

Accessible Referents in “Opaque” Belief Contexts

1. Introduction: comments on the “psychological” extension of DRT

Because of “the conviction that linguistics should stay clear from assumptions about what goes on in the heads of speakers or hearers”, DRT, Kamp’s representational dynamic discourse-semantics, is cautious about regarding DRSs (‘discourse representation structures’) as structures which the interpreter forms in his mind (Kamp et al. 2004: 5.1), despite that “[t]here is a natural connection between DRT and the description of propositional attitudes, such as belief, desire or intention. ... According to DRT, interpretation of an assertion one hears or reads takes the form of constructing a DRS for it. One way to think of this DRS is as a structure which the interpreter forms in his mind and which for him identifies the content of the interpreted statement.”² Their conclusion is that a non-psychological “core DRT” should be separated explicitly from an extension of DRT, in which DRSs are used to identify mental representations of content.

This article is devoted to representing sentences and discourses about beliefs and proposing solutions to stubborn *linguistic / philosophical* puzzles concerning beliefs — e.g. *intensional identity* (in “*Hob-Nob* sentences”) (Roberts 1996:237, Lewis 1986), and the puzzle of a *singular* definite expression raised by Benz (2000) — in a new DRT-based (decidedly *representational(ist)*) framework called *ReALIS* (Alberti 2004, 2005a-c, Kleiber 2005), a “REciprocal” And “Lifelong” Interpretation System, whose stance essentially coincides with that of this “extended” / “psychological” DRT.

The *lifelong* (Alberti 2000) character of *ReALIS* means nothing else but that interpreters’ information states are represented (mentally) from birth to death in a DRT-style, so discourses are to be assigned DRSs “inside interpreters”, and not in the usual abstract way (*ReALIS* is “real” in this sense). “Reciprocity” will be thoroughly elucidated in section 4. The essence is that in the *tensed* model applied in *ReALIS*, an interpreter’s information state at a certain moment can be regarded, later, as an “internal world” which can serve as the context / model of interpretation together with the external world³ (see also Alberti 2005c).

¹ I am grateful to Hungarian National Scientific Research Fund (OTKA T038386) for their contribution to all my costs in connection with ESSLLI 05.

² They add that “[a]ccording to DRT the anaphoric connection between pronoun and NP α can be established by identifying the discourse referent for the pronoun with the one for α . It is tempting to think that this account of what goes on in establishing indefinite-pronoun links tells us something about how the content of interpreted sentences is represented in the interpreter’s mind: the indefinite α does give rise, at the level of mental representation, to the introduction of an entity representation (corresponding to the discourse referent for α) and this representation can then serve, just as could in principle any other entity representation in the mind of the interpreter, as an antecedent for anaphoric noun phrases occurring in sentences that are to be interpreted subsequently.” “The fact that cross-sentential anaphora works in the way the theory predicts ..., and that the theory gives such an apparently simple account for it, was one reason for thinking that DRSs capture some genuine aspect of the way in which the mind represents mental content. A further early reason for thinking this was the observation, due to Partee, that pronominal anaphora is sensitive to the form of the preceding sentence, and not just to its “propositional” (i.e. intensional) content: *It is under the sofa* can be understood as a statement about the missing marble when it follows *One of the ten marbles is not in the bag*, but not when it follows the propositionally equivalent *Nine of the ten marbles are in the bag*. ... This distinction is also captured effortlessly by DRT, and it is one which seems to go directly against the fundamental assumptions about semantic content that were dominant within formal semantics at the time [in the 80’s].”

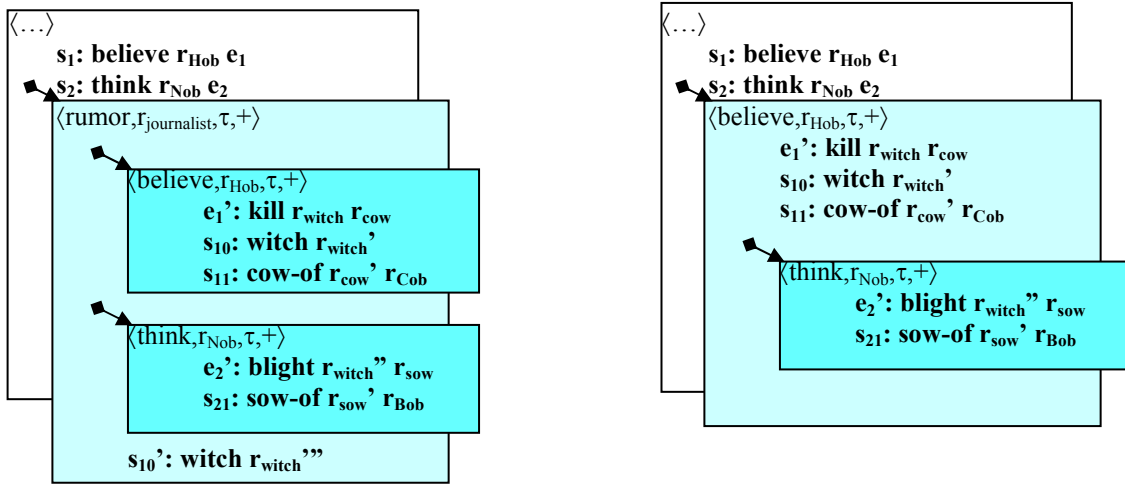
³ The model of *information state* offered by *ReALIS* can be regarded as a realization of what Zeevat (2005) writes about in his article whose purpose is coming up with “a problem inherent in the work of Kamp and Heim ...: to give a non-technical account of accessibility that generalises to belief contexts, counterfactuals, negations and corrections” (p550): “information states may have a [recursive (see p544)] foreground-background division” in connection with the fact that “secondary contexts conflicting with the primary context can be brought in by negations, modal statements, belief reports, plans and others” (p539).

2. Beliefs and doubts

First of all, let us consider the problem that arises in the case of the famous “*Hob-Nob* sentence(s)”, see (1a) below (Kamp et al. 2004: 5.4): “Geach [1962] pointed out that this sentence could be used truthfully in a report composed by a journalist describing the goings-on in some remote rural backwater, even if the journalist herself is persuaded that witches do not exist. This is a problem for the application of standard logical notation to the representation of truth-conditional content. For in order that the pronoun *she* in the belief attribution to Nob be bound by the “existential quantifier” *a witch* in the belief attribution to Hob, this quantifier would have to take scope over the two belief attributions. But this would, on the standard interpretation of quantification theory, imply that there are witches in the world in which Hob, Nob and the journalist live. That is something to which the journalist would under no conditions want to commit herself. And it is something to which ... [1a] does not commit her.”

(1) Illustration of the referential dependence of representations of different attitudes

- a. Hob believes that a witch has killed Cob’s cow and Nob thinks that she has blighted Bob’s sow.
- b. ReALIS-style representations of the relevant part of an interpreter’s information state in the case of the “*Hob-Nob* sentence” in (1a): $\leftarrow(1b^*)$ vs. $(1b^{**})\downarrow$



The problem has something to do with the assumption that a DRS is essentially equivalent to a set of possible (total) worlds in which the content of the given DRS is—at least “relatively”—true (true, for instance, according to a certain person’s beliefs). This assumption should be given up; which is nothing else but the essence of *representationalism* itself: an “anaphorically” coherent unit of information cannot necessarily be replaced with a family of possible (total) worlds where the given information can be regarded as true. In other words, it must not be excluded that an information state be truth-conditionally heterogeneous (Kleiber 2005, Zeevat 2005).

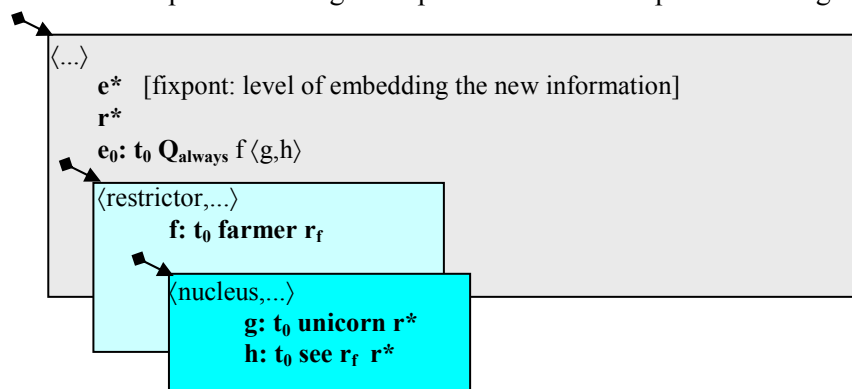
Representations in (1b) show the relevant part of an arbitrary interpreter’s potential information states in the style of ReALIS (here time is ignored). He stores the information that Hob believes something (s_1) and Nob thinks something (s_2). He also stores the pieces of information that according to the speaker, who is a journalist, there is a witch according to Hob’s belief, who killed a cow, denoted by r_{witch} above (e_1' , s_{10} , s_{11}), and there is a woman according to Nob’s thought (which is practically also a belief), who blighted a sow (e_2' , s_{21}). The referent that belongs to this “woman” (cf. *she*) is denoted by r_{witch}'' above. The problem mentioned in the last paragraph lies in the fact that these two referents cannot be identified in $(1b^*)$, at least immediately, because they belong to *incommensurable* worldlets according to the usual accessibility-ordering of DRS referents, since Hob’s and Nob’s beliefs do not

(necessarily) depend on each other.⁴ They should occupy “parallel” worldlets in (1b*) above: we are not forced to assume that Hob and Nob have consulted each other about the (not necessarily distinct) witches in whose existence they believe. It is the speaker, the journalist, that explicitly identifies Hob’s witch with Nob’s witch. By saying the sentence in (1a), she has committed herself to the assumption concerning the “identity” of Hob’s witch with Nob’s one in some sense (to be decided). Commitment to some information means its *accommodation*. Let us look at (1b*): what is represented is that we have “accommodated” a worldlet expressing the journalist’s thoughts about a witch referred to by r_{witch} ” on which both Hob’s above mentioned belief and Nob’s belief rely. Consequently, both Hob’s referent r_{witch} and Nob’s referent r_{witch} ” can be identified with referent r_{witch} ”, whilst, in ReALIS, nothing forces us to assume that the journalist has been committed to the *truth* of the content of the new worldlet. According to the reading discussed above, she regards the witch in the worldlet attributed to her as a participant of a certain rumor popular with people in Hob and Nob’s superstitious village (Roberts 1996:237). The relation of this rumor to the journalist is analogous to that of the fantasy world of novels, say, *Harry Potter* or *The Lord of Rings*, to its readers, who usually speak about its characters without actually believing in their existence.

The key to the solution thus is the introduction of referent r_{witch} ” in an appropriate place in the accessibility ordering of referents, which is an operation essentially the same as what is called *unpacking* by Kálmán (1990). His analysis of the ambiguous sentence in (2a) below can serve as an independent motivation: the (preferred) non-specific reading is considered to be primary, and the specific reading —which can be triggered by a continuation like the one in (2b)— is produced by exploiting this “deferred information”, whose decisive element is the operation of unpacking. In ReALIS, (2c) is the representation of the secondary specific reading, whilst we can get the representation of the primary non-specific one by simply omitting the row containing r^* under the row of e^* . An argument for this analysis relying on unpacking is that it is based on the advantageous assumption that the secondary reading can be obtained from the primary one by *monotonic increase of information* instead of construing the two readings as incommensurable in respect of the amount of information.

(2) Illustration of ambiguity between +/- specific reading

- a. Every farmer saw a unicorn.
- b. ... It was white like snow.
- c. Non-specific reading + “unpacked” *unicorn* = specific reading



⁴ Zeevat’s (2005: p549) following comments have made the distinction between the two interpretations demonstrated in (1b*) vs. (1b**) clear to me: “Now the literature contains many explanations... Hob may have told Nob about his belief [$\rightarrow(1b^{**})$], there may be a rumour in the village about a witch that has played a causal role in the formation of Hob’s and Nob’s beliefs [$\rightarrow(1b^*)$], there may have been an article in the local newspaper that Hob and Nob have each read [$\rightarrow(1b^*)$].” What is represented by (1b*) in the framework of ReALIS would be paraphrased by Zeevat (2005: p540) as follows: Nob’s relevant belief is *over* Hob’s belief (so r_{witch} ” $\rightarrow r_{witch}$ ’). In the other case, the two belief states are both *over* a certain “background” expressing the content of the rumor / the article (so r_{witch} ’ $\rightarrow r_{witch}$ ””, r_{witch} ” $\rightarrow r_{witch}$ ”).

According to Roberts (1996:237), “the problem of intensional identity in [Hob-Nob examples] ... reduces to the more general problem of *intensional identity*, i.e. identity across possible worlds. Such an approach, of course, encounters difficult problems in attempting to specify what it is for two individuals to believe in the existence of the same, possibly mythical entity (see Lewis (1986) and the references therein).” Note that ReALIS simply avoids this serious philosophical question by dispensing with “possible worlds”: the worldlets with different reality labels of different interpreters will serve as the “actually possible” “possible worlds” —which have ever been regarded as possible by an interpreter at least to the extent of a speculative experiment — in the course of a special generalization of truth-conditional interpretation (Alberti 2005c, Ch4), which enables us to compare the content of two arbitrary worldlets.

3. The basic definition of ReALIS

It is high time to provide a formal description of ReALIS – which will be a short one, unfortunately, because of space restrictions (but see Alberti 2005c).

A *ReALIS-type interpretation system* can be defined as a quadruple $\mathfrak{R} = \langle \mathbf{W}_0^\Omega, \mathbf{W}^\Lambda, \mathbf{Dyn}^\Delta, \mathbf{Tru}^\Theta \rangle$ where $\mathbf{W}_0 = \langle \mathbf{U}, \mathbf{T}, \mathbf{I}, \mathbf{M}, \mathbf{\Omega} \rangle$ is a *tensed human world*, or the *oracle’s / external / real world* (\mathbf{U} : universe of entities, $\mathbf{T} \subseteq \mathbf{U}$: temporal entities, $\mathbf{I} \subseteq \mathbf{U}$: interpreters, \mathbf{M} : impulses, $\mathbf{\Omega}$: external relations); \mathbf{W} is a partial function where $\mathbf{W}(\mathbf{i}, \mathbf{t}) = \mathbf{W}_t^i = \langle \mathbf{U}_t^i, \mathbf{Con}_t^i, \mathbf{Ide}_t^i, \mathbf{Acc}_t^i, \mathbf{\kappa}_t^i, \mathbf{\alpha}_t^i \rangle$ is *interpreter i ’s information state = internal world at moment t* (components: universe of referents / internal entities, relation of condition rows, identity relation, labeled accessibility relation, cursor, anchor; Λ : labels of reality status); $\mathbf{Dyn} : \mathbf{M} \times \mathbf{W} \rightarrow \mathbf{W}$ is the partial function of *dynamic interpretation*; and $\mathbf{Tru}(\mathbf{m}) = \mathbf{W}[\mathbf{m}(\mathbf{0}), \mathbf{\Theta}]$ is a set of propositions concerning a linguistic impulse \mathbf{m} , called its *generalized truth evaluation / static interpretation*.

It is to be highlighted that the *accessibility* relation between referents (and DRS-like “boxes”) in information states is defined *directly* –and not indirectly, as in DRT (Kamp et al. 2004)– and, hence, quite *freely*. Thus belief contexts, for instance, are not (necessarily) “opaque” any more; the cost (which should / can be “paid” according to Zeevat (2005) as well) is that an information state serving as the context of the interpretation of an “anaphorically coherent” piece of text is allowed to be truth-conditionally heterogeneous, i.e. to consist of partial world models, “worldlets”, potentially containing conflicting information content. These worldlets form a partially ordered system in an interpreter’s information state: practically a labeled tree where complex reality labels make it possible to impose restrictions on accessibility between referents.

An information state (serving as the context of interpretation) can be “trivially extended” in due course (cf. *accommodation*), which is a dynamic step of interpretation, due to the permanent cooperation between the static (truth-conditional) and dynamic sort of interpretation (expressing context change potential) (Kamp et al. 2004, Alberti 2005c).

4. Reciprocity in ReALIS

ReALIS can be regarded as a theory in which the representational apparatus of DRT is embedded, on the one hand, in an interpreter-centered “lifelong” framework and in a multi-agent system of information exchange, on the other hand. In this latter respect it should be compared with Anton Benz’s (2000) DRT-based multi-agent system (see also Dekker 1997, Fagin et al. 1995).

Benz’s (2000:181) central problems are to “provide a description of how the iterated specific use of an indefinite NP [and then coreferential definite ones] can lead to the establishment of referential chains across dialogues and dialogue participants..., ... how they introduce discourse referents, how they are related to the common ground, and how this common ground can be represented by the dialogue participants.” We argue that Benz’s above mentioned representation of the common ground, at least as it is described in his short 2000 *GötaLog* paper, is too “symmetrical”, which implies empirical problems. The alternative proposed in the framework of

ReALIS is based on an “asymmetrical” approach to participants of a conversation, which is also “constructive”: they (may) have “reciprocal” knowledge on each other (and the external world, and their knowledge / beliefs on the external world, and their knowledge / beliefs on each others’ hypothesized knowledge on the external world and each other...).

Benz (2000:182) argues that “the relation between established chains and the use of definite descriptions is of special interest, because it forces us to investigate how discourse referents are connected to the *common ground*. ... That the anaphoric referential use of a definite is sensitive to the *common* discourse referents can be seen in examples like [the one below in (3)a1-6],” where “the use of *the young girl* by Chris is felicitous although both of them know that there have been two young girls who were attacked by the Doberman. Only one of them is available through a common discourse referent.”

(3) **Illustration of interpreters’ *common ground***

- a. Benz’s (2000:182) story on two young girls bitten by a dangerous Doberman:
 1. At 7:00 am **Anna** and **Debra** see how a Doberman bites the young girl Melanie.
 2. **Anna** must leave Debra with the girl. Therefore she can’t see that the dog again attacks and bites another girl, Stefanie, some minutes later.
 3. Then **Anna** meets **Bob** and **Chris** and tells them that she has seen how a Doberman attacked a young girl.
 4. The next day, **Debra** meets **Bob**, and she tells him that the dog attacked also another young girl.
 5. Later, she [**Debra**] meets also **Chris** and tells him the same.
 6. **Chris**, who does not know that Bob knows already the whole story, meets **Bob** again and says to him: “*The young girl* was not the only one who was attacked by the dangerous Doberman.”
 - 6’. She also mentions that she has already told Bob the whole story. ~~Chris, who does not know that Bob knows already the whole story,~~ meets **Bob** again and says to him: “*The young girl* (thus) was not the only one who was attacked by the dangerous Doberman.”
- b. The local state of Bob (Benz 2000:184) “after his talk with Debra [see phase a.4 above]. The first column represents his total knowledge about the biting situation, the second his protocol for what he heard in common with Anne and Chris, and the third for what he has in common with Debra.”

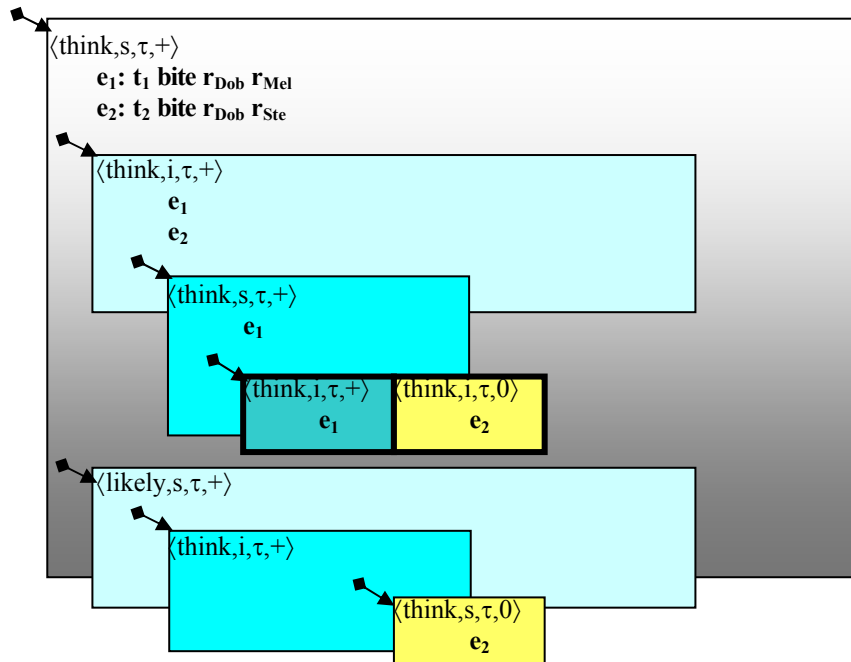
Bob	{Bob,An,Chr}	{Bob,Debra}
u ₁ u ₂ u ₃	u ₁ u ₂	u ₁ u ₂ u ₃
Doberman u ₁	Doberman u ₁	Doberman u ₁
young-girl u ₂	young-girl u ₂	young-girl u ₂
bit u ₁ u ₂	bit u ₁ u ₂	bit u ₁ u ₂
young-girl u ₃		young-girl u ₃
bit u ₁ u ₃		bit u ₁ u ₃
u ₃ ≠ u ₂		u ₃ ≠ u ₂

Benz (2000:183) claims that “the general apparatus for multi-agent system provides us with a natural representation of the mutual information of dialogue participants. But in view of our problem to explain the anaphoric referential use of a definite description we need a representation which provides us more directly with information about which subjects with which properties are common. For this reason we introduce the notion a *common DRS*.” The DRS in the second column in (3)b is a *maximal common DRS* for the group consisting of Anne, Bob and Chris. Benz (2000:183) argues, further, that “the uniqueness condition for the referential anaphoric use of a definite description is sensitive to the number of discourse referents in the maximal common DRSs. ... But how can the participants have access to this DRS? The most intuitive way seems to be that they keep track of the discourse referents which have been introduced to each group, and about the properties of those referents. I.e. a participant will not only update his own DRS, if he gets some new information, but he will also update a DRS representing the knowledge of the group which *commonly* got this information.”

What happens, however, if Chris has come to know from Debra after phase a.5 of the story that Bob also knows about both attacks? There are at least two consequences: on the one hand, some undoubted asymmetry will arise between Chris’s knowledge and Bob’s knowledge, which, on the other hand, cannot be treated by Benz’s method, because only the common DRS belonging to the set of Bob and Debra (see (3)b) would change, whereas the *maximal* common DRS would still remain the one belonging to the group of Anne, Bob and Chris. We have been led to the question whether the “undoubted asymmetry” mentioned above has any “linguistic” consequence. The modified story in (3)a.1-5+6’ above is devoted to the purpose of studying this question. We argue that there are at least two relevant consequences. The one is pragmatic: the sentence discussed above is less felicitous in (3)a.6’ than in (3)a.6. The source of this fact is clear from what has been established: the interpreter can identify *the young girl* on the basis of his assumption about the speaker that he, the speaker, thinks that the interpreter knows about only the first attack. This assumption is *mistaken* in the modified story and hence the sentence in question is *misleading* in the sense that it would corroborate the interpreter’s mistaken assumption about the speaker’s knowledge on the interpreter’s knowledge. This pragmatic anomaly can also be made explicit (in a syntactic sense) by the insertion of the word *thus*, as can be seen above (3)a.6’. The *thus* version will make the modified story felicitous whilst its use is entirely excluded in the original story.

These differences require a theory which can distinguish the original “symmetrical” story from the modified, “asymmetrical”, one, and can account for both the role of *thus* and the fact that the singular definite description *the young girl* is even still felicitous despite that the speaker precisely knows about the interpreter’s knowledge on both poor young girls.

(3)c. The ideal speaker’s relevant input knowledge before (3)a.6’ in (3)a1-5+6’:⁵



Let us consider the crucial part of a potential (extended) representation of the ideal speaker’s information state in (3)c above. The speaker knows about both young girls attacked by the Doberman, and he is aware of the fact that the interpreter also knows about both poor girls; so neither a “primary strategy” based on the speaker’s own knowledge, nor a secondary one based on the speaker’s expectable assumptions on the interpreter’s knowledge can legitimize the singular definite description *the young girl*.

⁵ The ideal *interpreter’s* relevant input knowledge before(3)a.6’ is the same as that before (3)a.6, because Bob’s relevant conversations are precisely the same as in the original story.

A tertiary strategy may help, which is based on an assumption concerning the interpreter according to which he assumes the speaker to know about only the first attack. As Bob's relevant knowledge in the modified story is entirely the same as his knowledge in the original story, the tertiary strategy can undoubtedly legitimize the sentence in question, at least to a certain degree in respect of confidence. We hypothesize that this degree of confidence is significantly lower than that in the case of the original story, because it must have some impact on the speaker that he is aware of the fact that the interpreter's hypothesized assumption is mistaken. The insertion of *thus* in the sentence in question makes this fact explicit, because the role of this word is nothing else but indicating that "I know that you are precisely aware of a certain fact but I'd like to speak about it; that's why I've mentioned it".

The presence of expressions like *thus* in natural languages explicitly shows the "reciprocal" character of interpretation in the sense in which it is used in the name of ReALIS: it is to be allowed for in the course of interpretation that the speaker has a certain hypothesis on the addressees' knowledge / hypotheses on his/her (s's) knowledge / hypotheses and, especially, on his/her (s's) construal of the relevant situation.⁶

5. Conclusions and further applications

In ReALIS, thus, belief contexts, and other sorts of modal contexts, are not (necessarily) "opaque" any more in respect of referent-accessibility due to the approach that an information state serving as the context of the interpretation of an "anaphorically coherent" piece of text is allowed to be truth-conditionally heterogeneous, i.e. to consist of appropriately labeled "worldlets" potentially containing conflicting information content.

Our approach straightforwardly offers a solution to numerous classical puzzles. The phenomenon of *modal anchoring* (mentioned by Roberts (1996:242), who attributes it to Farkas (1993)), for instance, is regarded as an extreme case of intensional identity. The linguistic aspect of this problem, as well as that of those discussed in sections 2 and 4, is that the reference of a *singular definite description* should be decided; which can be carried out in the framework of ReALIS by pointing at a worldlet that contains just the appropriate referent furnished with just the appropriate information. The puzzle in the two-sentence text below in (4)a is that "a noun phrase [*the castle*] is modally subordinated to a constituent occurring in previous discourse, while the sentence the noun phrase is part of is not modally subordinated" (Farkas (1993), quoted by Roberts (1996:243)). This contradictory case means a serious problem to semantic theories based on the elimination of possible worlds, as different parts of the sentence in question would require distinct ways of eliminating possible worlds.

⁶ Let us return to the singular definite description in the sentence in question. A second argument against the application of the tertiary strategy is that there is an overt contrast between the implicature of *thus* ("I am aware of the fact that you know about both attacks") and what this particular strategy suggests ("I don't know whether you have any kind of knowledge on the second attack"). A third argument can also be mentioned, which relies on an assumption concerning a tendency to construe situations symmetrically. In the case being discussed, this assumption can manifest itself as follows: "If I could come to know that you know about something, you could also come to know that I know it." Hence, we might give up this tertiary strategy. Note that the tertiary strategy of speakers is based on the secondary strategy of interpreters: "what the speaker should know about me". We may attempt, thus, to base a fourth-level strategy of speakers on the tertiary strategy of interpreters: "what I should know about the speaker's information state according to the speaker". Well, the interpreter should assume the speaker to assume an interpreter who knows about only the first attack. In other words, although the speaker regards the interpreter as knowing about both attacks, he correctly assumes that "the ideal speaker in the interpreter's internal world" is not such a person. And this assumption of the speaker is not mistaken: the interpreter should indeed start from the idea of a speaker assuming him (i) to know about only the first attack.

It should be added (at a workshop on belief *revision*) that the content of the interpreter's input information state – though it has successfully "legitimized" the *thus* version of the sentence in question in (3a).⁶ linguistically – should be revised as a result of the very sentence: the interpreter realizes that the speaker had known about his knowledge on both attacks.

(4) Illustration of modal anchoring as an extreme case of intensional identity

- a. Mary thought that there was a castle behind the trees. *The castle* turned out to be a huge oak tree.
- b. I thought that there was a castle behind the trees. But a bit later “*the castle*” turned out to be a huge oak tree.

It is not excluded in ReALIS to identify two given referents of the speaker: that of “the huge oak tree”, belonging to his current visual observing of the surrounding part of the external world, and that of “the castle”, belonging to the worldlet containing Mary’s beliefs. A further relevant factor of the story is that Mary and the speaker, at least according to the reading we consider to be the preferred one, were together, and the speaker obviously *anchors* (see section 3) the two referents to the same external entity. The case of the modified two-sentence text in (4)b is similar to that of the original one, with the slight difference that the two relevant worldlets express two different versions of the same speaker’s opinion, at distinct moments.⁷

We mention here that in the *counterfactual* in (5) below, word *too*, which is a presupposition trigger (making the entire sentence an anaphorically coherent unit), can also be legitimized in our approach: “someone’s going to the party” has an accessible eventuality referent (belonging to a fictive worldlet) despite that the persons mentioned are precisely known to have not gone to the party.

(5) Illustration of the problem of counterfactuals

If John had gone to the party, Mary would have gone *too*. (Zeevat 2005: p545)

We mention, finally, that misunderstanding coming from *distinct anchoring* on the basis of different beliefs, can also be explained in ReALIS. Suppose, for instance, the speaker performs this sentence: *My boss’s wife is gorgeous*, and his boss is Peter, whose wife is Mary. The following interpreters may suggest different truth-conditional interpretations: the speaker himself, who is assumed to believe that Peter’s wife is Norah; an interpreter who knows the relevant relations well; another interpreter who believes that the speaker’s boss is Joe; and a third interpreter who knows the relevant relations well but is also aware of the fact that the speaker believes Norah to be his boss’s wife. The case of the third interpreter is the most interesting one, as he is able to reconstruct the speaker’s thinking; it can be accounted for in a way similar to those demonstrated in the analyses above that he can react as follows: *Well, NORAH is undoubtedly gorgeous, but she is only your boss’s mistress, whilst his genuine wife MARY is not gorgeous at all.*

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⁷ That is why *reality labels* associated with the accessibility-classes of referents we call *worldlets* consist of quadruples of the name of a *reality status*, a *human referent*, a *temporal referent* and a *polarity* value (see (3c) above).