

This work presents an intensional dynamic account of anaphoric accessibility, offering a unified analysis of anaphora with antecedents under negation and non-veridical operators. Building on analyses of modal subordination (Stone 1999, Brasoveanu 2006), it introduces a flat-update dynamic semantics, where expressions with the potential to introduce a discourse referent (dref) do so globally, regardless of their embedding context. Constraints on anaphora are derived by assuming that anaphora is possible whenever the pronoun’s existential presupposition can be consistently locally accommodated. The formalization treats individual drefs as referencing individual concepts (Stone 1999), allowing their introduction and retrieval relative to possible worlds in the local context.

The problem. Classic dynamic analyses (Kamp 1981, Heim 1982, Groenendijk and Stokhof 1991) were designed to capture cases like (1) which illustrates Karttunen’s (1976) generalization that un-specific indefinites in the scope of negation usually don’t license subsequent anaphora.

(1) *There is [no bathroom]^v in this house. #It_v is in a weird place.*

However, several counterexamples have been discussed in the literature. These include: (2a) doubly negated antecedents (Karttunen 1976, Krahmer and Muskens 1995), (2b) bathroom-disjunctions, where the antecedent is in the first disjunct and the anaphor in the second (Roberts 1987), and (2c) modal subordination with negated antecedents (Roberts 1987, Frank 1996).

(2) a. Double negation:

It’s not true that there is [no bathroom]^{v₁} in this house. It_{v₁} is just in a weird place.

b. Disjunction: *Either there is [no bathroom]^{v₂} in this house, or it_{v₂} is in a weird place.*

c. Modal subordination: *There is [no bathroom]^{v₃} in this house. It_{v₃} would be easier to find.*

The data in (2) have previously received disparate analyses. Dynamic analyses of double negation and bathroom-anaphora (e.g., Krahmer and Muskens 1995, Elliott 2020, Mandelkern 2022) devise a mechanism whereby indefinites introduce a dref only when they have an existing referent, ruling out anaphora with antecedents under single negation like (2c). Analyses of modal subordination without flat update (Roberts 1987, Geurts 1999, Frank 1996, van Rooij 2000) allow variable mappings temporarily contributed by antecedents in non-veridical contexts to be reintroduced in a local context for the pronoun. This is typically tied to propositional operators (modals or attitude reports) and thus cannot readily capture the unembedded pronouns in (2a).

The analysis of (1) and (2) is 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 set of worlds in which their prejacent is interpreted. This allows for an account of how the availability of an anaphoric dependency is influenced by the veridicality of propositional embedders.

Intensional CDRT. The system uses four basic types: *t* (truth-values), *e* (entities), *w* (possible worlds), and *s* (variable assignments). A dref for individuals *v* is a function of type *s*(*w**e*) from assignments *i_s* and worlds *w_w* to individuals. The individual *v_{s(w_we)}*(*i_s*)(*w_w*) is the individual that the assignment *i* assigns to the dref *v* in *w*. A dref for propositions *ϕ* is a function of type *s*(*w**t*) from assignments *i_s* to sets of worlds (*w**t*). Natural language sentences are interpreted as DRSs, i.e. binary relations of type *s*(*s**t*) between input state *i_s* and output state *j_s*. A DRS contains a list of new drefs (*ϕ*, *ϕ* : *v₁*, ..., *v_n*), where individual drefs are introduced relative to the set of worlds in which they exist, and a series of conditions of type *s**t*, i.e. properties of discourse states (*C₁*, ..., *C_n*):

(3) $[\phi, \phi : v_1, \dots, v_n \mid C_1, \dots, C_n] := \lambda i_s. \lambda j_s. i[\phi, \phi : v_1, \dots, v_n]j \wedge C_1(j) \wedge \dots \wedge C_n(j)$

Accessibility. 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) Predication as DRS conditions (type st):

$$R_\phi\{v\} := \lambda i_s. \forall w \in \phi. R_{e(wt)}(v(i)(w))(w) \quad (\text{for } R \in \mathbf{Term}_{et}, v \in \mathbf{Term}_{s(wt)}, \phi \in \mathbf{Term}_{s(wt)})$$

(4) is defined for i only if $v(i)(w)$ 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 v' is accessible as antecedent for a discourse variable v , iff the referent of v' exists in the local context of v :

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

This accounts for the contrast between the unacceptable (1) and e.g. (2b).

No anaphora is possible for unembedded pronouns with singly negated antecedents (1), shown here for (6) and (7). We use a propositional dref ϕ_{CS} to model the current context set. The assertions of the two propositions ϕ_1 and ϕ_3 constrain ϕ_{CS} to be compatible with both ($\phi_{CS} \subseteq (\phi_1 \cap \phi_3)$).

(6) *There is [no bathroom]*^{v₁}. $\rightsquigarrow [\phi_1 \mid \phi_{CS} \subseteq \phi_1]; [\phi_2 \mid \phi_1 = \overline{\phi_2}]; [\phi_2 : v_1 \mid \text{bathroom}_{\phi_2}\{v_1\}]$

(7) *# It*_{v₃=v₁} *is upstairs.* $\rightsquigarrow [\phi_3 \mid \phi_{CS} \subseteq \phi_3]; [\text{upstairs}_{\phi_3}\{v_3\}]$

In (7), the anaphor v_3 is interpreted in the condition $\text{upstairs}_{\phi_3}\{v_3\}$. For v_1 to be an antecedent for v_3 , the referent of v_1 must exist in all ϕ_3 -worlds. (6) introduces v_1 relative to the negated local context ϕ_2 ($\phi_2 : v_1$), so its referent exists only in the ϕ_2 -worlds where there is a bathroom. It doesn't exist in the worlds in ϕ_1 , the complement of ϕ_2 . Because the context set includes only worlds contained in both ϕ_1 and ϕ_3 , there are ϕ_1 -worlds in ϕ_3 , i.e. worlds where v_1 doesn't exist. Resolving v_3 to v_1 would render the condition undefined, so v_1 is not an accessible antecedent.

Disjunction. In contrast, in disjunction (8), the disjuncts ϕ_2 and ϕ_3 need not be consistent.

(8) *There is [no bathroom]*^{v₁} *or it*_{v₃=v₁} *is upstairs.* $\rightsquigarrow [\phi_1 \mid \phi_{CS} \subseteq \phi_1]; [\phi_2, \phi_3 \mid \phi_1 = \phi_2 \cup \phi_3]; [\phi_4, \mid \phi_2 = \overline{\phi_4}]; [\phi_4 : v_1 \mid \text{bathroom}_{\phi_4}\{v_1\}]; [\text{upstairs}_{\phi_3}\{v_3\}]$

Again the local context of the anaphor v_3 is ϕ_3 , relative to the condition $\text{upstairs}_{\phi_3}\{v_3\}$. For v_1 to be a possible antecedent, it must exist in the ϕ_3 -worlds. v_1 is introduced as $\phi_4 : v_1$ and exists in all and only the ϕ_4 -worlds, and therefore 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. v_1 exists in ϕ_3 , i.e. the one where $\phi_2 = \overline{\phi_3}$, and v_3 can be resolved as v_1 .

Conclusion. The analysis results in a flat-update dynamic semantics that globally introduces individual drefs along with the information about the worlds in which they exist, and provides an understanding of when the surrounding context allows for an anaphoric relation anaphora and potential antecedents. It constitutes a step forward from previous approaches to anaphoric accessibility in classical dynamic (Kamp 1981, Heim 1982, Groenendijk and Stokhof 1991), as well as analyses of modal subordination (Roberts 1987, Geurts 1999, Frank 1996, van Rooij 2000, Stone 1999, Brasoveanu 2006) and the double negation and disjunction cases (Krahmer and Muskens 1995, Elliott 2020, Mandelkern 2022), by extending the empirical coverage.

References (abbreviated): Brasoveanu (2006). *Structured Nominal and Modal Reference*. • Elliott (2020). *Towards a principled logic of anaphora*. • Frank (1996). *Context Dependence in Modal Constructions*. • Geurts (1999). *Presuppositions and pronouns*. • Groenendijk & Stokhof (1991). *Dynamic predicate logic*. • Heim (1982). *The Semantics of Definite and Indefinite Noun Phrases*. • Kamp (1981). *A Theory of Truth and Semantic Representation*. • Karttunen (1976). *Discourse Referents*. • Krahmer & Muskens (1995). *Negation and Disjunction in Discourse Representation Theory*. • Roberts (1987). *Negation and Disjunction in Discourse Representation Theory*. • Stone (1999). *Reference to possible worlds*. • van Rooij (2000). *Anaphoric relations across attitude contexts*.