The anaphoric potential of indefinites under negation and disjunction

Indefinite DPs under anti-veridical operators such as negation do not usually introduce a dref that is available for subsequent reference (Karttunen (1969)):

(1)   *There is [no bathroom]$^\upsilon$ in this house. #It$_\upsilon$ is in a weird place.*

This generalization has some counterexamples. Indefinites under negation license anaphora when they are embedded under double negation (Karttunen (1969); Krahmer and Muskens (1995)), when the antecedent is in the first disjunct of a disjunction and the anaphor in the second (Krahmer and Muskens (1995)), when the anaphor is embedded under certain modals (cf. modal subordination, Roberts (1989)), or when the utterance containing the anaphor rejects the utterance containing the antecedent.

(2)   a.   Double negation:
            It's not true that there is [no bathroom]$^{\upsilon_1}$ in this house. It$_{\upsilon_1}$ is just in a weird place.
       b.   Disjunction:
            Either there is [no bathroom]$^{\upsilon_2}$ in this house, or it$_{\upsilon_2}$ is in a weird place.
       c.   Modal subordination:
            There is [no bathroom]$^{\upsilon_3}$ in this house. It$_{\upsilon_3}$ would be easier to find.
       d.   Denial:
            A: *There's [no bathroom]$^{\upsilon_4}$ in this house.*
            B: *You're wrong. It$_{\upsilon_4}$ is just in a weird place.*

Krahmer and Muskens (1995) note that standard DRT (Kamp (1981); Kamp and Reyle (1993)), designed to capture cases like (1), doesn't allow discourse referents (drefs) to outlive embedding under negation. They analyze double negation and disjunction cases with a semantics for negation that symmetrically switches between the extension and anti-extension of an expression, and a semantics for disjunctions that analogizes them to conditionals, truth-conditionally and dynamically. This analysis does not extend to cases without disjunction or double negation, like (2-c) and (2-d).

I am presenting an analysis of (1) and (2) in intensional CDRT (following Muskens (1996); Brasoveanu (2010)), based on the assumption that DPs can co-refer only if their referents exist in the same worlds. This is formalized by relativizing individual drefs to sets of worlds in which they refer, extending Stone's (1999) analysis of modal subordination to other cases of anaphora to non-veridically introduced drefs. This gives rise to an accessibility condition, which captures that pronouns presuppose the existence of a referent and are undefined otherwise. In the presented version of intensional CDRT, sentential operators may introduce drefs for sets of worlds to provide a local context in which their prejacent is interpreted. The relation between local and global context sets is semantically constrained by the interpretation of linguistic expressions (Karttunen (1973); Heim (1983)), and pragmatically constrained by the set of worlds compatible with a speaker's commitments (Stalnaker (1978, 2002); Gunlogson (2004)). This allows for an account of how the availability of an anaphoric dependency is influenced by the linguistic context, in particular by the veridicality of propositional embedders.

The system uses four basic types: t (truth-values), e (entities), w (possible worlds), and s (variable assignments). A dref for individuals υ is a function of type $s(we)$ from assignments i_s and worlds w_w to individuals x_e. The individual $\upsilon_{s(we)}(i_s)(w_w)$ is the individual that the assignment i assigns to the dref υ in w. A dref for propositions ϕ is a function of type $s(wt)$ from assignments i_s to sets of worlds (wt). Natural language sentences are interpreted as DRSs, i.e. binary relations of type $s(st)$ between input state i_s and output state j_s. A DRS contains a list of new drefs $(\phi, \phi : \upsilon_1, \ldots, \upsilon_n)$, where individual drefs are introduced relative to the set of worlds in which they exist, and a series of conditions of type st, i.e. properties of discourse states $(C_1, \ldots, C_n)$:

(3) $[\phi, \phi : \upsilon_1, \ldots, \upsilon_n \mid C_1, \ldots, C_n] := \lambda i_s.\lambda j_s.i[\phi, \phi : \upsilon_1, \ldots, \upsilon_n]j \wedge C_1(j) \wedge \cdots \wedge C_n(j)$

The accessibility condition requires existence of a pronominal referent in a local context. In this dynamic intensional system, the local context is defined wrt the evaluation of conditions (4), and consists of an assignment i_s, of which the condition is predicated, and a dref for a set of possible worlds $\phi_{s(wt)}$, which is a compositionally supplied intensional argument of the predicate.

(4)   Predicates with their arguments as basic conditions (type st):
$$R_\phi\{\upsilon\} := \lambda i_s.\forall w \in \phi.R_{e(wt)}(\upsilon(i)(w))(w) \qquad (\text{for } R \in \textbf{Term}_{et}, \upsilon \in \textbf{Term}_{s(we)}, \phi \in \textbf{Term}_{s(wt)})$$

(4) is defined for i only if $\upsilon(i)(w)$ is defined for all worlds w in $\phi(i)$, which is the case iff a referent exists in all $\phi(i)$-worlds. Accordingly, a dref υ' is accessible as antecedent for a discourse variable υ, iff the referent of υ' exists in the local context of υ:

(5)   Anaphoric accessibility condition:
A dref υ' is accessible as an antecedent for a discourse variable υ at i, ϕ, iff
$$\forall w.w \in \phi(i) \rightarrow \exists x_e.\upsilon'(i)(w)(x)$$

This accounts for the contrast between (1) and e.g. (2-b). Consider the discourse in (6) and (7), in which a speaker S asserts two propositions ϕ_1 and ϕ_3, constraining their set of discourse commitments to be compatible with both ($\phi_{DC_S} \subseteq (\phi_1 \cap \phi_3)$).

(6)   a.   S: *There is [no bathroom]$^{\upsilon_1}$.*
       b. $[\phi_1 \mid \phi_{DC_S} \subseteq \phi_1]; [\phi_2 \mid \phi_1 = \overline{\phi_2}]; [\phi_2 : \upsilon_1 \mid \text{bathroom}_{\phi_2}\{\upsilon_1\}]$

(7)   a.   #S: *It$_{\upsilon_3 = \upsilon_1}$ is in a weird place.*
       b. $[\phi_3 \mid \phi_{DC_S} \subseteq \phi_3]; [\phi_3 : \upsilon_2 \mid \text{place}_{\phi_3}\{\upsilon_2\}, \text{weird}_{\phi_3}\{\upsilon_2\}, \text{in}_{\phi_3}\{\underline{\upsilon_3}, \upsilon_2\}]$

The anaphor υ_3 is interpreted in the condition $\text{in}_{\phi_3}\{\upsilon_3, \upsilon_2\}$. For υ_1 to be a possible antecedent for υ_3, the referent of υ_1 needs to exist in all ϕ_3-worlds. υ_1 is introduced as $\phi_2 : \upsilon_1$, so its referent exists in all and only the ϕ_2-worlds. It doesn't exist in any of the worlds in ϕ_1, the complement of ϕ_2. Because the commitment set of S contains only worlds contained in both ϕ_1 and ϕ_3, there are ϕ_1-worlds in ϕ_3, i.e. worlds where υ_1 doesn't exist. Resolving υ_3 to υ_1 would result in undefinedness interpreting the condition, so υ_1 is not an accessible antecedent for υ_3. This is in contrast with (8), a disjunction of two propositions ϕ_2 and ϕ_3, which are not required to be compatible by the linguistic content.

(8)   a.   S: *There is [no bathroom]$^{\upsilon_1}$ or it$_{\upsilon_3 = \upsilon_1}$ is in a weird place.*
       b. $[\phi_1 \mid \phi_{DC_S} \subseteq \phi_1]; [\phi_2, \phi_3 \mid \phi_1 = \phi_2 \cup \phi_3];$
             $[\phi_4, \mid \phi_2 = \overline{\phi_4}]; [\phi_4 : \upsilon_1 \mid \text{bathroom}_{\phi_4}\{\upsilon_1\}];$
             $[\phi_3 : \upsilon_2 \mid \text{place}_{\phi_3}\{\upsilon_2\}, \text{weird}_{\phi_3}\{\upsilon_2\}, \text{in}_{\phi_3}\{\underline{\upsilon_3}, \upsilon_2\}]$

For υ_1 to be a possible antecedent for the anaphor υ_3, the referent of υ_1 needs to exist in ϕ_3, the local context of υ_3. υ_1 is introduced as $\phi_4 : \upsilon_1$ and exists in all and only the ϕ_4-worlds, and not in any worlds in ϕ_2, the complement of ϕ_4. Since ϕ_2 and ϕ_3 are not interpreted in conjunction, updating the context with (8) is compatible with an output discourse state, s.t. υ_1 exists in ϕ_3, i.e. the one where $\phi_2 = \overline{\phi_3}$, and υ_3 can be resolved as υ_1.

The analysis results in a flat-update dynamic semantics that globally introduces anti-veridical drefs along with the information about the sets of worlds in which they exist, and provides an understanding of when the surrounding context allows for an anaphoric relation between expressions introducing anaphora and potential antecedents. It constitutes a step forward from previous approaches to anaphoric accessibility in classical DRT (Kamp and Reyle (1993)), as well as analyses of modal subordination (Stone (1999)) and the double negation and disjunction cases (Krahmer and Muskens (1995)), by extending the empirical coverage. Krahmer and Musken's account also gives rise to concerns of overgeneration: If disjunctions and conditionals were dynamically equivalent, we would expect any kind of anaphora to pattern analogously in these two contexts. However, propositional anaphora exhibit a contrast between disjunctive and conditional contexts:

(9)   a.   If Mary is sick, she knows that.
       b.   Either Mary is not sick, or she #(is and) knows that.

This asymmetry is unexpected under a conditional analysis of disjunction. Although the presented account does not straightforwardly account for the asymmetry either, it does leave room for an explanation, since disjunctions and conditionals have distinct semantic representations. It therefore provides a vantage point over asymmetries between individual and propositional anaphora, to be explored in future research.

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