuse the bomb - they all can be said to have killed the one who came to grief through their action inadvertently. And so on.

In all these cases the description of the action *e* which the sentence provides, and which is one of the arguments of the 3-place relation that we take *inadvertent* to be, is not only different from the content of the intention of which *e* was the execution, but one that the agent did not even think of as a possible description of his action. Often, as we already noted, it is a description that the agent would not have wanted to execute, and in fact she may be horrified when *ex post facto* she

finds out that it fits her action.<sup>19</sup> For most of the sentences in (20) this is the sort of interpretation that comes to mind first. *Inadvertently* sounds especially natural in such interpretations, since its presence goes some way towards explaining how the agent could have done something that can be described in the disconcerting, or even catastrophic terms the sentence does. However, not all felicitous uses of *inadvertently* are of this kind. It is enough if the description is one that did not occur to the agent as a possible description of the action he performed. I may open the door to the cellar inadvertently while this doesn't have any untoward or unwanted consequences; I'll just be surprised when I find out the effect that my action- pushing button number 3 - actually produced.

(21.a), repeated here as (30.a), indicates that *inadvertently* is strange in combination with *fetch* and (30.b,c) show that the awkwardness is not just a matter of an unhappily chosen word order.

- (30) a. ?? John fetched his daughter from the kindergarten  
inadvertently.  
b. ?? Inadvertently John fetched his daughter from the  
kindergarten.  
c. ?? John Inadvertently fetched his daughter from the  
kindergarten.

This is in line with what we have said about hard-wired action verbs like *fetch*. If *inadvertently* indicates a mismatch between the action as it is described in the sentence and the intention that produced it, then *fetch* offers it no purchase. It would be rash, however, to conclude from this that *fetch* and *inadvertently* never go together. An example which shows that this is not so is (31)

- (31) Inadvertently John fetched the wrong child from the  
kindergarten.

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<sup>19</sup> Interesting examples of this sort are provided by dramatic mishaps like those in the myth of Oedipus. It seems perfectly natural to use *inadvertent* in the sentence "Iocaste inadvertently married her son." Note that *inadvertent* makes sense in this sentence only if the event description it provides is taken *de dicto*. Iocaste certainly had the *de re* intention to marry the person that can be correctly described as her son. What she didn't have, and is devastated to discover when the time comes, is that is was her son that she married

Here is a context in which (30) can be used felicitously: John is a social worker who has been called by a desperate single parent who has suddenly fallen ill and whose daughter needs to be fetched from her kindergarten. John goes to the kindergarten with a description of the child (which he has never seen). On the strength of that description he picks up a child at the kindergarten which, when they get to the address that the parent has given him, turns out to be different from the one he was supposed to collect.

A telling feature of this example is the word *wrong*. It helps us to focus on the identity of the child as the locus of the mismatch.<sup>20</sup> But there is also another feature of the example that deserves our attention. Note that as I have described the case John presumably had no way of finding out that his action didn't fit his intention at the time when he performed it: The child he took to the parent who called him may have fitted the description he had been given to perfection. But – and this will prove important – the match between intention and action wasn't perfect nevertheless; for surely it was part of John's intention to pick up the daughter of the parent who gave him the call.

Exactly which conditions must obtain in order that *inadvertently* can be used felicitously is a matter which I do not profess to fully understand. But the following example, which at first sight seems quite similar to (30) provides a further clue. In this example John goes to fetch a person from the station who has introduced himself in a letter as a distant relative and announced his arrival by train at a certain time on a certain day. As things turn out, this person murders John soon after his arrival. (We leave it open whether he came into town for this very purpose or the idea came to him only once he was there and had found out more about John.) In the light of what has been said so far, (32.a) would appear to qualify as an acceptable description of the situation. But to my own feeling the sentence is not very good in this context. It becomes notably better (and in fact perfect) when we replace *inadvertently* by *unwittingly*, as in (32.b).

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<sup>20</sup> This helps the intended interpretation, but isn't indispensable. In the given situation we could also say „John inadvertently fetched the Hutchinson girl.“ of that is the girl he brings to the disconcerted parent who called for his help, instead of her own daughter.



- (32) a. ?? Inadvertently John fetched his own murderer from the railway station.  
 b. Unwittingly John fetched his own murderer from the railway station.

The examples in (20) and (21) indicate that there is a difference between *inadvertently* and *unwittingly*. The difference appears to amount to this. As far as I am able to judge, all felicitous examples with *inadvertently* remain felicitous when *inadvertently* is replaced by *unwittingly*; this is true for the examples we have considered so far, and my guess is that this is so in general. But as we have just seen, the converse is not true; for in the situation I have described (32.b) seems to be acceptable while (32.a) is not.

The admissibility conditions for *inadvertently* are thus stricter than those for *unwittingly*. But what precisely does this greater strictness consist in? The comparison of the scenarios for (31) and (32.a,b) is I believe an important clue. In both cases the action description that is provided by the sentence is unforeseen by the agent. But only in the case of (31) is there an actual incompatibility between that description and the intention that the agent wanted to carry out. I will assume that *inadvertently* and *unwittingly* share the element of unexpectedness, but that they differ in that *inadvertently* requires in addition an actual inconsistency with the executed intention.

How does this hypothesis fare in the light of our Oedipus example? I claimed that Iocaste could be described as having inadvertently married her son. According to the hypothesis this implies an inconsistency between that description and the intention she had when she married. But is there such an inconsistency? If we think of the intention she had in marrying as *de re* – with the content: “I want to marry this man, who, by some stroke of fortune, has come into my life just as my husband had met his tragic end.” – then there is no inconsistency. However, we may assume that it is part of any normal desire to marry a man, and one that is all the more deeply rooted for being implicit, that that man is not one’s own son (or father, or, in many cultures, brother). And that it is therefore part of the intention to marry that one marry someone who isn’t one’s son. If Iocaste’s intention in marrying Oedipus is understood in this way, then what she did was inconsistent with what she wanted and the example doesn’t

contradict the hypothesis. But the example shows that the hypothesis can be upheld only if we construe intentions broadly enough.

Exactly how broadly, that is a question I must leave for closer scrutiny at some later time. There is a line to be drawn between the case of Locaste, who doesn't intend to marry her own son, even though that thought may never have occurred to her at the time, and that of John, who we may assume never thought of the person he was going to fetch from the station as his murderer-to-be. But it is not clear to me at this point how that line should be defined.

The difference between *inadvertently* and *by mistake* is fairly clear. When *by mistake* occurs as an adjunct in an action sentence, it says of the action it describes that some mistake was involved in its performance. One possibility is that the mistake takes the form of a mismatch between the description provided by the sentence and the intention that it was the execution of. In such cases the mismatch may be of any kind. Thus, in (20.b), repeated below, the mistake may be that John wanted to open some other door, but mistook the one referred to in the sentence for the one he wanted to open. Or he may have wanted to close the door, which was ajar when he got to it, but which, by some remarkable clumsiness, he ended up opening instead of closing.

(20.b) John opened the door by mistake.

However, the mismatches that justify the use of *by mistake* need not be mismatches between the description given by the sentence and the intention of the agent whose execution resulted in the described action. They may also be mismatches between that description and something else - the intention or desire of some other person, which the agent is trying to satisfy, or some instruction or prescription with which he is trying to comply. For instance, someone may have asked John to open the window, but he didn't hear correctly what he was told, thought he had been asked to open the door, formed the intention fitting that request and then executed that intention flawlessly. It is because *by mistake* also covers discrepancies of this sort that it be used quite happily in conjunction with *fetch* in cases where *inadvertently* cannot. Thus (21.b) - "John fetched his daughter from the kindergarten by mistake." - can be used in a situation where John, the father of twins one of which, Debbie, is a girl and the other, Bud, is a boy, has been

rung up by his wife with the request that he fetch Bud from the kindergarten. But he misunderstood, thought it was Debbie that he should pick up and that is what he did. In this scenario (21.b) seems all right, whereas (21.a) does not. And the reason for this is, I contend, that as I have presented the story there is no discrepancy between the description that the sentence gives of John's action and his own intention. It was the intention itself that fell short of the purpose it was meant to serve, viz. to satisfy the request made by John's wife. The mistake is not in the execution of the intention but in the intention itself.

It seems, then, that *by mistake* signals a discrepancy between the given action description and some intention, instruction or prescription that figures in the causal chain that led to the action, and of which the action can be seen as a – possibly indirect – implementation. The main difference with *inadvertently* is that the discrepancy indicated by the latter is more restricted; there the discrepancy is always between the given description of the action and the intention of which the action is the direct execution.<sup>21</sup>

In the light of what has been said about *inadvertently* and *by mistake* it should be reasonably clear how lexical entries for them can be stated formally. In either case we are dealing with 3-place relations between an agent  $x$ , an action  $e$  and an action description  $\hat{e}.K(e,x)$ . But in order to state these entries we need yet another extension to our formalism.

The relation expressed by *inadvertently* presupposes that  $e$  is an action, i.e. that it is the execution of a certain intention on  $x$ 's part, whose content we may assume to be  $\hat{e}.K'(e)$ . And what *inadvertently* says about these four elements is:

- (i)  $K$  and  $K'$  are incompatible (or, what comes to the same thing,  $\hat{e}.(K(e) \& K'(e))$  is an inconsistent property); and
- (ii)  $K'$  was not a property that  $x$  considered as one that his action  $e$  would or might satisfy.

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<sup>21</sup> *Unwittingly* covers certain cases where *by mistake* is not possible. An example is (30.b). Here there is no mistake of any kind – the agent does exactly what his intention tells him – nor does the case involve any other intentions to which the action stands in a relation of indirect realisation. That things would work out the way they did according to the story, with John being killed by the person he went to the station to meet was bad luck, but it wasn't a matter of something having gone wrong with the action of meeting the person as such.

The entry for *by mistake* differs from that for *inadvertently* as follows. It requires reconstruction from the context of some content of an intention, instruction, request, etc. which *e* can be seen as an attempt to satisfy, but which need not be the intention of which *e* is the execution, and it asserts incompatibility between  $\hat{e}.K(e)$  and that content.

The additional machinery that is needed for stating the entry for *inadvertently* involves two new predicates. First, we must add a new mode indicator to our repertoire of propositional attitudes. This is the type of attitude that consists in entertaining the possibility that some real or imagined object might have a certain property. I will represent this attitudinal mode as ENT (for "entertain"). Entertaining is a propositional attitude in that its content will always be a proposition, to the effect that the entity at issue has the given property. However, the contents of attitudes of type ENT will always be propositions of this particular form; moreover, the entity in question will always be given by a discourse referent that is declared in some other attitude belonging to the same attitudinal state (i.e. a discourse referent that belongs to the universe of the DRS that represents the content of that other attitude). In the few applications of ENT that I will give here I will always present the propositional content of an attitude of this type as a DRS consisting of a single condition of the form " $(\hat{e}',K(e'))(e)$ ", where *e* is the action in question, and " $\hat{e}',K(e')$ " represents the intended property.<sup>22</sup>

The second predicate we need is one that states that two properties are incompatible. I will use INCOM to express it. As we have seen, this predicate is needed as a (higher order) predicate whose arguments are event predicates. (In our applications these will be given in the forms  $\hat{e}.K(e)$  and  $\hat{e}.K'(e)$ .) We noted that INCOM could be defined as inconsistency of the corresponding conjunction  $\hat{e}.(K(e) \& K'(e))$ , but

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<sup>22</sup> In earlier work I have made use of the attitudinal mode indicator WON (for „wonder“). This is the attitude of someone who wonders whether a certain proposition is true. ENT is much like WON. However, the particular use of ENT we need here, where the entity of which a certain property is being contemplated is declared in an intention, is not among those that WON was meant to cover (and for which the verb *wonder* doesn't seem quite the right description.) WON was intended to be restricted to those cases where all discourse referents occurring in the content of the attitude but not declared within the content itself are declared in beliefs or anchors. Cases of ENT for which that condition is satisfied may, for all I can see, be subsumed under WON.

that is little help in addressing the real difficulty that is connected with the notion of incompatibility that is needed here. Two predicates are incompatible iff the non-existence of something that satisfies them both can be inferred. And this means in practice that the incompatibility that matters here is infected with the same problems as the notion of inference in terms of which it can be defined. And the problems that attach to the notion of inference that is relevant here - inference in natural language and, more generally to inference in the context of our daily existence, are notorious. For one thing such inferences tend to depend on a multitude of assumptions about the regularities of the world in which we live - how it is organised and about how it evolves in time; and secondly they are subject to various forms of non-monotonicity - default principles, second order rules of precedence according to which one first order principle can overwrite another, and so forth. None of all this is nearly as well understood as it should be, How much of it is relevant to the particular applications of incompatibility that are needed in the present context is hard to say, but it is hard to say in part precisely because the mechanisms themselves are still so poorly understood. As things stand our use of INCOM should be seen as a reminder of this large unsolved problem that also affects the notion it represents, in ways and to an extent that we are unable to estimate.

There is also a more specific issue that affects the notion of incompatibility we need. Incompatibility between the agent's intention and the description that a sentence gives of the result of its execution often depends on what may be called the "uniqueness of thematic roles". This is the principle that the events that are described in natural language uniquely determine their participants - agent, patient, beneficiary, instrument, time, etc. That this is so is part of the logic and metaphysics of the domain of events (or at any rate of that event domain that is directly relevant for the semantics of natural language). It is because of this that there is incompatibility between, for instance, the property of being an event of x fetching child y from the kindergarten and the property of being an event of x fetching a child with a feature F that y is known not to have. Since each fetching event is assumed to have a unique "fetchee", an event satisfying both properties would be one whose unique "fetchee" would both have and not have F.<sup>23</sup> Making the effect of the uniqueness of roles on

<sup>23</sup> This of course is not to deny that there are events whose themes consist of several individuals. For instance, an event of fetching can be an event of fetching two

incompatibility explicit looks like a much more tractable problem than dealing with the world knowledge and non-monotonicity aspects of inference. But it too is something that I won't try to work out.

Formalisation of the entry for *by mistake* also requires a new predicate, for the relation of "mediate implementation" of an intention, desire, instruction, request, etc. This is a relation between an event property  $E$  and an action  $e$ . As stated above, it is the relation which holds when  $E$  is the content of an intention, desire, etc. that is part of a chain that ends with an intention of which  $e$  is the execution, and where the chain is such that  $e$  can be regarded as the attempt to satisfy  $E$ . We will use IMPL for this relation. Here too I refrain from a closer analysis of the predicate.<sup>24</sup>

We are now almost ready for the entries for *inadvertently* and *by mistake*. There are just three further matters that need a decision. The first has to do with the internal structure of these two expressions. *by mistake* is obviously composed of the preposition *by* and the noun *mistake*. *inadvertently* too has an internal structure, whose constituents are the adjective *inadvertent* and the adverb-forming morpheme *-ly*. (One could try to go even further and analyse the internal structure of the adjective *inadvertent*.) In neither case will I try to reduce the meanings of these "compounds" into those of their constituents. That is left for another time (and for someone who thinks it is worth doing).

The second question has to do with the way in which the semantic representation of a VP adjunct is combined with that of the VP to which it is adjoined. I assume that the semantic representation of the VP provides three distinct constituents: (i) the discourse referent  $e$  for the eventuality it describes, (ii) the discourse referent  $x$  for the agent (to be filled by the subject NP of the sentence) and the description  $\hat{e}.K_{VP}(e,x)$  that the VP gives of  $e$ . As we have seen from our informal discussion of

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children. But in that case it is the set of those two children that is the theme of the event, and the event of fetching e.g. the first of those two children, while being an event whose existence is arguably entailed by the existence of the first event, is not identical with it. On the view presented it cannot be.

<sup>24</sup> Chains of the kind that IMPL refers to implicitly typically involve communicational links, in which one agent conveys a desire, supplies a piece of advice or issues an order or instruction to another. To state more precisely what such links are like and thus what the chains are that consist of such links seems well within our current reach. But this too is a task for some other occasion.

the meanings of *inadvertently* and *by mistake*, both these components are needed as inputs to the contributions they make. In the entries below I will state these inputs in the form of place holders in the top tier of the entry, just as we have represented the arguments of verbs in their lexical entries in Section 2 and the entries for *fetch* and *open* in this section. I take it to be part of the syntax and semantics of adjunction that these place holders are filled with elements that are supplied by the adjunction site in the way just described, but will not go into that matter further here.

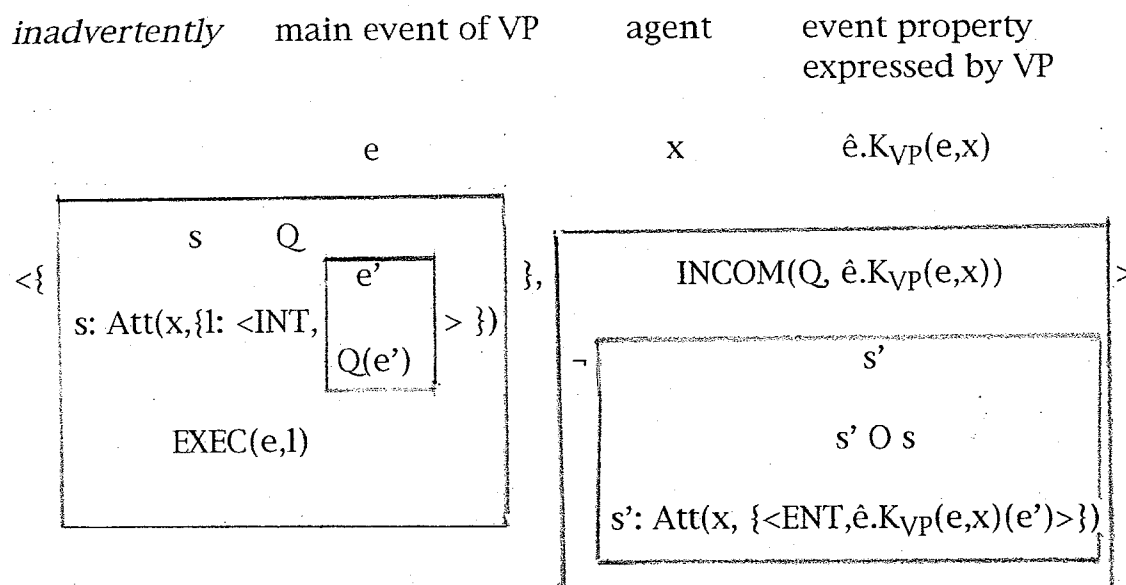
The final matter that should be settled in advance of the actual entries for *inadvertently* and *by mistake* is the question what in these entries should be considered presuppositional and what non-presuppositional. I take it to be a matter of presupposition that the event  $e$  is an action that was the execution of some intention of the agent  $x$  who is the subject of the sentence whose VP provides  $e$  and  $\hat{e}.K_{VP}(e)$ .<sup>25</sup> I also assume that for any event  $e$  that is the execution of some intention the intention of which it is the execution is uniquely determined. Finally, in the case of *by mistake*, there is an anaphoric presupposition for the content  $Q'$  of the intention (or desire, request, etc.).  $Q'$  must be recovered from the context and must be such that the intention etc. of which it is the content must stand to  $e$  in the relation IMPL. As we have seen, the default solution for  $Q'$  is to identify it with the content  $Q$  of the intention of which  $e$  is the direct execution, in which case IMPL reduces to EXEC.

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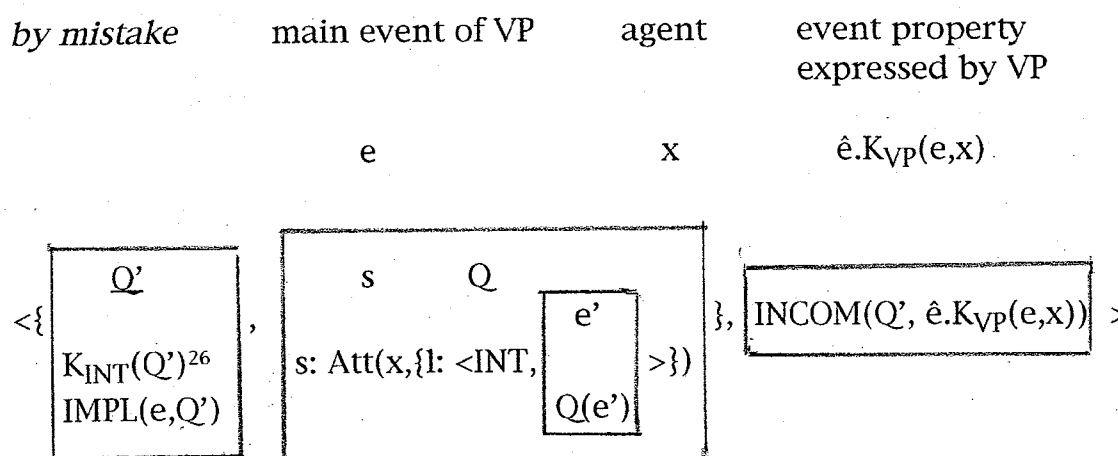
<sup>25</sup> What speaks in favour of treating this kind of information as presuppositional is that it can be seen as a kind of selection restriction on the arguments of intention-denying adverbials.

(33) (lexical entries for *inadvertently* and *by mistake*)

a. (entry for *inadvertently*)



b. (entry for *by mistake*)



<sup>26</sup> Here  $K_{INT}(Q')$  is a stop gap for the sort of disjunction of possibilities hinted at in the text:  $Q'$  could be the content of an intention, or the content of someone's desire, or the content of a request, and so on. I will not bother to make this more precise. Note that in principle the information that is covered by  $K_{INT}$  could also be packed into the analysis of the predicate  $\text{IMPL}$ .



I believe it is instructive to see how these entries work out in a couple of examples. So we will look at the effects they have on the construction of semantic representations for the sentences (20.a,b) and (21.a,b). We begin with (20.a).

(20.a) John opened the door inadvertently.

I assume that the semantic representation of the VP *open the door* is as given in (32). The most important aspect of this representation has to do with the fact that *open* is an action verb that is not hard-wired for intention. As we have argued, this entails that each event described by the verb is an action and thus the execution of some intention, but not necessarily of an intention whose content is given by the VP, in which *open* occurs as main verb. (cf. entry (23) for *open* earlier in this section.) In (28), the representation of a sentence with *open* but without an intention-denying adverb, there was no problem with including the information that *e* was the execution of some intention. But in the presence of *inadvertently* its presence is a potential source of trouble. The reason is that this is information that should *not* be part of the event property that the VP offers as input to the intention-denying adverb, For if it were included in this property, and thus part of the input that is fed into the entry, then that would lead straight into circularity or infinite regress.

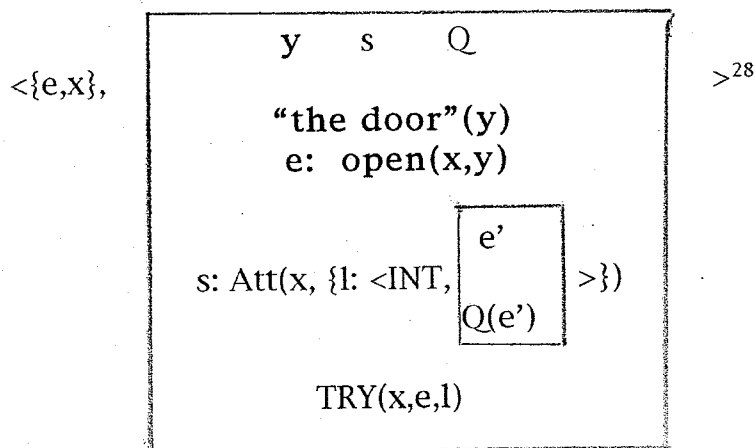
It is therefore necessary to divide the VP representation into two parts, the part that does feed into the representation of *inadvertently* - call this the *event description narrowly conceived*, or simply *narrow event description* - and the part which does not. Below I will indicate this division by putting the bits that belong to the narrow event description in boldface.<sup>27</sup> Note however that when the entries for action verbs are given in the form exemplified in (24), where the part of the semantics of the entry that is not part of the narrow event description has been eliminated in favour of the feature "Action verb", the characterisation of narrow content becomes very simple. it is what we get when the information contained in the feature "Action verb" is not unfolded. Semantic operations that involve narrow event descriptions can thus be characterised as operations which ignore this feature.

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<sup>27</sup> But this is just a cosmetic device introduced on the fly. I am unsure what to suggest as „official notation“ for the division between narrow and full event descriptions.

To simplify things somewhat I have treated the NP *the door* in (34) as a referential expression which introduces a discourse referent  $y$  whose referential identity is fixed by the condition “the door”(y),

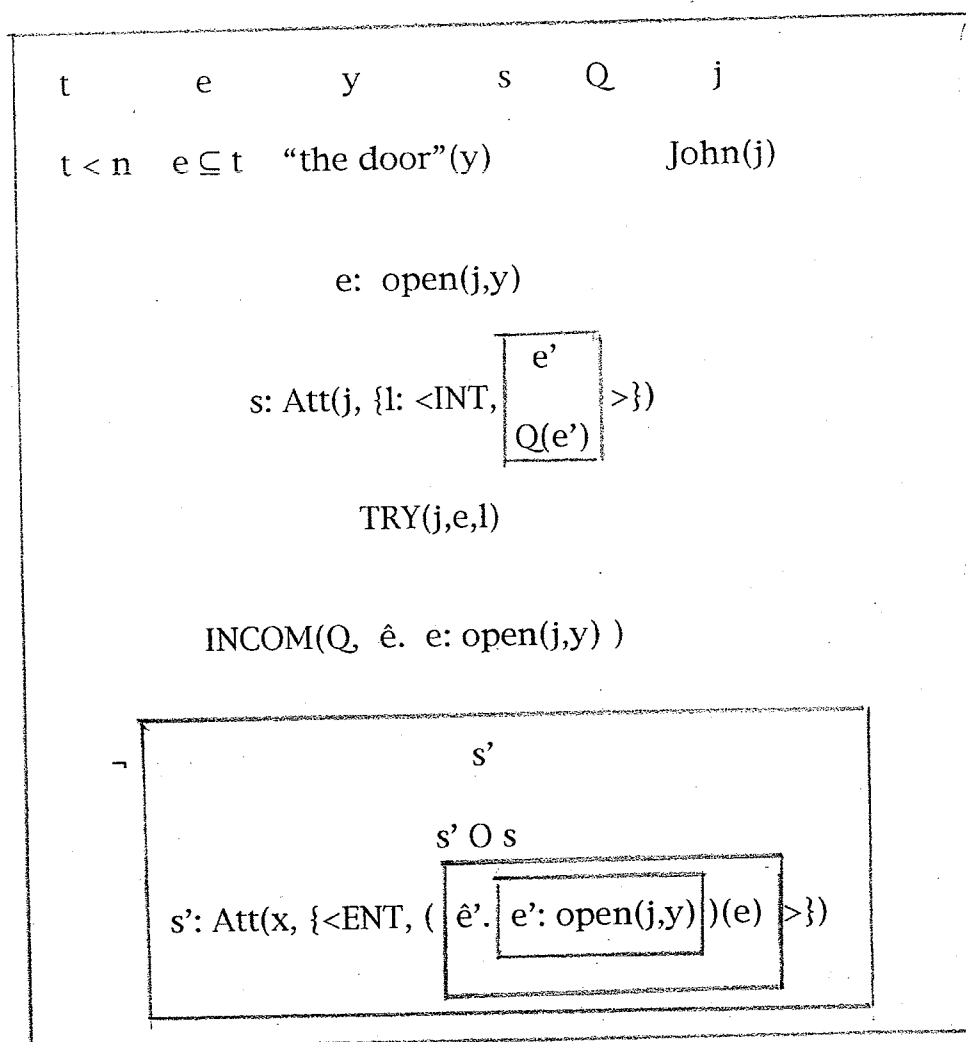
(34)



The first thing that must be done when (34) is combined with the entry (33.a) for *inadvertently* is the justification of the presupposition that is specified in the entry. Now (34) contains an attitude of the right kind, which provides the prima facie justification of this presupposition. In fact, since the intention of which  $e$  is the execution is uniquely determined by  $e$ , the intention represented in (34) *must* be the same as the presupposed intention of (33.a). Therefore the non-presuppositional part of (33.a) entails that the content  $Q$  of the intention in (34) is incompatible with the narrow event description in (34). In other words, the intention that led to  $e$  is different from (and inconsistent with), the way  $e$  is described in (20.a). (35) gives the representation of the entire sentence after (34) has been combined with the entry for *inadvertently* and subsequent to that, with the information provided by tense and with the subject NP.

<sup>28</sup> The first component of this representation is a „variable store“. The discourse referents in this store will be bound at some later stage of the representation construction.

(35)



We next turn to (20.b).

(20.b) John opened the door by mistake.

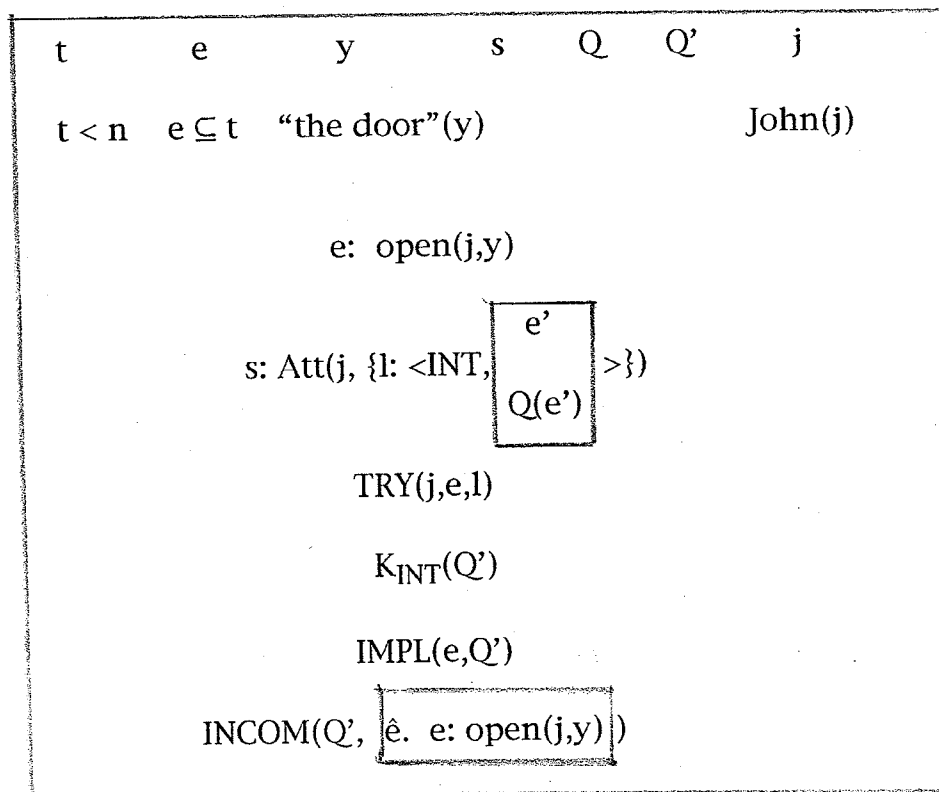
This time the semantic representation of the lower VP<sup>29</sup>, (34), must be combined with the lexical entry in (33.b). The difference with the construction of the previous DRS is that the entry of *by mistake* requires the resolution of two presuppositions, that for the agent's own intention of which e is the execution and that of the event property Q'. In principle it is possible to use the Att-condition in (34) to resolve both of these. In that case Q' gets identified with Q, and the mistake reduces to a discrepancy between the narrow event description provided by

<sup>29</sup> What is meant here is the VP without the adjunct by mistake. Recall that adjunction duplicates the node label of the adjunction site, creating a higher node with the same label which includes the adjunct together with its site.

(34) and the intention of John whose execution resulted in  $e$ . This is an interpretation that differs from the one in (35) only in that it is silent on the question whether John contemplated the possibility that his action might be describable as an opening of the given door. Since it should be clear how this representation resembles (35) and also where the two differ, we won't bother to display it.

It is my impression that this interpretation of (20.b) should be considered as the default, which is preferred unless additional contextual information is available to force the interpreter in a different direction. But even without such additional information it would seem possible to interpret this sentence also in such a way that  $Q'$  is not identified with the content  $Q$  of the intention of which  $e$  is the execution. In that case the mistake is not a discrepancy between that intention and the narrow event description provided by (20.b), but rather between that description and some intention, request or whatever of someone other than John, which John wanted to comply with by performing  $e$ . For good measure the representation of this interpretation, in which  $Q'$  and the conditions accompanying it in the lexical entry for by mistake have been accommodated, is displayed in (36).

(36)



Our next target is (21.a). We repeat it here jointly with (21.b).

- (21) a. ?? John fetched his daughter from the kindergarten  
inadvertently.  
b. # John fetched his daughter from the kindergarten  
by mistake.

This time we have a conflict. As in the case of the previous two sentences, we start with the semantic representation of the lower VP. Note that since we are now dealing with a hard-wired intentional verb, the intention of which the described event is the execution must match the description of the event provided by the sentence. In other words, we now know in advance what the intention was whose execution produced e. The representation of the lower VP is given in (37)

(37)

<{e,x},

e1 e2 e3 y l1 l2 l3 s

e1 < e2 < e3 x's daughter(y)

e = e1 ⊕ e2 ⊕ e3

e1 : MOVE(x) SLOC(e1) = l1 ELOC(e1) = l2

e2 : TAKE(x,y) LOC(e2) = l2

e3 : MOVE(x ⊕ y) SLOC(e3) = l2 ELOC(e3) = l3

s: Att(x, {l: <INT, {

e' e'1 e'2 e'3

n < e' e'1 < e'2 < e'3

e' = e'1 ⊕ e'2 ⊕ e'3

e'1: MOVE(i) SLOC(e'1) = l1

ELOC(e'1) = l2 e'2: TAKE(i,y)

LOC(e'2) = l2 e'3: MOVE(i ⊕ y)

SLOC(e'3) = l2 ELOC(e'3) = l3

EXEC(x, e, l)

It should be clear that combining this DRS with the lexical entry for *inadvertently* leads to an inconsistency. As we saw in connection with (20.a), the presupposed intention of the entry must be identified with the non-presuppositional intention condition of the VP representation. This identifies Q with the intention content of (37). But that content is indistinguishable from the narrow content of the VP. So the incompatibility between Q and this descriptive content that *inadvertently* requires is excluded in this case.

The matter is different for (21.b). Since *by mistake* doesn't insist that the content Q' that is involved in the incompatibility it requires be that of the executed intention, we can arrive at a coherent interpretation provided we do not identify Q' with Q, but construe Q' as the content of the intention, desire or whatever of someone else which stands to e in the required implementation relation. Since the executed intention is indistinguishable from the narrow event description of (21.b), it follows that the mistake is already contained in John's intention. Note that this interpretation is different from the one I took to be the default interpretation of (20.b). This was the reason for marking (21.b) with a #, when the sentence was first presented at the outset of Section 3; # was meant to indicate that while (21.b) does admit a coherent interpretation, it is not the one that mimics the most prominent interpretation for (20.b). We conclude the section with the semantic representation for (21.b)

(38)

t e e1 e2 e3 y l1 l2 l3 s Q' j  
 t < n e ⊆ t x's daughter(y) John(j)

e = e1 ⊕ e2 ⊕ e3 e1 < e2 < e3

e1: MOVE(j) SLOC(e1) = l1 ELOC(e1) = l2

e2: TAKE(j,y) LOC(e2) = l2

e3: MOVE(j ⊕ y) SLOC(e3) = l2 ELOC(e3) = l3

s: Att(x, {l: <INT, { e' e'1 e'2 e'3 >}})

n < e' e'1 < e'2 < e'3

e' = e'1 ⊕ e'2 ⊕ e'3

e'1: MOVE(i) SLOC(e'1) = l1

ELOC(e'1) = l2 e'2: TAKE(i,y)

LOC(e'2) = l2 e'3: MOVE(i ⊕ y)

SLOC(e'3) = l2 ELOC(e'3) = l3

EXEC(j, e, l)

K<sub>INT</sub>(Q')

IMPL(e, Q')

INCOMP(Q', e')

e' e'1 e'2 e'3

n < e' e'1 < e'2 < e'3

e' = e'1 ⊕ e'2 ⊕ e'3

e'1: MOVE(j) SLOC(e'1) = l1

ELOC(e'1) = l2 e'2: TAKE(j,y)

LOC(e'2) = l2 e'3: MOVE(j ⊕ y)

SLOC(e'3) = l2 ELOC(e'3) = l3

I conclude this section with a comment on what it has tried to do and what I take to be the prospects of more work along the lines of what has been proposed and suggested.

The first point that needs emphasising once more is that the formal proposals of this section rest on what is at this point very slim evidence. First there is the matter of judgements about the acceptability and the possible interpretations of particular sentences. The set of sentences that we have looked at is very small, judgements seem subtle and difficult, and I have so far had far less benefit of input from native speakers than I should have had and that even generous methodological standards would require. Directly connected with this insufficient empirical groundwork is what I myself see as the dubious basis of the semantic analyses I have proposed for those lexical items for which explicit entries have been given, i.e. the verbs *fetch* and *open* and the adverbs *inadvertently* and *by mistake*. As we have seen, these entries account for the few data that they have been used to explain reasonably well; but I wish I was more certain than I feel I have a right to be that this is not just a case of two nicely dove-tailing fantasies.

But while I am uncertain about these details, the work that led to this section has given me a strong conviction that there is something right and important about the basic tenor of it – that a crucial aspect of the meanings of many intention-related verbs has to do with how the descriptions that the verb provides of its referential arguments relates to the intentions that produced them; and that it is these relations that play a decisive part in the semantics of what I have called “intention-denying” modifiers and the clearly subtle differences between them.

As far as I know this is fairly new territory, and the very few verbs and modifiers that have been discussed here constitute only a very small fraction of that part of the vocabulary for which the semantic factors and mechanisms to which I have drawn attention are likely to play a role. So what is needed, assuming that I have not been barking up a totally wrong tree, is (a) a closer a more broadly based exploration of the expressions on which I have concentrated, and (b) a similar investigation of a much larger portion of the relevant vocabulary, and that not just for English, but also for other languages, beginning perhaps with those that are not too distant from English. (I myself am thinking in particular of German and Dutch, but that primarily because



those are the languages where I can hope to be able to make some sense of other speakers' judgements.)

A particularly natural extension, as has been suggested by some of those to whom I have given a preliminary presentation of this material is to those modifiers that are not intention-denying, but rather intention-asserting, such as *intentionally* or *on purpose*. One would expect that these produce effects that are complementary to those that we can observe with the intention-deniers. A perfunctory look at such expressions gives me the impression that is expectation is confirmed.

### 3.3 *Try again.*<sup>30</sup>

In Section 2.3 I gave an entry for the verb *try*, more precisely for those uses in which it combines with a *to*-infinitive. What we did not address there is the question how *try* combines with *to*-infinitives to yield the right sentence representations. The reason why this is a problem that deserves attention is that the verbs whose *to*-infinitives make good complements to *try* are typically action verbs. But the contribution that the *to*-infinitive of an action verb makes to the phrase that results when it is combined with *try* does not involve the infinitive's full meaning, but only what we have called its narrow event description. For instance, consider the sentence (39).

(39) John tried to open the door.

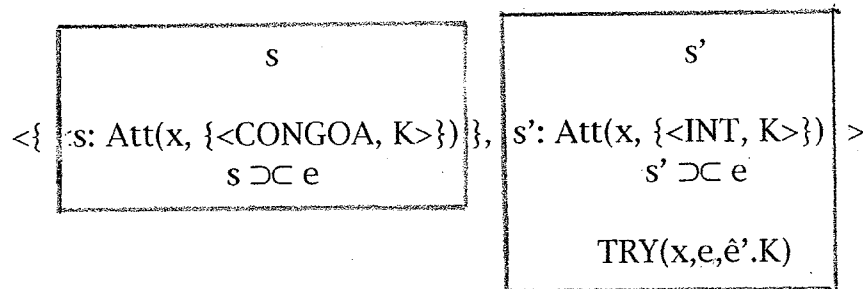
What this sentence says is that John made an attempt to execute the intention to instantiate the event property  $\hat{e}$ .  $\langle e|e:\text{open}(j,d) \rangle$ . It does not mean that John tried to bring it about that he had an intention to do something the execution of which would lead to his opening the door. This is not to deny, of course, that the meaning of (3) does involve an intention. But that intention is contributed by TRY, and it is necessarily the intention to open the door, not some other intention whose execution might have led to the door being opened. And that intention is contributed by the TRY-condition that occurs as part of the lexical entry of *try*. We recall in this connection that this lexical entry makes explicit that the content of the intention of which the event described by *try* is the execution is given by the *to*-infinitive that complements it. We repeat the entry here for easier reference.

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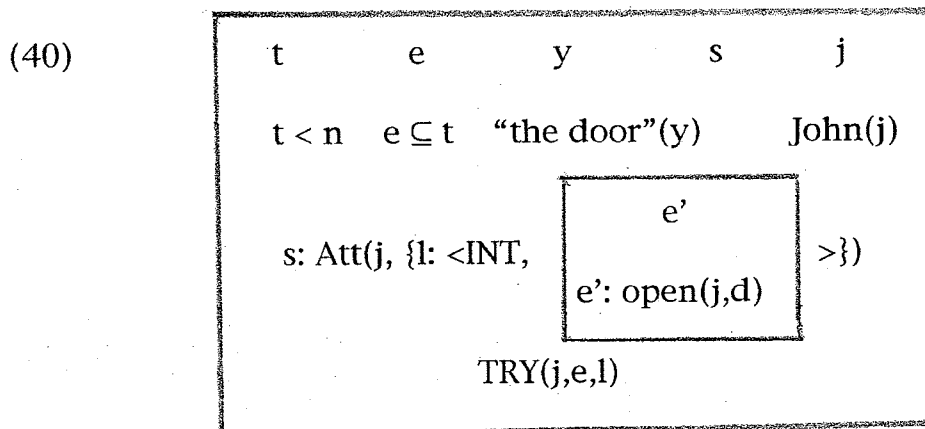
<sup>30</sup> I owe the point addressed in this section to an observation by Katja Kasinskaja.

(15)	<i>try</i>	NP Nom	<i>to</i> -infin.
	e	x	$\hat{e}.K$
<u>Logical Type</u>	eventual.	individual	eventual.
<u>Select. Restr.</u>	event	agent	type

Semantics



It should be clear that we get the right representation for (39) using the entries we have given for *try* and *open*, but only when we identify the DRS K from the entry for *try* with the narrow event description provided by the infinitival VP (*to*) *open the door*. The representation that results in this way is given in (40).



In the case of *try* the restriction to the narrow event description provided by its infinitival complement is essential, since otherwise we run into self-referential circularity. If we take the contribution of the *to*-infinitive whose verb is an action verb to be the full event description we get for the VP which consists of *try* together with this infinitival complement a semantic representation in which there are two intentions of which the described event (i.e. the referential argument of *try*) is the execution: (i) the intention implied by the TRY-condition,

[no page 63!]

## 4. Plans and their Execution.

### 4.1 Simple Linear Plans.

So far we have dealt with the successful and unsuccessful execution of intentions, without paying much attention to the internal structure of what is intended, or, for that matter, to the structure of the action or actions that the agent will undertake in order to realise his intention. For some purposes this is adequate, but for many others it is not. Much of our purposeful actions take the form of pursuing our goal in a way that is not only premeditated but also planned, with varying attention to detail. Even such comparatively trivial actions as making a pot of coffee or buying a railway ticket involve plans consisting of a number of actions, typically in some particular order, with each new action that has been accomplished creating the basis for carrying out the next action of the plan. The plans that we run through when we go about our lives are often routine. This is true in particular when we perform daily chores. There is usually no need to plan each new performance carefully; we can just rely on a schematised plan that we have put together for tasks of the given type once and for all, a plan which we have followed on many similar occasions before and that we can now re-instantiate once more, simply taking it, you might say, "off the shelf", and putting it into effect almost without thinking.

But even in such cases executing the plan will usually involve careful checking of what we are doing while we are at it and how the things we are doing work out - how well or badly they fit the specifications of that part of the plan that concerns them. And when things do go wrong, then we are often not only in a position to note this, but also to change the plan in such a way that the errors that have already occurred can be corrected and others that have now become more likely can be avoided.

Both with such prefabricated plans for actions, which are wholly or largely routine and standardised, and plans that have been developed for a given occasion - on those occasions when we "plan our actions", as common parlance has it -, execution typically involves the two-way interaction with the world that I emphasised in the introduction - efferent interactions through our actions on the world, which change it in certain ways and afferent interactions through our observation of

standing for the first sense of having a plan, while we use the mode indicator INT to indicate the second. Thus the examples of intentions that we have considered so far can all be considered as special cases of the more general notion of intention defined here, intentions which are special in that their content is like that of those considered in sections 1 - 3 in that they specify just the goal, but none of the means towards it. Plain intentions of this special kind are, you might say, intentions that either don't need a plan, or for which no plan has yet been made.

As far as the logic of plans is concerned, the following principles (42) - (44) below should be obvious from what I have said. First, having a plan in the first sense implies that one believes that by performing events  $e_1, \dots, e_n$  of types  $E_1, \dots, E_n$ , one will bring about a state  $s$  of type  $S$ . Second, having a plan in the second sense entails having it in the first sense, and third, having a plan in the second sense entails (i) intending to realise a state of type  $S$  and (ii) to performing each initial segment  $\langle e_1 \dots e_k \rangle$  of the means that the plan specifies towards that end. To state these principles somewhat more concisely we abbreviate the content of the plan in (41) as  $\langle e'_1 \dots e'_n \text{ s } x'_1 \dots x'_m \rangle$  MEANS( $e'_1, \dots, e'_n, E_1, \dots, E_n$ ); GOAL( $s', S$ ) and use similar abbreviations for MEANS and GOAL separately. By MEANS( $e'_1, \dots, e'_n, E_1, \dots, E_n$ ) I will understand the set of conditions in (41) that involve the event predicates  $E_1, \dots, E_n$  together with the condition " $e'_1 < e'_2 < \dots < e'_n$ "; by GOAL( $s', S$ ) I understand the singleton set whose only member is the condition of (41) which involves  $S$ .

(42) states that a plan for reaching the goal GOAL( $s', S$ ) must be accompanied by the belief that successful performance of events of the types  $E_1, \dots, E_n$  will lead to the goal's realisation. Thus the notion captured by PLAN is a fairly strict one. We often talk of plans for achieving some goal also in cases where we are not sure that the plan will actually work. But that is a weaker notion of planning than the one formalised here.

The force of (43) is in the opposite direction. It states a one-way implication between plans and the intentions to carry out the various stages of those plans with the realisation of their goals as final result. Each plan schema of the general form (41) can be the content of a corresponding intention to actually put the plan into action. (43) asserts that having that intention entails having the plan. But the converse need not hold. Someone can have a plan - in the strict sense intended here, according to which having it entails believing that the

(44.i)  $\langle \text{INT}_X, \langle e'_1, \dots, e'_n, s', y'_1, \dots, y'_m \mid \text{MEANS}(e'_1, \dots, e'_n, E_1, \dots, E_n); \text{GOAL}(s', S) \rangle \rangle$   
 $\Rightarrow \langle \text{INT}_X, \langle s', y'_1, \dots, y'_m \mid \text{GOAL}(s', S) \rangle \rangle$

(44.ii)  $\langle \text{INT}_X, \langle e'_1, \dots, e'_n, s', y'_1, \dots, y'_m \mid \text{MEANS}(e'_1, \dots, e'_n, E_1, \dots, E_n); \text{GOAL}(s', S) \rangle \rangle$   
 $\Rightarrow \langle \text{INT}_X, \langle e'_1, \dots, e'_k, y'_1, \dots, y'_k \mid \text{MEANS}(e'_1, \dots, e'_k, E_1, \dots, E_k) \rangle \rangle$

From a logical point of view these axioms are very simple. More such axioms will be added as we go along, about these same predicates as well as others that are still to be introduced. None of the other axioms will be very taxing of our logical understanding either. But what matters, both as regards these axioms and those that are still to come, is their status; and this requires a comment.

The axioms are to be understood as *constitutive* of the organisation of mental states. In that sense they are psychological, and they might even be called “psychological laws”. But they are not to be confused with “laws of thought”, either in the sense of stating how one ought to reason or of how people, or at least the normal and sound ones among them, do reason. Rather, they assert that you simply cannot have a plan in the sense that is intended here without believing that the means will yield the end - that the mentioned beliefs are simply *part* of what it is to have such a plan. Such structural principles should be sharply distinguished from inference principles, whether prescriptive in the sense of, e.g. Frege, or as capturing general patterns of thought to which people are generally prone. (Among the principles of this latter kind would be principles of practical reasoning according to which agents arrive at plans for their goals on the strength of what they know about the world - if indeed such principles exist. But this question - How does an agent arrive at a plan of the form of (41) to begin with? - is a matter about which I will have nothing to say here. Nor will I have anything to say about other possible generalisations about the mechanics of human information processing.<sup>37</sup>

<sup>37</sup> I leave it open whether the axioms (42) - (44) and the others of their kin that are still to follow should be seen as necessary constraints on the structure that mental states can have or whether they should be construed as formal characterisations of the notions - those corresponding to the different mode indicators - in terms of which the present theory describes mental states. If and to the extent that the theory has picked the psychologically relevant categories, that difference doesn't really matter - if it can be meaningfully drawn at all.

pattern can be more complicated than that, a direct requirement for achieving goal  $S$  is the realisation of a number of the action types among  $E_1, \dots, E_n$ . For the execution of each of these a number of further actions may be needed (including, possibly, some of those already considered), etc. The upshot of this is a partial order of the Means-events mentioned in the plan: for some of them the order in which they are performed is immaterial; but some of them must be performed before others, and often that is because the former are part of the plan only as means to create the opportunity for performing the latter. The linear order that is adopted in plans of the form given in (41) is thus in general partly arbitrary – things just have to be done in some order, since you cannot do everything at the same time – but in some other part imposed by the very nature of the action types from which it is made up.<sup>38</sup>

Here is one way of formalising these ideas. First, we need a formalisation of the notion of what it is for an agent  $x$  to be able to perform an event of type  $E$  at a time temporally included in a state  $s$ .  $x$ 's ability to perform an event of type  $E$  at a given time  $t$  is a notoriously complex relation which depends on the one hand on  $x$ ' general capacities and on the other on the circumstances that obtain at  $t$ . I will make no attempt here to come up with a proper analysis of this relation and the concepts of capacity and circumstance that are connected with it. I will simply formalise it as a 3-place relation between the agent  $x$ , the event type  $E$  and a state  $s$ , which I take to represent the external circumstances – circumstances in which  $x$  is able to perform an event of kind  $E$  iff the relation holds. I use “CAP( $x, E, s$ )” to represent this relation.

With the help of CAP we can state the first set of beliefs that  $x$  must associate with each event type of a plan of form (42):

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<sup>38</sup> The opposite of the priority relations spoken of in the text is sometimes relevant also: certain actions that belong to a plan must be performed before others because the latter block the performance of the former. For instance, my plan to get dressed may include the action of putting socks and the action of putting on shoes. These two actions have to be performed in the order in which they are mentioned not because you can't put on your shoes before you have put on your socks, but because you can't put on your socks after you have put on your shoes. I will assume tacitly that considerations of this kind also go into the partial order that imposes the relevant necessary constraints on the linear order that is part of plans of the form (41).

When we describe the state type of my being awake as *the* pre-state type associated with the event type of my falling asleep, what exactly do we claim? In order that I can fall asleep, it is arguably not enough that I am not asleep before I fall asleep. Other conditions must be satisfied, e.g. I must be tired or sleepy to a certain degree, it must not be the case that I am not being kept awake by special means (as in sleep deprivation applied to prisoners whose resistance during interrogation one wants to break), or ... . In fact, if I were to insist on defining the pre-state type associated with E as the type covering all and only those states *s* such that if *t* is time at which *s* holds, then there is nothing that would actually prevent an event of type E from happening (starting) at *t*, then I would be in deep waters. But in any case this wouldn't be a notion that would be relevant in the present context. We are concerned with the question what beliefs an agent with a plan must connect with it, and pre-states of the event types occurring in his plan are relevant in that connection only to the extent as he recognises them as such. (Recall what we said above about repeated abduction in plan construction.) It is normally just the most salient preconditions for the execution of a given type of action that the agent perceives, and it is only those that will enter into the beliefs that he associates with his plan.

I will assume therefore that an agent *x* who has a plan of the form (41) associates with some of the event types  $E_k$  that it contains as Means types a pre-state function  $PREST_x(E_k)$ , with which he connects the conviction that it won't be possible for him to perform an action of type at time *t* unless a state of type  $PREST_x(E_k)$  holds at *t*. These beliefs are captured in (46).

$$(46) \quad \langle PLAN_x, \langle e'_1, \dots, e'_n, s', y'_1, \dots, y'_m \mid MEANS(e'_1, \dots, e'_n, E_1, \dots, E_n); GOAL(s', S) \rangle \rangle \\ \& k \leq n \Rightarrow \langle BEL_x, \langle \{ \langle t, e'_k, y'_1, \dots, y'_m \mid \{ t \supset \subset e', E_k(e', i, y', \dots, y'_m) \} \rangle \} \rangle \\ \Rightarrow \langle s \mid \{ t \subseteq s, (PREST_x(E_k))(s, i, y'_1, \dots, y'_m) \} \rangle \rangle \rangle$$

In addition to this necessary condition on the possibility of realising  $E_k$ , *x* can be assumed to associate with his plan also a positive belief, to the effect that a state of the type  $PREST_x(E_k)$  will result when the event types  $E_1, \dots, E_{k-1}$  which precede  $E_k$  in the plan are instantiated in the given order. Beliefs of this kind support those captured by (45). The relevant axiom is given in (47)



## 4.2 Watching what you are Doing.

When we act purposefully we watch what we are doing. This is so whether our actions are physical, mental or a combination of both. First physical actions. Physical actions - such as carrying the garbage to the bin, cutting the carrots, cleaning the sink, or putting on a dress, building a shed; but the choice is totally arbitrary - always involve watching of some kind - watching where one is going, watching one's hands, watching the things one is doing something to. If one didn't watch, the thing one is trying to do would soon go off the rails. By the way, not all watching, in the general sense of perceptual control in which the word is intended here, is watching by sight. There are many things we can do "blindfold", as the phrase goes, things we do on purpose, but can do in the dark pretty much as well as we can when there is light - such as finding our way from the bedroom to the bathroom, getting a certain jar off the shelf or shutting up the alarm clock by pushing its button. In such cases we do not use our eyes, but our sense of touch, in our fingers and our feet, and probably other perceptual information as well, of which we are even less consciously aware, such as the draft near the window in the hallway that is always ajar, the cold radiating from an outside wall. (Physical actions by the blind involve such non-visual watching of necessity and the subtlety and precision of their perceptions is a never-ending source of astonishment for the seeing.)

The perceptual control that we exert when acting usually serves a double function: To make sure that what one is doing remains in step with the idea one has of what should happen, and to allow for a final judgement whether the goal has been accomplished or the attempt has failed.

With purely mental actions - looking for a solution to a certain practical or theoretical problem, doing a sum in one's head, trying to find a proof for a mathematical theorem, trying to recall someone's telephone number, or her face, or her name, or the first name of her father - there is "watching" of sorts too. Here too the agent is aware of what he is doing, of the reasoning steps he performs, of the progress he makes, and, in case of success, the awareness that the thing was done right. During the performance of such mental tasks the mechanisms by which we register our own actions is somewhat different from what it is in the case of physical action. For many of the simpler of our conscious

information to her brain. (When she uses a typewriter or computer and has been taught to use the keyboard properly, the feedback may be tactile only; but it will still be there.)

In all these cases the interaction between efferent and afferent causation is intimate and the details depend closely on what kind of action is being performed. This is a trivial but important observation, and it is that especially in the context of this note, in which I have made a point of distinguishing between afferent and efferent processes so that I can say something about how they interact. If all purposeful acting necessarily involves noting what you are doing while you are doing it, then that may make us doubt that a clean separation of efferent and afferent that I have been assuming. Moreover, this is a problem that not only affects the phenomenon of efferent interactions, some of which might have an inseparable afferent component. A similar doubt can also be raised in connection with those interactions which I have treated as the paradigms of afferent interactions, viz. those occurring in visual perception. Do we ever observe without taking some kind of active, controlling part in what and how we are observing? Isn't it that in order to see something we have to look in a certain direction, our eyes have to be accommodated to a certain distance and we must focus - must attend to what we observe? And, *mutatis mutandis*, isn't this the way also where other sensory modes than seeing are involved? Not in all cases perhaps. But certainly a much more careful analysis of what goes on in perceptual processes - a much more detailed phenomenology of perception - is needed than I could give.<sup>41</sup> However, for the considerations of this section the simplification involved in assuming that a neat separation between afferent and efferent processes is, as far as I can see, harmless; and it is certainly convenient.

When a plan is articulated into a number of successive actions of types  $E_1, \dots, E_n$ , then executing it will naturally include checking for each of the instantiating events  $e_k$  whether it really does instantiate  $E_k$  correctly before one moves on to the next subtask (that of performing an action

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<sup>41</sup> A project that I believe to be of the highest interest is to describe and understand these interactions in neuro-cognitive terms, and merely phenomenological analyses may be important preliminaries to such a project. But the present note is not meant as a contribution to an enterprise of that kind.

I should add that I am aware of the very large phenomenological literature on issues relevant to the matter of how afferent and efferent are intertwined. It is a literature that I do not know at all well, but the little I have seen makes me doubtful that as a preliminary to a neuropsychological account it is likely to prove very useful.

The concept of carefulness can be applied not only to successful executions, but also to executions that are not. Call a *partial* execution of a plan of form (41) the execution of some initial segment  $E_1, \dots, E_k$  of the sequence of event types  $E_1, \dots, E_n$  which the plan specifies.<sup>43</sup>

So far, all we have said about careful executions, whether partial or complete, is that for each event type  $E_i$  that the agent instantiates as part of his execution by an action  $e_i$  either a positive or a negative belief concerning the proposition that  $e_i$  correctly instantiates  $E_i$ . But I think it is reasonable to hold that careful execution involves more than that. As soon as the agent reaches the conclusion that some action  $e_i$  he has just performed does not satisfy  $E_i$ , it wouldn't be careful of him to carry on with the execution of his plan in spite of that. Of course he might conclude that the discrepancy between  $e_i$  and  $E_i$  won't affect the further execution of the plan; that it won't prevent the successful instantiation of the remaining event types and it won't endanger the final outcome. But that, I would argue, amounts to a kind of plan *revision*, in which the event type  $E_i$  is replaced in the plan structure (41) by a type  $E'_i$  which *is* satisfied by  $e_i$ , while the rest of the plan remains as before. More about plan revision and plan adjustment below.

It is not just the belief that the action  $e_i$  he has performed doesn't fit  $E_i$  that should stop  $x$  from going on as planned. The conclusion that he

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In addition to these beliefs that shape the agent's picture of the world as he takes himself to "know" it, there may be also propositions which he considers to be probably true (i.e. more likely true than false). Sometimes the term "belief" is extended to cover also such positive probability estimates. These, however, I want to exclude from the domain of BEL: as soon as the agent seriously entertains the possibility that a proposition might be false, that makes it into less than a plain belief, even if he takes there to be a strong bias in favour of its truth.

<sup>43</sup> We can think of the partial execution of a plan of the form (41) as the (complete) execution of a plan whose means are  $E_1, \dots, E_k$  and whose goal is what might be called the „formal result state" of this sequence of even types. The *formal result state* of a sequence of event types  $E_1, \dots, E_k$  is the property of being a state which holds at a time  $t$  in virtue of there having been instantiations  $e_1, \dots, e_k$  of  $E_1, \dots, E_k$  at times  $t_1 < \dots < t_k$  before  $t$ . (The term "formal result state" is taken from the linguistic literature on Tense and Aspect, where it plays a role in the theory of the Perfect.) The successful execution of such a plan, as defined in Section 4.1, is of course nothing more nor less than the correct instantiation of  $E_1, \dots, E_k$ .

his attempt to execute the old plan also account as an initial segment of an execution of the new plan.

An agent is lucky if he can conclude that the discrepancy between  $e_k$  and  $E_k$  is harmless to that extent. Often when we realise that one of our actions doesn't fit our specification for it, damage control will be a more serious problem. In such cases we can either try to perform the  $k$ -th action once more, taking greater care and hoping for success the second time round; or we may locate the source of the problem at some earlier stage of the plan - some of our earlier actions didn't create the preconditions for a successful production of the last action (even if they did meet their specifications) - back up to that earlier point and start over from there, following a plan whose revisions begin with that stage. Or, in cases of even more severe problems, we may decide that the given plan is hopeless and design a wholly new one. Or we simply give up altogether.

There is nothing I have to say about these different possibilities. But there is a related issue to which I want to devote some remarks, and I will do that in the next section. Sometimes we guard in advance against the kind of setback in plan execution that has just been described. We may be able to foresee where things might go wrong with a plan we have drawn up - for which  $k$  actions  $e_k$  that we will perform in order to realise the action specifications  $E_k$  of the plan are likely to go awry. If we consider it a serious possibility that that might happen, and if much hangs on the success of our plan, then we may well decide that the plan isn't good enough as it stands and supplement it with provisions for the contingency that  $e_k$  does not fit  $E_k$ .

As a closing remark to this section, note that failure of  $e_k$  to fit  $E_k$  is not the only reason for coming to see realisation of the Goal of one's plan in doubt. Another one is that  $x$  discovers after he has successfully performed actions  $e_1, \dots, e_k$  that in the state of affairs that he finds himself in after having finished  $e_k$  he isn't capable of performing the next action - in terms of our formalism:  $\neg \text{CAP}(x, s, E_{k+1})$ , where  $s$  is the state obtaining after  $e_k$ . If that turns out to be so, however, this need not be because of a lack of carefulness. What it shows is that the plan wasn't a good one (in the sense defined in Section 4.1) to begin with. For what  $x$  has just discovered is that his belief that successful

circumstances change, not just because of what the agent does himself, but also through the actions of others, and because the world changes with time even when nobody does anything, and in ways that we have limited powers to predict. I may plan a series of stock transactions, but whether they will pay off in the end depends on how the stock market will develop, and that is something about which I can only make educated guesses, partly because I cannot know how other investors will behave, but also because general prosperity, and the stock market as a reflection of that (however imperfect) do not only depend on human doings. Or I may plan the running of my farm for the coming growing season, but the success of my plan will depend heavily on the weather, something that is both outside my personal control and my power to predict.

For these two reasons – uncertainty about my own performance when the time for it will have come and uncertainty about the circumstances in which I will have to perform – it may be impossible for me to be sure now what will be the best way to continue after the first  $k$  stages of my plan have been carried out. If I realise this, I can decide not to plan any further, but to evaluate the situation once I will have reached the point beyond which I cannot predict how things will pan out.

But often there won't be time to do a proper evaluation when that point has been reached. While the medical team deliberates, the patient may die; while the generals confer about the next move, the enemy will deliver the decisive blow. So we have to consider now what the different possible situations could be that we may be faced with then, and make our plan ahead of time for what we should do in the situation as it will then present itself to us.

To repeat then, there are two different reasons why plan execution may run into problems at stage  $k$ . After action  $e_k$  there may be uncertainty about how to proceed from there, either because  $e_k$  doesn't fully match the intended type  $E_k$  or because it is impossible to foresee what the conditions will be under which the next action will have to be performed. As far as the possibility is concerned that  $e_k$  will not fit  $E_k$ , it may be foreseeable that  $e_k$  will fail  $E_k$  in one of a number of different ways; that is,  $e_k$  may turn out to satisfy one of a number of alternative event types  $E^1_k, \dots, E^{e(k)}_k$  all of which are incompatible with  $E_k$  and with each other. Similarly, with regard to the conditions obtaining at the time when  $e_k$  has been performed it may be predictable at planning

In trees of this kind a node  $v$  is a descendant of node  $v'$  iff  $v'$  is an initial segment of  $v$ . So the initial segment relation is nothing other than the reflexive partial order in terms of which trees are often defined. Note that condition (i) entails that when  $T$  is non-empty, then the empty sequence  $\emptyset$  must be among the members of  $T$  and that  $\emptyset$  will always be the root of  $T$ , from which all other nodes of  $T$  descend. Further, if for any given node  $v$  of  $T$   $k$  is the largest number such that  $v^{\wedge k}$  belongs to  $T$ , then that means that  $v$  has  $k + 1$  immediate successors (or “daughters”) in  $T$ , viz. the nodes  $v^{\wedge 0}, \dots, v^{\wedge k}$ . If  $v$  is a node of  $T$ , we understand by  $[v]_{\leq}^T$  the chain  $\emptyset, [v]_1, [v]_2, \dots, [v]_{r-1}$  of nodes that runs from the root to  $v$ , but does not include  $v$  itself. (Here  $r$  is the length of  $v$ ,  $\emptyset$  is the root and  $[v]_i$  is the initial segment of  $v$  consisting of its first  $i$  elements; note that  $v = [v]_r = [v]_{r-1}^{\wedge}$ , where  $j$  is the last element of  $v$ .)

Formally a disjunctive plan will consist of a goal – as before a property of states – and a *plan structure*. A plan structure will be a decorated tree, i.e. a pair consisting of a tree  $T$  and a function that is defined on its nodes. This function, which we will call ‘PL’, tells us for each node  $v$  what the agent should do next if his execution of the plan has led him to  $v$  so far, and under what conditions. The information that is needed in this connection depends on whether the execution has not yet begun, has just begun or has already progressed beyond the first step. Accordingly,  $PL(v)$  will look differently depending on whether (a)  $v$  is the root  $\emptyset$ ; (b)  $v$  is a daughter of  $\emptyset$  (or, in other words, a sequence of length 1) or (c)  $v$  is a sequence of length  $\geq 2$ . The intuitive significance is this. As before, we think of a plan as the plan of a certain agent  $x$  at a certain time  $t$  for achieving a certain goal. However, in connection with disjunctive plans it now recommends itself to draw a distinction that we did not consider in our discussion of linear plans, viz. between plans that are intended for immediate execution and those that are made for future use, and where some future period  $t_{st}$  has been earmarked as setting the temporal limits within which execution is to begin. In both cases we assume that the speaker has a concept of what the current state of affairs is like, that that concept will as a rule have gone into the design of his plan and that it must therefore be treated as an integral part of it. We formalise this concept of the current state or situation as a state property  $C_{\emptyset}$ .  $C_{\emptyset}$  is what PL associates with the root  $\emptyset$ .

This is what the case of plans for immediate and that of plans for delayed execution have in common. To see how they differ, let us focus

satisfy  $E'_\mu$ . Rather,  $x$  will not count on this, but only assume that the action  $e_\mu$  he will produce will have one of a finite set of alternative event properties  $E_{\langle\mu^0\rangle}, \dots, E_{\langle\mu^k\rangle}$  that are specified in the immediate successors  $\langle\mu^0\rangle, \dots, \langle\mu^k\rangle$  of  $\mu$ . If  $e_\mu$  turns out to have the property  $E_\nu$  that is part of  $PL(\nu)$ , and moreover the state of the world directly following  $e_\mu$  proves to be of type  $C_\nu$ , then that combination will determine what  $x$ 's next action should be: he is to follow the guideline provided by  $PL(\nu)$  and perform an action of type  $E'_\nu$ .

This should be enough by way of preliminary to the formal definition of the concept of a disjunctive plan.

(50) *Def. a.* A *disjunctive plan structure* is a pair  $\langle T, PL \rangle$ , where

- (i)  $T$  is a finite tree; and
- (ii)  $PL$  is a function defined on  $T$  which maps
  - (i) the root  $\emptyset$  of  $T$  to a state property;
  - (ii) each node  $\nu$  of  $T$  that is an immediate descendant of  $\emptyset$  to a pair consisting of (a) a state property  $C$  and (b) an event property  $E$ ; and
  - (iii) each of the remaining nodes of  $T$  to a triple consisting of (a) an event property  $E$ , (b) a state property  $C$  and (c) an event property  $E'$ .

(Where  $\nu$  is a node of  $T$  we write ' $E_\nu$ ', ' $C_\nu$ ' and ' $E'_\nu$ ' for the corresponding components of  $PL(\nu)$ .)

b. By a *goal* we understand a property of states.

c. A *disjunctive plan* is a pair  $\langle \text{Means}, \text{Goal} \rangle$ , where

- (i) *Means* is a disjunctive plan structure  $\langle T, PL \rangle$
- (ii) *Goal* is a goal.

$e_{[v]_1}, \dots, e_{[v]_{r-1}}, e_v$  satisfying the types  $E_{[v]_2}, \dots, E_v, E'_v$ , respectively, then directly following there will be a state satisfying the goal state type.

Stating these various beliefs within our formalism is a mere exercise, and even duller than describing them semi-formally, in the way I just did. I will, as part of this exercise, formalise the last three of the beliefs just described. The others are even simpler and all can be turned without difficulty into axioms of the kind exemplified in (42)-(47).

(51) (last three of the beliefs described above of  $x$  at  $t$  associated with a disjunctive plan in the sense of Def. (50))

iv. 
$$\begin{array}{l} e_{[v]_1} \dots e_{[v]_{r-1}} s' \\ C_v(s') \\ e_{[v]_1} < \dots < e_{[v]_{r-1}} \supset C s' \\ E_{[v]_2}(e_{[v]_1}) \dots E_v(e_{[v]_{r-1}}) \end{array} \Rightarrow \begin{array}{l} \text{CAP}(i, E'_v, s') \end{array}$$

v. 
$$\begin{array}{l} s_\mu \quad e_\mu \\ s_\mu \supset C e_\mu \\ C_\mu(s_\mu) \\ \text{TRY}(i, e_\mu, E_\mu) \end{array} \Rightarrow \begin{array}{l} s' \\ e_\mu \supset C s' \\ E_{\mu^1}(e_\mu) \vee \dots \vee C_{\mu^k}(e_\mu) \\ C_{\mu^1}(s') \vee \dots \vee C_{\mu^k}(s') \end{array}$$

vi. 
$$\begin{array}{l} e_{[v]_1} \dots, e_{[v]_{r-1}} e_v \\ e_{[v]_1} < \dots < e_{[v]_{r-1}} < e_v \\ E_{[v]_2}(e_{[v]_1}) \quad E_v(e_{[v]_{r-1}}) \quad E'_v(e_v) \end{array} \Rightarrow \begin{array}{l} S_g \\ e_v \supset C S_g \\ S_g(s_g) \end{array}$$

(In (vi)  $B$  is a branch of  $T$  of length  $r$  and  $S_g$  is the state type of the plan's goal.)



daughters of node  $\mu$  are  $\mu^{\wedge}0, \dots, \mu^{\wedge}n$ . Then these could be given weights  $w(\mu^{\wedge}0), \dots, w(\mu^{\wedge}n)$ . When we think of these weights as probability weights, then we should want that  $\sum_{i=1, n} w(\mu^{\wedge}i) = 1$ .<sup>44</sup>

(In the special case of a main plan with a contingency plan we would have:  $w(\mu^{\wedge}0) + w(\mu^{\wedge}1) = 1$  and  $w(C_{\mu^{\wedge}0} \cap C_{\mu^{\wedge}1}) = 0$ , with  $w(\mu^{\wedge}0)$ , the probability of the continuation according to the main plan, substantially bigger than  $w(\mu^{\wedge}1)$ .)

The assumption that the weights of the nodes  $\mu^{\wedge}0, \dots, \mu^{\wedge}n$  add up to 1 is consistent with my assumptions that having plan carries with it the beliefs recorded in (42), (44) – (47) and those stated in part in (51) (and informally described above (51)). These beliefs express the agent's confidence that the plan optimally fits its requirements – that all its subparts are within the agent's ability and that when he follows the plan (or, in the case of disjunctive plans, follows the path that the circumstances will dictate), then he is bound to achieve the plan's goal. There are situations, however, which might give us pause to wonder whether these adequacy conditions aren't too restrictive. Sometimes we embark on a plan to realise something we want badly, even though our confidence that what this will get us where we want to be. Think of the situation – by now familiar to most of us – where someone has sent you an e-mail attachment that you have been trying to open in all sorts of ways, and you have by now run out of all the tricks that you remember sometimes worked on previous occasions. So you think hard what you might try next (short of giving up altogether) and you come up with an outlandish sequence of operations that – who knows – might just do it. Your confidence that this will work is minimal; but, well, since all else has failed, it might be worth a try.

Should what I have just described be called a (proper) plan? This may be a matter of stipulation, but given the daily use we make of the word “plan” it has, I think a good claim on being called that. If that is what we decide is right, then we should drop the belief conditions I have been at pains to spell out, or reserve them for a special kind of “ideal” plan, which is to be distinguished from the notion of a plan in general.<sup>45</sup>

<sup>44</sup> This of course presupposes that that the  $C_{\mu^{\wedge}i}$  are mutually exclusive.

<sup>45</sup> Observation owed to Torgrim Solstad (p.c.)

content is *de re* at least with respect to the action that has just been performed, and perhaps also with respect to other entities. But let us concentrate on the action that the agent has performed. I take it that attitudes can be *de re* not only with respect to individuals – people, animals, trees, rocks, artefacts, rivers, mountains, cities and so on – but also with respect to events, and to actions as a sub-variety of them. With this goes, necessarily, the view that events are entities in the world with their own observer-independent grounds of existence, and their own identity criteria (although I believe that these can be vague<sup>46</sup>). This, however, is the view of events which underlies the model-theoretic semantics that is part of the treatment of tense and aspect in DRT, as found in particular in (Kamp and Reyle, 1993), and with that also the DRT-based formalism that is being used in this note. (In fact, I myself am inclined towards a pseudo-Davidsonian event metaphysics, in which events get their identity, wholly or partly, through their location in time and space and their positions within the causal network that is part of the world as an objective given; admittedly, vague identity conditions are not part of this view as such, but, as I stated in the last footnote, I maintain that they can be added without leading to inconsistency.)

When events are understood in this way – as entities which exist in the world independently of us and which can enter into causal relations with other entities – then the intuition that we can observe events and thereby form opinions *about* them (for instance, about their causes or about their effects) is theoretically coherent as well as pretheoretically plausible. In particular, it is then possible to maintain that by observing what he is doing when he performs a physical action an agent enters into a relation of direct perception with his action, and that the belief or beliefs that he ends up with on account of this qualify as *de re* about the action he has performed, just as a belief or other attitude can be *de re* with respect to other kinds of entities, a few of which I listed above.

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<sup>46</sup> The coherence of the notion of vague identity criteria has been questioned in the literature See e.g. (Evans, 1977?), (Wiggins 1977?), but I do not think the arguments given are conclusive against the treatment of vagueness I have in mind. This is a matter I cannot go into here. (I hope to take it up in a reworking of a ms. that goes back 20 years, in which the coherence of vague identity, in the sense intended here, is demonstrated by developing a formal language with identity in which the semantics for = allows for vagueness.)

(52)

	$e'_1$	$e'_2$	$e'_3$	$s'$	
<PLAN ,	$e'_1$ : MOVE(i) SLOC( $e'_1$ ) = $l_1$	ELOC( $e'_1$ ) = $l_2$	(MEANS)		>
	$e'_2$ : BUY(i,y) LOC( $e'_2$ ) = $l_2$				
	$e'_3$ : MOVE(i $\oplus$ y) SLOC( $e'_3$ ) = $l_2$	ELOC( $e'_3$ ) = $l_3$			
	$e'_1 < e'_2 < e'_3 < s'$				
	$s'$ :AT(i $\oplus$ y, $l_3$ )		(GOAL)		

In Section 2.1 I noted the fact that (8.b) is *de re* with respect to several entities – the fetchee  $y$ , and the three locations  $l_1$ ,  $l_2$  and  $l_3$ . (In addition it is *de se* about the agent, since the self-referring discourse referent  $i$  also occurs in some of its conditions.) But it is not *de re* with respect to either  $e'$  or to its component events  $e'_1$ ,  $e'_2$  and  $e'_3$ , and that is what is at issue here. Once part of the plan has been carried out, however, that part gets converted into beliefs in which the discourse referents for the events that have already been realised become internally and externally anchored. Thus suppose that the agent  $x$  has gone to  $l_2$  and has picked up  $y$  there. So actions  $e_1$  and  $e_2$  have been carried out, and only the last leg of the plan is still outstanding. Let us assume that  $e_1$  and  $e_2$  have been carried out to  $x$ 's own satisfaction that is, at this point  $x$  believes that  $e_1$  was an event of his going from  $l_1$  to  $l_2$  and that  $e_2$  was a case of collecting  $y$ . So  $x$ 's attitudinal state at this point can, as far as it has to do with the fetching  $y$ , be represented as it is in DRS (53). (In (53) I have largely returned to the fully explicit notation exemplified in (3) of Section 1.1 for representing *de re* attitudes, in which internally anchored discourse referents are externally anchored via their internal anchors, to the external objects that the attitudes are about; this concerns both the events  $e_1$  and  $e_2$  and the thing  $y$  that the agent has set out to fetch. However, I haven't been fully consistent in this in that (53) still uses the abridged notation in relation to the locations  $l_1$ ,  $l_2$  and  $l_3$ .<sup>48</sup>)

<sup>48</sup> In (52) the beliefs that  $x$  has formed about the part of the fetching that is behind him have been collated into a single belief. But of course that is not essential. They could have been kept distinct, and would have had to be if, e.g. the representation would have included information about the distinct times at which the two beliefs originated.

a is said to *replace* b, then a and b must be different. I think that in this case the implication is intuitively correct: no belief can be identical with an intention (even if their contents were exactly the same, something which, I have argued, is not even true in the example under consideration). But why, really, should we be satisfied with this conclusion? Couldn't we say just as well that the attitude that was x's intention to go to I<sub>2</sub> is still an element of x's attitudinal state after the change and that the change consists merely in that some of its properties have been changed: its mode from intention to belief and two of the constituents of its content representation from unanchored to anchored?

To answer this question isn't as easy as our gut feelings may well suggest it should be. Ultimately the matter hinges, I think, on the very different roles that beliefs and intentions play in our mental life and the way it causes us to impose ourselves on the world around us. True, one could, without running into inconsistency, also describe this as a case of the same entity playing very different roles before and after the change. But somehow that doesn't feel right. Exactly what seems to speak against this option is something that I cannot quite lay my finger on, but I strongly suspect that it has something to do with our deeper theoretical convictions. So I doubt that this is an identity question for which there exists a theory-free answer.

Saying that intention and belief are distinct is not to claim, however, that there isn't an intimate connection between the two attitudes. It seems to make good sense to describe the intention as "turning into" the belief. For certainly there is a direct connection between the disappearance of the first and the emergence of the second. But that is different from saying that we are dealing with one entity rather than two. We describe caterpillars as turning into butterflies. But it doesn't *follow* from this that the caterpillar and the butterfly are identical. Many do want to say that the butterfly *is* the same individual as the caterpillar, and one reason for that might be that it is after all the same DNA which first takes on the one and then the other of these two strikingly different appearances. But how much individuality must there be in the DNA of particular caterpillars and the butterflies that they develop into in order for this consideration to be convincing?

For another example to show how delicate such questions of cross-temporal identity can be consider the case of a painter who, short of

him much about this, let alone anyone who claimed to have seen it, or to have met someone else who did. So his beliefs about the source of the Orinoco – e.g. that it is less than two hundred miles from the Amazon, is purely existential. If he then, after a long search, discovers the source of the Orinoco, and finds his beliefs about it confirmed, these now all become beliefs about the source he has seen with his own eyes. By our light this is a change from *de dicto* to *de re* beliefs and thus from one kind of belief content to another. But is it really true that the beliefs he now has are *numerically* different from the beliefs he held previously? Sure, he will have acquired new beliefs about the source, about its exact location, as well as perhaps that it is subterranean, how much water it produces per day and so on. And in the light of those new beliefs the old ones may take on a new significance. But that is certainly not a reason for saying that the old beliefs have been discarded and that new ones have taken their place. That old bits of information suddenly take on an unexpected importance because of new information with which they can be combined to yield unexpected conclusions is a familiar phenomenon – a large part of intellectual progress consists in the creative combining of new information with information one already had. But that is no reason for taking the identity of the old information to have been compromised.

Let us now turn to the third level, that of the representations of individual entities. Given the general concerns of this note this level is arguably the most interesting of the three. Our example showed how representations of individual entities can be transformed from representations without anchors to representations with anchors. Recall our presentations of x's attitudinal state just before he set off to fetch y and of his state after he has got himself to l<sub>2</sub> and taken hold of y there (see (52)). In both these representations the first two of the three actions that go into an event of fetching are represented by the discourse referents e'1 and e'2. The roles that these discourse referents play in the two representations enable us to visualise both the change and the continuity between the represented attitudinal states in a form that strikes me as apt and illuminating: Actions that are at first mere objects of intention – mere blueprints for things that the agent wants to bring about – become realities through the very execution of the intentions to bring them about.

important. It is easy to come up with similar examples in which what has at first existence only in the imagination and then becomes a part of external reality only later on is an action rather than a house.

It is the actual wording in (54) that makes these examples interesting for the purpose of our discussion. Perhaps the most persuasive example is (54.d), where the same NP is used to speak of a house that is merely imaginary and of one that is inhabited by real people and so must be real as well. (54.a-c) illustrate essentially the same point, although here the matter is complicated somewhat by the fact that the verbs that must be interpreted as predicates of house conceptions and those that must be interpreted as predicates of real houses have distinct argument phrases (the anaphoric pronoun *it* and its anaphoric antecedent). But they too seem to point to the same conclusion as (54.d): we often talk about what is at first only in the mind but later acquires an external correlate as if these were different stages of the same entity.

We have looked at what is only a small selection from the different locutions that can be used to describe the attitudinal change on which this section has focussed. But we saw that even those few carry contradictory implications about what is identical to what. For the orderly metaphysician, who wants the entities he admits into his ontology arranged in the manner of a formal garden<sup>49</sup>, this playing loose and fast with identity conditions in our modes of speech must be alarming, or at least distasteful; and he may see it as yet another proof (if any more would be needed) of the logical untidiness of ordinary speech. The concern about identity conditions for the different ontological categories one is prepared to acknowledge is a philosophical worry with an impressive pedigree, with Geach, Wiggins, Lewis, Parfitt and Evans among the more recent exponents. Their work shows how much that doesn't meet the philosophically untrained eye can be tickled out of our pre-theoretical intuitions even on questions like these. But nevertheless the upshot of this work appears to be that even when all has been told a number of consistent but mutually exclusive possibilities remain.

I would not want to add yet another theory of this sort to the range of those that already exist. But the project of this section, and more generally of the entire note, has been of a different kind. The aim here has been to reflect on the ways in which human agents represent

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<sup>49</sup> In the style of Versailles rather than Knowles or Chatworth

part of the evolving mental states of agents as learn new facts, draw new conclusions and change their minds accordingly, pretty much all that should and can be said about the cross-temporal identity of attitudes has been said.

I will therefore devote this last part of Section 4 to the question how the evolution of the kinds of attitudes that have been the topic of this note, viz. intentions and plans, can be represented in a more detailed and formally precise way than I have done so far. In particular, we want to look in this section at the representation of the *de re* belief that result when agents find that all or parts of the plans they are trying to carry out have been accomplished, and of how these beliefs are connected to the intentions which they “replace” (to repeat the phrase I used to describe the relation in the last section).

In this undertaking I will exploit the circumstance that the formalism we have already been using for the formal description of attitudinal states allows us not only to describe the internal structure of an agent's mental state at a given time, but also to describe the agent as going through a number of attitudinal states at successive times. Such descriptions of successions of mental states gives a ready framework for stating relations between constituents of successive states, although as it stands it does not provide all of the descriptive machinery needed for this as it stands. We will therefore have to extend the framework as we proceed. Not much will be needed beyond what can be found in the framework as we have been using it. But the new notions will reflect precisely that which gives the cross-identity question for propositional attitudes their special character.

Earlier in this section I argued that intermediate verification of what was done so far in executing a complex plan was in accordance with its specifications leads from *de dicto* intentions to *de re* beliefs. The new beliefs are *de re*, I claimed, with respect to the actions already performed, to which the agent stands in the kind of causal relation that makes having *de re* attitudes towards them possible. In order to get an account of the curious continuities involving ideas and physical objects suggested by the examples in (53) we need to elaborate this account of the relation between *de dicto* intentions and *de re* beliefs in two directions, but neither of these seem to add anything surprising or essential. First, we should note that it isn't quite right to describe the transition from intentions to beliefs in the course of executing a

the plan to fetch  $y$  from the location  $l_2$  – with the belief that the two actions already performed (going to and picking up  $y$  there) were successful implementations of the first two items of the plan's means list. This requires, besides the belief and intention mentioned in (53), (i) the belief that the agent had the “fetch” plan at an earlier time  $t_0$ , and (ii) that the events represented by  $e_1$  and  $e_2$  are successful executions of the first and second items on the means list. The extended representation is given in (55). For the sake of uniformity I have spelled out all de re occurrences of discourse referents – not only those of the event discourse referents  $e_1$  and  $e_2$ , but also those of  $y$  – explicitly in the form of internal and external anchors.



Here (52), repeated below, is a representation of the intention of the entry of *fetch*, recast in the format of a plan conforming to schema (41).<sup>51</sup>

(52)

	$e''_1$	$e''_2$	$e''_3$	$s''$	
<PLAN ,	$e''_1$ : MOVE(i)	SLOC( $e''_1$ ) = $l_1$	ELOC( $e''_1$ ) = $l_2$	(MEANS)	>
	$e''_2$ : BUY(i,y')	LOC( $e''_2$ ) = $l_2$			
	$e''_3$ : MOVE(i $\oplus$ y')	SLOC( $e''_3$ ) = $l_2$	ELOC( $e''_3$ ) = $l_3$		
	$e''_1 < e''_2 < e''_3 < s''$				
	$s''$ : AT(i $\oplus$ y', $l_3$ )			(GOAL)	

Of special note in (55) are the conditions “EXEC( $e_1$ ,  $m_1(l)$ )” and “EXEC( $e_2$ ,  $m_2(l)$ )”, which capture two of the beliefs that the agent has acquired on the strength of what he has done up to the point where he is in the attitudinal state that is represented in (55). Strictly speaking these two are *de re* belief contents that are *de re* with respect to  $e_1$  and  $e_2$ . But they differ in one significant way from the *de re* beliefs about these events that are given higher up in (55). Those beliefs simply attribute certain ordinary properties to  $e_1$  and  $e_2$  - those properties that the plan specified as requirements for the first two of the three actions whose execution it demands. The conditions “EXEC( $e_1$ ,  $m_1(l)$ )” and “EXEC( $e_2$ ,  $m_2(l)$ )” are special in that they attribute to  $e_1$  and  $e_2$  the status of *having come about as* the realisations of those parts of the plan. This is property that an event has in virtue of the way in which intentions and plans impinge on the outside world in plan execution. These uses of the EXEC predicate are thus just as irreducible to other notions as the first uses we made of this predicate (cf. the discussion in Section 2).

What we need to account for concept-object continuities like that between the dreamt-of house and real house in the examples in (54) is

<sup>51</sup> Note that it is necessary to switch to different “variables” in the specification of this plan ( $e''_1$  in lieu of  $e'_1$ , etc.) since some of the latter are now used as internally and externally anchored discourse referents. (E.g.  $e'_1$  is anchored to  $e_1$ )

(56)

	$e''_1$	$e''_2$	$e''_3$	$y''$	$s''$	
<PLAN ,	$e''_1: \text{MOVE}(i)$	$\text{SLOC}(e''_1) = l_1$	$\text{ELOC}(e''_1) = l_2$	(MEANS)		>
	$e''_2: \text{OBT}(i, y'')$	$\text{t't-to-tr'l-to-Z''}(y'')$	$\text{LOC}(e''_2) = l_2$			
	$e''_3: \text{MOVE}(i \oplus y'')$	$\text{SLOC}(e''_3) = l_2$	$\text{ELOC}(e''_3) = l_3$			
	$e'_1 < e'_2 < e'_3$					
	$s': \text{AT}(i \oplus y'', l_3)$				(GOAL)	

The crucial difference between (56) and the plan given in (52) is that (52) is *de re* with respect to  $y$ , i.e. the thing that is to be fetched. In contrast, (56) only specifies the kind of thing that is to be fetched, viz. something that satisfies the condition "ticket for travelling to Z". This means that execution of the plan in (56) will involve not only the realisation of the event types represented with the help of  $e'_1$ ,  $e'_2$  and  $e'_3$ , but also the realisation of the object type (that of a ticket which that will enable the agent to travel the next day to Z) that is represented with the help of  $y'$ . Once the agent has obtained an object  $y$  of this kind he will see it as the ticket he came to the station to buy, just as he comes to see his actions  $e_1$  and  $e_2$  as the realisations of the first two items on the means list of his plan, once he has performed those actions. The following representation (57) of the agent's attitudinal state after having carried out the first two parts of the plan captures this

execute after having executed the first two parts of it is not *de re* with respect to the thing that he wants to fetch. In fact, the predicate “REAL(ise)” occurring in the condition “REAL(y', y)” is just as much a reflection of the efferent relations between mind and world as the predicate EXEC, and thus is just as irreducible.

It is this relation, I want to suggest, that is responsible for the semantics of the noun phrases in (54), which seem to imply a kind of identity between concepts and their subsequent realisations. As I said earlier, for an account of how these uses are possible it may not really matter all that much whether we consider the two identical or not; or, better perhaps, we do not need to insist that there is a sense in which entities that are as different as concepts and physical objects would seem to be are nevertheless “identical”. All we need to appeal to is that there is some intimate relationship between the two that permits one and the same NP to do the double duty of referring to one in the context of one predicate and to the other in the context of another predicate. In this regard, I would surmise, the relationship between concepts and the real objects that come to realise them are much like what we find with certain type-token relations, such as between a text and a particular piece of paper on which it is printed or written. From this perspective the sentences in (54) are much like endlessly discussed examples like: “After reading the pamphlet I tore it up in a very large number of very small pieces.” I doubt that the last word about this phenomenon has been said. And so long that hasn't happened, there is, I think, no way of answering the question whether the phenomenon we have noted here can be seen as just one more special case of it.

## 5. Extensions of the Formalism: Syntax and Model Theory.

[A complete and proper version of this section is still to be written.]

This section is little more than a testimony to my doing a logician's regular duty. I think it can be skipped without loss.

Extending the formalism of (Kamp, 2003) with the new devices that have been introduced in the preceding sections is straightforward from the point of syntax. These devices are:

- (i) labels for representations of attitudes that occur as parts of the

have seen, this can be represented as a single existential proposition and by a single DRS – backed up by the desire to reach the goal and the belief that the goals can be realised by performing the specified actions (see (42) in Section 4.1). We can then, if we want to, introduce attitude representations of the form  $\langle \text{INT}, \langle \langle \hat{e}_1.K_1, \dots, \hat{e}_n.K_n \rangle, \wedge s.K \rangle \rangle$  (where  $\langle \langle \hat{e}_1.K_1, \dots, \hat{e}_n.K_n \rangle, \wedge s.K \rangle$  has the form of a content representation that is suited as complement of the mode indicator PLAN) as syntactic sugar.

(iii) For the predicates TRY and CAP we have to specify the atomic conditions in which they occur. In previous sections we have seen often enough what these conditions are like. Worth emphasising is that since both TRY and CAP have one argument for an eventuality, they do not require a further specification of predication time, and therefore also no additional eventuality argument (occurring to the left of the predicate separated by a colon) of which the predication can then be seen as a type characterisation. So atomic conditions involving TRY have the simple form “TRY(x, e, l)” or “TRY(x, e,  $\hat{e}.K$ )”, where x is a discourse referent for an individual, e is a discourse referent for an event, l is a label (of an intention of x, if the predication is to be true), and  $\hat{e}.K$  denotes an event type (which has to be the content of an intention of x in order that the predication be true). Similarly, atomic conditions involving CAP have the form “CAP(x,  $\hat{e}.K, s$ )”, where x and  $\hat{e}.K$  are as above and s is a discourse referent for a state. (These syntactic decisions are to some extent arbitrary; given the assumptions about eventuality characterisations that have played any role in what has been said in this note we might just as well have decided on the forms “e: TRY(x,  $\hat{e}.K$ )” and “s: CAP(x,  $\hat{e}.K$ )”,)

## 2. Model Theory.

The model theory for the syntactic extensions described above builds on the model theory of the formalism reviewed in Section 1.2 (see (Kamp, 2003)) In this model theory it is simply assumed that agents are in complex attitudinal states at certain times. That is, each model will assign each agent capable of propositional attitudes a complex attitudinal state in each world w at each time t such that the agent exists in w at t and is at that time in a state of consciousness that entails his having some attitudinal state. The assigned attitudinal states have a structure that is closely reminiscent of the state descriptions that occur as second arguments of Att, differing only in that they have intensions where the descriptions have content representing DRSs. However, the

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