Generalized Concept Generators[*]

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1. Introduction

In this paper, I develop a unified semantic account of de re, de dicto, and third reading attitude reports by generalizing Percus & Sauerland's (2003) Concept Generator theory, resulting in a theory that does not suffer the problems plaguing standard accounts of these readings. In doing so, I account for *de re* expressions that are not of type e, like quantifiers and predicates. Furthermore, I avoid the problem that expressions lacking extensions at the actual world pose for standard accounts of the third reading in particular. I conclude by noting some potential problems that the Generalized Concept Generator theory faces.

1.1 *De re*, *de dicto*, and the Third Reading

At least since Quine (1956), it has been observed that attitude reports like (1) can be true in distinct situations.

(1) Peter thinks Mary kissed a fisherman.

a. Mary and Peter go to a party, where Peter sees Mary kissing Bobby. Bobby is a prominent local fisherman, though Peter doesn't know this.
b. Mary and Peter go to a party, where she tells him, "I kissed a fisherman."
c. Peter and Mary are at a party thrown by the town's fishermen, all of whom are wearing tuxedos. Peter doesn't know the tuxedoed men. He hears that Mary kissed one of the tuxedoed men.

The salient interpretation of (1) judged true in the scenario in (1a) requires that Peter believes Mary to have kissed a particular person, and furthermore that this person actually must be a fisherman, though Peter needn't be aware of this fact. The salient interpretation of (1) judged true in the scenario in (1b) is that Peter believes Mary to have kissed some

[*]Many thanks to Seth Cable, Rajesh Bhatt, Valentine Hacquard, Alexander Williams, and others who provided comments and feedback on this work at MACSIM V and NELS 46.

person, and he believes that person to be a fisherman. The former interpretation has been called *de re*, and the latter *de dicto*.

Fodor (1970) noted that (1) can be judged true in the scenario in (1c). In this scenario, there is no person such that Peter thinks Mary kissed *that* persoon, so the interpretation is not *de re*. Since Peter doesn't know that the tuxedoed men are fishermen, in his belief worlds Mary needn't kiss a fisherman, so it is not *de dicto*. What is true is that in all of Peter's belief worlds, Mary kissed one of the tuxedoed men, and those men are fishermen. This is often called the 'third reading.'

The classic analysis of (1a) and (1b) treats the ambiguity as a matter of the relationship between the scope of the quantifier and that of the attitude verb at LF. In the *de re* interpretation, *a fisherman* is raised out of the embedded clause via Quantifier Raising (QR), contrasting with the *de dicto* interpretation, where *a fisherman* is left in situ. We can thus assign the truth conditions in (2)[1].

(2) a. $\exists$x. x is a fisherman in w_0 & $\forall$w' $\in$ Bel(Peter, w_0): Mary kissed x in w'.
    b. $\forall$w' $\in$ Bel(Peter, w_0): $\exists$x. x is a fisherman in w' & Mary kissed x in w'.

The third reading poses a major problem for this QR-based solution, however. If we scope *a fisherman* out of the embedded clause, it will pick out the same entity across all of Peter's belief worlds. In Fodor's terms, the indefinite is *specific*. Furthermore, that entity is a fisherman in the actual world, so the indefinite is *transparent*. If we leave the indefinite in situ, it will pick out different entities across Peter's belief worlds, and the entities will be fishermen in his belief worlds—it will be *non-specific* and *transparent*.

The crucial problem here is that *specific* indefinites *must* be *transparent*—the two properties cannot be divorced. The reading of (1) true in (1c) shows, however, that specificity and transparency are not essentially linked together. Across Peter's belief worlds, the indefinite picks out different entities (i.e. *non-specific*), and these entities are fishermen in the actual world (i.e. *transparent*). The standard solution is to posit silent world pronouns in the syntax (à la Percus (2000)). We can coindex the world pronoun associated with *a fisherman* in (1) with the actual world, and leave it in situ, deriving an LF as in (3):

(3) $\forall$w' $\in$ Bel(Peter, w_0): $\exists$x. x is a fisherman in w_0 & Mary kissed x in w'.

By leaving *a fisherman* within the scope of the attitude operator as in (3), it remains *non-specific*; by adding the pronoun coindexing actual world, we derive the *transparency*.

1.2 Three Problems

The scope account sketched above is designed to deal with quantifiers like *a fisherman*. This is a problem, however, because attitude reports containing proper names seem to exhibit both *de re* and *de dicto* interpretations. If we assume (following Kripke (1972)) that proper

[1]I assume here that *think* and *believe* have the same Hintikka-style semantics, such that these verbs quantify universally over the attitude holder's belief worlds (Hintikka 1969).

names are not quantifiers, but rather rigid designators, the scope account cannot derive adequate truth conditions for *de re* attitude reports containing proper names.

(4) Ralph thinks Ortcutt is a spy.

a. Ralph sees a man in a brown hat at the beach acting suspiciously. He thinks to himself, "The man in the brown hat is a spy." We know that this man is Ortcutt, but Ralph doesn't.

b. I tell Ralph, "Ortcutt is a spy." He forms the belief that Ortcutt is a spy.

We can judge (4) true in both the above scenarios. The reading of (4) true in (4a) seems to be *de re*, since it's not the case that in all of Ralph's belief worlds, Ortcutt is a spy. However, this does seem to be the case in the scenario in (4b), and so it seems the reading of (4) that is true is *de dicto*. Assuming names are not quantifiers, we would need to posit a mechanism other than QR to account for the truth of (4) in these two scenario.

The scope account also fails to account for the possibility of *de re* readings of other types of expressions, like properties[2]. Sudo (2014) argues that *de re* properties are available in certain cases.

(5) John thinks that Mary is Catholic.

a. John knows that his friend Bob is dating Mary. Furthermore, John has the belief that Bob would never date anyone outside his religion. Despite this, he does not know what religion Bob belongs to. We know that Bob is Catholic.

If we judge (5) true in the scenario in (5a), it is not *de dicto*, since Mary needn't be Catholic in all of John's belief worlds. Rather, there is a property, namely *being Catholic*, that Mary satisfies in the actual world, and this property is contextually equivalent with the property that John ascribes to Mary, namely *being the same religion as Bob*—all this suggests a *de re* interpretation. As with proper names, the scope account cannot deal with this.

The final problem concerns third readings. Schwager (2011) notes that there is a major problem with analyses which try to derive *non-specific, transparent* truth conditions for the third reading in terms of world variables. Such approaches fail for (6).

(6) Mary wants to buy a building with 192 floors.

a. Mary is looking at the Burj Dubai, which has 191 floors and is currently the highest building in the world. Also, no other building has more floors. Mary doesn't know these facts. She also doesn't know how many floors the Burj Dubai has, nor its name. She thinks to herself, 'Wow! I want to buy a building that's one floor higher than that one!' (Schwager (2011), p. 399)

[2] I will assume that properties and predicates are semantically the same object, being <s,et> functions, and I will use the two terms interchangeably.

The reading of (6) available in (6a) is not *de dicto*, since Mary has no idea how many floors the building in question has; it is also not *de re*, since there is no particular building *x* such that Mary wants to buy *x*. We would then assign the truth conditions as in (7) to (6):

(7) $\forall$w' $\in$ Desires(Mary, w_0): $\exists$x. 192-floor-building(x) in w_0 & Mary buys x in w'.

However, these truth conditions are not right. By assumption in (6a), there is no such building in the actual world. The truth conditions in (7) thus hold only when the set of worlds where Mary's desires are met is empty because the indefinite will fail to pick out any entity in the actual world. So, (7) will be true only when Mary has inconsistent desires. It is clear, however, that Mary's desires are consistent, and that (6) is an appropriate way to describe her desires.

To deal with these two problems, Schwager and Sudo propose similar mechanisms. For reasons of space, only Schwager's solution, the REPLACEMENT PRINCIPLE, is given below.

(8) REPLACEMENT PRINCIPLE:
For the sake of reporting an attitude, a property that is involved in the content of the attitude that is to be reported (the **reported property**) can be replaced by a different property (the **reporting property**) as long as the reported property is a subset of the reporting property at all worlds metaphysically closest to the actual world where the reported property is nonempty.

Essentially, Schwager's proposal is that for third readings we need to evaluate the descriptive content of DPs not with respect to the actual world, but rather at those worlds that are 'metaphysically closest' to the actual world—that is, at those worlds which are similar to the actual world in every relevant way except that the descriptive content of the DP in question is nonempty. The issue here, though, is that this principle is non-compositional—it requires and if it is possible, we would prefer a mechanism which compositionally (and uniformly) derives all the relevant readings of these attitude reports.

1.3 Concept Generators

In order to solve the issues discussed in the previous section, we will utilize the solution developed by Percus & Sauerland (2003) (from now, P&S)[3]. They propose that in addition to silent, bound variables over possible worlds, the syntax of attitude reports contains silent, bound variables called concept generators (CGs). These are one-to-one functions mapping entities to individual concepts (ICs), which are <se> functions. ICs are the ways in which an attitude holder identifies the entities in question—acquaintance relations in the Kaplanian (1968) sense are built into the semantics of these pronouns. CGs take as input an

[3] P&S are mostly concerned with *de se* attitude ascriptions in the sense of Lewis (1979), which are outside the scope of this paper. However, minor changes to the system developed here will allow us to derive the truth conditions of such attitude reports.

entity within the scope of an attitude verb, and return a function denoting the guise under which the attitude holder apprehends that entity. CGs are defined as in (9).

(9) **G** is an acquaintance-based concept generator for x in w iff:

a. G is a function from entities to individual concepts (i.e. of type <e,se>).
b. Dom(G) = {z: x is acquainted with z in w}, and
c. The concepts G yields are acquaintance-based in the sense that,
$\forall$z $\in$ Dom(G): $\exists$R such that x bears R uniquely to z in w, and
$\forall$w' $\in$ Bel(x, w). x bears R uniquely to G(z)(w') in w'.

To make this all clearer, recall our example (4) and the scenario in (4a). For a concept generator G_1 for Ralph in w_0, G_1(⟦Ralph⟧) can return the function [λw'. the man in the brown hat in w']. CGs take type e expressions as input, and return an <se> function. These pronouns are bound by lambda operators sitting immediately below the attitude verb. So, we could posit the LF in (10) for (4), and derive the following truth conditions.

(10) a. [Ralph [thinks [λG_1 [λw_1 [[[G_1 Ralph] w_1] [[is a spy] w_1]]]]]]
b. $\exists$G for Ralph in w_0 s.t. $\forall$w' $\in$ Bel(Ralph, w_0). G(Ralph)(w') is a spy in w'.

The truth conditions in (10b) will hold if in all of Ralph's belief worlds w', *the man in the brown hat in w' is a spy in w'*. Assuming that the lambda operator over CGs is always present below an attitude verb, deriving the *de dicto* truth conditions of (4) requires allowing the operator to vacuously bind the embedded clause.

2. Generalizing Concept Generators

2.1 Preliminaries

As it stands, the CG theory cannot account for *de re* properties, and P&S are silent on how exactly third readings are to be dealt with in their system—we would need to posit some additional mechanism to account for third readings. However, we can modify the P&S system in order to account for these very problems. In order to generalize the system, we will first make some harmless modifications to the original system. First, we add one additional condition to the definition of a CG given in (9):

(11) *The Equivalence Condition (first version)*:
$\forall$y $\in D_e$, G(y)(w_0) = y.

This new condition guarantees that a CG returns an individual concept whose value at the actual world *is* the entity that the CG takes as argument. That is, this guarantees that [λw'. the man in the brown hat in w'] actually picks out Ortcutt in w_0. Next, we will intensionalize proper names, such that they are <se> functions. They will still be rigid designators, and so ⟦Mary⟧ = [λw'. Mary].

We need to amend our definition of a CG now, in line with intensionalizing proper names. Instead of being <e,se> functions, they will now be <se,se> functions[4]. Our revised definition for CGs is as follows.

(12) **G** is an acquaintance-based concept generator for x in w iff:

a. G is a function from entities to individual concepts (i.e. of type <se,se>).
b. Dom(G) = {z: x is acquainted with z in w}, and
c. The concepts G yields are acquaintance-based in the sense that,
$\forall$z $\in$ Dom(G): $\exists$R such that x bears R uniquely to z in w, and
$\forall$w' $\in$ Bel(x, w). x bears R uniquely to G(z)(w') in w'.
d. $\forall y \in D_{se}$, $G(y)(w_0) = y(w_0)$.

The reader will notice an additional change to the right half of the equivalence condition in (12d)—there is now a world variable denoting the actual world. This is in line with the shift to the fully intensional system; all y will be $< se >$ functions. This ensures once again that the object a CG takes as input is contextually equivalent to the object the CG returns at the actual world.

2.2 Step One

We are now in a position to amend CGs in such a way that we can handle *de re* properties. If properties are <s,et> functions, we can imagine that a different CG specifically for properties that would take a property within the scope of an attitude verb as input, and return the property that the attitude holder ascribes to the relevant entity satisfying that property. Such a CG would be an <set,set> function. Recall the intuition discussed at the end of the last section and its relationship to (5). First, it seems that that the *de re* attitude report expressed in (5) is true in virtue of some *de dicto* attitude that John has in that context (i.e. that he believes Mary is the same denomination as Bob). Second, there is a property (*being Catholic*) which is contextually equivalent to some other property (*being the same denomination as Bob*). This equivalence is what allows us to say (5) in (5a).

At this point, we have two different types of CGs: ones whose domain is individuals, and ones whose domain is properties. Given that we have made proper names <se> functions, we can note a parallel between the two kinds of CGs: CGs are functions from an intensional type τ to that same intensional type τ. With this parallel in mind, we can generalize CGs, and define them as follows:

(13) **G** is an acquaintance-based concept generator for x in w iff:

a. G is a function from an intensional type τ to that same type τ (i.e. $<\tau,\tau>$).

[4]There is another possible type for CGs once we make the change to intensional proper names—that CGs are <se,sse> functions. Such a view will force us to add another world variable sitting above CGs, and it is not clear why this would be motivated, and furthermore, this view will be problematic when we move to generalize CGs to properties.

b. $\text{Dom(G)} = \{\Phi_\tau$: x stands in appropriate attitude-based contact with Φ in w$\}$[5],
c. The concepts G yields are acquaintance-based in the sense that,
$\forall$z $\in$ Dom(G): $\exists$R such that x bears R uniquely to z in w, &
$\forall$w' $\in$ Bel(x, w). x bears R uniquely to G(z)(w') in w'.
d. $\forall y \in D_\tau$, $G(y)(w_0) = y(w_0)$.

We now need to make a modification to the lexical semantics of attitude verbs, such that our system can accurately derive the truth conditions of an attitude report. We will use *think* as a template for all attitude verbs. We will define a new semantic type, g, such that the first argument of an attitude verb is a function from g to propositions.

(14) a. $D_g = \{G$: G is a $<\tau,\tau>$ function, where τ is an arbitrary intensional type$\}$
b. $[\![\text{thinks}]\!] = \lambda\Pi_{<g,st>}\lambda w\lambda x$. $\exists$G for x in w such that $\forall$w' $\in$ Bel(x,w). Π(G)(w)

With all this, we can derive the truth conditions of (5) as follows:

(15) $[\![(5)]\!] = 1$ iff $\exists$G for John in w_0 such that,
$\forall$w' $\in$ Bel(John, w_0). G($\lambda w\lambda x$. x is Catholic in w)(w')(Mary).

These truth conditions will hold in (5a) because there is a G such that G($[\![$is Catholic$]\!]$) returns the property [$\lambda w'\lambda x$. x is the same denomination as Bob in w'], the property John ascribes to Mary. In all of John's belief worlds, Mary satisfies that latter property.

2.3 Step Two

The final issue to be dealt with here concerns the Burj Dubai. Though we did not go into detail here, Schwager's approach, with the REPLACEMENT PRINCIPLE as its centerpiece, ultimately treats third readings as *de re* properties, with the qualification that they be evaluated with respect to those worlds most similar to the actual world except that the relevant property extensions are nonempty. Given that we have shown how properties are to be dealt with in a generalized theory of CGs, third readings are automatically dealt with. Furthermore, we can incorporate key elements of her theory into ours such that we avoid the problem Burj Dubai cases pose. To do so, we have to manipulate the Equivalence Condition one more time, as in (16):

(16) *The Equivalence Condition (final version)*:
$\forall y \in D_\tau$: $\forall$w'. w' is the metaphysically closest world to w_0 where $y(w') \neq \emptyset$,
$G(y)(w_0) = y(w_0)$.

This revised condition states that G(y) is equivalent to y not at the actual world, but at *all* the metaphysically closest worlds where y is nonempty—that is, as those worlds most

[5] It is important to note that being 'acquainted with' a property is in no way clearly defined here, and will not be. Indeed, in order for this account to be satisfying, such a notion must be well defined. This is left open for future work

similar to the actual world except that y is nonempty. The actual world is trivially the most similar world to the actual world, so whenever the property is nonempty at the actual world, we won't need to shift worlds to evaluate the equivalence between the input and output of a given CG. As such, when the property holds in the actual world, as in the interpretation of (1) true in (1c), the updated Equivalence Condition will guarantee that the output of a concept generator G is equivalent to the input at the actual world. It is only when the output these properties are nonempty that the world-of-evaluation shift occurs. So, for (6), we would derive the following truth conditions, which will hold in (6a).

(17) $[\![(6)]\!] = 1$ iff $\exists$G for Mary in w_0 such that, $\forall$w' $\in$ Desires(Mary, w_0): $\exists$x. G([λwλy. y is a building with 192 floors in w])(w')(x) & Mary buys x in w'.

Thus, the modification of the Equivalence Condition in (17) easily incorporates the relevant parts of Schwager's analysis of the Burj Dubai problem, in a straightforwardly compositional manner. The Concept Generator theory of Percus & Sauerland (2003) can be adequately augmented in order to derive the truth conditions for a variety of attitude reports, resulting in a Generalized Concept Generator theory of attitude reports. This theory avoids rampant lexical ambiguity of attitude verbs, does not appeal to scope or movement, and is advantageous because it deals with double vision cases, *de re* properties, and empty extensions in an elegant, uniform way.

3. Problems and Conclusion

3.1 Problems

A few problems with the theory developed here deserve noting. First, the Generalized Concept Generator Theory is in principle unrestricted: there are no constraints whatsoever that prevent the generation of a multitude of *de re* readings for expressions of different intensional types. This includes whole propositions, as well as higher intensional types. If we consider the possibility of a CG taking as argument the entire clause embedded by an attitude verb, we run into serious problems. Consider the (marginal) case in (18).

(18) Bob said that the Red Sox won a game!

a. *Context*:
Bob is new to Boston. He's not familiar with the city or even its sports teams. He calls Mary while on tour, and we're with Mary. He walks by the Prudential Center, and sees the building light up—the lit windows show "GO SOX!" He says to Mary, 'The Prudential Center says "GO SOX!"' even though he has no idea what that means. Mary knows that this only happens when the Red Sox win a game, and knowing that we are avid baseball fans, Mary says (18).

To the extent that (18) is judged true, it is problematic for the theory presented here, since it would seem to be of a *de re* species of attitude reports. We would derive truth conditions as in (19) for such an interpretation.

(19) $\exists$G for Bob in w_0 such that, $\forall$w' $\in$ Bel(Bob, w_0): G([λw. the Red Sox won a game in w])(w').

Unfortunately, while these truth conditions would indeed hold in the scenario in question, they are far too weak. G can take the proposition [λw. the Red Sox won a game in w] and return an extensionally equivalent proposition. Given that this proposition is true in the actual world in this scenario, G could return *any* true proposition at the actual world. It could return [λw. Barack Obama is the President in 2016 in w], because, being a true proposition, it is an extensionally equivalent proposition. There is nothing in the theory presented here which prevents this from happening—any concept generator G can return a different true proposition for *The Red Sox won a game*. Consequently, the truth conditions in (19) will hold so long as Bob has any true beliefs at all. Clearly, this isn't desirable—we need to restrict the power of this theory.

A first pass at characterizing the restriction could go like this. For a given proposition ϕ embedded in the clausal complement of an attitude verb, if we know that in all of the metaphysically closest worlds, ϕ iff ψ, and if we believe that the attitude holder is agnostic about ψ, then we can report their *de dicto* attitude about ϕ with ψ. In the case of (18a), Bob's report *The Prudential Center says "GO SOX!"* is ϕ; *The Red Sox won a game* is ψ. Because we know that ϕ iff ψ, and because we know Bob has no opinion about ψ, we can report his speech with ψ. Such a restriction would block a CG from returning only extensionally equivalent propositions.

There is another, perhaps deeper issue concerns concept generators themselves. While assuming that these objects are present in the syntax allows us a great deal of flexibility and derivational power, one might worry about blindly assuming that these unpronounced elements are actually in the syntax. If they were, we would expect them to behave like other silent elements (e.g., pronouns, traces, and world pronouns, assuming the reading accepts that the latter are also explicitly in the syntax). The same arguments justifying that such elements are in the syntax ought to apply to CGs as well. If we find that these elements are surely not syntactic objects at all, we may need to reevaluate our theory, and devise a new strategy for the derivation of the kinds of readings of attitude reports discussed here, or reject the theory out of hand. It is also important to note that the theory discussed here (and indeed, many theories of the *de re/de dicto* ambiguity in general) place the burden on the semantics of attitude reports. We may wish to place the burden on the pragmatics, however, as do Salman (1986) and Soames (1988).

3.2 Conclusions

The Generalized Concept Generator theory as presented is able to derive the relevant interpretations of attitude reports discussed here in a principled, compositionally elegant manner. We showed that the original CG theory presented by Percus & Sauerland (2003) can be generalized to account for not only classic *de re* and *de dicto* attitude reports, but third readings, *de re* properties (and expressions of other intensional types), and expressions with empty extensions at the actual world, and we can do so in a uniform, elegant manner.

4. Contact information

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