Discourse Structure in Dialogue

Lecture 5: Underspecification

Julian J. Schlöder

Where we were

Linguistic Forms

are interpreted to

Underspecified Logical Forms — partially describe content

are specified to

SDRSs — describe narrative structure

are converted to

DRSs — describe event structure

are evaluated in

Models

- The ULF language contains predicates to describe SDRSs and predicates to record linguistic information from linguistic forms.

Linguistic Form to Narrative Structure

- So, given the linguistic form of a discourse, we:
  - $\rightarrow$ Compute for every *clause* the corresponding DRS K (by the DRT construction algo), except that we don't resolve anaphora here.
  - $\rightarrow$ Pick an unused label variable l_1 and add $\mathit{labels}(l_1, K)$.
  - $\rightarrow$ (If there is an ambiguity, you can also add $\mathit{labels}(l_1, K) \vee \mathit{labels}(l_1, K')$).
  - $\rightarrow$ For every anaphor x in K add $\mathit{anaphor}(l_1, v_x)$.
  - $\rightarrow$ Add appropriate predicates on l for cue phrases and linguistic features (aspect etc.).
  - $\rightarrow$ For every clause except the very first one, pick another two unused label variables l_0, l_2 and add $\mathit{relates}(l_0, l_2, l_1, D)$ (i.e. l_1 attaches somewhere)
- Call the conjunction of all these $\mathcal{K}$.

Linguistic Form to Narrative Structure

- So, given the linguistic form of a discourse, we:
  - $\rightarrow$ Compute for every *clause* the corresponding DRS K (by the DRT construction algo), except that we don't resolve anaphora here.
  - $\rightarrow$ Pick an unused label variable l_1 and add $labels(l_1, K)$.
  - $\rightarrow$ (If there is an ambiguity, you can also add $labels(l_1, K) \vee labels(l_1, K')$).
  - $\rightarrow$ For every anaphor x in K add $anaphor(l_1, v_x)$.
  - $\rightarrow$ Add appropriate predicates on l for cue phrases and linguistic features (aspect etc.).
  - $\rightarrow$ For every clause except the very first one, pick another two unused label variables l_0, l_2 and add $relates(l_0, l_2, l_1, D)$ (i.e. l_1 attaches somewhere)
- Call the conjunction of all these $\mathcal{K}$.

Not good enough!

Two Sentence Example

(1) There is a woman. She runs.

$$A(l_0) = \pi_0, A(l_1) = \pi_1, A(l_2) = \pi_2,$$
$$A(D) = \mathit{Elaboration}$$
$$\Pi = \{\pi_0, \pi_1, \pi_2\}, L = \pi_2$$
$$\mathcal{F}(\pi_1) = \boxed{\begin{array}{l} \text{x} \\ \hline \texttt{woman(x)} \end{array}}$$
$$\mathcal{F}(\pi_2) = \boxed{\begin{array}{l} \text{e,y} \\ \hline \texttt{run(e,y)} \\ y = x \end{array}}$$
$$\mathcal{F}(\pi_0) = \mathit{Elaboration}(\pi_1, \pi_2)$$

$$\models$$

$$\mathit{labels}(l_1, \boxed{\begin{array}{l} \text{x} \\ \hline \texttt{woman(x)} \end{array}})$$
$$\wedge\ \mathit{labels}(l_2, \boxed{\begin{array}{l} \text{e,y} \\ \hline \texttt{run(e,y)} \end{array}})$$
$$\wedge\ \mathit{anaphor}(l_2, v_y)$$
$$\wedge\ \mathit{relates}(l_0, l_1, l_2, D)$$
$$\wedge\ \mathit{last}(l_2)$$

Two Sentence Example

(1) There is a woman. She runs.

$$A(l_0) = \pi_0, A(l_1) = \pi_1, A(l_2) = \pi_2,$$
$$A(D) = QAP$$
$$\Pi = \{\pi_0, \pi_1, \pi_2\}, L = \pi_2$$
$$\mathcal{F}(\pi_1) = \boxed{\begin{array}{l} \text{x} \\ \hline \texttt{woman(x)} \end{array}}$$
$$\mathcal{F}(\pi_2) = \boxed{\begin{array}{l} \text{e,y} \\ \hline \texttt{run(e,y)} \\ y = x \end{array}}$$
$$\mathcal{F}(\pi_0) = QAP(\pi_1, \pi_2)$$

$$\models \quad labels(l_1, \boxed{\begin{array}{l} \text{x} \\ \hline \texttt{woman(x)} \end{array}})$$
$$\wedge \; labels(l_2, \boxed{\begin{array}{l} \text{e,y} \\ \hline \texttt{run(e,y)} \end{array}})$$
$$\wedge \; anaphor(l_2, v_y)$$
$$\wedge \; relates(l_0, l_1, l_2, D)$$
$$\wedge \; last(l_2)$$

Enrichment

- The underspecified information that we get *directly* from the linguistic form needs to be *enriched* with more information.
  - → Pragmatic, world knowledge, cue phrases need to be interpreted...
- So we use Commonsense Entailment again to phrase a *logic for enrichment of ULFs*.
- It's called the Glue Logic (GL).

Glue Language

- The Glue Language is obtained from the underspecified language by adding the connectives $\rightarrow$ and $>$.
- Moreover, the Glue Language contains additional predicates for world knowledge.
- For instance $cause(K_1, K_2)$ for "$K_1 \therefore K_2$" is a valid enthymeme".
- Commonsense entailment really only works on decidable logics.
- DRT-Entailment is not decidable, so we still only use K's as *tokens*—we only know them by their description, but have no *truth-conditional* knowledge of their *contents* in this logic.

Enrichment by Axioms

- In the Glue language, we *hard-code* “rational assumptions” about how discourses are typically interpreted.
- Let $\mathit{occasion}(l_1, l_2)$ describe that the event labelled l_2 is occasioned by the one labelled l_1.
- A script for occasion is a Glue formula to infer *occasion* from content-level information (i.e. from descriptions of DRSs):

Enrichment by Axioms

- In the Glue language, we *hard-code* “rational assumptions” about how discourses are typically interpreted.
- Let $occasion(l_1, l_2)$ describe that the event labelled l_2 is occasioned by the one labelled l_1.
- A script for occasion is a Glue formula to infer *occasion* from content-level information (i.e. from descriptions of DRSs):
- One suggested by Asher & Lascarides:

$$\begin{aligned} & relates(l_0, l_1, l_2, D) \\ \wedge\ & labels(l_1, K_1) \wedge \texttt{fall}(e_1, x_1) \in K_1 \\ \wedge\ & labels(l_2, K_2) \wedge \texttt{help-up}(\texttt{e}_2, \texttt{x}_2, \texttt{x}_3) \in K_2 \\ >\ & occasion(l_1, l_2) \end{aligned}$$

- (I use italics for Glue predicates and monospace for DRT predicates; AL2003 use brackets, e.g. $[fall]$)

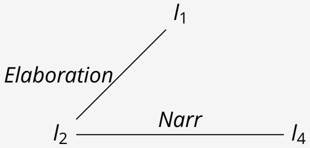
This Seems Very Tedious

- The Big Problem of Formal Pragmatics: how do these things generalise?
- At the current state of research, we can describe mechanisms for pragmatic inference.
- But we need to hard code world knowledge, lexical knowledge etc.
- Part of our mechanisms is also a language for hard-coding.

"Structural" Principles (Asher 1993)

- We also encode certain stipulation about what is a "good" narrative.
- For example, that sub-narratives form complex segments.

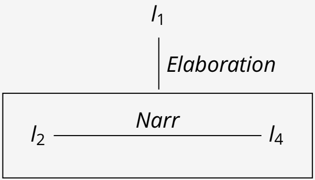
$$
\begin{aligned}
&\big(relates(l_0, l_1, l_2, D_1)\\
&\wedge relates(l_3, l_2, l_4, D_2)\\
&\wedge D_1 = Elaboration\\
&\wedge Coordinating(D_2)\big)\\
\rightarrow &\big(outscopes(l_5, l_2) \wedge outscopes(l_5, l_4)\\
&\wedge relates(l_0, l_1, l_5, D_{Elab})\big)
\end{aligned}
$$



“Structural” Principles (Asher 1993)

- We also encode certain stipulation about what is a “good” narrative.
- For example, that sub-narratives form complex segments.

$$
\begin{aligned}
&\big(relates(l_0, l_1, l_2, D_1) \\
&\wedge\ relates(l_3, l_2, l_4, D_2) \\
&\wedge\ D_1 = Elaboration \\
&\wedge\ Coordinating(D_2)\big) \\
\rightarrow\ &\big(outscopes(l_5, l_2) \wedge outscopes(l_5, l_4) \\
&\wedge relates(l_0, l_1, l_5, D_{Elab})\big)
\end{aligned}
$$

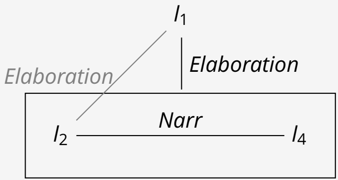


“Structural” Principles (Asher 1993)

– We also encode certain stipulation about what is a “good” narrative.

– For example, that sub-narratives form complex segments.

$$
\begin{aligned}
&\big(relates(l_0, l_1, l_2, D_1) \\
&\wedge relates(l_3, l_2, l_4, D_2) \\
&\wedge D_1 = Elaboration \\
&\wedge Coordinating(D_2)\big) \\
\rightarrow &\big(outscopes(l_5, l_2) \wedge outscopes(l_5, l_4) \\
&\wedge relates(l_0, l_1, l_5, D_{Elab})\big)
\end{aligned}
$$



Interpretation Schema

Glue Axioms (axioms for interpretation) *enrich*$\Rightarrow$

Linguistic Forms

are interpreted to

ULFs (partially describe content)

are specified to

SDRSs (describe narrative structure)

are converted to

DRSs (describe event structure)

are evaluated in

Models

Interpretation Schema

Glue Axioms
(axioms for interpretation)

enrich⇒
⇐*include*

Linguistic Forms

are interpreted to

ULFs (partially describe content)

are specified to

SDRSs (describe narrative structure)

are converted to

DRSs (describe event structure)

are evaluated in

Models

Back-flow of semantic information

- The following are Glue logic axioms:

$$(\textit{relates}(l_0, l_1, l_2, D_{Explanation}) \wedge \textit{labels}(l_1, K_1) \wedge \textit{labels}(l_2, K_2))$$
$$\rightarrow \textit{cause}(K_2, K_1).$$

$$(\textit{relates}(l_0, l_1, l_2, D_{Narration}) \rightarrow \textit{before}(l_1, l_2).$$

- So if we already have inferred a relation, we learn a bit more about the label contents.
  - → This is in spite of us not having proper access to these contents.
- We do this by encoding our knowledge about meaning postulates in such Glue axioms.

Inferring Relations: sufficiency

- SDRT typically includes Glue axioms that state if all semantic consequences of a relation obtain (and this is known to the Glue logic), then the relation is inferred.
- (“the totality of necessary consequences is sufficient”)
- $labels(l_1, K_1) \wedge labels(l_2, K_2) \wedge relates(l_0, l_1, l_2, R) \wedge cause(K_2, K_1) > R = D_{Explanation}$.
- $labels(l_1, K_1) \wedge labels(l_2, K_2) \wedge relates(l_0, l_2, l_1, R) \wedge cause(K_2, K_1) > R = D_{Result}$.

Notation

- Hereinafter, I will make our lives a bit easier, where possible:
  - $\rightarrow$ $R(\alpha, \beta) \wedge \textit{cause}(\beta, \alpha) > R = \textit{Explanation}$.
- Typical abbreviation in SDRT papers:
  - $\rightarrow$ $\lambda :?(\alpha, \beta) \wedge \textit{cause}(K_\beta, K_\alpha) > \lambda : \textit{Explanation}(\alpha, \beta)$.

Inferring Relations from Enriched Information

– $\mathit{R}(\alpha, \beta) \wedge \mathit{occasion}(\alpha, \beta) > \mathit{R} = \mathit{Narration}$.

(2) a. Max fell.
    b. John helped him up.
Narration

– $\mathit{cause}(\beta, \alpha) \rightarrow \neg \mathit{occasion}(\alpha, \beta)$

(3) a. Max fell.
    b. John pushed him.
Explanation

Penguin Principle

- Typically, narrative structure follows event structure:
- ***R***$(\alpha, \beta) >$ ***before***(α, β).
- Typically, if one event can cause another, it does.
- ***R***$(\alpha, \beta) \wedge \Diamond$***cause***$(\beta, \alpha) >$ ***cause***(β, α).
- Second one wins.

(4) a. Max fell.
    b. John pushed him.

Explanation

- (Both of these are *tacitly* endorsed by AL).

Inferring Relations: aspectual knowledge

(5) a. John cancelled the picnic.
    b. He knows that it will rain.

Background

(6) a. John knows that it will rain.
    b. He watched the weather report.

Background

- $R(l_1, l_2) \wedge state(l_2) \wedge \neg state(l_1) > Background(l_1, l_2)$
- $R(l_1, l_2) \wedge \neg state(l_2) \wedge state(l_1) > Background(l_1, l_2)$
- So *Background* is sensitive to aspectual changes.
- (In the book, the predicate $Aspect(\alpha, \beta)$ means that the semantic index of α and β have the same aspect)

Inferring Relations: world knowledge

- $\mathit{R}(\alpha, \beta) \wedge \neg(\alpha > \beta) \wedge (\beta > \alpha) > \mathit{R} = \mathit{Elaboration}$.
- $\mathit{labels}(\mathit{l}_1, \mathit{K}_1) \wedge \mathit{labels}(\mathit{l}_2, \mathit{K}_2) \wedge \mathit{relates}(\mathit{l}_0, \mathit{l}_1, \mathit{l}_2, \mathit{R}) \wedge$ $\neg$[>](K_1,K_2) $\wedge$ [>](K_2,K_1) $> \mathit{R} = \mathit{D}_{\mathit{Elaboration}}$.
- Where $[>]$ is a (shallow!) predicate denoting the world knowledge that $\mathit{K}_1 > \mathit{K}_2$.
  - $\rightarrow$ AL2003: *subtype*

Inferring Relations: world knowledge

- $R(\alpha, \beta) \wedge \neg(\alpha > \beta) \wedge (\beta > \alpha) > R = \textit{Elaboration}$.

- $\textit{labels}(l_1, K_1) \wedge \textit{labels}(l_2, K_2) \wedge \textit{relates}(l_0, l_1, l_2, R) \wedge$
  $\neg$[>](K_1,K_2) $\wedge$ [>](K_2,K_1) $> R = D_{\textit{Elaboration}}$.

- Where $[>]$ is a (shallow!) predicate denoting the world knowledge that $K_1 > K_2$.
  - → AL2003: *subtype*

- A heuristic approach: for any *n*, $\vdash^n$ ("FOL-provable in *n* or less steps") is decidable. This can be encoded as a predicate.
  - → (A computational approach would use an automated theorem prover with a time limit)

Inferring Relations: Cue Phrases

- Monotonic cues:
  $(R(\alpha, \beta) \wedge \textit{therefore}(\beta)) \rightarrow R = \textit{Result}$
  $(R(\alpha, \beta) \wedge \textit{and-then}(\beta)) \rightarrow R = \textit{Narration}$

- Performatives:
  $\textit{inform}(\pi) \rightarrow$
  $((R(\lambda, \pi) \wedge \textit{right-veridical}(R)) \vee (R(\pi, \lambda) \wedge \textit{left-verdicial}(R)))$.

- Defeasible cues:
  $\textit{declarative}(\pi) \rightarrow$
  $((R(\lambda, \pi) \wedge \textit{right-veridical}(R)) \vee (R(\pi, \lambda) \wedge \textit{left-verdicial}(R)))$.

Inferring Relations: Rationality Principles

– It is rational to interpret a response to a question as an answer:

$$(R(\alpha, \beta) \wedge \textit{interrogative}(\alpha) \wedge \textit{declarative}(\beta) \wedge \textit{spk}(\alpha) \neq \textit{spk}(\beta)) > R = \textit{IQAP}$$

(7) a. A: Is John going out tonight?
b. B: I saw him get dressed earlier.
$\Big]$ IQAP

(8) a. A: Why is seaweed good for you?
b. B: Lots of vitamins.
$\Big]$ IQAP

– A question after a declarative should ask something about it:

$$(R(\alpha, \beta) \wedge \textit{declarative}(\alpha) \wedge \textit{interrogative}(\beta) \wedge \textit{spk}(\alpha) \neq \textit{spk}(\beta)) > R = \textit{Q-Elab}$$

Case Study

Attachment of *Why?*

- *Why*-questions can either ask for why a *content is true* or for why *an utterance is made*.
- The second one is a meta-linguistic discourse relation, marked with an asterisk *.

(9) a. Richard: They'll check every single doctor.
 b. Anon Why is that?

$\Big]$ Explanation$_q$

(10) a. Gillian: Do you want mum to come to Argos?
 b. Robert: Why are you asking me?

$\Big]$ Expl$_q^*$

Bare *Why?*

(11) a. Brenda: He's in hospital.
b. Carla: Why?
[*Why is he in hospital?* ~~*Why are you telling me?*~~]
c. Brenda: Because he's not very well

(12) a. Anon: Do you love me $\langle$unclear$\rangle$?
b. Bnon: Why?
[*Why are you asking?*]
c. Anon: $\langle$unclear$\rangle$ I love you so much.

– It seems that assertoric antecedents are Explanation$_q$ and non-assertoric antecedents are Explanation$^*_q$.

Counterexample

- (Joint work with Ellen. Special thanks to Robin.)

(13) a. Amy: I'll have you know that I'm upset.
b. Bob: Why?
[*Why are you upset?* OR *Why are you saying that?*]
c. Amy: I had a terrible day at work.

(14) a. Amy: I'll have you know that I'm upset.
b. Bob: Why?
[*Why are you upset?* OR *Why are you saying that?*]
c. Amy: So you be careful around me today.

- So, sometimes, bare *Why?* is ambiguous with assertoric antecedents.

Performatives Matter

(15) a. Amy: I'm upset.

b. Bob: Why?

[*Why are you upset?* ~~OR *Why are you saying that?*~~]

c. Amy: I had a terrible day at work.

(16) a. Amy: I'm upset.

b. Bob: Why?

[*Why are you upset?* ~~OR *Why are you saying that?*~~]

??c. Amy: So you be careful around me today.

– So, the *I'll have you know* ($\approx$ *I am hereby telling you*) matters.

Coding it in the Glue Logic

- Introduce a predicate $\texttt{prop}$ in the underspecified language such that:
  $K, A \models \texttt{prop}(l)$ iff the content labelled by $A(l)$ has propositional content (not a question or command).

  (we didn't do question semantics here)

- Take *Why?* to be a monotonic linguistic cue for asking for an explanation.

$$why(l_2) \wedge relates(l_0, l_1, l_2, D) \rightarrow (R = Explanation_q \vee R = Explanation^*_q)$$

Inferring the Right Relation

Glue Axioms for *Why?*

a. $(R(\alpha, \pi) \wedge (R = \mathit{Explanation}_q \vee R = \mathit{Explanation}^*_q)$
$\wedge \mathtt{prop}(\alpha) > R = \mathit{Explanation}_q$.

b. $(R(\alpha, \pi) \wedge (R = \mathit{Explanation}_q \vee R = \mathit{Explanation}^*_q)$
$\wedge(\mathtt{inform}(\alpha) \vee \mathtt{interrogative}(\alpha) \vee \mathtt{imperative}(\alpha))$
$> R = \mathit{Explanation}^*_q$.

c. $\neg(R_1(\alpha, \pi) \wedge R_2(\alpha, \pi) \wedge R_1 = \mathit{Expl}_q \wedge R_2 \mathit{Expl}^*_q)$.

- *Both* (a) and (b) apply for *I'll have you know that p*.
  - $\rightarrow$ Nixon Diamond!

World Knowledge, again

– (with thanks to Jonathan Ginzburg)

– World knowledge can override these defaults.

(17) a. Amy: You're upset.
b. Bob: Why?
[~~*Why am I upset?* OR~~ *Why are you saying that?*]

– Only I have knowledge of my internal states.

– Amy cannot *know* that Bob is upset, let alone *why*.

$\Box\neg know(spk(\alpha), K_\alpha) \wedge R(\alpha, \beta) \rightarrow \neg R = Explanation_q$.

Case Study

SDRT-Update

Case Study

SDRT-Update

Interpretation Schema

Linguistic Forms

are interpreted to

Glue Axioms (stipulations about interpretation) *enrich*$\Rightarrow$ $\Leftarrow$*include* ULFs (partially describe content)

are specified to

SDRSs (describe narrative structure)

are converted to

DRSs (describe event structure)

are evaluated in

Models

Interpretation Schema

Linguistic Forms

are interpreted to

Glue Axioms

(stipulations about interpretation)

enrich$\Rightarrow$
$\Leftarrow$*include*

ULFs (partially describe content)

are specified to

SDRSs (describe narrative structure)

are converted to

DRSs (describe event structure)

✓*are evaluated in*

Models

Interpretation Schema

Linguistic Forms

are interpreted to

Glue Axioms

(stipulations about interpretation)

enrich⇒

⇐*include*

ULFs (partially describe content)

are specified to

SDRSs (describe narrative structure)

✓*are converted to*

DRSs (describe event structure)

✓*are evaluated in*

Models

Interpretation Schema

Linguistic Forms

✓*are interpreted to*

Glue Axioms

(stipulations about interpretation)

enrich$\Rightarrow$

$\Leftarrow$*include*

ULFs (partially describe content)

are specified to

SDRSs (describe narrative structure)

✓*are converted to*

DRSs (describe event structure)

✓*are evaluated in*

Models

Interpretation Schema

Linguistic Forms

✓*are interpreted to*

Glue Axioms ✓*enrich*⇒ ⇐*include* ULFs (partially describe content)

(stipulations about interpretation)

are specified to

SDRSs (describe narrative structure)

✓*are converted to*

DRSs (describe event structure)

✓*are evaluated in*

Models

Interpretation Schema

Linguistic Forms

✓*are interpreted to*

Glue Axioms ✓*enrich*⇒ ⇐*include* ULFs (partially describe content)

(stipulations about interpretation)

are specified to

SDRSs (describe narrative structure)

✓*are converted to*

DRSs (describe event structure)

✓*are evaluated in*

Models

Construction of SDRSs (overview)

- Context (the information contained in the prior discourse) may contain underspecified / defeasible information.

- Thus, the context is a big ULF formula Γ (possibly empty).

  → If you so desire, let the context be set σ of SDRSs. Then define Γ to be the ULF that describes them all ($\Gamma = \mathit{Th}(\sigma)$, in the book).

Construction of SDRSs (overview)

- Context (the information contained in the prior discourse) may contain underspecified / defeasible information.
- Thus, the context is a big ULF formula Γ (possibly empty).
  - $\rightarrow$ If you so desire, let the context be set σ of SDRSs. Then define Γ to be the ULF that describes them all ($\Gamma = Th(\sigma)$, in the book).
- Now, let $\mathcal{K}$ a ULF representing new information. Let l_{new} be a label variable not not used in Γ. Then define:
- $update(\Gamma, l_{new} : \mathcal{K})$ is the set of all (and only) those pairs (S, A) (S an SDRS; A an assignment) where $L = A(l_{new})$ and that satisfy the defeasible consequences of attaching $\mathcal{K}$ to some available segment in Γ.

Construction of Discourse (formal)

- Let l_{new} be a label variable not used in Γ.
- Let R_n, l_1 and l_2 be variables not used in Γ.
- Let l_λ be the "last" label in Γ (i.e. the l_{new} from the last update).

  → Can also define this as the "accessibility-minimal" label.

- Then: $(S, A) \in update(\Gamma, l_{new} : \mathcal{K})$ iff
  $S = (\Pi, \mathcal{F}, L)$, is an interpretable SDRS with $L = A(l_{new})$, and
  for all formulae φ of the underspecified language (if $\Gamma \neq \emptyset$):

  If $\Gamma \wedge \mathcal{K} \wedge relates(l_1, l_2, l_{new}, R_n) \wedge accessible(l_2, l_\lambda) \mathrel{|\!\!\sim} \varphi$, then $S, A \models \varphi$.

  (if $\Gamma = \emptyset$): If $\mathcal{K} \mathrel{|\!\!\sim} \varphi$, then $S, A \models \varphi$.

Construction of Discourse (formal)

- Let l_{new} be a label variable not used in Γ.
- Let R_n, l_1 and l_2 be variables not used in Γ.
- Let l_λ be the "last" label in Γ (i.e. the l_{new} from the last update).

  → Can also define this as the "accessibility-minimal" label.

- Then: $(S, A) \in \mathit{update}(\Gamma, l_{new} : \mathcal{K})$ iff
  $S = (\Pi, \mathcal{F}, L)$, is an interpretable SDRS with $L = A(l_{new})$, and
  for all formulae φ of the underspecified language (if $\Gamma \neq \emptyset$):

  If $\Gamma \wedge \mathcal{K} \wedge \mathit{relates}(l_1, l_2, l_{new}, R_n) \wedge \mathit{accessible}(l_2, l_\lambda) \mid\!\sim \varphi$, then $S, A \models \varphi$.

  (if $\Gamma = \emptyset$): If $\mathcal{K} \mid\!\sim \varphi$, then $S, A \models \varphi$.

good enough?

Some Remarks

- To be clear:
- We do not expect to arrive at *one* fully specified SDRS.
- A context will almost-always contain a certain amount of underspecification.
  - → When we assign a single SDRS to a discourse we are to some degree using our magic human powers of interpretation.
- In addition, even if we get a single SDRS, the next utterance might require us to revise.
- So, *officially*, we consider a context to be the ULF that represents *only* the linguistic information of a linguistic form.
- We compute all the Glue-consequences anew *every time*.

Maximise Discourse Coherence

- There may be a *lot* of SDRSs in *update*$(\Gamma, \pi : \mathcal{K})$.
- We want to pick out the "best" ones.
- Intuitively, some ways of structuring a discourse "tell a better story" than others.
- We'll call the good ones "most coherent" and formalise conditions on what such coherence might be.

MDC

An SDRS K is at least as coherent as an SDRS K', $K' \leqslant^c K$, if and only if all of the following hold:

1. *Prefer consistency:* If K' is consistent, then so is K.
2. *Prefer rich structure:* K has at least as many coherence relations as K'.
3. *Prefer resolution:* K binds (over accommodates) at least as many presuppositions as K' does.
4. *Prefer better relations:* For every rhetorical relation $R(\pi_1, \pi_2)$ that K' and K share: $R(\pi_1, \pi_2)$ is at least as coherent in K as it is in K'.
5. *Prefer flat structure:* K has at most as many labels as K' unless K' has a *semantic clash* and K does not.

(these are "global" conditions and cannot be put as glue axioms)

MDC: Clashes

– A semantic clash is a conflict of veridicality.

(18) a. π_1: If a shepherd goes to the mountains,
π_2: he will bring his dog.
π_3: He brings a good walking stick too.

✓b. π_0: $\mathit{Consequence}(\pi_1, \pi)$
π : $\mathit{Parallel}(\pi_2, \pi_3)$

✗c. π_0: $\mathit{Consequence}(\pi_1, \pi_2) \wedge \mathit{Parallel}(\pi_2, \pi_3)$

MDC: Quality of Relations

- Some Contrasts sound better than others; some Parallels sound better than others.

(19) a. John loves opera, but hates musicals.
??b. John loves opera, but likes musicals.

(20) a. John had pocket aces, but lost.
??b. John had nothing, but lost.

(21) a. John loves opera and likes musicals, too.
??b. John loves opera and likes to go swimming, too.

- Both: good quality $\approx$ a good partial isomorphism between clause ULFs, plus semantically:

  Contrast: dissimilar isomorphic elements OR expectation-defying.

  Parallel: similar isomorphic elements.

MDC: Quality of Relations, Example

- Sometimes the “better relation” decides some underspecified element.

(22) Joan was at the bank, and Marius was near the river too.

(23) Joan was at the bank, but Marius was near the river.

Full SDRT Interpretation

Linguistic Forms

are interpreted to

Glue Axioms (axioms for interpretation) *enrich⇒* *⇐include* ULFs (partially describe content)

are specified to

MDC (axioms for rich narratives) *selects* SDRSs (describe narrative structure)

are converted to

DRSs (describe event structure)

are evaluated in

Models

DONE!

(with the basic theory)