

Opacity and Presupposition Inheritance in Belief Contexts

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Kyoung Ae Kim. 1999. Opacity and Presupposition Inheritance in Belief Contexts. *Language and Information 3.2*, 67–83. This paper attempts to provide an account for the problems of intensional opacity of referring expressions and the presupposition inheritance in the belief contexts from the discourse perspective. I discuss Jaszczolt's discourse model based on DRT to account for the belief reports. Jaszczolt analyzes referring expressions in terms of the three readings (de re, de dicto₁ and de dicto₂) and attempts to represent the differences between them in the DRS's via different anchoring modes; external anchoring, formal anchoring and non-anchoring. I propose an extended model to account for the presupposition inheritance in the belief contexts and attempt to analyze the data in Korean based on this model. The differences in the PI and in the representations of DRS's which are induced by the different complement types, ...*ko* (*mitta*) and ...*kesul* (*mitta*), are discussed. (Hankyong University)

1. Introduction

Analysis of belief reports and beliefs has long been controversial among philosophers and linguists. It has been pointed out that formal semantics has limitations to deal with the belief reports appropriately, unable to present a suitable model to account for the intensional opacity. The problem of opacity of referring expressions and the failure to support the truth-preserving substitutivity of logical equivalents under the belief constructions led the linguists to take the view of pragmatics and to make attempts to solve them by the discourse models. The interpretation of the propositions or the referring expressions in the utterances in which propositional attitude verbs are used involves clarification of the utterer's intention. The referring expression, e.g., 'the man in a white suit' can be ambiguous in that it can be used to refer to a specific person or to any person wearing a white suit or sometimes the description may be used misreferentially. In communication the hearer tries to understand whom the speaker has in mind, recovering the speaker's intention in the context. Johnson-Laird (1977) contends that an individual's propositional attitudes can be represented in a mental model, parts of which will be beliefs about the beliefs of other people, founded on a mental representation of another person's mental world.¹ An utterance like "My friend believes that transvestites are monks." may have ambiguities between metalinguistic and non-metalinguistic readings (misapprehension about the meaning of *transvestite* or a false belief about *transvestites*, etc.). Jaszczolt

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1. Johnson-Laird (1977) mentions that the phenomena of opacity are inherited by all verbs that contain a particular sort of primitive that corresponds to the construction of a mental model. (He takes a procedural (psychological) approach and attempts to model psychological processes involved in sentence production and interpretation.)

(1998) argues that the ambiguity of belief reports belongs to the domain of pragmatics and can be accounted for by resorting to the speaker's intentions. Jaszczolt contends that referring expressions can be interpreted in such three readings as *de re*, *de dicto*₁ (for misreference), and *de dicto*₂. I introduce Jaszczolt's model based on DRT and make an attempt to offer an extended model to deal with the phenomena of PI in the belief contexts, devising a way of representing the mental states of the discourse participants to account for the ambiguity of the belief reports. I will maintain the model of world and context presented in Kim (1993) and Kim (1998). First, I will discuss the problem of the ambiguous interpretations concerning the definite descriptions in the belief contexts, focusing on the model developed by Jaszczolt (1998). Then I will analyze several sentences including the verb *mitta* 'believe' in Korean on the basis of the revised model.

2. Opacity of Belief Contexts

The problems of propositional attitude contexts including belief contexts have long been argued among semanticists and linguists. They especially have posed serious problems for the truth-conditional semantics. Partee (1982) contends that there is no semantic type within Montague's intensional logic of the right sort to serve for the objects of the propositional verbs, since substitution of intensionally equivalent expressions operates validly for any type in the intensional logic, but not always validly in propositional attitude contexts. The problematic cases involve the problems of substitution of logical equivalence and the lexical items with the same intension. Let's consider several examples. In the following examples, the arguments shown in (1a) and (1b) are invalid.

- (1) a. Jeff is wondering whether *kkamagwi* is the black bird. Therefore, Jeff is wondering whether *kkamagwi* is *kkamagwi*.
 b. Ellena believes that all Greeks are Greeks. Therefore, Ellena believes that all Greeks are Hellenes.

According to the direct reference theory, if proper names have just the role to refer, then a principle of substitution is warranted, which says that substitution of one name for another will not only preserve truth value but also the proposition expressed. But when the substitutions are made in propositional attitude contexts, there arise difficulties. As shown in the above, in the case of lexical items with the same intension it may be possible that a speaker of a language can very well fail to know that two terms in it have the same intension, especially when the corresponding term is in another language. Likely, in the following (2) and (3) the arguments are not valid, either, which is due to the lack of factual omniscience.

- (2) Debbie believes that *Hak* is a lucky bird. Therefore, Debbie believes that *Tulumi* is a lucky bird.
 (3) a. The ancients believed that *Phosphorus* is the god of light.
 b. *Hesperus* is also the god of light.
 c. Therefore, the ancients believed that *Hesperus* is the god of light.

Though '*Hak*' in Korean refers to the same bird as '*Tulumi*' and also '*Phosphorus*' and '*Hesperus*' refer to the same star, it may be possible that the believer fails to know

this, which makes the sentence opaque to interpretation.² The truths of the propositions substituted by other terms with the same intension cannot be preserved. To deal with the ambiguous interpretations, Donnellan (1966) makes a distinction between the referential and attributive definite descriptions. The same definite description like *the best dresser* can be used referentially or attributively depending on the contexts, or on the speaker's intentions. In the former reading, which is called *de re*, the description is used to pick out a particular person, while in the latter called *de dicto*, the description is used to refer to any person or object with the property.

Donnellan (1978) contends that speaker reference seems necessary to provide semantic reference, focusing on the significance of speaker intention in using the definite descriptions. In the following (4), there is some link between the definite description and the pronoun in the Mr. Smith's utterance. They are coreferential and they both refer to the denotation of the description. The pronoun *he* must refer to the same referent of the speaker, i.e., to whatever person Mr. Smith has in mind. As shown in Mrs. Smith's continuing utterance the audience may disagree about the applicability of the description. However, it doesn't change the denotation of the description determined by Mr. Smith's original description.

- (4) Mr. Smith: The fat old humbug we met yesterday has just been made a full Professor. He must have bamboozled the committee.
Mrs. Smith: Do you mean the funny little man with the goatee? I don't think he's fat and he seemed quite genuine.

Jackendoff (1975) discusses the puzzles of belief contexts in which contradictory beliefs about the same object exist. The following sentence (5) has ambiguity involved in belief reports. On one reading, Charley holds a contradictory belief, simultaneously believing that a certain book is both burned and not burned, or that a certain individual is both dead and alive. On the other reading Charley holds the belief that a certain book, which is actually burned, is not burned and a certain man, who is in fact dead, is alive.³ It shows that in the belief world there might exist seemingly contradictory thoughts about the same object or person, since the believer might not know that the objects (about which the person has different thoughts) are actually the same object or the believer might have different beliefs from others or wrong beliefs.

- (5) a. Charley believes that the book that was burned was not burned.
b. Charley believes that the dead man is alive.

So far several examples concerning the intensional opacity have been reviewed. The problems arise due to the fact that as for the propositional attitude verbs, omniscience of epistemology does not hold and the referring expressions can be interpreted ambiguously.

Now let's take an example concerning the PI in belief contexts. In (6a) it is admitted that the presupposition of the complement clause (6c) is inherited by the whole clause, whereas in (6b) it is not clear that the embedded presupposition (henceforth EP), (6c) is inherited by the whole clause. Unlike the factive verb *know*, in case of the utterance including the verb *believe* the truth of the complement clause is not preserved by the matrix clause due to the opacity of the belief contexts.

2. Cole (1978) argues that opacity results when a sentence containing an attributive description is embedded beneath a verb of propositional attitude.

3. The former reading is called the opaque reading and the latter the transparent reading.

- (6) a. Allen knows that it is Jeff who helped the old woman.
 b. Allen believes that it is Jeff who helped the old woman.
 c. Somebody helped the old woman.

In Korean, however, the propositional attitude verb *mitta* 'believe' can be used as a factive or a non-factive predicate. It seems that the speaker chooses different types of complements, each of which seems to be associated with the speaker's specific attitude towards the presuppositionality of the complement clause (Kim (1993)). There will arise a need for the relative evaluation considering the factors of contexts. I will discuss the PI in the belief contexts after I briefly discuss the models presented by Kamp (1990) and Jaszczolt (1998) and attempt to present a revised model based on the notions of world and context.

3. Discourse Models for Belief Reports

Recently many linguists find Discourse Representation Theory (developed by Kamp in Kamp (1981) and subsequent work) a suitable framework in which discourse processing can be represented. Asher (1986) points out that the traditional formal semantic theories⁴ are not able to deal with the problems of analyzing ordinary belief reports. Asher argues that Discourse Representation Theory can provide a coherent account for the contradictory beliefs about the same object in an internal sense and attempts to extend the DRS construction algorithm to treat belief reports. The DRSs represent information communicated in the given context and the world, in which reference markers which are real entities or conceptual individuals function as pegs on which property ascriptions can be hanged.

Kamp (1990) presents a communicative interpretive model for the belief and other attitude reports based on DRT. Kamp's primary concern is to present semantics of the attitudinal structures representing the intentionality of the believers. Beliefs are considered a kind of disposition which affects the decision in choosing a certain action and the theory of attitudinal reports ought to account for how the dispositions induce the rational agents to form intentions.

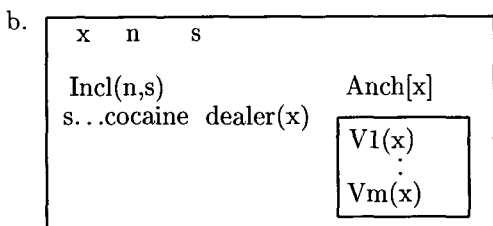
Basically he attempts to offer a structural account of attitude reports by formulating construction algorithm, which maps discourses into certain interpretive structures and via a certain syntax assigns to each sentence a syntactic structure on which the algorithm can operate. The DRS's are the output structures derived from the syntactic inputs, which represent certain truth conditions (DRS also serves as an input of the interpretation process). The sentences make up a coherent discourse containing many kinds of linking elements, creating a semantic web with these elements interpreted. Kamp is concerned with the representation of the discourse connectedness, ongoing communication. Discourse referents serve as one of those important linking factors. The resulting DRS includes conditions which specify certain properties of the discourse referents and the relations between them, providing descriptive information about the represented entities.

4. Traditional theories analyzed belief reports to involve three components, the subject or believer, a proposition and a relation (the relation of believing that obtains between the believer and the proposition). In the hidden-indexical theory believing is regarded as a three-place relation, $B(x, p, m)$, holding among a believer x , a certain sort of structured proposition p , and a mode of presentation m under which x believes p . The notion of a mode of presentation is functionally defined and contextually determined. See Schiffer (1992) and Ludlow (1995) for more.

The DRS contains information accumulated from the previous sentences and represents newly added information, which imposes an additional limitations on the set of worlds compatible with his beliefs, representing the incrementational way of discourse processing.

Jaszczolt (1998) develops his model for the belief reports on the basis of Kamp (1990), adopting the anchoring devices to account for the ambiguities of referring expressions. Kamp (1990) proposes the devices of external and formal anchors. A DRS is to be connected with the appropriate entity to be evaluated in terms of truth conditions. When a discourse referent is connected with an entity in the real world, it is externally anchored. Formally an external anchor is a pair consisting of a discourse referent and an entity. Formal anchoring is concerned with the property ascription. A formally anchored DRS contains conditions of the form “Anch[.]”, which derive from the previous discourse or the context and specify the discourse referent. Let’s consider the following utterance (7a), which someone says, pointing at a man standing on a street corner. The DRS diagram of (7a) may contain several conditions which the recipient obtain from the earlier observation of the man, as shown in (7b)⁵.

(7) a. That man is a cocaine dealer.



In the above DRS, $V1(x), \dots, Vm(x)$ are the conditions which fix the anchor x by providing specific descriptions, e.g. ‘the man doing certain things, standing in a certain place, wearing certain clothes, etc’. $Anch[x]$ ⁶ is the signal that x is intended to function as anchored, via the descriptive conditions $V1(x), \dots, Vm(x)$. A formally anchored DRS is a pair of $\langle K, A \rangle$, consisting of a DRS K including one or more conditions and a function A which assigns to each discourse referent.

Jaszczolt (1998) presents a discourse model based on Kamp’s, focusing on the intentional interpretation. While Kamp makes an attempt to link the DRS’s on both sides of the discourse participants, the speaker and the hearer, representing their sharing aspects of discourse referents based on common knowledge, Jaszczolt focuses on the belief interpretation on the side of the hearer and offers a discourse model which can represent the three differentiated readings of referring expressions. As mentioned above, the problems in the belief contexts arise due to the ambiguous nature of the psychological states of the believers and the reporters. Sometimes the believers may be referentially mistaken or sometimes may have unrightful beliefs. The reporter has to arrange all this information considering the context in order for the report to fulfill a communicative function in a

5. The utterance (7a) contains two directly referential elements; the demonstrative noun phrase *that man* (x) and the present tense (n).

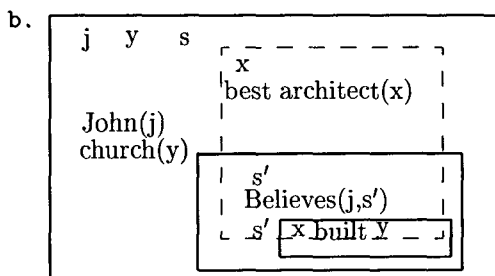
6. $Anch[x]$ does not make an attribution to whatever object the discourse referent x represents, but rather imposes a special constraint on the role of the discourse referent itself, being rigidly linked to whatever object the descriptive conditions determine. Kamp distinguishes these formal conditions which say something about how discourse referents relate to what they represent, from the descriptive conditions which describe the represented entities.

conversation. Jaszczolt mentions that the status of the referring expression in the subject position of the embedded sentence can be problematic since referring expressions⁷ can be used referentially or attributively, and specifically, non-specifically or generically. Jaszczolt (1998) distinguishes the three possible interpretations of the referring expression such as *de re*, *de dicto*₁, *de dicto*₂. As shown in the following example (8), the same situation can be described in various ways. The definite expression *the spy* or even the proper name Bernard can be used referentially or attributively, because he need not know who Bernard is, and further, he may use the name misreferentially. The example (8d) shows that the referential expression can be used mistakenly, and Jaszczolt calls this case *de dicto*₁.

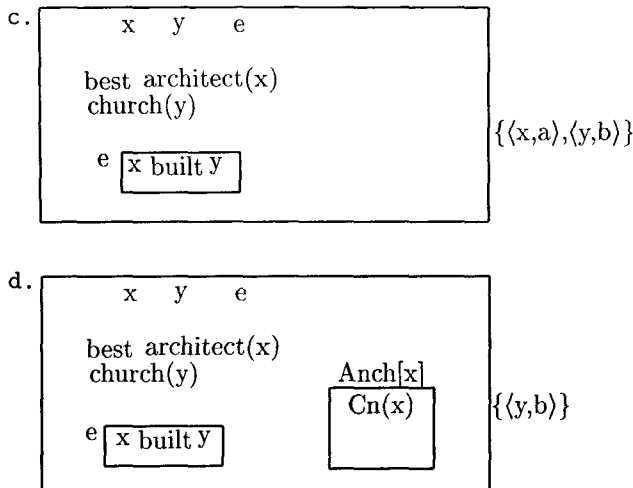
- (8) a. Ralph believes that the spy escaped from prison.
 b. Ralph believes that Bernard escaped from prison.
 c. Ralph believes that the innocent Frenchman escaped from prison.
 d. Ralph believes that Roland escaped from prison but he mistakenly calls him Bernard.

Jaszczolt accounts for the interpretation of belief utterances in conversation in two stages. Firstly, an estimate of the extent of semantic representation of an utterance towards the recognition of the communicated context and disambiguation of the semantic representation for truth-conditional evaluation. Jaszczolt's account is based on the model directly borrowed from Kamp (1990), which emphasizes the two aspects such as intentionality of beliefs and intentions in communication. The crucial task of the hearer is to locate the object of the belief in question, recovering the speaker's intentions from the utterance. On the one hand, the reporter sums up the information from the context or from past experience, based on conversational principles such as the relevance principle or Gricean cooperative principle. On the other hand, the reporter tries to identify the object, determining the placement of the object. Let's consider the following example (9a). The reporter, on hearing John utter (9a), tries to recover the speaker's intentions, summing up all the information and deciding the placement of discourse referent in the DRS. In (9b) the dotted line delineates the range of possibilities of placement of a discourse referent in the universes of various DRSs. The distinction is made by means of the depth of the embedding of *y*, which is represented differently in the respective DRS corresponding to the *de re*, *de dicto*₁, and *de dicto*₂ (proper).

- (9) a. The best architect built this church.



7. Jaszczolt (1998) mentions that with due respect to direct reference theory, the discourse-interpretive story of beliefs nearly evens proper names up with definite descriptions and calls them both referring expressions.



The interaction of intentions in communication will determine how the discourse referents are connected with the belief, i.e. how to choose from within the dotted lines in (9b). In (9a), if the descriptive noun phrase *the best architect* refers uniquely and is interpreted as de re, then it acts as a directly referential term. This reading is presented in (9c), in which the discourse referent is externally anchored, i.e. directly mapped into an object in the real world. If the description ‘the best architect’ is taken referentially but a possibility of a referential mistake is viable, then the referent is not externally anchored but (internally) formally anchored by the conditions, as represented in the DRS (9d).⁸ This is the case of de dicto₁ reading. The referring expression *the best architect* can be used attributively. In this case the referent will remain unanchored, and it first appears in the innermost box. The decision of this placement of the referent is guided by the recognition of the speaker’s intentions in communication.

In the case of proper names the same processes are applied to establishing the corresponding DRS. The referent, say, Orcutt, can be a transparent one (externally anchored in the outermost DRS), a partly oblique referent (one that may require further elaboration by the reporter like ‘Orcutt but he calls him Smith’, de dicto₁ reading) or a truly oblique one (de dicto₂ reading).

Thus discourse interpretation is governed by the recognition of the speaker’s intentions in communication, and the inference is led by the default reasoning based on the principle of generalization. Jaszczolt further argues that the de re reading tends to be more salient than other readings. In ordinary situations the hearer tends to take it for granted that a certain interpretation is the case, and usually it is the de re interpretation on the basis of the communicative and the informative intention.

4. A Discourse-Functional Model for Beliefs and PI: A Revised Model

So far I reviewed the models presented by Kamp and Jaszczolt based on DRT. Now I attempt to extend Jaszczolt’s model to represent the informational states in terms of the contrast between presupposition and assertion and to treat the PI in the belief contexts.

8. (10d) corresponds to Donnellan’s *weakly referential reading*, the one that allows for the possibility of a referential mistake, whereas (10c) is a strongly referential reading, akin to standard singular propositions. Cn(X) stands for an n number of formal conditions C, i.e. the description of the previous knowledge about the referent, e.g. ‘the man I met at a cafe’, ‘uncle of John Smith’, etc.

The extended model is basically a different one since it incorporates a model of world and context in which presuppositions are evaluated, which is effective in representing discourse incrementation and disambiguation of the referring expressions. In Kim (1993) and Kim (1998), I have taken a discourse approach to deal with the PI. The discourse model can offer fairly proper accounts for the interpretation of belief reports and for the PI in the belief contexts. I adopt the three-way distinction of *de re*, *de dicto*₁, *de dicto*₂ to account for referential expressions. Each referring expression is judged against the given world and the context. When the referring expression is directly referential (and if not misreference), it leads itself to a transparent reading by picking out the corresponding discourse referent, externally anchored in the outermost world. If the referent is used attributively and is not to single out any specific individual or object, it is present in the innermost box which represents the belief itself. The status of the discourse referent depends on the context in which the inferences or assumptions obtained from the previous utterances or discourse have been added. Each proposition is organized in the corresponding world and the context in which given information functions as the restriction of the object in consideration, reducing the set of alternative possibilities.

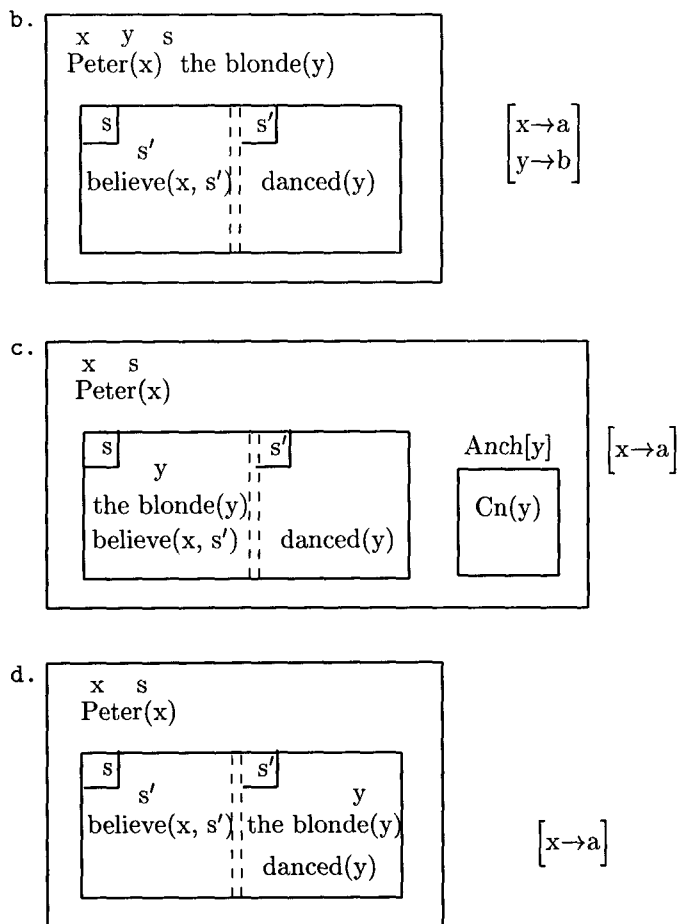
As the discourse is going on, the context is incremented and the information is organized in a different world respectively according to the individual referent. Discourse interpretation is incremental and doubly dynamic in such ways that on the one hand the information is *organized and evaluated* in the given world and on the other the propositions are constructed into the context which is augmented by the added information. During the conversation the reporter compiles the information around the object about whom or which the believer is talking. Thus the report is based on the whole communicated information. The reporter's world is nested in the outermost box. Basically, the embedded proposition is evaluated against the world and the context in which it is given, and the discourse referent is considered against the world and the context to which the proposition is subordinated. Thus the discourse referent in the innermost world is not evaluated in the real world from the first, but is evaluated in the limitedly constructed world, which is said to be a hypothetical world constructed by the believer.

In the DRSs hypothetical inferences or accommodated presuppositions are shown in the right box separated by a pair of dotted lines, and actual presuppositions or other shared information are separated by a pair of actual lines from the left box which contains the asserted information. This device is effective in representing the contrast between the assertion and the presupposition and is able to capture the processes involved in PI. If the embedded presupposition (EP) is inherited by the whole utterance, the EP which is represented in the inner box goes up to the higher level and appears in the outer box, established as the reporter's presupposition. If not, the EP just remains within the inner box (within the believer's world), and an altered presupposition is inherited by the whole utterance. The PI will be discussed in the next section in more detail.

Now, let's consider some examples and their DRSs. The reporter utters the following (10), on hearing Peter say "The blonde danced." The proposition containing the belief appears in the right box separated by a pair of dotted lines from the left box containing the superordinate clause. As for the status of the definite description *the blonde*, the three possible readings can be allowed, i.e. *de re*, *de dicto*₁, and *de dicto*₂. First possibility may be the case of *de re* reading, in which a specific referent in the world is picked out and the reporter rightly recognizes the blonde as the same person that Peter has in mind. In this case, as represented in the DRS (10b), *the blonde* is anchored in the outermost world. The second possible reading may be *de dicto*₁, in which the description is used referentially but there is possibility of misreference since the reporter does not identify the exact referent, who is specified by some given properties. In this case *the blonde* is

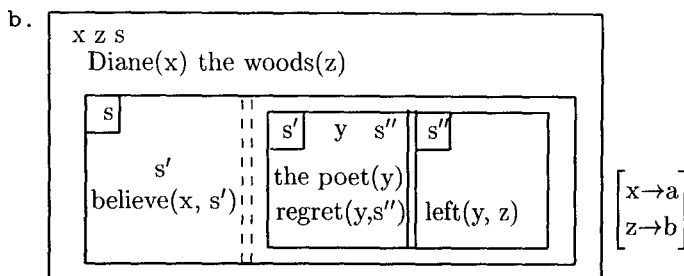
formally anchored and appears in the Peter’s belief world, as shown in the DRS (10c). Lastly, the referring expression can be used attributively and interpreted by de dicto₂ reading. The DRS (10d) shows that ‘the blonde’ is unanchored and is just held within the innermost box.

(10) a. Peter believes that the blonde danced.



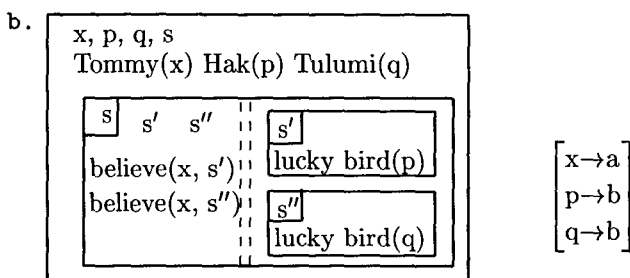
The following (11a) includes a factive verb *regret* and a propositional attitude verb *believe*. The complement clause has the EP *the poet left the woods*, which appears in the rightmost box restricting the set of compatible worlds. The definite expression *the poet* may be interpreted in various ways. The DRS (11b) represents the de re reading.

- (11) a. Diane believes that the poet regrets leaving the woods.



The following (12a) presents one of the controversial cases of belief contexts, in which Tommy has inconsistent beliefs about the same object, not recognizing their being equivalents. (12b) shows that the objects which exist as different entities in Tommy's world are anchored on one same entity in the real world.

- (12) a. Tommy believes that Hak is a lucky bird, but he does not believe that Tulumu is a lucky bird.



The above DRSs show that the devices of external and formal anchoring can be effectively utilized to represent the contradictory beliefs about the same object as well as the ambiguous readings of the same referential expression.

5. Inheritance of Presupposition in Belief Contexts

5.1 Problems of PI in the Belief Sentences

I have discussed the interpretation of belief sentences focusing on the status of the referent in the subject position in the embedded clause. It has been pointed out that the three readings are possible such as de re, de dicto₁ and de dicto₂. and the choice of the reading is dependent upon the context (communicated information). In this section I discuss the problems of PI in the belief contexts. The PI in the belief contexts has been much argued among the linguists as one of the most problematic cases. In the following (13), (13a) presupposes (13c), but (13b) doesn't. Morgan (1969) contended that in case of the "world-creating" verbs, the presupposition of the complement is inherited just within the clause. Thus, (13b) does not presuppose (13c) as a whole, since the verb *believe* belongs to the class of "world creating" verbs that blocks PI.

- (13) a. Lynn knew that he was a German and that he regretted it.

- b. Lynn believed that he was a German and that he regretted it.

c. Lynn was a German.

Karttunen (1973) found it difficult to assign the category for the propositional attitude verbs and first put them into the category of “plugs”. Basically, Karttunen and Peters (1979) take a compositional approach and explain that the propositional verbs are associated with a rule that takes the presuppositions of the complement and embeds them under the beliefs of the subject. In the following example (14a), the second conjunct has the presupposition (14c) which is attributed to the set of beliefs that Garby has, but (14a) as a whole does not presuppose (14c) since the first conjunct of (14a) entails it.

- (14) a. Garby believes that Jimmy has a spaniel and believes that Jimmy’s spaniel bit the cat.
 b. Garby believes that Jimmy’s spaniel bit the cat.
 c. Jimmy has a spaniel.

Gazdar (1979) gives an account based on the cancellation mechanism. The above sentence (14a) has the potential presupposition (14c) derived from the complement clause. However, (14b) has the clausal implicature that ‘Garby does not know that Jimmy has a spaniel.’ If the speaker knows that (14c) is true, he would have used the stronger expression ‘Garby knows that ...’ Thus, it is possible that Jimmy has a spaniel or he does not have a spaniel and (14c) cannot be the actual presupposition, consequently being cancelled.

Schiebe (1979) and Dinsmore (1981) provide accounts based on a procedural approach from the discourse perspective. Let’s consider Dinsmore’s account (1981) based on world-binding function (WBF). Let C be the context in which PC occurs. Let f be the function which maps any $p \in P$ onto the proposition that Garby believes p . F is a distributive WBF since if $f(p)$ and $f(q)$, then $f(p \& q)$. Let w be the world uniquely bound to w_0 by f in each case. The sentence (14a) entails in w the truth of the simple sentence (14b) which shares the EP (14c). Therefore, by (CSP)⁹ (14b) $\in G(c, w)$. It means that (14c) is considered to be true against the Garby’s world. Dinsmore’s model also offers right predictions about some other problematic cases. In the following sentence (15), (15a) entails the truth of (15b) which shares the EP (15c). In the same way as in (14), the EP is satisfied in the Bill’s belief world.

- (15) a. Bill was of the opinion that Maria, who he believed to be sick, kept her sickness a secret.
 b. Maria kept her sickness a secret.
 c. Maria was sick.

The following (16) is a problem for Karttunen and Peters, who predict filtering of PI incorrectly since the EP is entailed in the first conjunct. They have no device to differentiate the two *someone* belief sets. According to Dinsmore, f , the function which maps any $p \in P$ onto the proposition that someone believes p is a non-distributive WBF. f is a WBF because $f(p)$ and $f(p \parallel q)$, then $f(q)$. However, f is not distributive, because $((f(p) \& f(q)) \neq f(p \& q))$. Thus (16b) is evaluated against a different world from the one for the first conjunct. Therefore, filtering of (16b) is not predicted.

9. The condition on the satisfaction of presupposition states that presupposition should be satisfied with respect to the world and the context in consideration.

- (16) a. Someone believes that Fred used to smoke and someone believes that Fred stopped smoking.
 b. Fred used to smoke.

5.2 PI in the Belief Sentences in Korean

I reviewed the problems of PI in belief contexts. Simple cancellation or compositional approaches are unable to provide proper accounts for the PI in the belief contexts. The discourse view is needed to interpret the belief reports properly, considering the psychological states of the discourse participants. Now, I will discuss PI in the belief contexts including the data in Korean. I argue that in the belief contexts the EPs are evaluated against the world and the context to which it is nested and unless contradicted, they are accommodated into the context and serve as presupposition in contrast with assertion. In Korean, in case of *kesul mitta* the EP is inherited by the whole sentence.

During the ongoing conversation the initial context keeps on incrementing by the incoming information added. The assertion will be admitted into the context, if it is not contradictory to the existing context or is not refuted by any objection by the addressee. Once the assertion is admitted into the context, it will serve as presupposition at the next stage of discourse processing, restraining the set of compatible worlds. In ideal circumstances the discourse participants share the same common ground, which constitutes non-defective states, but in actual situation conversation usually takes place in defective contexts, in which the common ground of the participants is not the same. If the divergence resulting from the defective context set arises, it would not directly lead the conversation to a break-up, but rather the discourse participants tend to cooperate to lead their common ground into a non-defective one through the stage of accommodation.

Suppose two high school alumni meet after a long time and are talking. If one of them says, "My son is going to get married next month", the addressee understands through accommodation of his context that the utterer has a son even though he did not know the fact before the utterance. Thus via accommodation the presupposition is admitted into the common ground as if it were there already, as unfocused information and into the common ground the incoming information is added, involving the incrementation of the context. In this case presupposition can be defined as accessible or inarguable information, not actually given.

Elsewhere, in Kim (1993), I explained the case of belief context as one of the non-committal cases in defective contexts along with the cases of conditionals. The non-committal cases are those in which the speaker does not commit himself to the truth of the proposition presented in presupposition construction (PC) in question, which is normally expected to produce presupposition. In these cases the presuppositions are inherited by the matrix sentences in altered forms. The embedded presupposition (EP) produced by the PC is not believed to be true in the speaker's reality, but is assumed to be true in a certain hypothetically relativized world. The presupposed information presented by the speaker may be new to the addressee, but if the addressee doesn't find any objection to the proposed presupposition, he will adjust his context to accommodate the presupposition. The sentences uttered in a non-factual mood involve modal subordination and accommodation.¹⁰ In conditionals, first the antecedent clause is hypothetically added to the common ground, then the consequent clause which is modally subordinate to the antecedent is considered. The whole conditional is true if the consequent is true in each of these hypothetically built possible worlds. If there is no contradiction (or objection

10. Refer to Roberts (1985) and Kim (1993).

from the addressee), the (embedded) presupposition is accommodated and admitted into the context and is assumed to be satisfied in the context.¹¹

The same account can be applied to the cases of belief contexts. The EP is considered and accommodated against the limited belief world and context. Let's consider the following example.

- (17) a. Hyunsek believes that Mihye regrets visiting the place.
 b. Mihye visited the place.
 c. Hyunsek believes that Mihye visited the place.

In (17) the complement clause is modally subordinate to the main clause. The truth of the EP (17b) should be judged against the relativized Hyunsek's world in which it is nested and the reporter is non-committal toward the EP, the truth of which is preserved in the relativized Hyunsek's belief world. As a result, the EP (17b) is not inherited by the reporter's reality as it is, but the altered presupposition (17c), altered with respect to Hyunsek's belief world, is inherited by the whole utterance. As for the above example (14a), (14c) should be judged against the given Garby's world and since it is satisfied in the limited Garby's world without any contradiction, it serves as presupposition in the given context. Thus as a whole, the altered presupposition, that is, the proposition in question preserved to be true in the limited belief world, is inherited by the utterance. The same explanation can be applied to the cases of propositional attitude verbs in English, i.e., the truth of EP is ascribed to the believer, and is preserved within the nested world. In Korean, however, there are observed different cases of belief sentences which are transparent to presupposition inheritance. The verb 'mitta'¹² (believe) can take different complement types such as *...kesul (mitta)* and *...ko (mitta)*. While in the latter case, which is the same as the verb *believe* in English, the truth of the EP of the complement clause is just ascribed to the believer, the former *...kesul mitta* serves like the factive verb *know* in English and lets through the EP. The speaker's choice of complementizers indicates his commitment to the factivity of the complement clause, making the EP transparent to PI. In other words, *...lako mitta* is opaque to the factivity of the complement clause, while *...lanun kesul mitta* is considered to allow a transparent reading. The EP goes up to the higher clause and can be inherited by the whole utterance. Let's consider the following examples. In (18a) the reporter is non-committal to the truth of the complement clause, the content of which can be denied in the next clause without resulting in any contradiction. Whereas in (18b) and (18c), the EP is inherited by the whole utterance. In (18b) the EP 'Minho-ka Unci-lul coahanta. (Minho likes Unci.)' is presupposed by the reporter and in (18c) the EP 'Unci-ka Minho-lul mannassta. (Unci met Minho)' is inherited by the whole utterance.

- (18) a. [s [s₁ Minho-nun [s₂ Unci-ka caki-lul coahanta]-ko mitko
 issununtey], [s₃ sasil, Unci-nun Cinkyu-lul coahakoisse]].
 'Minho believes that Unci likes him, in fact she likes Cinkyu.'

11. For more discussion of "accommodation", the reader is referred to Lewis (1979), Heim (1983), Roberts (1985), Beaver (1992), Sandt (1987), Sandt (1992), Zeebat (1992), etc.

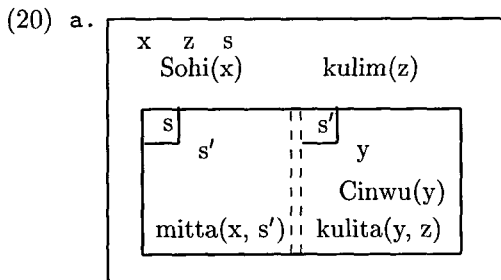
12. I regard the verb *mitta* as an ambifactive verb, which can take both the presuppositional complement type (*...kesul*) and non-presuppositional ones (*...ko*, *...kesulo*) (Kim (1993)). Lee (1978) pointed out that the verb *alta(know)* can be a factive predicate (when used with the complement *kesul*) or a non-factive one (when used with 'kesulo').

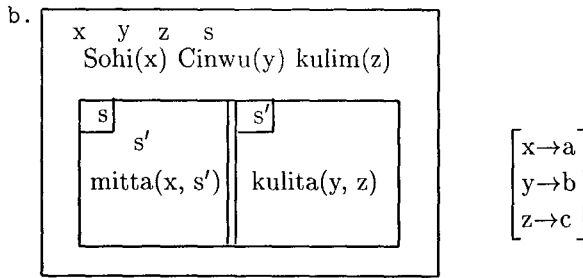
- b. [s [s₁ Unci-nun [s₂ Minho-ka caki-lul coahanta]-nun kesul mitci anihay], [s₃ sasil nwukwuna alkoissnuntey]].
 ‘Unci does not believe that Minho likes her, in fact, everybody knows it.’
- c. [s[s₁ Minho-nun [s₂ Unci-ka [s₃ caki-lul manna]-n kesul hwuhoyhanta]-ko mitkoisse].
 ‘Minho believes that Unci regrets meeting him.’

Now, let’s take some more examples, focusing on the differences in the way of PI between the two different complement types which the verb *mitta* takes. In the following example (19), (19a) does not presuppose (19c), that is, the reporter is non-committal to the factivity of the complement clause and the EP (19c) is to be considered against the temporarily built Sohi’s belief world. Whereas (19b) presupposes (19c), which is inherited by the reporter’s reality.

- (19) a. Sohi-nun Cinwu-ka ku kulim-ul kulyessta-ko mitkoissta.
 ‘Sohi believes that Cinwu drew the picture.’
- b. Sohi-nun Cinwu-ka ku kulim-ul kulyessta-nunkesul mitkoissta.
 ‘Sohi believes that Cinwu drew the picture.’
- c. Cinwu-ka ku kulim-ul kulyessta.
 ‘Cinwu drew the picture.’

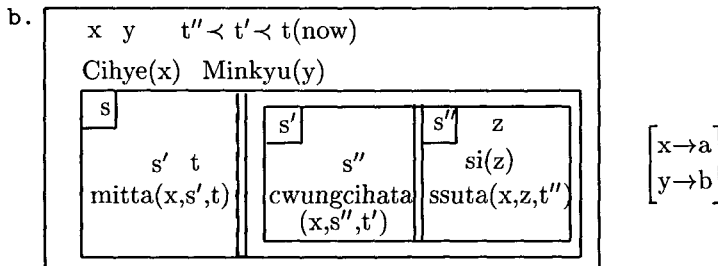
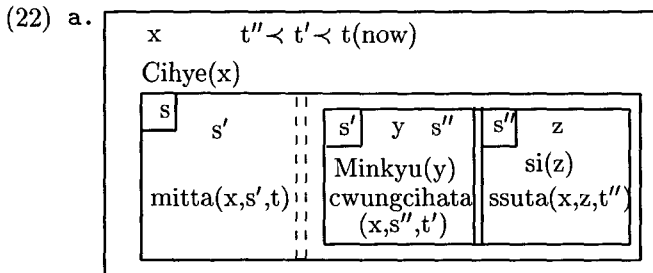
The differences between the two types of complements *...kesul* and *...ko* are represented in the DRS’s via different informational states and different ways of PI. In the DRSs presuppositions are shown on the right box which is separated from the assertion by a pair of lines. Presuppositional propositions are represented by using a pair of actual lines and non-presuppositional, hypothetical propositions by a pair of dotted lines. In (19a) the reporter is non-committal to the factivity of the complement clause and the EP (19c) is to be considered against the temporarily built Sohi’s belief world. The status of the discourse referent in the embedded clause is opaque in three ways; de re, de dicto₁ and de dicto₂. The figure (20a) is the DRS which represents the de dicto₂ reading of ‘Cinwu’ in (19a), in which the referent is known just by his name and property, unanchored. The dotted lines in (20a) represent the hypothetical status of the proposition on the right. (19b) is also understood to allow the three possible readings, i.e. de re, de dicto₁ and de dicto₂, but here the de re and the de dicto₂ readings can be considered preferred readings due to the transparency of the EP (by the use of *...kesul*). (20b) is the DRS representation of the de re reading of (19b), in which a specific person is singled out in the real world, being externally anchored. The actual lines show that the proposition on the right box serves as presupposition and is inherited by the reporter’s reality.





Now let's consider the sentences in (21). (21a) shows that the truth of (21c) is preserved in the Cihye's world, that is, the altered presupposition (21d) is inherited by the whole utterance. Whereas in (21b), the speaker is committed to the truth of the EP, which is inherited by the whole utterance. As for the referring expression 'Minkyu', the three readings are possible in both (21a) and (21b). In (21b), however, the de re reading will be preferred (default reading) due to the transparent use of the complement type. Three DRSs are possible, however, since the just placement of the referent in the complement clause appear in different. The de dicto reading for (21a) and the de re reading for (21b) are represented in (22a) and (22b) respectively.

- (21) a. Cihye-nun Minkyu-ka sissuki-lul cwungcihayssta-ko mitkoissta.
'Cihye believes that Minkyu stopped writing poems.'
- b. Cihye-nun Minkyu-ka sissuki-lul cwungcihayssta-nun kesul mitkoissta.
'Cihye believes that Minkyu stopped writing poems.'
- c. Minkyu-ka si-lul ssessta.
'Minkyu stopped writing.'
- d. Cihye-nun Minkyu-ka si-lul ssessta-ko mitkoissta.
'Cihye believes that Minkyu wrote poems.'



6. Concluding Remarks

So far I have discussed the possible interpretations concerning the status of the referring expressions in the complement clause and the PI in the belief contexts. As for the referring expression used in the subject position in the complement clause of belief sentences, there are allowed three possible readings, that is, de re, de dicto₁ and de dicto₂. The choice of the reading depends on the context, mostly on the reporter's decision. The addressee decides the type of reading considering all the information available from the context. The DRS's can represent the differences effectively. The differences among the readings, mostly in the ways of identifying the referents, are captured via the different anchoring modes. External anchoring is the device used to pick out a specific person in the real world (de re reading), and the discourse referent in the DRS is mapped into a specific entity in the real world. In case of formal anchoring, the discourse referent is formally anchored within the world in consideration via certain conditions obtained about the discourse referent from the context, which is used to represent the de dicto₁ reading. As for the de dicto₂ reading, the discourse referent is not anchored anywhere, it does not single out any specific individual or any object (referring to whoever or whatever fits the name or the description) Then I discussed the PI in the belief contexts, focusing on the different ways of PI in the sentences containing the verb *mitta* in Korean. The ambi-factive verb *mitta* can take two types of complements ...*(la)ko* and ...*(lanun)kesul*. In case of ...*ko mitta*, the presupposition is not inherited by the whole utterance, but considered against the limited belief world. If there is no contradiction, it is satisfied just within the given world and the addressee accommodates the proposition, adjusting his context. While if it is the case where the speaker chooses the complement type 'kesul mitta', the EP of the complement is considered to be true in the reporter's world and is inherited by the whole utterance. An attempt has been made to represent the differences in respective DRS's.

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