

Discourse Structure in Dialogue

Lecture 6: Dialogue and Commitments

Julian J. Schlöder

Maximise Discourse Coherence

An SDRS K is at least as coherent as an SDRS K' , $K' \leq^c K$, 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)

Linguistic Forms

are interpreted to

Glue Axioms
(axioms for
interpretation)

enrich

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

- So far, we've been mostly working through SDRT as given in the AL2003 book (with updated notation and some simplifications).
- Now we're entering more recent developments and ongoing research issues.

Presupposition

Presupposition Projection

(1) If John is bald, then John's son is bald.

∂ John has a son.

(2) If John has a son, then John's son is bald.

∂ John has a son.

(3) If John went diving before, he'll bring his wetsuit.

∂ John has a wetsuit.

Binding and Accommodation

- It is a syntax-semantics interface job to produce a presupposition.
- But it is a pragmatics job to resolve it.
- If the context entails the presupposed content, our life is easy: we can just delete it.
- If not, then we need to **add** the content somewhere in the context.

Remember how Names Are Funny

- Names are presupposition triggers!

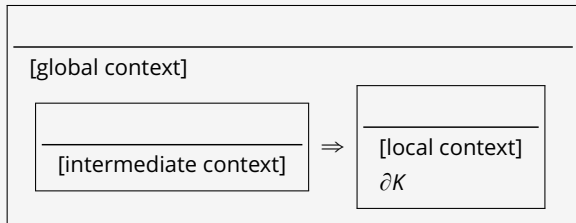
(4) It is not the case that a man is running. ??He takes his time.

(5) It is not the case that John is running. He takes his time.

≈ There is someone named John. It is not the case that he is running.
He takes his time.

Accommodation: Options

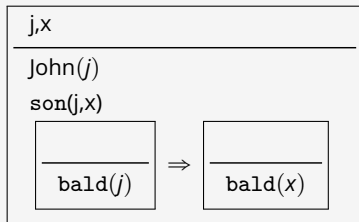
- Traditional division:



- In SDRT: **any accessible segment**

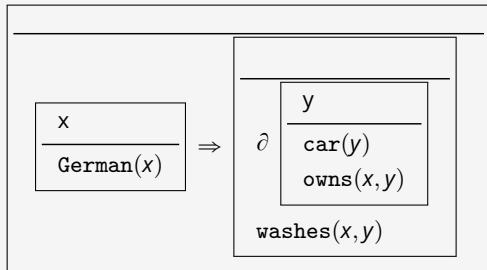
Global Accommodation

(6) If John is bald, then John's son is bald.



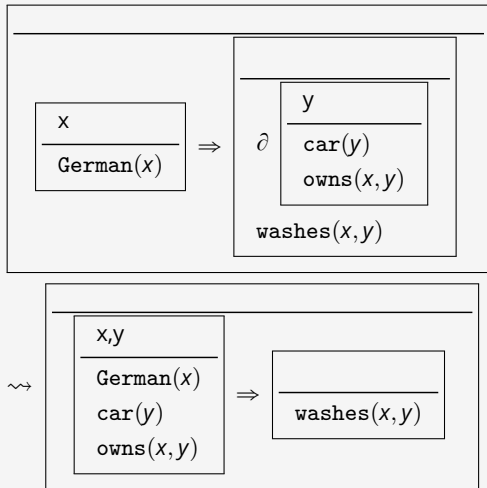
Intermediate Accommodation

(7) All Germans wash their cars.



Intermediate Accommodation

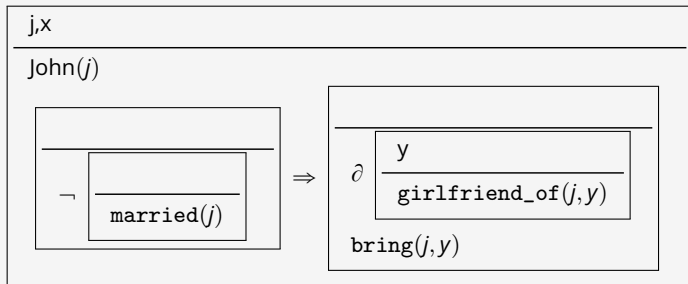
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Local Accommodation

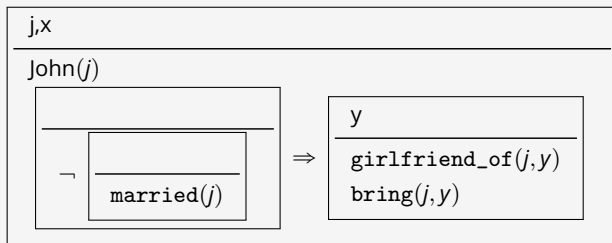
(8) (John will bring his female partner.)

If John is not married, he will bring his girlfriend.



Local Accommodation

- (9) (John will bring his female partner.)
If John is not married, he will bring his girlfriend.



DRT: informativeness + consistency

- The DRT story: accommodate as **globally as possible** where **consistent** and **informativeness is preserved**.

(10) Either this house has no bathroom, or the bathroom is in an odd place.

~~\exists there is a bathroom~~

- *the bathroom* generates the presupposition *there is a bathroom*.
- Global accommodation is preferred.

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- Global accommodation is preferred.
 - ✓consistent
 - ✗informative (because of first disjunct)
- Hence: local accommodation

Either this house has no bathroom, or it has one in an odd place

Trouble for DRT

(11) Either John didn't make cookies, or Mary stole the cookies.

~~\exists there are cookies~~

- Informativeness doesn't apply here: accommodating globally that *there are cookies* does not render *John didn't make cookies* uninformative.

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- And also:

(13) A woman lives in this house. ??The man is bald.

- *there is a man* is both informative and consistent.

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- *there is a man* is both informative and consistent.
- *but not coherent*

SDRT Presupposition

- Instead of demanding informativeness, we demand *coherence*—and let MDC figure out the rest.
 - *General Slogan of SDRT*: instead of stipulating *specific* principles for a phenomenon, always select for the interpretation that tells the best story (by *general* principles)!
- So, SDRT presupposition is simple:
- If the grammar produces $\mathcal{K}_1 \partial \mathcal{K}_2$ from a clause, verify that it is *possible* to update with \mathcal{K}_2 (without \mathcal{K}_1). If so, update with $\mathcal{K}_2 \wedge \mathcal{K}_1$.
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- Typically, a presupposition attaches as *Background*.
 - Because presuppositions are typically statives.
- (this is how Schlöder & Lascarides (2017/ms.) do presupposition, who modify AL2003; the primary source AL1998 is outdated)

Backgrounds and Backgrounds

- Compare:

(14) a. (π_1) John walked (π_2) while it was raining.

$Background_{bckw}(\pi_1, \pi_2)$

b. (π_1) While it was raining, (π_2) John walked.

$Background_{fwd}(\pi_1, \pi_2)$

- These tell (arguably) the same story.
- So we need two backgrounds:
 - The main story PRECEDES the background ($Background_{backward}$)
 - The main story FOLLOWS the background ($Background_{forward}$)
- (Because we want the narrative structure to track the order of utterance; also see Asher, Prevot & Vieu (2007).)

Background and Anaphor

- *Backgrounds* have magical anaphora properties!

(15) a. While it was just drizzling,
b. a woman searched for shelter,
c. to not get wet.

}Expl }Background_{fwd}

Background and Anaphor

- *Backgrounds* have magical anaphora properties!

(15) a. While it was just drizzling,
b. a woman searched for shelter,
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d. then it started pouring
e. while **she** was still searching

Expl Background_{fwd} Background_{bckw} Narration

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- (15) a. While it was just drizzling,
b. a woman searched for shelter,
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- Diagram illustrating the structure of the sentence (15):
- The sentence is divided into two main parts: *Background_{fwd}* (a, b, c) and *Background_{bckw}* (d, e).
 - The *Background_{fwd}* part is further divided into *Expl* (a, b, c) and *Narration* (d, e).

Diagram illustrating the structure of the sentence (15):

it was just drizzling — *Narration* — it started pouring

Background_{fwd} | Background_{bckw}

w searched shelter | ?x is still searching

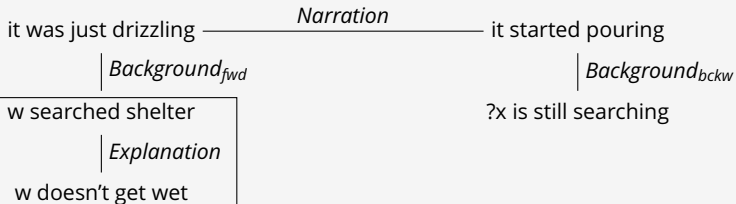
Explanation

w doesn't get wet

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- Expl } Background_{fwd} } Narration
Background_{bckw}



- Idea: Backgrounds are transparent to anaphora.

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To anaphorical intents and purposes *Background* CDUs are EDUs.
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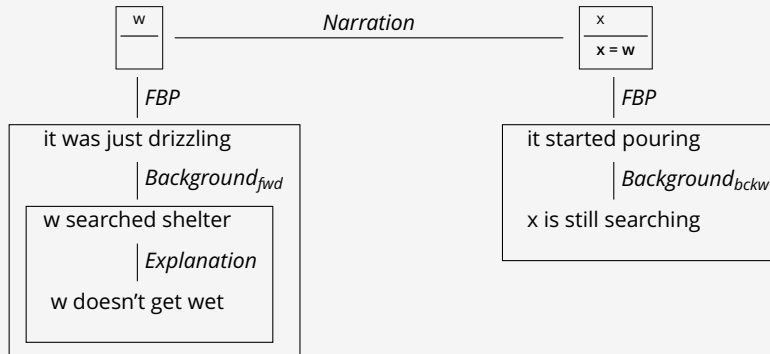
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Presupposition

Presupposition: Examples

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Intermediate Accommodation

(16) π_1 : Every German, g
 π_2 : washes their car c .
 π_3 : x has a car.

- The presupposition is coherent because *every german has a car*. is coherent.
- Glue: $\text{Consequence}(\pi, \pi_2) \wedge \text{outscopes}(\pi, \pi_1)$ (from cuephrase)

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 $\lambda : \text{Consequence}(\pi_1, \pi_2)$
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Intermediate(-ish) Accommodation

(17) π_1 : If John went diving before,
 π_2 : he'll bring his wetsuit.
 π_3 : John has a wetsuit.

- *j is coming; j has a wetsuit.* is coherent because of shared topic.
- Glue: *Def-Consequence*(π_1, π_3) (from sufficiency)
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- Flattest structure:
 $\pi_0 : \text{Def-Consequence}(\pi_1, \pi_3) \wedge \text{Consequence}(\pi_1, \pi_2)$
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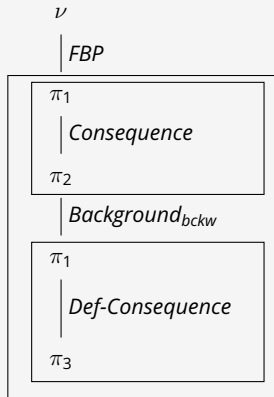
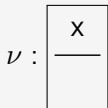
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- Global accommodation:
 $\lambda : \text{Consequence}(\pi_1, \pi_2)$
 $\pi_0 : \text{Background}_{bckw}(\lambda, \pi_3) \wedge \text{Def-Consequence}(\pi_1, \pi_3)$
Xsemantic clash (π_3 both veridical and non-veridical in π_0)

Intermediate(-ish) Accommodation

- (18) π_1 : If John went diving before,
 π_2 : he'll bring his wetsuit.
 π_3 : John has a wetsuit x .

– Correct structure:

$\pi : \text{Consequence}(\pi_1, \pi_2)$
 $\mu : \text{Def-Consequence}(\pi_1, \pi_3)$
 $\lambda : \text{Background}_{bckw}(\pi, \mu)$
 $\pi_0 : \text{FBP}(\nu, \lambda)$



What is special here?

(19) π_1 : If John went diving before,
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– Glue: *Def-Consequence*(π_1, π_3) (from sufficiency)

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– Glue: ~~*Def-Consequence*~~(π_1, π_3)

\Rightarrow global accommodation
 λ : *Consequence*(π_1, π_2)
 π_0 : *Background*(λ, π_3)

Local Accommodation

(21) a. π_1 : Either John didn't make cookies,
 π_2 : or Mary stole the cookies.
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- “j didn't make cookies; there are cookies” is coherent (*Contrast*).

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- Global: π_0 : *Alternation*(π_1, π_2) π : *Background*_{bckw}(π_0, π_3)

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- Intermediate: $\pi_0: \text{Alternation}(\pi, \pi_2) \quad \pi : \text{Contrast}(\pi_1, \pi_3)$
✗anaphor
- Global: $\pi_0: \text{Alternation}(\pi_1, \pi_2) \quad \pi : \text{Background}_{bckw}(\pi_0, \pi_3)$
- Local: $\pi_0: \text{Alternation}(\pi_1, \pi)$
 $\pi : \text{Contrast}(\pi_3, \pi_2) \wedge \text{Background}_{fwd}(\pi_3, \pi_2)$
✓most relations and no clashes

Presupposition: Examples

Dialogue

Presupposition: Examples

Dialogue

- Again, I'm giving a language and a methodology with which to model (some) dialogue phenomena.
- And some very fragmented (or very fundamental) things to do with that language.

Problem 1: Dialogue has disagreement

- Disagreement data shows that **dialogues need not be consistent.**

(22) π_1 : A: There's a dog in the park.
 π_2 : B: No it's a cat.
 π_3 : A: I just heard it barking.

} Correction
} Counterevidence } Elaboration

$$\pi_0 = \text{Correction}(\pi_1, \pi_2) \wedge \text{Counterevidence}(\pi_2, \pi_3) \wedge \text{Elaboration}(\pi_1, \pi_3).$$

$$f[\mathcal{F}(\pi_0)]g \text{ iff } f[\mathcal{F}(\pi_2)] \circ [\Phi_{\text{Corr}}] \circ [\mathcal{F}(\pi_3)] \circ [\Phi_{\text{CE}}] \circ [\mathcal{F}(\pi_1)] \circ [\mathcal{F}(\pi_3)] \circ [\Phi_{\text{Elab}}]g$$

- This is inconsistent!

Problem 2: Dialogue has agreement

(23) π_1 : A: There's a dog in the park.
 π_2 : B: Yes, you're right. } Accept

- What does *Accept* mean or *do*?

Dialogue has *implicit* agreement.

- (slightly constructed, from AL2009)

(24) a. Mark: Karen and I had a fight.
b. Mark: Because she went out with Keith and not me. } Explanation
c. Karen: Well, you never asked me out. } Explanation

- Karen agrees with:
 - That they had a fight.
 - That she went out with Keith.
 - AND that Keith was the reason for the fight.

In Sum

- Speakers agree *on SDRSs*.
- Yet, they construct *jointly* a narrative (that might be inconsistent).
- Everyone gets an ULF per turn:

Turn	Speaker A	Speaker B	global
1	\mathcal{K}_A^1	–	$\mathcal{K}_1 = \mathcal{K}_S^1$
2	$\mathcal{K}_A^2 = \mathcal{K}_A^1$	\mathcal{K}_B^2	$\mathcal{K}_2 = \mathcal{K}_B^2 \wedge \mathcal{K}_B^2$
3	$\mathcal{K}_A^3 \neq \mathcal{K}_A^2$	$\mathcal{K}_B^3 = \mathcal{K}_B^2$	$\mathcal{K}_3 = \mathcal{K}_B^3 \wedge \mathcal{K}_B^3$

- But what are these ULFs? What are their *implicit* contents?
- (AL2009 put fully specified SDRSs here and call such a table a DSDRS)

Commitment

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- And commitments have a **logic** that allows us to compute implicit and explicit commitments.

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Lascarides & Asher (2009), *Agreement, Disputes and Commitments in Dialogue*, JoS.

Lascarides & Asher (2008), *Agreement and Disputes in Dialogue*, SIGdial.

Asher & Lascarides (2008), *Commitments, Beliefs and Intentions in Dialogue*, SemDial.

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- This is a component that is still actively developed:

Schlöder, Venant & Asher (2016), *Aligning Intentions: Acceptance and Rejection in Dialogue*, SuB.

Schlöder & Lascarides (2015), *Interpreting English Pitch Contours in Context*, SemDial.

Asher & Lascarides (2013), *Strategic Conversation*, S&P.

What's that, Commitment?

- Hamblin 1971: it's just a formal device for scorekeeping.
- Brandom 1994: speakers make themselves responsible for the truth of their commitments.
- Asher & Lascarides (2003,2008,2009): it's speakers' publicised beliefs.
- Condoravdi & Lauer (ongoing): speakers promise to act as if their commitments were true.
- Schlöder 2018: speakers make themselves responsible for the propriety of their speech acts.

Commitment to what?

- Classically conceived: the **undertaking of a commitment** is the context-update effect of **making an assertion**.
- We now make speakers commit to **speech acts**.
- In fact, to **relational** speech acts: when I give an answer, I am not just committing to its content, but also to its *answerhood*.
- So they commit to *discourse relations*: that makes commitment closed under meaning postulates. Hence they commit to **SDRSs**.

Example

(25) π_1 : A: There's a dog in the park.
 π_2 : B: No it's a cat.
 π_3 : A: I just heard it barking.

} Correction
} Counterevidence } Elaboration

– The full SDRS:

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(25) π_1 : A: There's a dog in the park.
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- Speaker B is committed to:

(28) π_B : *Correction*(π_1, π_2)

The Logic of Commitment

- We (again) use a **quantifier-free modal logic** (you know where this is going) with the usual connectives ($\vee, \wedge, \neg, \rightarrow, >$).
- Let C_A and C_B stand for “A/B is committed to” and give them \Box -like semantics.
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 - $\rightarrow M, w \models \mathcal{B}_A \varphi$ iff for all $v \in R_{\mathcal{B}_A}(w)$, $M, v \models \varphi$
- Let I_A and I_B be **second order modals** for “A/B intends”.
- That is, I_A can take other modals as arguments (e.g. $I_A C_A \varphi$ is well-formed, “A intends to commit to φ ”).
- $M, w \models I_A M \varphi$ iff for all $v \in R_{I_A}(w) \cap R_M(w)$, $M, v \models \varphi$.

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E.g. $C_A \text{Elab}(\alpha, \beta) \rightarrow C_A K_\alpha \wedge C_A K_\beta$
- *There will be consistent commitments (according to this logic) that are in fact inconsistent.*

- Usually (everywhere except AL2009) we pretend that CML is a separate logic, but in fact it's part of the Glue logic.
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 - In fact, AL2009 define *everything* by Glue axioms on DSDRSs.
 - That's tedious, so you again get “my” version of that paper.
- So, every well-formed CML formula is now a Glue formula.
- Also, whenever you add a new *last* label π to update with an utterance of speaker S , add a modal operator $[say_S(\pi)]$.
 - “After S uttered π ”

Explicit Commitments

Let $\pi_1 \dots \pi_n$ be EDUs spoken by $S_1 \dots S_n$. Define $\Gamma_n^{S_i}$ to be the explicit commitments of S_i after π_n :

- Compute the ULF Γ^n for the full discourse after π_n .
- Compute the smallest sub-ULF $\Gamma_n^{S_i}$ of Γ^n that contains the conjunction of all EDUs from S_i 's utterances.

Let \vdash_G be the nonmonotonic proof theory of the glue logic.

- If $\Gamma_n^{S_i} \vdash_G \varphi$, then $\Gamma_n \vdash_G [\text{say}_{S_1}(\pi_1)] \dots [\text{say}_{S_i}(\pi_i)] C_{S_i} \varphi$.

- (My translation of AL2009 in the CML notation)
- “Explicit” does not mean “semantic”—this contains (some) implicatures! (AL2013 investigate which implicatures are “safe”).

(Some) Implicit Inferences

- **Sincerity.** (a) $C_A\varphi > B_A\varphi$ and (b) $B_A\neg\varphi > \neg I_A C_A\varphi$.

Normally, you believe what you commit to; and you do not intend to commit to what you do not believe.

- **Intention Transfer.** $C_A\varphi > C_A I_A C_B\varphi$.

Normally, you intend to make your commitments shared.

- **Cooperativity.** $C_A I_A\varphi > I_B\varphi$.

Normally, intentions are kept aligned.

- **Sincere Questions.**

(a) $interrogative(\varphi) \rightarrow (C_A\varphi > \neg B_A resolved(?K_\pi))$.

(b) $interrogative(\pi) \rightarrow (B_A resolved(\varphi) > \neg I_A C_A ?K_\pi)$.

Normally, questions sincerely ask for unknown information.

- (As stated by SL2015 based on AL2013;
SVA2016 and S2018 derive these from first principles.)

CML to Glue?

- One would expect that CML-info can affect Glue-construction.
→ I'm not aware of any paper that actually does this.
- Suppose that it is common ground (= shared commitment, AL2008) that *A* believes that *everybody loves chocolate*.

(29) a. A: John doesn't like chocolate.
b. B: Seriously, who doesn't like chocolate?
c. A: I know!

} Q-Elab
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- By **Sincere Questions**, B does not commit to the literal question.

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→ not clear what that means in SDRT
- Similar things may work for ironic utterances.
→ SL2015 propose this, but S2018 goes a different route

Implicit Agreement

Undenied Commitments (LA2009)

- If R is a left-veridical relation that is not *Accept*,
- and R' is any relation,
- and $C_A R(\beta, \gamma)$
- and $C_B R'(\alpha, \beta)$ (or $C_B R'(\beta, \alpha)$)
- then typically, $C_A R'(\alpha, \beta)$ (or $C_A R'(\beta, \alpha)$).

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Written out:

$$C_A R(\beta, \gamma) \wedge C_B R'(\alpha, \beta) > C_A R'(\alpha, \beta)$$

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(30) π_1 Mark: Karen and I had a fight.
 π_2 Mark: Because she went out with Keith and not me.
 π_3 Karen: Well, you never asked me out.

} Explanation
 } Explanation

$$C_M Expl(\pi_1, \pi_2) \wedge C_K Expl(\pi_2, \pi_3) \mid \sim C_K Expl(\pi_1, \pi_2)$$

– So, Karen agrees *that* there was a fight, and *why* there was a fight.

- This is not so for explicit acceptance. Compare:

(31) π_1 A: John is not a good speaker.
 π_2 A: Because he mumbles a lot.
 π_3 B: I agree he mumbles a lot.
 $\nabla \rightarrow$ *John is a bad speaker*

$\left. \begin{array}{l} \text{Explanation} \\ \text{Accept} \end{array} \right\}$

(32) π_1 A: John is not a good speaker.
 π_2 A: Because he mumbles a lot.
 π_3 B: It's because he's shy.
 \rightsquigarrow *John is a bad speaker*

$\left. \begin{array}{l} \text{Explanation} \\ \text{Explanation} \end{array} \right\}$

- Here is a case where Undenied Commitments is cancelled:

(33) π_1 A: John is not a good speaker.	}Explanation	}Explanation
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- Glue says that B is committed to: *Explanation*(π_1, π_3)
- So, (by veridicality), B is also committed to π_1 .
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- But B is committed to π_3 being the *sole* reason.
- Hence Undenied Commitments is cancelled.
- (To execute this, add a CML axiom saying that one typically cannot commit to two sole reasons:
 $C_SExpl(\alpha, \beta) \wedge \alpha \neq \gamma > \neg C_SExpl(\alpha, \gamma)$)

Dynamics of Commitment

Persistence. If $A \neq S$, then $C_A\varphi \rightarrow [s_S(\pi)]C_A\varphi$.

A person's public commitments are unaffected by other speakers.

Conservativity. $([s_S(\pi)]\mathcal{B}_{S'}\varphi) \rightarrow (\mathcal{B}_{S'}\varphi \vee \mathcal{B}_{S'}((C_S K_\pi) > \varphi))$.

Beliefs after an utterance are either carried over from before, or are inferred from that utterance.

Foresight. $(\mathcal{B}_{S'}[s_S(\pi)]\varphi) > ([s_S(\pi)]\mathcal{B}_{S'}\varphi)$.

If a speaker believes that after the act π , the proposition φ holds, they normally have that belief in foresight.

- (from SL2015)
- (Amsterdam disclaimer: these are *static* principles *about* dynamics—the logic itself is not dynamic.)

Hindsight

- A conceptually somewhat difficult axiom is the *Hindsight axiom*:

Hindsight. If $\Gamma \vdash_C [s_{S_1}(\pi_1)] \dots [s_{S_n}(\pi_n)] \mathcal{B}_S [s_{S_i}(\pi_i)]^{-1} \varphi$,
then $\Gamma \vdash_C [s_{S_1}(\pi_1)] \dots [s_{S_{i-1}}(\pi_{i-1})] \mathcal{B}_S \varphi$

Beliefs about 'before'-operators cancel up to a corresponding 'after'-operator.

- The conclusion does *not* mean that after utterance $i - i$ the context entailed that speaker S believed that φ .
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- The conclusion does *not* mean that after utterance $i - i$ the context entailed that speaker S believed that φ .
- It means that **from the information after utterance n** , we can derive that it must have been the case.
- So, **Hindsight** can fire in a context Γ_n but $\Gamma_{i-1} \not\vdash [s_{S_1}(\pi_1)] \dots [s_{S_{i-1}}(\pi_{i-1})] \mathcal{B}_S \varphi$.

Hindsight: Applications

- Speakers can **comment** on their belief revision.

(34) a. A: Who is coming for dinner?

b. B: John and Mary. I thought you knew.

(35) a. A: Trump is actually doing a good job.

b. B: I did not think you'd say that.

(36) a. A: It's raining.

b. B: Really?!

- In all these cases, *A* learns something about *B*'s belief state from *before A* made her utterance.

Example: Surprise

- Hindsight can give a **logical form for the cognitive attitude of surprise**:

$$[s_H(\alpha)]^{-1} \mathcal{B}_S \neg I_H C_H \mathcal{K}_\alpha.$$

\approx before **Hearer** said α , **Speaker** believed that Hearer would not want to commit to the content of α .

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(37) α : A: It's raining.

π : B: Really?!

$$[s_A(\alpha)][s_B(\pi)]C_B[s_A(\alpha)]^{-1}\mathcal{B}_B\neg I_A C_A \mathcal{K}_\alpha.$$

$$\sim [s_A(\alpha)][s_B(\pi)]\mathcal{B}_B[s_A(\alpha)]^{-1}\mathcal{B}_B\neg I_A C_A \mathcal{K}_\alpha \text{ (Sincerity a).}$$

$$\sim \mathcal{B}_B \mathcal{B}_B \neg I_A C_A \mathcal{K}_\alpha \text{ (Hindsight).}$$

$$\sim \mathcal{B}_B \neg I_A C_A \mathcal{K}_\alpha \text{ (Belief modal iterates).}$$

\rightsquigarrow "At the beginning of the dialogue, B thought that A wouldn't say that!"

Dialogue

Summing Up

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Maximise **Dialogue** Coherence

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

1. *Prefer consistent commitments:* If in K' , **both / all speakers' commitments are consistent**, then also in 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.

(this is where we sort out missed inconsistencies)

Dialogue SDRT Interpretation

Linguistic Forms

are interpreted to

Glue Axioms
(axioms for
interpretation)

enrich

ULFs



are translated to

CML
(axioms for
impl commitment)

enriches

Commitments to ULFs

are specified to

MDiaC
axioms for
rich narratives

selects

{A's SDRSs} {B's SDRSs}

are converted to

{A's DRSs} {B's DRSs}

are evaluated in

Models