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HOW MUCH LOCALITY WITH CONCEPT GENERATORS?[2]

Abstract. This paper presents a design for an *experimentum crucis* as to the particular type of locality found with the binding of variables ranging over so-called concept generators in the compositional semantics of *de re* readings of attitude reports (Percus, Sauerland 2003). The outcome of the experiment would show whether Santorio's (2014) formulation of the locality constraint is adequate. If it is not, this will affect his technical proposal. This paper presents an alternative proposal couched in terms of agreement and thus capable of capturing a more flexible, relative kind of locality.
Keywords: attitude reports, *de re*, possible worlds, counterpart semantics, Alternative Semantics.

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ГЕНЕРАТОРЫ КОНЦЕПТОВ И ПРОБЛЕМА ЛОКАЛЬНОСТИ В СЕМАНТИКЕ ВЫСКАЗЫВАНИЙ ОБ УСТАНОВКАХ *DE RE*

Аннотация. Статья посвящена формальному семантическому анализу высказываний о пропозициональных установках, интерпретируемых *de re*. Уже ставший традиционным анализ, использующий переменные по генераторам концептов (Percus, Sauerland 2003), перепорождает (Santorio 2014); мы описываем способ, каким можно проверить, адекватно ли требование локальности означивания этих переменных, сформулированное П. Санторио. В случае отрицательного результата альтернативная формализация, предложенная Санторио, окажется неадекватной. Мы предлагаем ещё одно решение, основанное на комбинации согласования (в смысле генеративистской теории признаков) и семантики альтернатив и предсказывающее относительную, а не абсолютную локальность.
Ключевые слова: высказывания о пропозициональных установках, *de re*, возможные миры, семантика двойников, семантика альтернатив.

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1. Concept Generators

Quine (1956) famously introduced double vision scenarios in the study of the semantics of attitude reports. In particular, both (1a) and (1b) can be truly uttered in a scenario where Ralph has seen Ortcutt twice under different circumstances without realising that he was seeing the same man.

(1) a. Ralph believes that Ortcutt is a spy.
b. Ralph believes that Ortcutt is not a spy.

Kaplan (1968) suggested that each of the reports in (1), if interpreted *de re* w.r.t. *Ortcutt*, is true iff there is a suitable mode of presentation of Ortcutt for Ralph such that the individual so presented is (resp. is not) a spy in Ralph's belief worlds; one way to model this is to say that in each of Ralph's belief worlds, there are two counterparts—in Lewis's (1968) sense—of the actual individual Ortcutt, each presented under a guise the real Ortcutt has, e.g. 'the man I [Ralph] saw spying around' and 'the man I [Ralph] saw relaxing at the beach.'

Conceptual arguments, such as the general compositional, step-by-step architecture adopted by modern formal semantics, as well as empirical evidence, such as the dependence of the choice of the mode of presentation on quantifiers higher in the structure (Charlow, Sharvit 2014, *pace* Aloni 2001), point to the necessity of coding the choice of the mode of presentation in the Logical Form of *de re* attitude reports. The de facto default theory to that end is presented in Percus, Sauerland (2003), where, apart from possible world variables, variables over **concept generators** (CGs) are added as sister nodes to terms interpreted *de re*.

The LF postulated for (1a) on the default analysis is (2a),

(2) a. Ralph believes λ_2 λ_1 [w_1 $\boxed{[\,G_2$ Ortcutt $]\ w_1}$ is.a.spy]
b. $[\![believes]\!]^{@} = \lambda p_{\langle\langle e,\langle s,e\rangle\rangle,\langle s,t\rangle\rangle}\lambda x.\exists G\forall w, @R_x w : p_w(G) = \mathbf{1}$
c. $\exists G_{2\ \langle e,\langle s,e\rangle\rangle}\forall w_1, @R_{\text{Ralph}} w_1 : Spy_{w_1}(G_2(ortcutt, w_1))$

Here λ_1 abstracts over the possible world variable—turning the embedded clause semantically from a proposition-in-extension, i.e. a truth-value, into a proposition-in-intension, i.e. a function from possible worlds to truth values. λ_2 abstracts over the concept generator variable, thereby turning a proposition-in-intension into a function from CGs to propositions-in-intension. A CG is a function of the type $\langle e, \langle s, e\rangle\rangle$ which, for a given individual (Ortcutt in (2a)), supplies an individual concept—a function from possible worlds to individuals possessing a certain individuating property each in its possible world.[3] Thus in (2a), the boxed expression will denote the individual which is the unique bearer at w_1 of a certain property of which Ortcutt is the unique bearer at @, the actual world. For reasons much discussed since Kaplan, the range of CG variables such as G_2 is typically restricted to properties involving some kind of

[3]Throughout the paper, it is assumed that an individual is confined to a particular possible world, and instead of trans-world identity counterpart relations are used.

epistemic proximity to, or acquaintance with, the bearer of the property, on behalf of the speaker (or, in case of deeper embedding, attitude holder); e.g. the property of being 'the (only) baby girl I saw in my apartment last Monday' fits, whereas 'the baby girl now located highest from the sea level' does not.

With both the world and the CG variable abstracted over, the attitude verb is assumed to quantify over them (2b), so that the interpretation of (2a) will be as in (2c), which reads: 'There is a way G_2 to correlate individuals with indivudual concepts based on Ralph's acquaintance s.t. (a) Ortcutt is the unique x s.t. $G_2(x, @)$ and (b) for each doxastic alternative w_1 of Ralph at @, the unique y s.t. $G_2(y, w_1)$ is a spy at w_1.'

Together with the referring expression whose referent has the relevant mode of presentation (*Ortcutt* in (2a)) and the possible world pronoun whose referent is the world where the individual so presented has to be found (w_1 in (2a)), a CG variable forms a complex that will be boxed for legibility throughout this paper and referred to as a "CG-shell" (a non-standard but convenient term).

2. Santorio on Locality

Santorio (2010; 2014) has pointed out that the default analysis overgenerates in that a given CG variable is predicted to be bindable by any attitude verb higher in the structure, whereas in fact—Santorio argues—it can only be bound by the closest such verb. (This situation can be viewed as similar to the tension between the apparent need for overt world pronouns in the syntax and the necessity to restrict their distribution; see Percus (2000) as a starting point and Schwarz (2012) for a more recent and principled account.) To see this, consider his

(3) Ralph believes that Ramona believes that Ortcutt is a fly guy.

According to Santorio, (3) does not have a true reading in the following scenario:

Scenario 1. Ralph and Ramona see Ortcutt perform. Ralph is impressed and says "That guy is a fly guy"; Ramona is unimpressed and says "That guy is not a fly guy." Ralph also thinks that Ortcutt, who is exceptionally short, is the shortest fusion drummer that they have ever seen. Ramona disagrees: "You're wrong. *Shortcutt* is the shortest fusion drummer we've ever seen, and he, differently from that guy, is fly" (Santorio 2014, p. 12).

This shows that the CG variable in the CG-shell of *Ortcutt* in (3) cannot be bound by the higher attitude verb, i.e. the only LF available is (4a), not (4b).

(4) a. Ralph believes
$$\lambda_4\ \lambda_3\ \Big[\, w_3 \text{ Ramona believes } \lambda_2\ \lambda_1\ [\, w_1\ \boxed{[\, G_2 \text{ Ortcutt}\,]\ w_1}\ \text{is.a.fly.guy}\,]\,\Big]$$

b. *Ralph believes
$$\lambda_4\ \lambda_3\ \Big[\, w_3 \text{ Ramona believes } \lambda_2\ \lambda_1\ [\, w_1\ \boxed{[\, G_4 \text{ Ortcutt}\,]\ w_1}\ \text{is.a.fly.guy}\,]\,\Big]$$

Assuming a binding mechanism in the style of Heim, Kratzer (1998),[4] where it is performed by indices in the syntax (represented as λ_i here), this restriction cannot be accounted for: lambda operators bind at any depth into their scope, interacting with any coindexed variable therein, just like first-order quantifiers do, and it is as impossible to preclude the configuration in (4b) as it is to rule out $\exists y \exists x P(y)$ once you allow for $\exists y \exists x P(x)$.

This is why Santorio uses, instead of quantification over explicit variables used in first-order logic and in the analyses of modality with overt world variables, a kind of quantification over an implicit variable analogous to the behaviour of traditional modal operators $\Box$ and $\Diamond$ in modal logic:[5] if a subformula is within the scope of a sequence of such operators, it will be interpreted at the possible worlds introduced by the last operator in the sequence, e.g.

(5) $[\![\Diamond\Box p]\!]^w = \mathbf{1}$ iff $\exists w', wRw' : \forall w'', w'Rw'' : [\![p]\!]^{w''} = \mathbf{1}$.

Likewise, Santorio assumes that attitude verbs quantify over a new kind of assignment, whose only role is to value CG variables, and simultaneously restrict the range of the variable to CGs of the attitude holder. Therefore, abstraction over CGs (our λ_2 and λ_4 in (4)) is not needed, and the interpretation of (3) corresponding to the LF in (4b) is as in (6), with the new kind of assignment denoted as h (notation differs from Santorio's).

(6) a. LF: Ralph believes $\lambda_3 \left[w_3 \text{ Ramona believes } \lambda_1 \left[w_1 \boxed{G \text{ Ortcutt}} \text{ is.a.fly.guy} \right] \right]$

b. $[\![\textit{believes}]\!]^{@,g} = \lambda S_{\langle s,t \rangle} \lambda x. \exists h \forall w, @R_x w : [\![S]\!]^h(w) = \mathbf{1}$
(abstracting from usual assignments)

c. Interpretation of (6a): 'For each doxastic alternative w_3 of Ralph at @, there is a way h to assign Ramona's CGs to CG variables such that for each doxastic alternative w_1 of Ramona at w_3, the individual which is $h(G)$ at w_1, where $h(G)$ is a property Ortcutt has at @, is a fly guy at w_1'

3. Diagnosing for Embedding

Santorio's proposal, however, is not the only one consistent with the behaviour of his (3). Apart from absolute locality—that is, the requirement that all CG variables be valued by the closest attitude verb—one could suggest that we are dealing with relative locality, i.e. the requirement that at the point of structure-building at which a CG variable is going to become bound, it has to be bound by the structurally closest abstractor **provided that** the closest abstractor does not bind a structurally higher

[4] As can be seen here, this paper assumes the textbook wisdom that indices are part of the syntactic representation of a sentence not reducible to any other component of that representation. This is no longer unchallenged, see e.g. Reuland (2011); as D. Zelenskii points out, viewing indices as product of syntactic movement or feature checking may provide theoretical resources to exclude the interpetations unavailable according to Santorio.

[5] Concerning this distinction, see Fintel, Heim (2011, ch. 8).

CG variable in the same nominal projection. To my knowledge, this option has not been systemically investigated. Santorio does not consider it, merely taking for granted that an actual indivudual (Ortcutt) can be an argument of a CG expression under two layers of embedding (cf. (7c) below). Moreover, it is not discussed in Tiskin (2016b[b]), which assumes CGs and deals explicitly with double embeddings. As noticed in a footnote there, Sudo (2014) has a brief mention of the possibility of intermediate readings with double embeddings, but both his primary empirical focus and his technical means are different from ones explored here.

To tell the two kinds of locality apart, we need to construct a scenario where the only true reading of an attitude report with double embedding could be the one with **nested** CG-shells of the form $\boxed{[\,G_i\ \boxed{[\,G_j\ a\,]\ w_k}\,]\ w_m}$. This means that other options, such as directly applying G_i to a, have to be excluded as leading to impossible or false interpretations. The following pair consisting of Scenario 2 and the sentence (7) is an attempt to provide for this need. However, this paper is not an empirical study, so the issue of the truth of the pertinent LF in (7d) is not resolved here; the claims of the following Section 4 are thus conditional on the establishment of its truth.

Scenario 2. On Saturday, Ralph meets the mayor on the beach without knowing who he is. On Sunday, Ralph gets drunk with his friends and acquires false memories; now he mistakenly believes that he has taken a funny picture of the notorious man on the beach and shown the picture to his friend Mary; moreover, he now thinks Mary could not but conclude that the man in the picture was hilarious.

(7) Ralph believes that Mary thinks that the mayor is hilarious.

a. *Ralph believes $\lambda_4\ \lambda_3\ \Big[w_3$ Mary thinks
$\lambda_2\ \lambda_1\ [\,w_1\ \boxed{[\,G_4\ [\text{the } @/w_3 \text{ mayor}\,]]\ w_1}\ \text{is.hilarious}\,]\Big]$

b. Ralph believes $\lambda_4\ \lambda_3\ \Big[w_3$ Mary thinks
$\lambda_2\ \lambda_1\ [\,w_1\ \boxed{[\,G_2\ [\text{the } w_3 \text{ mayor}\,]]\ w_1}\ \text{is.hilarious}\,]\Big]$

c. Ralph believes $\lambda_4\ \lambda_3\ \Big[w_3$ Mary thinks
$\lambda_2\ \lambda_1\ [\,w_1\ \boxed{[\,G_2\ [\text{the } @ \text{ mayor}\,]]\ w_1}\ \text{is.hilarious}\,]\Big]$

d. Ralph believes $\lambda_4\ \lambda_3\ \Big[w_3$ Mary thinks
$\lambda_2\ \lambda_1\ [\,w_1\ \boxed{[\,G_2\ \boxed{[\,G_4\ [\text{the } @ \text{ mayor}\,]]\ w_3}\,]\ w_1}\ \text{is.hilarious}\,]\Big]$

The LF in (7a) is prohibited by Santorio's constraint. The remaining options are considered below.[6]

[6]Embedding of coindexed CG variables, as in $\boxed{[\,G_2\ \boxed{[\,G_2\ [\text{the } @ \text{ mayor}\,]]\ w_1}\,]\ w_1}$, will be equiva-

Option I The LF in (7b) is not expected to be true in Scenario 2, given that Ralph does not know, or even believe, that the individual in question is the mayor.

Option II The LF in (7c) is not expected to be true in Scenario 2, given that there is no acquaintance relation between Mary[7] and any counterpart of the mayor, who is an actual individual. What Mary is acquainted with (in Ralph's belief worlds) is a counterpart of Ralph's counterpart of the mayor, and a counterpart of a counterpart of a need not be a counterpart of a (Lewis 1968).

Option III The remaining option is the LF in (7d). Uncontroversially, Ralph is acquainted with the mayor, therefore in Ralph's belief worlds there are (acquaintance-based) counterparts of the mayor. Moreover, Ralph can have a belief about Mary's mental state which would be *de re* w.r.t. Ralph's counterpart of the mayor, of the kind 'Mary believes, of the man I [Ralph] saw on the beach, that he is hilarious.' Mary's having of a counterpart of Ralph's man in each of her belief worlds accessible from *Ralph's* belief worlds is guaranteed by Ralph's allegedly having shown her a picture.

Thus, if (7) has a true reading in Scenario 2 at all, it is due to the possibility of CG-shells embedding one another.

4. Consequences for Locality

If (7) indeed has a true reading in Scenario 2, this will have consequences for the evaluation of Santorio's proposal. Given that he operates with assignment shifts, the assignment will be shifted for the whole most embedded clause, to the effect that all CG variables there will be restricted to CGs of Mary. However, if our analysis of Scenario 2 is correct, we should have the possibility of using CGs of a more distant attitude holder (Ralph) as well, as shown in (7d); therefore, Santorio's constraint will have to be restricted—but not abandoned, provided that we still have to rule out (7a).

(8) **Santorio's constraint** (revised)
The order of CG-shell embedding should be the mirror image of the embedding of attitude holders, with the least embedded CG-shell being evaluated with the CG of the closest holder.

The mechanism responsible for this kind of generalisation can no longer be assignment shift; neither can it be unrestricted variable binding, for in that case we will lose the power to predict the unavailability of (7a)-type readings. While I would not like to preclude the possibility of a semantic (or ontological) analysis of the kind proposed by Sauerland (2014) for constraints on world variable binding, my proposal explores a different route.

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lent to $\boxed{[\,G_2\,[\text{the} \mathbin{@} \text{mayor}]]\ w_1}$, given that I am my own counterpart in the world where I live.

[7]For simplification I speak about Mary, although, given world-boundedness of all individuals, I would have to speak about Mary's counterparts in Ralph's doxastic alternatives.

One way to go might be via the syntactic notion of agreement. Suppose CG variables in the syntax bear an unvalued holder feature [H : _], which requires valuation; the valued version of the same feature is located on the attitude verb, which in turn gets it valued from its subject, which denotes the attitude holder. The resulting configuration for (7d) is

(9) Ralph believes$_{[\text{H : Ralph}]}$ λ_4 λ_3 $\Big[w_3$ Mary thinks$_{[\text{H : Mary}]}$
λ_2 λ_1 $[w_1$ $\boxed{[G_{2[\text{H : Mary}]}\ \boxed{[G_{4[\text{H : Ralph}]}\ [\text{the @ mayor}]]\ w_3}]\ w_1}$ is.hilarious$] \Big]$

Although initially unvalued, the holder feature on a CG variable will be interpretable, restricting the range of the variable to CGs of the specified holder. What is thereby gained is the particular type of locality: provided that the necessity of agreeing G_2 first is established on principled grounds, G_2 agrees with the closest attitude verb, which is Mary's, and the only option for G_4 would be to agree with the closest attitude verb not yet involved in agreement relations; hence the agreement with Ralph's attitude verb in (9).

However, this proposal raises theoretical issues as to the direction and order of agreement. I am not going to pursue this direction; suffice it to say that for an adequate treatment of cases where a single embedded clause contains several terms interpreted *de re* whose CGs will be linked to the same attitude holder,[8] multiple Agree is needed to provide for the possibility of both CG-shells to be linked to the same attitude verb. This will also be needed on the account offered here.

Another option is to exploit the idea that a *de re* reading, or more generally a transparent reading of whatever kind, involves the activation of semantic **alternatives** to the entity whose name is interpreted *de re*. This intuition has been more clearly articulated with regard to so-called "third," or "revisionist" readings of predicates (see Tiskin 2016a(a) for a discussion of pre-dating work, and Blumberg, Lederman 2020 for newer developments) but can be extended onto *de re* readings of terms. Manipulating sets of alternatives, i.e. sets of semantic entities of the same type, perhaps restricted by further conditions, is employed for a variety of tasks in semantics, including the analysis of information structure (Büring 2016) and questions (Kotek 2016); in both cases mentioned, it is sometimes necessary to manipulate sets *of sets* of alternatives as well.

Suppose that, instead of CG variables, we have alternative-inducing operators with the holder feature. For example, $\boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]}\ \mathit{Ortcutt}}$ will denote, for a given world w_3, the set of individuals in w_3 linked to the real Ortcutt by Ralph's different acquaintance-based counterpart relations:

[8] As e.g. in *The dean believes that Jones scored higher than Smith* uttered when the dean's only acquaintance relation to Jones is 'the student whom I saw from the back in Room 345' and to Smith, 'the student whom I saw from the back in Room 346.'

(10) $\{G(Ortcutt, w_3) \mid G \text{ is for Ralph}\}$

Likewise, $\boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]}\ \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]}\ Ortcutt}}$ will denote the set of sets of individuals:

(11) $\Big\{\{G'(G(Ortcutt, w_3), w_1) \mid G \text{ is for Mary}\} \;\Big|\; G' \text{ is for Ralph}\Big\}$

This denotation is combinable with the more traditional denotation for e.g. *is hilarious* via Hamblin's pointwise functional application, to the effect that the clause

$$\textit{that}\ \boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]}\ \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]}\ Ortcutt}}\ \textit{is hilarious}$$

will denote a set of sets of propositions-in-intension:

(12) $\Big\{\{\lambda w.Hilarious_w(G'(G(Ortcutt, w_3), w)) \mid G \text{ is for Mary}\} \;\Big|\; G' \text{ is for Ralph}\Big\}$

An attitude verb, instead of quantifying over CGs (or sequences of CGs,[9] as e.g. in Charlow, Sharvit 2014), quantifies over most deeply embedded alternatives but combines with the higher-level alternatives, Hamblin-style; thus

$$\textit{that Mary thinks that}\ \boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]}\ \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]}\ Ortcutt}}\ \textit{is hilarious}$$

will denote the following set of propositions-in-intension:

(13) $\Big\{\lambda v.\exists p \in \{\forall w, vR_{\text{Mary}}w : Hilarious_w(G'(G(Ortcutt, w_3), w))\} : p(v) = \mathbf{1}\Big\}$,
G is for Mary, G' is for Ralph

The subsequent completion with *Ralph believes...* yields the whole of (7d) with the interpretation as in

(14) $\lambda u.\exists p' \in \Big\{\forall u, uR_{\text{Ralph}}v :$
$\exists p \in \{\forall w, vR_{\text{Mary}}w : Hilarious_w(G'(G(Ortcutt, v), w))\} : p(v) = \mathbf{1}\Big\} : p'(u) = \mathbf{1}$,
G is for Mary, G' is for Ralph

This captures Santorio's restriction if we assume that e.g. Ralph's counterparts are defined only in worlds accessible for Ralph, so that the indexings such as in (7a) would require that Mary's counterparts by acquaintance have properties at worlds where they do not exist. (I am assuming that the set of Mary's alternatives accessible from Ralph's alternatives does not intersect, let alone coincide, with the set of Mary's alternatives

[9] Alongside with Santorio's assignment shift, the present proposal helps avoid the problem which arises on the standard CG-based account: the attitude verb as a lexical entry does not see how many terms read *de re* the embedded clause contains and therefore has to quantify over sequences of CGs of any finite length, one for each term. To the contrary, on the present proposal the alternatives stemming from different terms compose into a single set of propositional alternatives over which the attitude verb quantifies. Thanks to the anonymous reviewer for their enquiry concerning the benefits of the alternative-based proposal.

accessible directly from @ or with the set of Ralph's alternatives at @; this is basically the requirement that only tree-like modal frames be used—that no world is accessible from more than one other world; see Tiskin 2016b(b) for the motivation of applying **tree frames** to the analysis of attitude reports.) At the same time this accounts for the restriction's more permissive version in (8) because Ralph's alternatives are for the time being protected from entering the semantic composition by another level, i.e. Mary's alternatives, and enter it only when Ralph's own attitude verb is merged.

To see how this proposal works, consider an example. Suppose that, in Scenario 2, Ralph stands in two suitable acquaintance relations to the mayor, producing two individual concepts, f_1' = 'the man I [Ralph] saw on the beach' and f_2' = 'the man I [Ralph] saw in the local newspaper.' Given that Ralph does not know whether the two descriptions are coreferential, in some of his doxastic alternatives w_3, $f_1'(w_3) \neq f_2'(w_3)$; in such worlds, there will be two counterparts of the actual mayor. From each of Ralph's doxastic alternatives a set of Mary's[10] doxastic alternatives are accessible. Given that Ralph does not think he told Mary anything about the man in the local paper, Mary will only have counterparts of $f_1'(w_3)$ in each of her worlds w_1 accessible from a given w_3 of Ralph. However, nothing precludes Mary from having more than one counterpart of $f_1'(w_3)$ in some of her doxastic alternatives, e.g. if in some w_3's Ralph tells her two different stories about the man on the beach and Mary fails to identify the protagonists. Therefore, in a given w_1 accessible from a given w_3 there might be two distinct individuals, $f_1(w_1)$ and $f_2(w_1)$ for some individual concepts f_1 and f_2 based on two distinct acquaintance relations s.t. Mary at w_3 stands in both to $f_1'(w_3)$.

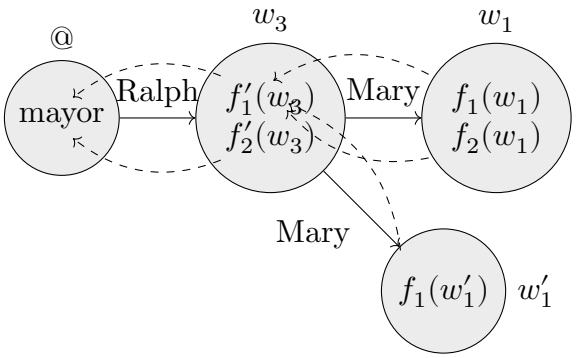

Figure 1: The frame for our example (only some doxastic alternatives shown). Solid arrows: accessibility relations; dashed arrows: counterpart relations, pointing from the counterpart to the prototype.

Let us interpret (15), the version of (7d) with alternative generators, in this setting; this is done in (16).

[10]More precisely, of Mary's counterpart in that world; see fn. 7.

(15) Ralph believes

$$\lambda_3 \Big[\, w_3 \text{ Mary thinks } \lambda_1 \big[\, w_1 \boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]} \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]} \text{ the @ mayor}}} \text{ is.hilarious} \,\big] \Big]$$

(16) a. $[\![\boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]} \text{ the @ mayor}}]\!] = \{f'_1(w_3), f'_2(w_3)\}$

b. $[\![\boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]} \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]} \text{ the @ mayor}}}]\!] = \{\{f_1(w_1), f_2(w_1)\}, \emptyset\}$,
because $f'_1(w_3)$ has two counterparts at w_1 and $f'_2(w_3)$ has none

c. $[\![\lambda_1 \big[\, w_1 \boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]} \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]} \text{ the @ mayor}}} \text{ is.hilarious} \,\big]]\!] =$

$$\left\{ \begin{Bmatrix} \lambda w.Hilarious_w(f_1(w)), \\ \lambda w.Hilarious_w(f_2(w)) \end{Bmatrix}, \emptyset \right\}$$

d. $\Big[\!\Big[\lambda_3 \Big[\, w_3 \text{ Mary thinks } \lambda_1 \big[\, w_1 \boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]} \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]} \text{ the @ mayor}}} \text{ is.hilarious} \,\big] \Big] \Big]\!\Big] =$

$$\left\{ \lambda v. \exists p \in \begin{Bmatrix} \forall w, vR_{\text{Mary}}w : Hilarious_w(f_1(w)), \\ \forall w, vR_{\text{Mary}}w : Hilarious_w(f_2(w)) \end{Bmatrix} : p(v) = \mathbf{1}, \lambda v. \exists p \in \emptyset : p(v) = \mathbf{1} \right\}$$

e. $\Big[\!\Big[\text{Ralph believes } \lambda_3 \Big[\, w_3 \text{ Mary thinks } \lambda_1 \big[\, w_1 \boxed{\mathcal{A}^{w_1}_{[\text{H : Mary}]} \boxed{\mathcal{A}^{w_3}_{[\text{H : Ralph}]} \text{ the @ mayor}}} \text{ is.hilarious} \,\big] \Big] \Big]\!\Big] =$

$$\lambda u. \exists p' \in \left\{ \begin{matrix} \forall v, uR_{\text{Ralph}}v : \exists p' \in \begin{Bmatrix} \forall w, vR_{\text{Mary}}w : Hilarious_w(f_1(w)), \\ \forall w, vR_{\text{Mary}}w : Hilarious_w(f_2(w)) \end{Bmatrix} : p(v) = \mathbf{1}, \\ \forall v, uR_{\text{Ralph}}v : \exists p' \in \emptyset : p(v) = \mathbf{1} \end{matrix} \right\} : p'(u) = \mathbf{1}$$

Given that the role of u is played by @, let us check whether (16e) is true at @. For it to be true, there has to be an alternative among those in outermost brackets such that it is true; given that the empty set does not contain any proposition-in-intension p', this should be the first alternative. In its turn, it is true iff for each Ralph's doxastic alternative v at u there is a proposition-in-intension p from the innermost bracketed set s.t. it is true at v. In Scenario 2, Ralph believes that Mary has got acquainted with the man he had seen on the beach and thinks he is hilarious, therefore either $f_1(w)$ or $f_2(w)$ (or both) will satisfy *Hilarious* at each w accessible for Mary from v (e.g. in w_1 in Figure 1). Thus the innermost existentially quantified statement of (16e) holds at each v, therefore the outermost existentially quantified statement holds true at @.

5. Conclusion

This paper has pointed out that Santorio's "intensional" assignment shift analysis of concept generators in attitude reports may be insufficiently flexible, and provided a sample scenario for the future empirical testing of this hypothesis. Moreover, I attempted to construct an alternative analysis, whose main components are: (a) feature-based linking of concept generator-inducing expressions to attitude verbs; (b) an alternative semantics for counterparts; (c) ontological assumptions about frames: undefinedness of counterparts of by x's acquaintance in worlds inaccessible for the holder x, and strict tree-like architecture of frames. This alternative analysis can be applied if the critical scenario provided a negative result for Santorio's analysis.

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