Propositions and rigidity in Layered DRT

Emar Maier and Bart Geurts
University of Nijmegen
`<{ | }@phil.kun.nl>`

ESSLLI 2003 Workshop "Direct Reference and Specificity"
19th August 2003

Kripke/Kaplan on rigid terms

- names and indexicals are directly referential/rigid designators
- wide-scope behavior w.r.t. operators
- not synonymous with the description giving their 'descriptive meaning', as shown by Kripke-Kaplan examples (1) and (2):
  - 'Sam' $\not\equiv$ 'the person called 'Sam''

    (1) a. Sam is called Sam
        b. The person called Sam is called Sam

  - 'I' $\not\equiv$ 'the speaker'

    (2) a. I am the speaker
        b. The speaker is the speaker

Discourse Representation Theory

- meaning encoded in descriptive representational conditions in a DRS
- definite NPs treated as presuppositions
- 2-stage interpretation (;):
  - syntactic module **Prel** builds preliminary DRS from sentence
  - pragmasemantic resolution algorithm
    - merges **Prel**(σ) with previous discourse-/background-DRS

* performs anaphora and presupposition **Res**olution (binding new presuppositions to old representations or accommodating them)

Resolution

1. presuppositions are to be bound (e.g. anaphors)
2. otherwise, accommodate as high as possible (e.g. some definite descriptions, factive complements)

- presupposition resolution accounts for definite NP's wide-scope behavior
- how about the alleged special behavior of proper names/indexicals?

Descriptivism

suggests that names are like other definite NP's

- both definite, thus presupposition triggers
- reduction: 'John' = 'the person called 'John''
- accounts for proper name's normal wide scope behavior,
- but also the (rare) other behaviors that proper names appear to share with definite descriptions. . .
- no familiarity required (global accommodation):
  (3) My best friend is John
- narrow scope (local and intermediate accommodation):
  (4) If alphabetical order had been the method of electing the American president, Aaron Aardvark might have been president
- bound variable (presupposition binding/cancellation):
  (5) If a child is christened 'Bambi', then Disney will sue Bambi's parents
- but no account for Kaplan-Kripke examples!

Layered DRT

- (conservative) extension of standard DRT

- abstract interface for representing the interaction of different *types* of information
- layers for e.g. presuppositions, implicatures, asserted (Fregean) content, syntactic features,. . .
- all layers get truthconditional evaluation

Applications

- binding problems (reference marker can be employed at several layers at once)
- denial (denial can be directed at one specific layer)
- rigidity

Rigid designation in LDRT

- represent proper names and indexicals as descriptive conditions,
- but at separate layer 'k'
- add 2-dimensional semantics to rigidify only that layer
- extension: at representational level, treat k like presupposition layer (to account for bound variable uses of names)

Syntax

- primitive symbols:
  - a set $\mathcal{X}$ of reference markers
  - some sets $\mathcal{P}red^n$ of n-place predicates
  - a set Λ of layer labels
- if $x \in \mathcal{X}$, $L \subseteq \Lambda$, then x_L is a labeled reference marker
- if $x_1, \ldots, x_n \in \mathcal{X}$, $L \subseteq \Lambda$, then $P_L(x_1, \ldots, x_n)$ is a labeled condition
- if φ and ψ are labeled conditions, $L \subseteq \Lambda$, then $\neg_L \varphi$, $\varphi \vee_L \psi$, and $\varphi \Rightarrow_L \psi$ are also labeled conditions

- if U is a set of labeled reference markers and Con a set of labeled conditions, then $\langle U, Con \rangle$ is an LDRS

Application

- $\Lambda = \{fr, k, imp, pr\}$
  - fr = the Frege layer, what is "said"
  - k = Kaplan-Kripke layer for rigid stuff
  - imp = implicature layer
  - pr = (unresolved) presupposition layer

Examples

(6) a. The soup is warm

b.

$$\begin{array}{|c|}\hline \text{x}_{pr} \\ \hline \text{soup}_{pr}\text{(x)} \\ \text{warm}_{fr}\text{(x)} \\ \neg_{imp} \begin{array}{|c|}\hline \\ \hline \text{hot}_{imp}\text{(x)} \\ \hline \end{array} \\ \hline \end{array}$$

Binding problems

e.g. with presuppositions ( )

(7) a. ?Someone managed to succeed George V on the throne of England.

b. $\exists x[\text{succeed\_george\_v}(x)]_{\{\exists x[\text{had\_diff\_succ\_george\_v}(x)]\}}$

c. ?

$$\begin{array}{|c|}\hline \text{x}_{fr}\ \text{y}_{k} \\ \hline \text{george\_v}_{k}\text{(y)} \\ \text{succeeded}_{fr}\text{(x,y)} \\ \text{had\_difficulty\_succeeding}_{pr}\text{(x,y)} \\ \hline \end{array}$$

Semantics

- $\mathcal{M} = \langle D, W, I \rangle$
  - D is a domain of individuals
  - W is a set of possible worlds
  - I interpretation function (from basic predicates to their intensions in D^W)

- $$\|\varphi\|^f_{L,w} \begin{cases} = \{g \mid f \subseteq g \wedge Dom(g) = \\ \quad = Dom(f) \cup U_L(\varphi) \wedge \\ \quad \wedge \forall \psi \in Con(\varphi)[\|\psi\|^g_{L,w} = 1]\} & \text{if } \exists g[f \subseteq g \wedge Dom(g) \\ & \quad = Dom(f) \cup U_L(\varphi) \wedge \\ & \quad \wedge \forall \psi \in Con(\varphi) \\ & \quad [\|\psi\|^g_{L,w} \in \{0,1\}]] \\ \text{undefined} & \text{otherwise} \end{cases}$$

- $$\|P_K(x_1, \ldots, x_n)\|^f_{L,w} \begin{cases} = 1 & \text{if } K \cap L = \emptyset \text{ or} \\ & (x_1, \ldots, x_n \in Dom(f) \text{ and} \\ & \quad \langle f(x_1), \ldots, f(x_n) \rangle \in I(P)(w)) \\ = 0 & \text{if } K \cap L \neq \emptyset \text{ and} \\ & x_1, \ldots, x_n \in Dom(f) \text{ and} \\ & \quad \langle f(x_1), \ldots, f(x_n) \rangle \notin I(P)(w) \\ \text{undefined} & \text{otherwise} \end{cases}$$

- $$\|\neg_K \psi\|^f_{L,w} \begin{cases} = 1 & \text{if } K \cap L = \emptyset \text{ or } \|\psi\|^f_{K \cap L,w} = \emptyset \\ = 0 & \text{if } K \cap L \neq \emptyset \text{ and } \|\psi\|^f_{K \cap L,w} \text{ defined and} \\ & \|\psi\|^f_{K \cap L,w} \neq \emptyset \\ \text{undefined} & \text{otherwise} \end{cases}$$

- $$\|\psi \vee_K \chi\|^f_{L,w} \begin{cases} = 1 & \text{if both } \|\psi\|^f_{K \cap L,w} \text{ and } \|\chi\|^f_{K \cap L,w} \text{ defined,} \\ & \text{and } \|\psi\|^f_{K \cap L,w} \cup \|\chi\|^f_{K \cap L,w} \neq \emptyset \\ = 0 & \text{if } \|\psi\|^f_{K \cap L,w} = \|\chi\|^f_{K \cap L,w} = \emptyset \\ \text{undefined} & \text{otherwise} \end{cases}$$

Layered content

- $\mathcal{C}^f_L(\varphi) = \begin{cases} \{w \in \mathcal{W} \mid \exists g \in \|\varphi\|^f_{L,w}\} & \text{if } \exists w[\|\varphi\|^f_{L,w} \text{ defined}] \\ \text{undefined} & \text{otherwise} \end{cases}$
- $\mathcal{C}_L(\varphi) = \mathcal{C}^{\emptyset}_L(\varphi)$

Problems

often undefined (because of layer interdependencies):

(8) a. The King of France is bald

b.

x_{pr}
king_of_france$_{pr}$(x) bald$_{fr}$(x)

c. $\mathcal{C}_{pr,fr}(\quad) = \{w \in W \,|\, \text{there is a bald king of France in } w\}$

d. $\mathcal{C}_{fr}(\varphi)$ undefined

(9) a. I am speaking

b.

x_k
speaker$_k$(x) speaking$_{fr}$(x)

c. The speaker is speaking

d.

x_{fr}
speaker$_{fr}$(x) speaking$_{fr}$(x)

e. $\mathcal{C}_{k,fr}(\quad) = \mathcal{C}_{k,fr}(\quad) = \mathcal{C}_{fr}(\quad) = W$

f. $\mathcal{C}_{fr}(\quad)$ undefined

to insure definedness, add extra layers as ‘background’ for interpretation. . .

The weak proposal

weak one-dimensional content substitute:

(10) $\mathcal{C}_L^{[K]}(\varphi) = \mathcal{W} - (\mathcal{C}_K(\varphi) - \mathcal{C}_{K\cup L}(\varphi)) = \{w \in \mathcal{W} \mid w \in \mathcal{C}_K(\varphi) \rightarrow w \in \mathcal{C}_{K\cup L}(\varphi)\}$

handy for denial applications, but:

(11) $\mathcal{C}_{fr}^{[k]}(\quad) = W$

Adding another dimension

- $\mathcal{M} = \langle D, W, C, I \rangle$
  - D is a domain of individuals
  - W is a set of worlds
  - I is interpretation function
  - C is a set of contexts, i.e. for all $c \in C$: $I(\text{speaker})(c)$, $I(\text{Mary})(c)$,. . . are singletons
- $\mathcal{K}_L^c(\varphi) \begin{cases} = \mathcal{C}_L^f(\varphi) & \text{if } \|\varphi\|_{k,c}^{\emptyset} = \{f\} \\ \text{undefined} & \text{otherwise} \end{cases}$

(12) a. Ashley is called ‘Ashley’

b.

x_k
$\text{ashley}_k(\text{x})$ $\text{ashley}_{fr}(\text{x})$

c. Ashley is Ashley

d.

$\text{x}_k\ \text{y}_k$
$\text{ashley}_k(\text{x})$ $\text{ashley}_k(\text{y})$ $\text{x}=_{fr}\text{y}$

$\mathcal{C}_{k,fr}(\quad) = \mathcal{C}_{k,fr}(\quad) = W$, $\mathcal{C}_{fr}(\quad)$, $\mathcal{C}_{fr}(\quad)$ undefined

$\mathcal{K}_{fr}^c(\quad) = \mathcal{C}_{fr}^{\{\langle x, \textbf{ash}_c\rangle\}}(\quad) = \{w | \textbf{ash}_c \text{ is in } w \text{ called ‘Ashley’}\}$

$\mathcal{K}_{fr}^c(\quad) = \mathcal{C}_{fr}^{\{\langle x, \textbf{ash}_c\rangle, \langle y, \textbf{ash}_c\rangle\}}(\quad) = W$

Refinements

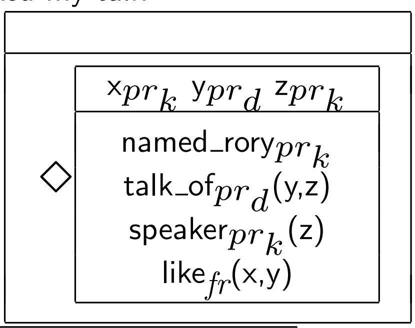
suggests that names are like other definite NP’s, with e.g. bound variable uses:

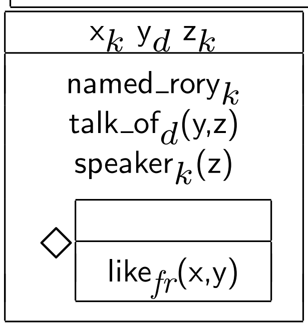
(13) a. If a child is christened 'Bambi', then Disney will sue Bambi's parents
b. Every time we do our Beatles act, Ringo gets drunk afterwards

Names as presuppositions

- $\Lambda = \{pr_d, d, pr_k, k, fr, imp\}$
  - pr_d = descriptive presupposition layer
  - d = accommodated (descriptive) presupposition
  - pr_k = name/indexical presupposition
  - k = rigidifiable layer
- **Prel** puts names and indexicals in pr_k, definite descriptions in pr_d
- **Res** tries to bind pr_k and pr_d whenever possible, otherwise pr_k stuff is dropped as high up as possible in k, pr_d gets dropped at d

(14) a. Maybe Rory liked my talk

b. **Prel**( ) = 

c. **Res**( ) = 

(15) a. If a child is christened 'Bambi', then Disney will sue Bambi's parents

b. **Prel**( ) =

[| [x_{fr} | child_{fr}(x), $\mathsf{named\_bambi}_{fr}$(x)] $\Rightarrow$ [y_{pr_k} Z_{pr_d} w_{pr_k} | disney_{pr_k}(y), $\mathsf{parents\_of}_{pr_d}$(Z,w), $\mathsf{named\_bambi}_{pr_k}$(w), sue_{fr}(y,Z)]]

c. **Res**( ) =

[y_k | disney_k(y), [x_{fr} Z_d | child_{fr}(x), $\mathsf{named\_bambi}_{fr}$(x), $\mathsf{parents\_of}_d$(Z,x)] $\Rightarrow$ [| sue_{fr}(y,Z)]]

Further research

- The dynamics of the pr_k layer: how, why, when does pr_k stuff become part of new descriptive content (accommodation examples)?
- difference between names and indexicals?

Appendix I: syntax

The primitive symbols of an LDRT language are:

- a set $\mathcal{X}$ of reference markers
- some sets $\mathcal{P}red^n$ of n-place predicates
- a set Λ of layer labels

The rest of the syntax is:

- if $x \in \mathcal{X}$, $L \subseteq \Lambda$, then $x_L = \langle x, L\rangle \in \mathcal{X} \times \wp(\Lambda)$ is a labeled reference marker
- if $P \in \mathcal{P}red^n$, $L \subseteq \Lambda$, then P_L is a labeled predicate
- if $x, y \in \mathcal{X}$, $L \subseteq \Lambda$, then $x =_L y$ is a labeled condition

- if $x_1, \ldots, x_n \in \mathcal{X}$, P_L a labeled predicate, then $P_L(x_1, \ldots, x_n)$ is a labeled condition
- if φ and ψ are labeled conditions, $L \subseteq \Lambda$, then $\neg_L \varphi$, $\varphi \vee_L \psi$, and $\varphi \Rightarrow_L \psi$ are also labeled conditions
- if U is a set of labeled reference markers and Con a set of labeled conditions, then $\langle U, Con \rangle$ is an LDRS
  - $\varphi =_{\text{def}} \langle U(\varphi), Con(\varphi) \rangle$
  - $U_L(\varphi) =_{\text{def}} \{x \big| \exists K[K \cap L \neq \emptyset \wedge x_K \in U(\varphi)]\}$

Appendix II: semantics

- $\mathcal{M} = \langle D, W, R \rangle$
  - D is a domain of individuals
  - W is a set of extensional interpretation functions from basic predicates into subsets of D
  - $R \subseteq W^2$
- $f[X]g =_{\text{def}} f \subseteq g \wedge Dom(g) = Dom(f) \cup X$
- $\|\varphi\|^f_{L,w} \downarrow =_{\text{def}} \|\varphi\|^f_{L,w} \in \{0, 1\}$
- $$\|\varphi\|^f_{L,w} = \begin{cases} \{g \mid f[U_L(\varphi)]g \wedge \\ \quad \wedge \forall \psi \in Con(\varphi)\big[\|\psi\|^g_{L,w} = 1\big]\} & \text{if } \exists g\big[f[U_L(\varphi)]g \wedge \\ & \quad \wedge \forall \psi \in Con(\varphi)\big[\|\psi\|^g_{L,w} \downarrow\big]\big] \\ \uparrow & \text{otherwise} \end{cases}$$
- $$\|x =_K y\|^f_{L,w} = \begin{cases} = 1 & \text{if } K \cap L = \emptyset \text{ or } x, y \in Dom(f) \wedge f(x) = f(y) \\ = 0 & \text{if } K \cap L \neq \emptyset \text{ and } x, y \in Dom(f) \wedge f(x) \neq f(y) \\ \text{undefined} & \text{otherwise} \end{cases}$$
- $$\|P_K(x_1, \ldots, x_n)\|^f_{L,w} = \begin{cases} = 1 & \text{if } K \cap L = \emptyset \text{ or} \\ & x_1, \ldots, x_n \in Dom(f) \wedge \langle f(x_1), \ldots, f(x_n)\rangle \in w(P) \\ = 0 & \text{if } K \cap L \neq \emptyset \text{ and} \\ & x_1, \ldots, x_n \in Dom(f) \wedge \langle f(x_1), \ldots, f(x_n)\rangle \notin w(P) \\ \text{undefined} & \text{otherwise} \end{cases}$$
- $$\|\neg_K \psi\|^f_{L,w} = \begin{cases} = 1 & \text{if } K \cap L = \emptyset \text{ or } \|\psi\|^f_{K \cap L,w} = \emptyset \\ = 0 & \text{if } K \cap L \neq \emptyset \text{ and } \|\psi\|^f_{K \cap L,w} \downarrow \wedge \|\psi\|^f_{K \cap L,w} \neq \emptyset \\ \text{undefined} & \text{otherwise} \end{cases}$$

- $\|\psi \vee_K \chi\|^f_{L,w} = \begin{cases} = 1 & \text{if } \|\psi\|^f_{K\cap L,w} \downarrow \wedge \|\chi\|^f_{K\cap L,w} \downarrow \wedge (\|\psi\|^f_{K\cap L,w} \cup \|\chi\|^f_{K\cap L,w} \neq \\ = 0 & \text{if } \|\psi\|^f_{K\cap L,w} = \|\chi\|^f_{K\cap L,w} = \emptyset \\ \text{undefined} & \text{otherwise} \end{cases}$

- $\|\psi \Rightarrow_K \chi\|^f_{L,w} = \begin{cases} = 1 & \text{if } \|\psi\|^f_{K\cap L,w} \downarrow \wedge \forall g \in \|\psi\|^f_{K\cap L,w} : \ \|\chi\|^g_{K\cap L,w} \downarrow \wedge \|\chi\|^g_{K\cap} \\ = 0 & \text{if } \exists g \in \|\psi\|^f_{K\cap L,w} : \ \|\chi\|^g_{K\cap L,w} = \emptyset \\ \text{undefined} & \text{otherwise} \end{cases}$

- $\|\Box_K \psi\|^f_{L,w} = \begin{cases} = 1 & \text{if } \forall w' R w : \ \|\psi\|^f_{K\cap L,w'} \downarrow \wedge \|\psi\|^f_{K\cap L,w'} \neq \emptyset \\ = 0 & \text{if } \exists w' R w : \ \|\psi\|^f_{K\cap L,w'} = \emptyset \\ \text{undefined} & \text{otherwise} \end{cases}$

References

Geurts, Bart. 1997. Good news about the description theory of names. *Journal of Semantics* 14.319–348.

——. 1999. *Presuppositions and Pronouns*. Amsterdam: Elsevier.

——, & Emar Maier, ms. Layered DRT. (2003).

Karttunen, Lauri, & Stanley Peters. 1979. Conventional implicature. In *Syntax and Semantics II: Presupposition*, ed. by ChoonKyo Oh & David A. Dineen, 1–56. New York: Academic Press.

Maier, Emar, & Rob A. van der Sandt. to appear. Denial and correction in Layered DRT. In *Proc. of DiaBruck 2003*.

van der Sandt, Rob A. 1992. Presupposition projection as anaphora resolution. *Journal of Semantics* 9.333–377.