Kontextsensitivität und Interaktionsmanagement
(in RUDI)

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"Wie bitte?"
Vom Umgang mit Verständnisproblemen

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Introduction

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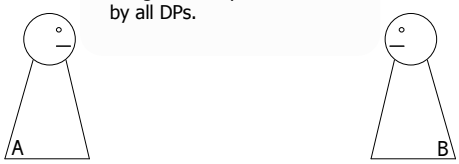
Common Ground:
(Stalnaker 1974, Clark & Marshall 1981)
- Things mutually believed by all DPs.



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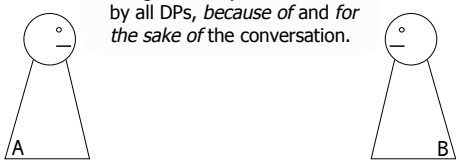
(Stalnaker 1974, Clark & Marshall 1981)
- Things mutually believed by all DPs, *because of* and *for the sake of* the conversation.



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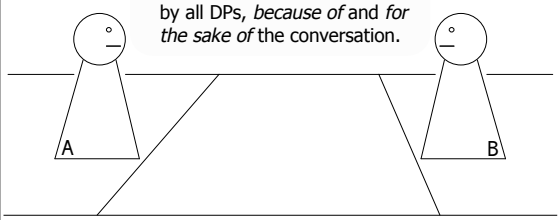
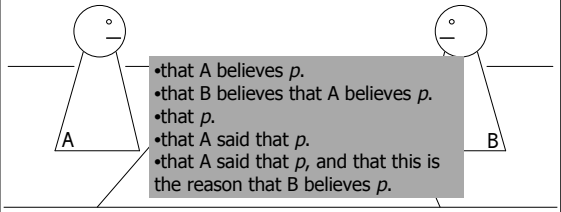


Introduction

A: Peter came to the party.
B: Uhu.



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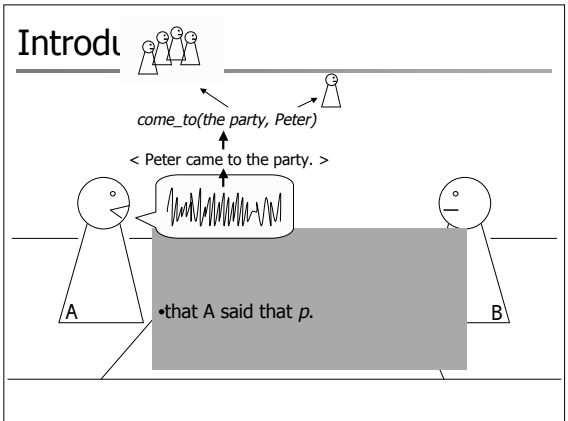

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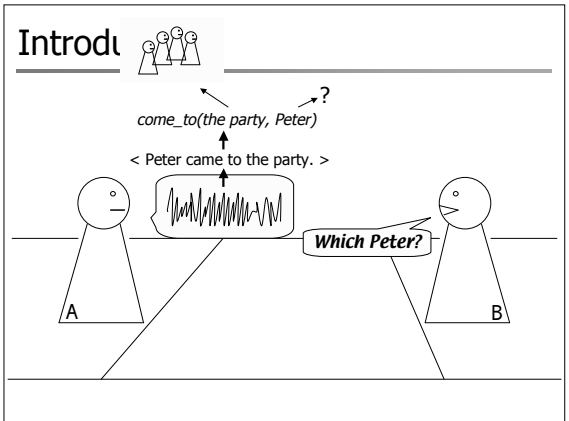

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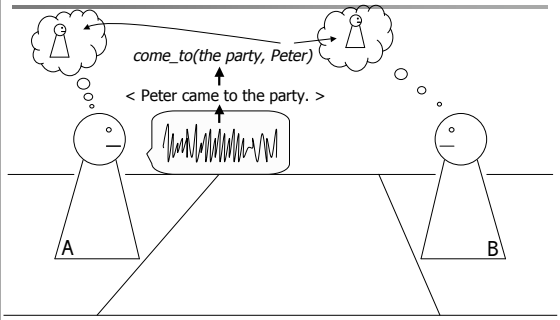
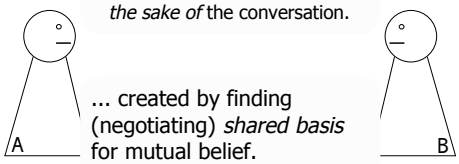


Overview

- Common Ground and mutuality
- Misunderstandings
- Non-understandings
  - A diagnostic tool: Clarification Requests
  - Levels of understanding
    - CRs as semantic probes
    - "Why?"; literal meaning vs. pragmatic meaning
  - Extent of the understanding problem
  - Severity of the problem
  - Form -> Function
  - Snowballing
- A computational model of non-understanding

Common Ground and Mutuality

Common Ground:
- Things mutually believed by all DPs, *because of* and *for the sake of* the conversation.



... created by finding (negotiating) *shared basis* for mutual belief.

Misunderstandings

- DPs think there is shared basis, but there isn't. ("Peter" -> P. Miller / P. Smith)
- Might lead to problems later on (when other utterances rely on what speaker assumes to be CG).
- Costly to detect and to repair.
- Hirst et al., 90s
  (eg. (Hirst, McRoy, Heeman, Edmons, Horton 1994))

Non-understandings

- Shared basis could not (yet) be established;
- DPs collaborate on establishing it, by using *Clarification Requests*:
  "what?", "pardon?", "Peter?", "who's that?", etc..
  - Form: often elliptical, either repetitions of material (reprise CRs) or reformulations; or conv. particles.
- Tell us what went wrong, and "how wrong" it went.
- (only one part of Clark's (1996) model of how CG is established)

Why are CRs interesting?

- Tell us about understanding process ("vertically", "horizontally");
- *Tell us about semantics & relation semantics-pragmatics;*
- Very frequent: 4% (Purver et al. 2001)
  ~ 5.8% (Rodríguez & Schlangen 2004);
- Would be v. useful if SDSs could understand and produce them in natural way.

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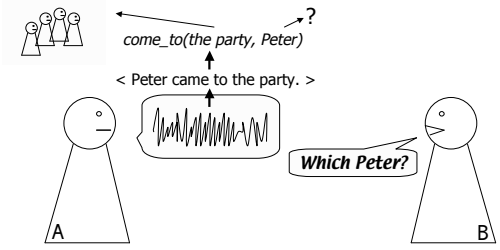
Levels of understanding



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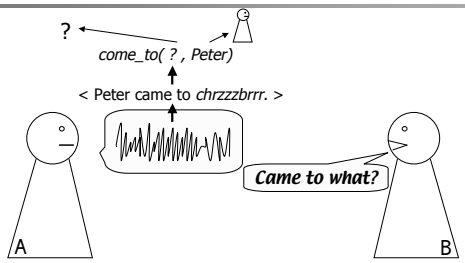

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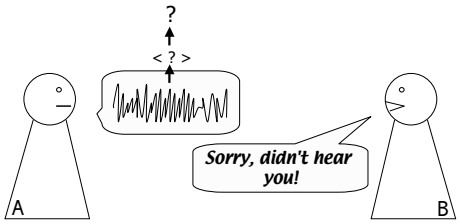

Levels of understanding

- *inter alia* (Larsson 2003; Gabsdil 2003)
- based on (Clark 1996) / (Allwood 1995)

Level	*Clark*	*Allwood*	
4	proposal & consideration	reaction 2 evocative func.	(prag.) underst. prob.
3	meaning & understanding	understanding	(sem.) underst. prob.
2	presentation & identification	perception	acoustic prob.
1	execution & attention	contact	attention prob.

A fine-grained classification

- (Schlangen 2004): Clark / Allwood + SDRT
  (Asher & Lascarides 2003)

Level	*Description*
4	recognising speaker's intentions
3c	contextual relevance (= computing rhet. relation)
3b	resolving underspecification:
-i	reference
-ii	tense, scope, presuppositions, lex. amb., etc.
3a	parsing:
-i	determining a *unique* syntactic structure
-ii	determining syntactic structure
-iii	recognising all words
2	speech recognition
1	establishing contact

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Level	*Description*
4	recognising speaker's intentions
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3b	resolving underspecification:

A: Max fell. John pushed him.
B: Are you saying Max fell *because* John pushed him?

-i	determining a *unique* syntactic structure
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3a	parsing:

A: Every wire has to be connected to a power source.
B: Each to a different one, or can it be the same for all wires?

1	establishing contact

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CRs as *semantic* probes

- Reprise Content Hypothesis (PG04):
  A nominal fragment reprise question queries exactly the standard semantic content of the fragment being reprised.
- A: Let's take out the turkey.
  B: The turkey?

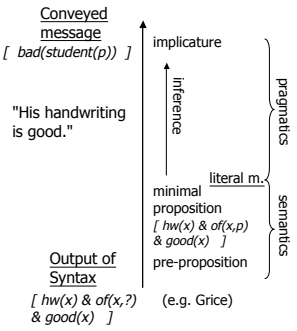
CRs as *semantic* probes

- Reprise Content Hypothesis (PG04):
  A nominal fragment reprise question queries exactly the standard semantic content of the fragment being reprised.
- A: The ham sandwich left without paying.
  B: The ham sandwich?
  A: Yeah, what a bastard. (Nunberg 1977)

CRs as *semantic* probes

- Reprise Content Hypothesis (Purver 04, p.c.):
  A nominal fragment reprise question queries exactly the intended semantic content of the fragment being reprised.
- A: The ham sandwich left without paying.
  B: The ham sandwich?
  A: Yeah, what a bastard. (Nunberg 1977)

The syntax-pragmatics interface



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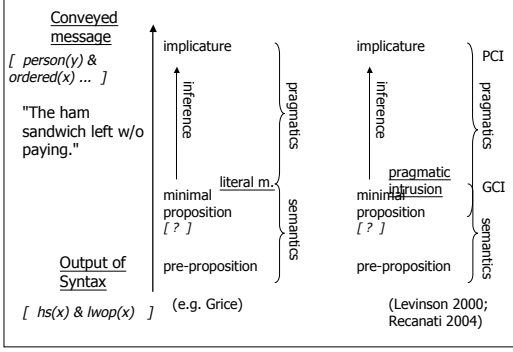

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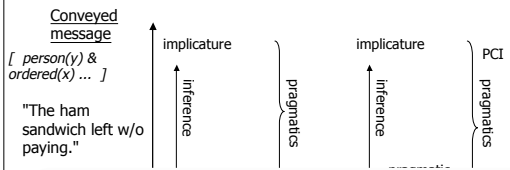

- should we expect to be able to find CRs on all levels?
- if so, then we should find CRs on level of literal meaning, if there is such a level.

[hs(x) & lwop(x)] Recanati 2004)

The syntax-pragmatics interface

- A: Is he a good student?
  B: His handwriting is good.
  A: I know, but what do you mean?
- A: The ham sandwich left w/o paying.
  B: What's a ham sandwich?
  A: ....
  B: ??The bastard.
- A: Peter has 3 children.
  B: 3? [is it at least 3 children you say Peter has?]
- A: Are you hungry?
  B: I've had breakfast.
  A: When? [when {in your lifetime | today } have you had bf?]

The syntax-pragmatics interface

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- A: The ham sandwich left w/
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- A: Are you hungry?
  B: I've had breakfast.
  A: When? [when {in your lifetin

What does this tell us? Possibilities:

- Inferences are so trivial that you can't fail to make them.
- There is no level of literal (= purely ling. governed) meaning (required for theory of clarification).

A fine-grained classification

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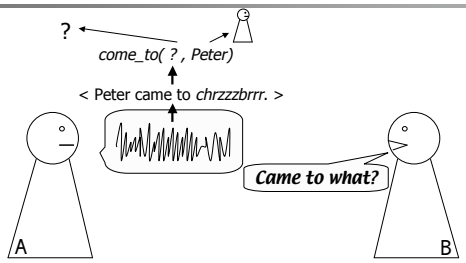
- Two remaining dimensions (besides "level of problem") from (Schlangen 2004):
  - Extent
  - Severity

Extent of problem



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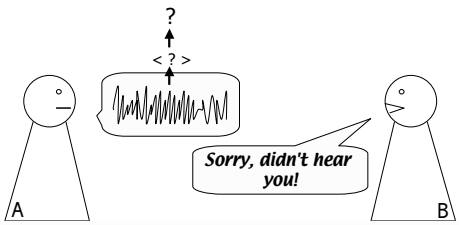
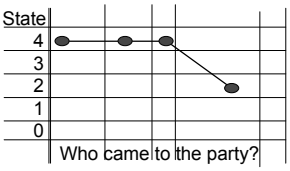


Extent: CRs can indicate which part of the utterance exactly was problematic.

Dimension "Extent"

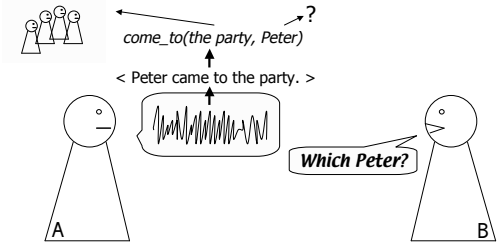
- e.g. "the what?" vs. "huh?"
- (Clark & Schaefer 1987):



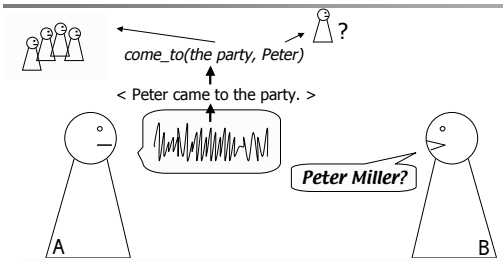
Dimension "Extent"

- Granularity?
  - A: Have you seen my agapanthus?
    B: Have I seen your aga-WHAT? (Blakemore 1994)
  - A: There are stalagmites.
    B: stalagMItes?

Dimension "Severity"



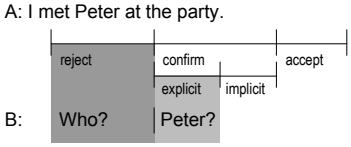
Dimension "Severity"



Severity: Is there a hypothesis or not?

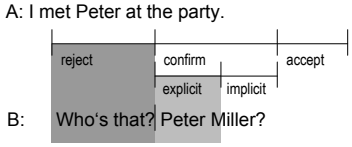
Dimension "Severity"

- is hypothesis maintained or not?
  ("Peter?" vs. "Who?")
- *quality* of hypothesis / confidence in it
- ... old news to people working on SDS: confidence score of speech recognition



Dimension "Severity"

- *quality* of hypothesis / confidence in it needed at *all* levels of processing!
  (here: reference resolution)



CR - model vs. real world

- 3 Dimensions for classification of problems:
  - Level
  - Extent
  - Severity
- What does real world look like?
  - (Rodríguez & Schlangen 2004): corpus study on German task-oriented dialogue;
  - mark up form of CRs, function, try to link form and function.
  - -> mostly fragmental, equally often question intonation & not, mostly next turn repair;
  - -> very often ambiguous: exact level of problem is not made clear!

CR - model vs. real world

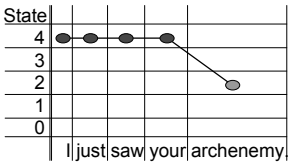
- Ambiguous: overanswering doesn't hurt.

  A: I saw Peter.
  B: Peter? [Did you say Peter? / Who's Peter?]
  A: Your cousin.

- But also: maybe not *discrete* states.

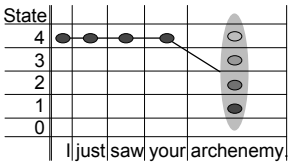
Interdependencies

- not always in discrete state..



Interdependencies

- snowballing: wrong hypothesis at one level will lead to dubious hyps. at higher levels.



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  - Levels of understanding
    - CRs as semantic probes
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Detour - Contextual inf. in SDSs

- current SDSs always have understanding problems, on acoustic level (speech Recognition)
- SDSs only use limited amount of contextual information (language models / grammars; state dependent selection of grammars)
- Speech recognition w/o context is hard!

  `<video: 04:51>`

Detour - Contextual inf. in SDSs

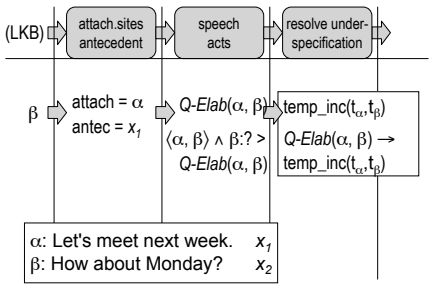
- Verstanden?

  "In mud eels are, in clay none are."

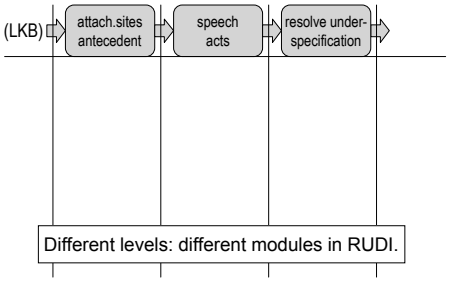
RUDI

- RUDI (Schlangen, Lascarides and Copestake 2001; Schlangen & Lascarides 2002,2003; Schlangen 2004)
  - "testbed" for theory of dialogue semantics and pragmatics, not practical system;
  - deep processing: "real" grammar, "real" LFs, "real" inference;
  - not a (full) dial sys!
    overhearer that tracks conversation and
    - computes certain context sensitive aspects of its meaning,
    - and asks for clarification, if it has problems understanding what it tracks.

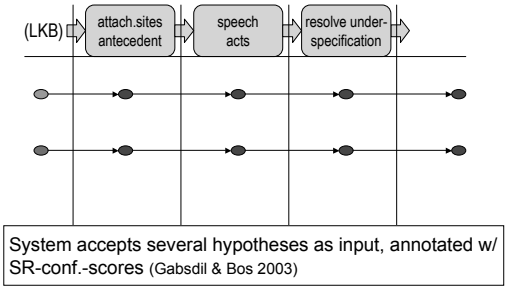
RUDI



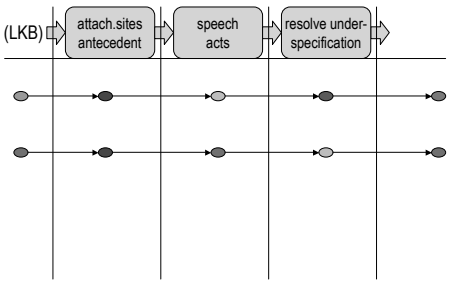
RUDI$_{clar}$: Dimension "levels"



RUDI$_{clar}$: Dimension "severity"



RUDI$_{clar}$



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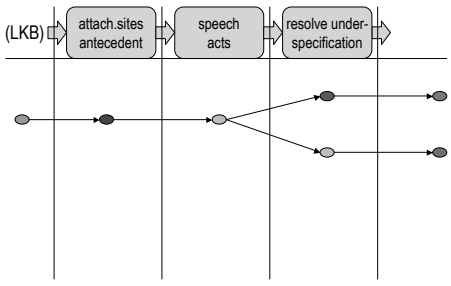

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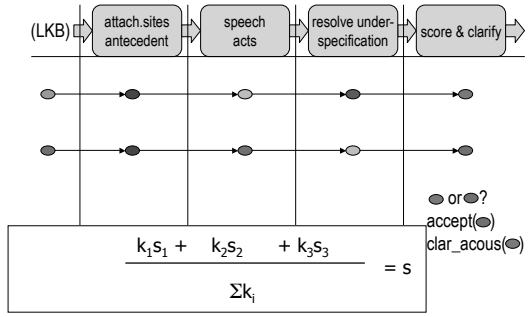

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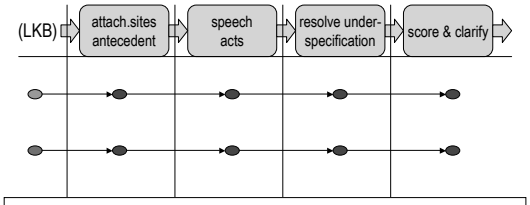
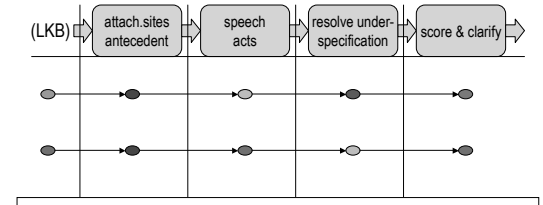


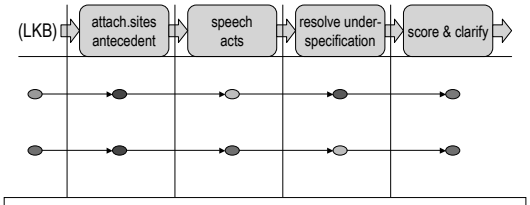
A: We should arrange another meeting.
B: I am free on {Monday | Sunday} the 15th.

RUDI$_{clar}$



A: We should arrange another meeting. [now = 1st March 2004]
B: I am free on {Monday | Sunday} the 15th.
[Mon 15th = 15th Mar. '04]
[Sun 15th = 15th Aug. '04]

RUDI$_{clar}$



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R_{clar}: Monday the 15th, let's see.
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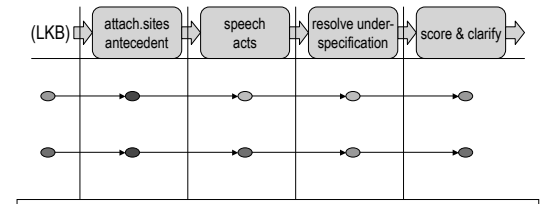

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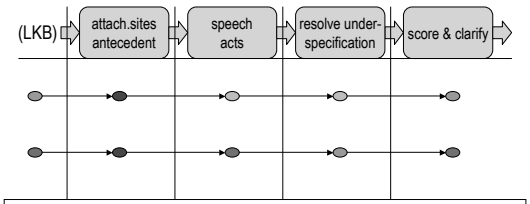
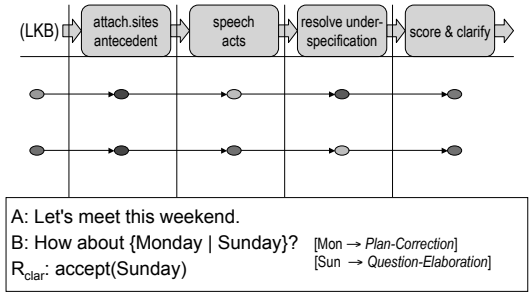
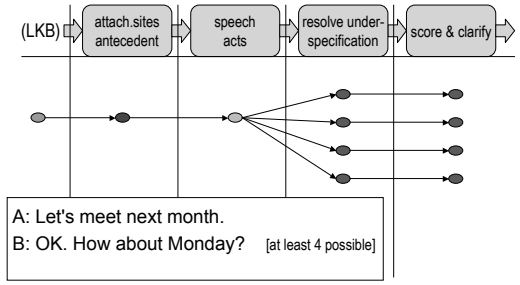


A: We should arrange another meeting. [now = 1st February 2004]
B: I am free on {Monday | Sunday} the 15th.
R_{clar}: Sorry,
Monday the 15th or *Sunday* the 15th?
[Mon 15th = 15th Mar. '04]
[Sun 15th = 15th Feb. '04]

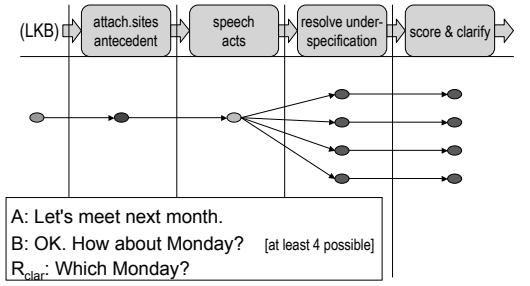
RUDI$_{clar}$



RUDI$_{clar}$



RUDI$_{clar}$



RUDI, clarification: summary

- A model of 2 aspects of CR:
  - Level and
  - Severity (using confidence scores on all levels).
- Generates natural clarification behaviour, by improving validity of SR confidence.
- Distinguishes:
  - domain-specific scoring rules ("prefer dates closer to now", "prefer times between 8am and 8pm", etc.)
  - discourse general sc. rules ("prefer direct SAs").

RUDI, clarification: summary

- Further work:
  - learn weights for combination of scores?
  - test whether "disc. general" rules are indeed disc. general.
  - does this scale up?

Overview

- Common Ground and mutuality
- Misunderstandings
- Non-understandings
  - A diagnostic tool: Clarification Requests
  - Levels of understanding
    - CRs as semantic probes
    - "Why?"; literal meaning vs. pragmatic meaning
  - Extent of the understanding problem
  - Severity of the problem
  - Form -> Function
  - Snowballing
- A computational model of non-understanding

Vom Umgang mit Verst.prob.

- Menschen produzieren Klärungsfragen bei Verständnisproblemen (und nicht selten: 5% d. Äußerungen).
- CRs geben uns Einsichten in Verstehensprozess / *grounding* (Intuition, Korpora-st., Experimente).
- Theoretisch interessant und praktisch: Dialogsysteme sollten CRs verstehen & produzieren können.
- Dialogsysteme sollten bei der Interpretation verschieded Informationsquellen berücksichtigen können.

The End

Danke für Ihre Aufmerksamkeit!

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