

An Introduction to Semantics using Type Theory with Records

Lecture 1

Jonathan Ginzburg
Université Paris-Diderot, Sorbonne Paris-Cité
Robin Cooper
University of Gothenburg

Basic information about the course

Lecturers: Robin Cooper, Jonathan Ginzburg

Email: cooper@ling.gu.se,
yonatan.ginzburg@univ-paris-diderot.fr

Office hours: by appt

Website: <https://sites.google.com/site/semtr>

The Primacy of Spoken Language

- ▶ Uncontroversial: Spoken language is the primary form of language, both from the point of view of language evolution and language acquisition.
- ▶ Controversial: **interaction is built into the grammar.**

Interaction and Grammar

- ▶ Given the state of the art, a simple **actual** conversation such as (1), still constitutes a significant challenge to formal grammar of just about any theoretical flavour.

3 People trying to print a file (ca. 1990)

John: Okay which one do you think it is?

Try F1 F1 again and we'll get

Sarah: Shift and F1?

Sue: It's, no.

John: No, just F1 F1.

Sue: It isn't that.

John: F1.

Right, and that tells us

Sue: It's shift F7.

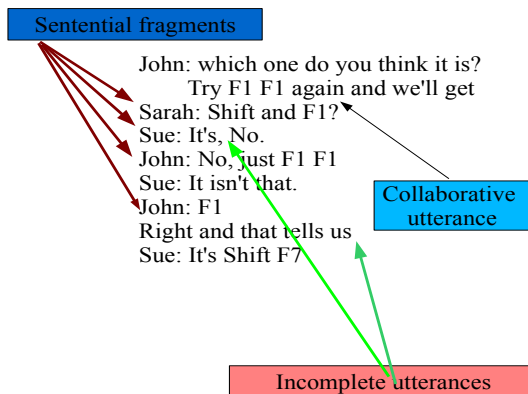
(from the British National Corpus)

3 People trying to print a file (ca. 1990)

- ▶ a rather humdrum conversation from the British National Corpus (BNC).

Fragments in conversation: frequency

- Distinguishing characteristic of spoken language—high frequency of *fragments*



Challenges to semantic/discourse theories

Self answering (cf. Speech act based analyses)

John: which one do you think it is?
Try F1 F1 again and we'll get

Partial comprehension

Sarah: Shift and F1?
Sue: It's, No.
John: No, just F1 F1
Sue: It isn't that.
John: F1
Right and that tells us
Sue: It's Shift F7

inconsistency/disagreement

multilogue

3 People trying to print a file

- ▶ Making sense of all these phenomena in a systematic way is a challenge undertaken in the Type Theory with Records (TTR)–based dialogue framework KoS KoS (Ginzburg (1994); Larsson (2002); Ginzburg and Cooper (2004); Purver (2004); Fernández (2006); Ginzburg (2012)).
- ▶ We will illustrate throughout the course how the various ingredients that make up TTR allow this challenge to be met.
- ▶ We will revisit the example at the end of the course ...
- ▶ But for now the first issue is:

Why Type Theory with Records? I

We will motivate the need for the framework with arguments from:

1. **Semantic ontology**: Why not possible worlds?
2. **syntax-semantics interface**: Why is a Typed Feature Structure (TFS)-based syntax-semantics insufficient?
3. **grammar and interaction**: meaning in dialogue can only be expressed with reference to either highly incremental context (e.g. Non sentential utterances, dysfluencies) or very global, conversation-genre context. A framework like TTR is needed to model such grammar-context relations.

Why Type Theory with Records: Semantic ontology I

- ▶ Possible worlds semantics has intrinsic problems, ones Montague was aware of when he first used it in his seminal papers in the 1970s.
- ▶ Lack of fine grain / logical omniscience: necessarily equivalent propositions cannot be distinguished.
- ▶ So the following sentences are predicted to have the same truth values:
 - (1) a. Jill believes that Jill is identical to herself.
b. Jill believes that Jill's father is identical to himself.
c. Jill believes that $e^{i\pi} + 1 = 0$

Why Type Theory with Records: Semantic ontology II

- ▶ These problems are often ignored because of the assumption that attitude sentences are complex in any case and the difficulties for possible worlds semantics can be contained.
- ▶ Regardless of whether one can maintain this view about attitude sentences, we present problems for possible worlds in a domain which is more difficult to quarantine—negation.
- ▶ In most frameworks sentences like (2a,b) are taken to denote the same entity:
 - (2) a. Is Gu Xilai guilty?
 - b. Is Gu Xilai not guilty?
- ▶ We will offer extensive linguistic evidence against this conclusion.

Why Type Theory with Records: Semantic ontology III

- ▶ We will develop treatments of negation and questions in TTR that can both distinguish between sentences like (3a,b), while ensuring that sentences like (4a,b) remain equivalent:
 - (3) a. Bo saw Jill leave.
b. Bo saw Jill leave and Max enter or Max not enter.
 - (4) a. Jill knows whether Gu Xilai is guilty.
b. Jill knows whether Gu Xilai is not guilty.

Why Type Theory with Records: Syntax Semantics interface I

- ▶ Two types of approaches to synsem interface.
- 1. λ -calculus driven (inspired by Montague semantics): function-based.
 - ▶ function application as semantic glue.
 - ▶ Generalized quantifiers as functions (from properties to propositions)
 - ▶ Questions as propositional abstracts.
 - ▶ Meanings as functions from contexts to contents.

Why Type Theory with Records: Syntax Semantics interface II

2. Feature based grammar: uses typed feature structures and unification.
 - ▶ basis for capturing generalizations at various levels of grain in grammar (lexical hierarchies, constructional hierarchies)
 - ▶ allows utterance types ('signs')—parallel representations of various grammatical dimensions: important for quotation, metacommunicative interaction:
 - (5) a. 'Bo' is a noun.
 - b. 'Bo starts with b.
 - c. 'Bo' is used to refer to a person named 'Bo'.(Ginzburg and Cooper (2012))
 - ▶ unification: useful for combining partial information, e.g. in incremental processing

Why Type Theory with Records: Syntax Semantics interface III

- ▶ λ -calculus driven approaches don't have feature structures and unification.
- ▶ feature-based grammar approaches don't have functions and binding.
- ▶ TTR is both function-driven and has feature structures with unification. We will give examples of how the two complement each other as we progress.

Why Type Theory with Records: grammar and interaction

- ▶ Accommodating the fact that spoken language involves interaction typically viewed as external to the grammar as such.
- ▶ to the extent we accept that indexicals such as 'I', 'You', 'Here', and 'Now' need to be accommodated by the grammar a similar claim can be made for the NSUs exemplified in (6):
- ▶ The meaning of words or constructions involves notions that irreducibly involve notions of interaction.

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

Why Type Theory with Records: grammar and interaction

II

- b. Ann: Well put it on the draining board and I'll wash it and then put it back (pause) James: Right, I'll see ya tonight
Ann: **Mhm, mhm** (pause) James: Tarrah Ann: mm, **bye**
[conversation ends]
- c. Tim: Those pink things that af after we had our lunch.
Dorothy: **Pink things?** Tim: Yeah. Er those things in that bottle. Dorothy: Oh I know what you mean. For your throat?
- d. Cherrilyn: Are you still (pause) erm (pause) going to Bristol (pause) on Monday? Fiona: Dunno. Cherrilyn: No?
Fiona: I dunno. Doubt it, why? (= *Why do you ask if I'm going to Bristol?*)

Why Type Theory with Records: grammar and interaction III

- (7) a. A: *Yes.*; meaning of 'yes': p , where $p?$ is the current issue under discussion.
- b. A: *Bye.*; meaning of 'bye': A seeks to disengage from a conversation with B which has involved at least some discussion.
- c. A: *mmh.*; meaning of 'mmh': A acknowledges understanding of B's latest utterance.
- d. B: Did Jo leave? A: *Jo?*; intended content meaning of reprise fragment 'u?': A asks B what is the intended reference of B's (sub-utterance) u under condition of phonological segmental identity.

Why Type Theory with Records: grammar and interaction IV

- e. B: Did Jo leave? A: *Why?*; meaning of metacommunicative 'Why?': A asks B of the cause of an utterance by B, an utterance the issue which it raises remains under discussion.

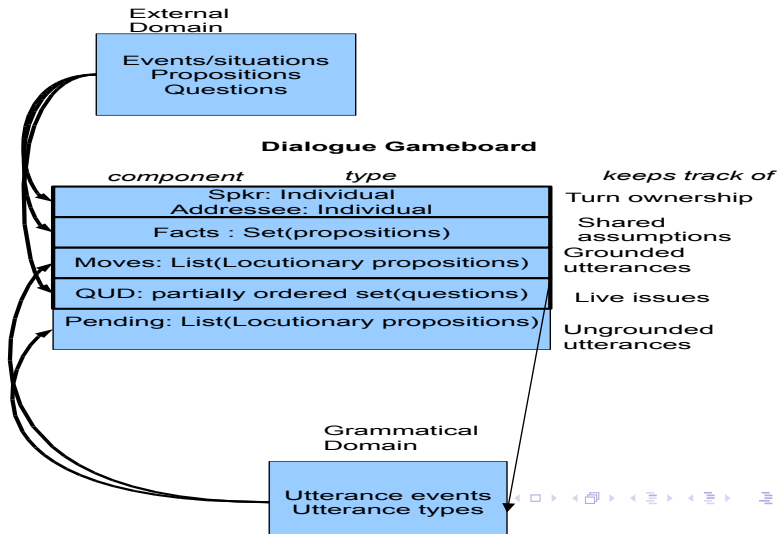
Why Type Theory with Records: grammar and interaction

- ▶ Need formal theory that provides notions such as ‘current issue under discussion’, ‘disengagement from conversation’, ‘acknowledgement of understanding’, ‘ask intended reference of other’s utterance’, ...
- ▶ KoS (Ginzburg (1994); Larsson (2002); Ginzburg and Cooper (2004); Purver (2004); Fernández (2006); Ginzburg (2012)) links up: the external world, grammar, and interaction.
- ▶ Fundamental to KoS is 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 existing commonly shared contextual “resources”.

Why Type Theory with Records: grammar and interaction VI

- ▶ This suggests thinking of context as structured by resources which conversational participants keep track of, as demonstrated by linguistic evidence.
- ▶ Working out what these resources are and how to model interaction in their terms will be a focus of lectures 3 and 4.

Linking up the external world, grammar, and interaction



Course Plan

- ▶ **Lecture 1:** Motivation for using TTR; Introduction to TTR
- ▶ **Lecture 2:** Grammar in TTR: frames and lexical semantics;
- ▶ **Lecture 3:** A theory of abstract entities (propositions, questions, outcomes) and illocutionary interaction: analysis in terms of dialogue game boards; Negation.
- ▶ **Lecture 4:** Unifying metacommunicative and illocutionary interaction; Generalized quantifiers and clarification.
- ▶ **Lecture 5:** Non-sentential utterances; extensions: disfluencies, multilogue, conversational genres.

- Fernández, R. (2006). *Non-Sentential Utterances in Dialogue: Classification, Resolution and Use*. Ph.D. thesis, King's College, London.
- Ginzburg, J. (1994). An update semantics for dialogue. In H. Bunt, editor, *Proceedings of the 1st International Workshop on Computational Semantics*. ITK, Tilburg University, Tilburg.
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- Ginzburg, J. and Cooper, R. (2004). Clarification, ellipsis, and the nature of contextual updates. *Linguistics and Philosophy*, **27**(3), 297–366.
- Ginzburg, J. and Cooper, R. (2012). Quotation, formal grammar, and type theory. In *Quotation: Perspectives from Philosophy and Linguistics*, Bochum.
- Larsson, S. (2002). *Issue based Dialogue Management*. Ph.D. thesis, Gothenburg University.

Purver, M. (2004). *The Theory and Use of Clarification in Dialogue*. Ph.D. thesis, King's College, London.