Computational Semantics and Pragmatics

Autumn 2014



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Outline for this week

Dynamic semantics for dialogue.

- Introduction to a prominent dialogue semantics theory: Ginzburg's KoS.
- Treatment of particular phenomena in KoS: non-sentential utterance, metacommunication (other- and self-repair).

- Marked homework coming on Thursday.
- Choose a project topic by the end of Thursday.
- Please choose a slot for the project meetings next week asap.

Interaction and Grammar

- It is uncontroversial that spoken dialogue is the primary form of language (also from the point of view of language acquisition).
- However, it is still controversial to assume that interaction is built into the grammar.
- The dominant paradigms in grammar and semantics have, on the whole, abstracted away from interaction, viewing it as somebody else's problem.
- Given the state of the art, typical conversations (fragmentary, disfluent, etc) still constitute a significant challenge to formal grammar of just about any theoretical flavour.

Interaction and Grammar

Some example from the BNC, abridged:

Ann: Can you hear the birds singing? Listen.
James: Er (pause) **yeah.**
Ann: Can you hear?
Bryony: I hear birds singing.
Ann: **Yes.**

Ann: Well put it on the draining board and I'll wash it and then put it back
James: Right, I'll see ya tonight
Ann: **Mhm, mhm**

Tim: Those pink things that af after we had our lunch.
Dorothy: **Pink things?**
Tim: Yeah. Er those things in that bottle.

Characterising the meaning of these constructions necessarily involves notions of interaction: Need formal theory that provides notions such as 'current issue under discussion', 'acknowledgement of understanding', 'ask intended reference of other's utterance'

Ginzburg's KoS

Jonathan Ginzburg (2012) *The Interactive Stance: Meaning for Conversation* [KoS ≈ *conversation-oriented semantics*]

- A theory of meaning for spoken interaction that can, in particular, account for non-sentential utterances, and characterise the potential for misunderstanding.
- We'll be able to see only a snapshot of the framework.

KoS is based on the dynamic strategy to meaning pioneered by Stalnaker, Lewis, Kamp, Heim, Barwise, Groenendijk and Stokhof et al.

- the meaning of a linguistic form is explicated in terms of the effect its use has on commonly shared "contextual resources".
- this suggests thinking of context as structured by resources which conversational participants keep track of

Ginzburg's KoS

- KoS provides a theory of context for conversation by means of which NSUs and metacommunication can be analysed formally.
- Main questions:
  - How is context structured?
  - How does context evolve?

- Other comprehensive accounts of a theory of context for dialogue include work in the PTT framework (e.g. Poesio & Traum 1997, 1998, Poesio & Rieser 2010) and work within Segmented Discourse Representation Theory (SDRT) (e.g. Asher & Lascarides 2003, 2008).

A Single Context?

Classic semantics operates under the assumption that perfect communication obtains — nothing go wrong, interpretation leads to an identical update of the interlocutors' information states.

- D. Lewis (1968): Whenever S is uttered, the utterer intends to communicate p and the hearer acquires the belief p.
- *Equal Access to Context*: As a conversation proceeds a shared context (the common ground) emerges: A has her turn, reaches a transition relevance point (TRP); Then either A proceeds or B takes over from the common ground point at which A spoke.

It seems a plausible assumption: e.g., A can make an initial utterance, a query, which either A or B can follow up on:

A(1): Who should we invite to the conference?
A(2): Perhaps Noam, huh?
B(2): Perhaps Noam, huh?

A Single Context?

However, these examples illustrate that the contextual possibilities for resolving the fragment 'Bo?' are distinct for speaker and addressee:

A: Who does Bo admire?
B: Bo?
– reading 1: Does Bo admire Bo?
– reading 2: Are you asking who BO (of all people) admires? / Who do you mean 'Bo'?

A: Who does Bo admire? Bo?
– reading 1: Does Bo admire Bo?
– reading 2: Did I say 'Bo'?

Turn Taking Puzzle (Ginzburg 1997): The resolution of the bare 'Why?' phrase changes according to who keeps or takes over the turn.

A: Which members of this audience own a parakeet?
A: Why? (= Why own a parakeet?)
B: Why? (= Why are you asking which members of this audience own a parakeet?)

Context in KoS

- In KoS, there is actually no single context.
- Instead of a single context, analysis is formulated at a level of information states, one per conversational participant.
- The total information state, with two components: one public (the dialogue gamebord) and one private.

$$\begin{bmatrix} \text{DGB} \\ \text{Private} \end{bmatrix}$$

- We will be concerned with the DGB.

Context in KoS: the DGB

- The dialogue gameboard (DGB) represents information that arises from publicized interactions.
- DGB (initial definition):

$$\begin{bmatrix} \text{spkr: Ind} \\ \text{addr: Ind} \\ \text{Facts : Set(Prop)} \\ \text{Moves : list(IllocProp)} \\ \text{QUD : poset(Question)} \end{bmatrix}$$

- The speaker/addressee roles serve to keep track of turn ownership.

The Dialogue GameBoard

- FACTS represents the shared knowledge conversationalists utilise during a conversation (information that can be embedded under presuppositional operators).
  - initial common ground: *7th October, Amsterdam, cloudy,. . .*
  - facts about content and form of (parts of) the utterance

A: Did Mark send you a love letter?
B: No, though it's interesting that. . .
— you refer to Mark/my brother/our friend
— you bring up the sending of love letters
— ask about Mark's epistolary habits
— that the final two words you just uttered start with 'I'.

  - Not all these facts can be picked up in ellipsis / anaphora.

B: No, why? (= why are you asking whether Mark sent me a love letter; cannot mean: why do you refer to Mark/my brother/our friend, why do you bring up the sending of love letters etc)

B(3b): No. Don't you think that's a bit over inquisitive? ('that' = your asking me whether Mark sent me a love letter)

The Dialogue GameBoard

Does FACTS contain only semantic information?

- Confirmation readings require partial syntactic parallelism:

> A: I phoned him. B: him? / #he?
> A: Did he phone you? B: he? / #him?

- Information pertaining to syntactic and phonological aspects of an utterance becomes presupposed after the utterance has been grounded at some level (not merely the utterance's content).
- We need fine-grained representations that allow for this (phon/syn information may fade away faster than semantics).
- We'll come back to this later.
- This point has also been argued for extensively by Massimo Poesio, see e.g. Poesio & Traum, 1997; Poesio & Rieser, 2010.

The Dialogue GameBoard

- MOVES keeps track of the dialogue acts made.
- It is useful to single out the Latest-Move, a distinguished fact that characterises the most recent move made.
- The main motivation for this is to segregate from the entire repository of presuppositions information on the basis of which coherent reactions could be computed.

The Dialogue GameBoard

- QUD: (mnemonic for Questions Under Discussion): questions that constitute a "live issue". That is, questions that have been *introduced for discussion* at a given point in the conversation and not yet been resolved or abandoned.
- There are additional, indirect ways for questions to get added into QUD, the most prominent of which is during metacommunicative interaction (more on Thursday).
- Being maximal in QUD (MAX-QUD) corresponds to being the current 'discourse topic' and is a key component in the theory.
- QUD and MAX-QUD are key elements of KoS.

The meaning of 'yes'

As an example, let's consider how the DGB could explicate the meaning of a propositional lexeme like "yes".

Ann: Can you hear the birds singing? Listen.
James: Er (pause) **yeah.**
Ann: Can you hear?
Bryony: I hear birds singing.
Ann: **Yes.**

- Hypothesis: the meaning of 'yes' is *the proposition introduced by Latest-Move into the context*.
- A cursory examination of any conversational corpus will attest that this description covers a high percentage of the occurrences of 'yes'.
- Nonetheless, the description is intrinsically incomplete. . .

The meaning of 'yes'

A: Did Billie show up at all?
B: Billie?
A: Billie Whitechapel.
B: Yes.

Proposition introduced by Latest-Move: *The person A was asking whether she showed up is Billie Whitechapel.*
Meaning of 'yes': *Billie showed up.*

Richard: He started he's back next weekend
Anon 6: Who?
Richard: Morse
Anon 6: No he's not
Richard: Oh yes .

Richard: Well we'll get the motor work done first
Anon 6: Mm
Richard: then play table tennis
Anon 6: No
Richard: Yes.

The meaning of 'yes'

- One of the major claims advanced in KoS is that QUD is a resource on the basis of which resolution of the various distinct classes of non-sentential utterances (NSUs) can be achieved.
- The resolution of 'yes' constitutes a simple example of this:

  Refined hypothesis: *the meaning of 'yes' is p, where $p?$ is maximal in QUD.*

  - when 'yes' affirms the positive option in a polar question $p?$, the polar question has been introduced to QUD as a consequence of the query act.
  - Although other questions might have been introduced in the interim, if they are downdated from QUD, $p?$ will return to become QUD-maximal.
  - Similarly, when 'yes' affirms a previously asserted proposition, the resolution builds on the presence of $p?$ in QUD as a consequence of an assertion.

Basics of Interaction

- Dialogue analyst's task: describe conventionally acceptable patterns of interaction (*protocols*), in terms of sequences of information states.
- Conversation as collection of coupled information states: each agent analysed in terms of her own dialogue gameboard and an unpublicized component.
- The basic units of change are mappings between DGBs that specify how one DGB configuration can be modified into another – conversational rule.
- The types specifying the mapping's domain and range are the preconditions and the effects of the rule.

$$\mathrm{DGB}_n \mapsto \mathrm{DGB}_{n+1} \qquad \begin{bmatrix} \mathrm{pre} & : \mathrm{DGB}_n \\ \mathrm{effects} & : \mathrm{DGB}_{n+1} \end{bmatrix}$$

Asking and Asserting

- Broadly speaking queries and assertions are either issue initiating (forward-looking) – they introduce an issue unrelated to those currently under discussion – or they are reactive (backward-looking) — they involve a reaction to a previously raised issue.
  - a CR is a reactive query
  - an answer is a reactive assertion
- Accounting for the reactive ones using DGB-based conversational rules is simple.

Simple assertion and querying

querying	assertion
LatestMove = Ask(A,q)	LatestMove = Assert(A,p)
A: push q onto QUD; release turn;	A: push p? onto QUD; release turn
B: push q onto QUD; take turn; make q-specific utterance	B: push p? onto QUD; take turn; Option 1: Discuss p? Option 2: Accept p
	LatestMove = Accept(B,p)
	B: increment FACTS with p; pop p? from QUD;
	A: increment FACTS with p; pop p? from QUD;

Conversational Rules for simple assertion / querying

Ask QUD–incrementation:

$$\begin{bmatrix} \text{pre} & : & \begin{bmatrix} \text{q} : \text{Question} \\ \text{LatestMove} = \text{Ask(spkr,addr,q):IllocProp} \end{bmatrix} \\ \text{effects} & : & \left[\text{qud} = \left\langle \text{q,pre.qud} \right\rangle : \text{poset(Question)}\right] \end{bmatrix}$$

Assert QUD–incrementation:

$$\begin{bmatrix} \text{pre} & : & \begin{bmatrix} \text{p} : \text{Prop} \\ \text{LatestMove} = \text{Assert(spkr,addr,p):IllocProp} \end{bmatrix} \\ \text{effects} & : & \left[\text{qud} = \left\langle \text{p?,pre.qud} \right\rangle : \text{poset(Question)}\right] \end{bmatrix}$$

[NB: several aspects of this notations have not been explained; take it intuitively.]

Accepting

The background for an acceptance by B is an assertion by A and the effect is to modify LatestMove (not to raise a QUD).

Accept move:

$$\left[\begin{array}{ll} \text{pre} & : \left[\begin{array}{l} \text{spkr: Ind} \\ \text{addr: Ind} \\ \text{p : Prop} \\ \text{LatestMove} = \text{Assert(spkr,addr,p):IllocProp} \\ \text{qud} = \left\langle \text{p?,preconds.qud} \right\rangle \text{: poset(Question)} \end{array}\right] \\ \text{effects} & : \left[\begin{array}{l} \text{spkr} = \text{preconds.addr: Ind} \\ \text{addr} = \text{preconds.spkr: Ind} \\ \text{LatestMove} = \text{Accept(spkr,addr,p) : IllocProp} \end{array}\right] \end{array}\right]$$

Accepting

- The second component of acceptance is the incrementation of FACTS by p and the downdating of p? from QUD
- This is not quite as straightforward as it might seem: check for all existing elements of QUD that they are not resolved by the new value of FACTS.
- Hence, accepting p involves both an update of FACTS and a downdate of QUD – minimally just removing p?, potentially removing other questions as well.

Summing Up

- Given the primacy of spoken dialogue, semantics and grammar should be concerned with interaction.
- KoS is a theory of dialogue semantics that explains key features of dialogue: NSUs, metacommunication.
- Context is represented in terms of individual informations states: the DGB component represent the take of each interlocutor on the common ground.
- The DGB can explicate basic patterns of interaction and how they allow for the interpretation of NSUs.
- KoS has been used to underpin the development of dialogue system, e.g., GODIS (Larsson 2002).