Computational Semantics and Pragmatics

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Raquel Fernández
Institute for Logic, Language & Computation
University of Amsterdam

Speech Act Theory vs. Joint Action Model

Models of language use: product vs. process.

- Classic pragmatic models of speech acts (Austin 1962, Searle 1975) emphasise the idea that language is a form of action.
- However:
  - the characterisation of speech acts focuses on the speaker
  - and abstract away from actual conversational contexts
  - speech acts are a product of the speaker.

- Dialogue models (Clark & Schaefer 1989, Allwood 1995) emphasise the idea that language is a form of interaction.
  - focus on communication (Latin *communicare* - *'to share'*)
  - conversation is a continuos process of establishing common ground (Stalnaker 1978) between speaker and addressee.

The Joint Action Model

Also called collaborative model or grounding model.

- Clark & Schaefer (1989) put forward a model of dialogue interaction that sees conversation as a joint process, requiring actions by speakers and addressees.
- Conversation is a continuos process of establishing common ground between speaker and addressee ⇒ grounding
- Speakers and addressees have mutual responsibility in managing the grounding process and making communication successful.

Clark & Schaefer (1989) Contributing to discourse. *Cognitive Science*, 13:259–294.

Clark (1996) *Using Language*. Cambridge University Press.

Levels of Communication

Ladder of actions at different levels of communication performed by speakers and addressee with each utterance (Clark / Allwood)

Level	Actions
1 contact:	A and B pay attention to each other
2 perception:	B perceives the signal produced by A
3 understanding:	B understands what A intends to convey
4 uptake:	B accepts / reacts to A's proposal

In contrast to Austin's distinction between locutionary, illocutionary, and perlocutionary acts, the emphasis here is in the joint character of the actions performed with/by utterances

$\Rightarrow$ effective utterances in dialogue are joint actions.

Grounding Criterion

Level	Actions
1 contact:	A and B pay attention to each other
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3 understanding:	B understands what A intends to convey
4 uptake:	B accepts / reacts to A's proposal

Lack of understanding may occur at any level of action

- we may not realised we are being addressed
- we may not hear our interlocutor properly
- we may not know the meaning of a word the speaker uses
- we may fail to recognise the relevance of what is said

To achieve grounding, dialogue participants must understand each other at all levels of communication up to the *grounding criterion*:
$\Rightarrow$ the appropriate degree of understanding given the communicative situation at hand (sufficient for current purposes).

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According to Clark, the levels of action are connected by two principles:

- Upward causality: actions at lower levels (completed successfully up to the grounding criterion) allow actions at higher levels.
- Downward evidence: evidence that a level has been achieved can be taken as evidence that the grounding criterion has been reached at all lower levels.

A: How would you like to be contacted?
B: By email, please. At `john.smith@email.com`
A: OK. Thank you very much and have a good day
B: Goodbye.

Evidence of Understanding

How does it become established whether the grounding criterion has been reached?

- Addressees give constant feedback to the speaker regarding their level of understanding.
  - positive feedback: implicit or explicit acknowledgements
  - negative feedback: clarification requests

- Mechanisms to provide positive evidence of understanding:
  - acknowledgement / bachchannel
  - repetition
  - demonstration (paraphrase, reformulation, completion)
  - relevant next contribution
- This need for evidence of understanding structures the dialogue into contributions:
  - each contribution to dialogue is made up of a presentation phase and an acceptance phase.

Feedback

Feedback mechanisms can be classified according to the level of communication at which the evidence of understanding is given.

A: I know a great tapas restaurant in Goldoni street.
B: Pardon?
A great what?
Goldoni street?
Should I consider this an invitation?

However, there is not a one-to-one correspondence between the form of feedback utterances and their function.

yeah	$\rightsquigarrow$ level 1 / 2 /3 / 4 ?
Goldoni street?	$\rightsquigarrow$ level 2 / 3 / 4 ?

Note also that one single utterance can give positive and negative feedback simultaneously:

B: A tapas restaurant where?

A: ... I need to travel in May.
B: And, what day *in May* did you want to travel?
A: *OK* uh I need to be there from the 12th to the 15th.
B: And you're flying from what city?
A: I want to fly from Pittsburgh
B: *Mm hmm*
A: to Seattle.
B: *OK.*

A: Most machines don't record that slow.So I'd wanna, when I make a tape
B: *be able tuh speed it up.*
A: *Yeah.*

Least Collaborative Effort

Which feedback mechanism is appropriate in a given situation depends on several factors

- the degree of uncertainty regarding a possible misunderstanding
- the desire to be brief and efficient
- ...

Clark's principle of least collaborative effort: dialogue participants will try to invest the minimum amount of effort that allows them to reach the grounding criterion.

Here effort is *collaborative* (cf. Gricean quantity maxims)

Grounding and Metacommunication

- The primary function of feedback acts is to manage the grounding process
- They are *meta-communicative*: while other types of acts deal with the topic of the conversation, the subject matter of feedback utterances are the basic acts of communication.

	Layer 1: basic communicative acts	Layer 2: meta-communicative acts
B:	There is not one ticket left in the entire planet! So annoying!	
C:		Where for?
B:		Crowded House.
B:	My brother is going and he doesn't even like them.	
A:	Why doesn't he sell you his ticket?	*implicit positive evidence*
B:	Cos he's going with his work. And Sharon.	*implicit positive evidence*
A:		Oh, his girlfriend?
B:		Yes.
B:	They are gonna come and see me next week.	

Grounding Utterances and Turn-Taking

Backchannels (*'uhu'*, *'mhm'*) do not follow the CA model:

- frequently produced in overlap;
- not meant and not perceived as attempts to take the floor;

According to Clark (1996), the CA turn-taking rules do not apply to utterances at the meta-linguistic level of interaction:

- backchannels do not indicate floor competition
- their placement determines which part of the utterance they react to.

Clarification requests have slightly different constraints:

- they involve turn switching
- but the preceding turn can be resumed smoothly

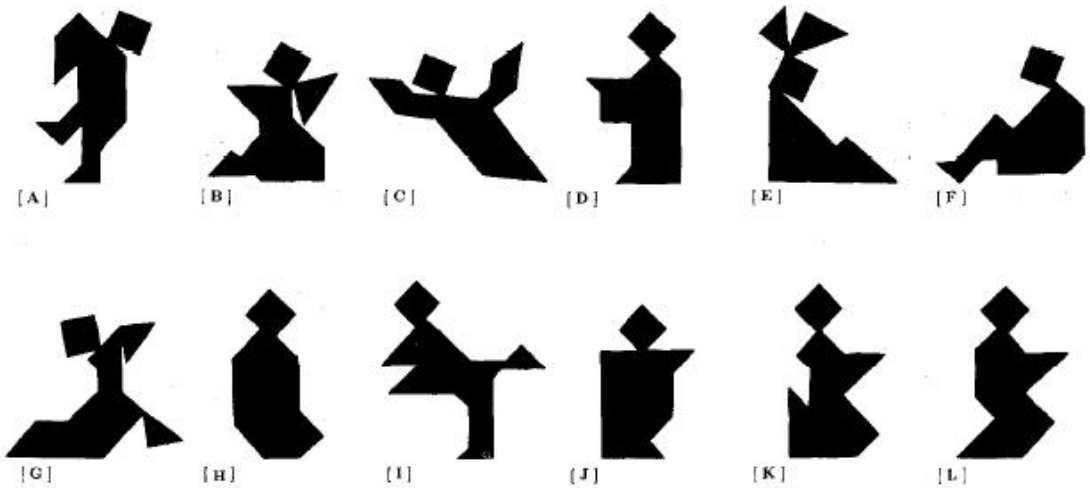
(1) A: They X-rayed me, and took a urine sample, took a blood sample. Er, the doctor...
B: Chorlton?
A: Chorlton, mhm, he examined me...

Matching Referring Tasks

The Joint Action model has used referring task as a case study.

The classic *"Tangram experiments"* by Clark & Wilkes-Gibbs:

- matching referring task: an instruction giver (director) and an instruction follower (matcher)
- the task is to get the matcher identify the tangram figures
- the task is repeated (in different orders) over several trials



This facilitates investigation of the referring process as participants accumulate common ground and precedents for referring expressions.

Referring as a Collaborative Process

Basic exchange:

(1) A: Number 4's *the guy leaning against the tree*.
B: Okay.

Refashionings:

(2) A: OK, the next one is the rabbit.
B: Uh–
A: That's asleep, you know, it looks like it's got ears and a head pointing down?
B: Okay.

(3) A: Um, the third one is the guy reading with, holding his book to the left.
B: Okay, kind of standing up?
A: Yeah.
B: Okay.

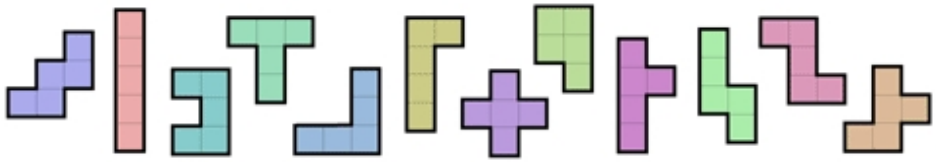
Basic exchanges occur seldom on early trials (6%) but often on later trials (84%). Refashionings decline in later trials once a RE has been mutually established.

Minimizing Collaborative Effort

- Clark & Wilkes-Gibbs' Principle of Least *Collaborative* Effort

  "Our proposal is that speakers and addressees try to minimize collaborative effort, i.e. the work both speakers and addressees do from the initiation of the reference process to its completion"

- There is a trade-off in effort between initiating an expression and refashioning it: the more effort the speakers put in the initial expression, the less refashioning it is likely to need.
- Initial expressions are not always optimal due to time pressure, complexity, ignorance, ...
- Speakers deal with these constraints minimizing collaborative effort with repairs, instalments, and trial and error.
- Addressees minimize collaborative effort by indicating quickly and informatively what is needed for mutual acceptance.



B: it's a block of three . and then one tagged on . to the edge
A: oh it's like . . a symmetrical L and then another two blocks . attached on to another end kind of thing
B: What? [*laughter*]
A: Okay, uhm you've got . . uh (t- + two) blocks
B: Yeah.
A: Uhm and then on the end of those two blocks
B: Yeah.
A: you've got .. . another . block (it's like + it's) kind of making an L
B: u:hm.
A: and then . . on that block . on that edge . uhm
B: I think I know what you're talking about, so there's three blocks up and one block across but in the middle block . of the one that's going up there's one sticking out [. . .]
A: One by one block that's been taken out and it's been moved
B: Yes and this has been put in the middle. Yeah yeah yeah yeah.
A: In the middle. Yeah?
B: Yeah, got it.
A: Yeah, OK.

Establishing Conceptual Pacts

When speakers and addressees arrieve at a successful expression (*ground* a reference), they create a *conceptual pact*, a temporary agreement about a conceptualisation for a particular entity.

A: A docksider.
B: A what?
A: Um.
B: Is that a kind of dog?
A: No, it's a kind of um leather shoe, kinda pennyloafer.
B: Okay, okay, got it.

⇒ Thereafter "the pennyloafer"



Conceptual pacts

- overwrite quantity maxims: they will continue to call it *'the pennyloafer'* even when it does not need to be distinguished from other shoes
- are partner-specific: they will do so only when interacting with the dialogue partner with whom the expression had been grounded.

Brennan & Clark (1996) Conceptual Pacts and Lexical Choice, *Jrnl. of Experimental Psychology*, 22(6):1482–1493.

The Dynamics of Referring Expressions

Ways of referring are not static but evolve during dialogue:

- expressions are modified according to interlocutors' feedback,
- they become shorter as grounding is more firmly established.

Utterances by one director referring to the same figure on trials 1 to 6:

1. All right, the next one looks like a person who's ice skating, except they're sticking two arms out in front.
2. Um, the next one's the person ice skating that has two arms?
3. The fourth one is the person ice skating, with two arms.
4. The next one's the ice skater.
5. The fourth one's the ice skater.
6. The ice skater.

Experiments by Krauss & Weinheimer (1966) showed that this happens when talking to responsive partners, but not to a tape recorders.

Krauss & Weinheimer (1996) Concurrent feedback, confirmation, and the encoding of referents in verbal communication, *Journal of Personality and Social Psychology*, 4:343–346.

Referring in Interactive Settings (summary)

- speakers don't get only one chance to produce a description – they can reformulate
- they receive online feedback from their addressees
- addressees themselves contribute to the referring process
- referring expressions do not emerge from solitary choices of the speaker (cf. Gricean maxims), but from an interactive process by speaker and addressee.
- speakers and addressees can agree on a description for a referent during the referring process – what works for a dyad may not work for another one

$\Rightarrow$ Referring is a joint process where speakers and addressees try to minimize collaborative effort.

Clark & Wilkes-Gibbs (1986) Referring as a collaborative process. *Cognition*, 22:1-39.

Brennan & Clark (1996) Conceptual Pacts and Lexical Choice, *Journal of Experimental Psychology*, 22(6):1482–1493.

Recommended readings

- For this Thursday:
  Benotti, L. (2009) Clarification Potential of Instructions. In *Proceedings of the SIGDIAL 2009 Conference*, pp. 196–205, Association for Computational Linguistics, London, UK, 2009.

- R. Fernández, D. Schlangen, and T. Lucht (2007) Push-to-talk ain't always bad! Comparing Different Interactivity Settings in Task-oriented Dialogue. In *Proceedings of the 11th International Workshop on the Semantics and Pragmatics of Dialogue (SemDial)*, pp. 25–31, Trento, Italy.
- R. Fernández, T. Lucht, and D. Schlangen (2007) Referring under Restricted Interactivity Conditions. In *Proceedings of the 8th SIGdial Workshop on Discourse and Dialogue*, pp. 136–139, Antwerp, Belgium.

- Buschmeier, H., & Kopp, S. (2014). A dynamic minimal model of the listener for feedback-based dialogue coordination. In *Proceedings of the 18th Workshop on the Semantics and Pragmatics of Dialogue (SemDial)*, pp. 17–25, Edinburgh, UK.
- Buschmeier, H. & Kopp, S. (2013). Co-constructing grounded symbols — Feedback and incremental adaptation in human-agent dialogue. *Künstliche Intelligenz*, 27:137–143.