Dialogue across the Lifespan

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Basic Information

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Today's Lecture

1. What is the course about? Answer 1: Turing test dialogical relevance.
2. Antecedents (speech act theory, language games, formal semantics, conversational analysis, ...)
3. What is the course about? Answer 2: adding multimodality and lifespan perspective
4. KoS: some basics
5. Type Theory with Records (TTR): some basics

Dialogical Relevance: Turing style

1. Dialogical **Relevance** in the sense of *conversational coherence* is the most fundamental notion for research on dialogue.
2. Some examples for relevant responses to a query and to an assertion are given in (1a,b) and irrelevant (indicated by '#') to both in (1c).

   (1) a. A: Is that chair new? B: ✓Yes/It's a Louis XIV replica/new?;
   b. A: Jill arrived late last night. B:✓She did not./Why?/Jill?/To spite us.
   c. B: # Tomorrow/Please insert your card/The train.

3. It is the cornerstone of theories of dialogue in the same way that *grammaticality* is to syntax.
4. Alan Turing: basic test for intelligence as a benchmark for theories of dialogue (Turing, 1950)

Speech Acts: Austin, and Searle I

- 53 years since the publication of Searle's *Speech Acts* (Searle, 1969).
- Searle offers a systematic (but in some respects simplified) approach to a view of language initiated by his supervisor Austin.
- (Austin, 1962): language is a subspecies of *action*:
  —locutionary act (the linguistic action performed)
  —illocutionary act (the direct effect)
  —perlocutionary act (indirect effects)
- Austin: much of language is not merely *assertion*. (Though, as we shall see, Austin has very important things to say about assertion. (Austin, 1961))

Speech Acts: Austin, and Searle II

- Searle: two dimensional view of content:
  - (2) a. Illoc-force(propositional-content)
    b. Illoc-force includes { assert, threaten, promise, query, command }
  - (3) a. Emmanuel Macron will win the 2022 elections.
    b. Will Emmanuel Macron win the 2022 elections?
    c. (uttered to EM:) Win the 2022 elections!
- Problem: Speech act theory about isolated acts, no theory of context, in particular of relational dependencies (Question/Answer, Assertion/acceptance, Greeting/Conter-greeting etc)
- The lack of global structure is an issue for Speech Act Theory's contemporary version RSA (Goodman and Frank, 2016)

Language Games and Ellipsis: Wittgenstein I

- Two important insights from the Cambridge philosopher Ludwig Wittgenstein (Wittgenstein, 1953):
  1. Language Games.
     — “Regular" language-games including, e.g., *reporting an event, speculating about an event, forming and testing a hypothesis, making up a story, reading it, play- acting, singing catches, guessing riddles, making a joke, translating, asking, thanking*, etc
  2. Are non-sentential utterances disguised sentential utterances?

Language Games and Ellipsis: Wittgenstein II

But what about this: is the call "Slab I" in example (2) a sentence or a word? If a word, surely it has not the same meaning as the like- sounding word of our ordinary language, for in [section 2] it is a call. But if a sentence, it is surely not the elliptical sentence: “Slab” of our language. As far as the first question goes you can call “Slabl” a word and also a sentence; perhaps it could be appropriately called a ’degenerate sentence’ (as one speaks of a degenerate hyperbola); in fact it is our ’elliptical’ sentence. But that is surely only a shortened form of the sentence "Bring me a slab", and there is no such sentence in example (2). But why should I not on the contrary have called the sentence "Bring me a slab" a lengthening of the sentence "Slab"? Because if you shout "Slab!" you really mean: "Bring me a slab". But how do you do this: how do you mean that while you say "Slabl"? Do you say the unshortened sentence to yourself? … (Wittgenstein, 1953)

Language Games and Ellipsis: Wittgenstein III

- Tying utterance interpretation to facts characteristic of specific domains provides a potential way of dealing with a variety of actually occurring non sentential utterances (NSUs) in various domains:

  (4) a. [A advances to bar, addresses barman] A: A Franziskaner and a Duwel.

  b. (1) 'Your name?' asked Holmes.
  (2) 'Patrick Cairns.'
  (3) 'Harpooner?'
  (4) 'Yes, sir. (5) Twenty six voyages.'
  (6) 'Dundee, I suppose?'
  (7) 'Yes, sir.' ('Black Peter', Sir Arthur Conan-Doyle).

- Problem: Wittgenstein's view of language games is not formalized and not integrated in contemporary formal theories.

Formal Semantics I

- In LA (the other campus) Montague and his student Kaplan developed important initial analyses of context dependence: crucial distinction between meaning/character and content.
- Crucial for analyzing indexicals such as ‘I’, ‘you’, ‘now’.
- Crucial for analyzing all words/phrases in conversation …
- Problem: Generalized Quantifier Theory (Barwise and Cooper, 1981) one of the jewels of formal semantics relies on problematic denotations from a dialogical perspective.

Chomskyan grammar

- The Chomskyan view of language as a (disembodied, internal, non-communicative) biological endowment, emphasis on tight link between grammar and language acquisition.
- Problems:
  - interaction is crucial for understanding language acquisition (e.g., for explaining why wh–questions are acquired before polar questions, (Moradlou et al., 2021), lecture 5);
  - No opposition between I-language and E-language—both are needed, but the former brain–based. (lecture 5)

Conversation Analysis I

- Everything so far has been arm chair theorizing...
- Real dialogues:

(5)

1. Fri: They still haven't figured out, (.) how they're gonna get to the country: < who's gonna take care of huh m:othah while [they're- y'know 'p in the country. on the weekend.(**disfluency**)
2. Dav: [Mm (0.2 secs) (**non-sentential utterance**)
3. Fri: So: (.) you know, (0.8 secs)
4. Fri: an besides tha[:t,
5. Rub: [You c'n go any[way
6. Dav: [Don - Don git- don [get] (**disfluency**)
7. Fri: [they] won t be:
8. Dav: Y know there- there s no- no long explanation is necessary (**disfluency**)

Conversation Analysis II

9. Fri: Oh noon no: (**interjection**), (**disfluency**)
I'm not- I jus: : uh-wanted: you to know that you can go up anyway.= (**overlapping turns**)
10. Rub: =Yeah:. (0.1 secs) (**non-sentential utterance**)
11. Fri: You know. (0.2 secs)
12. Fri: Because-ah (3.3 secs) (**disfluency**)
13. Rub: They don mind honey they're jus not gonna talk to us ever again.= (**overlapping turns**)
14. Dav: = (laughter) / ri:(h)ight) (**non-sentential utterance**)
(From E.A. Schegloff, 2001)

Conversation Analysis III

- Conversation Analysis pioneered a different mode of theorizing based on taking seriously what happens in real conversations.
- Important insights include:
  1. Importance of *adjacency pairs* as markers of conversational structure.
  2. Disfluencies are not noise but acts of *self-repair* (Emanuel Schegloff, Gail Jefferson and Sacks, 1977) / *own communication management* (Allwood et al., 2005).
  3. Laughter is not a low–level emotional signal or a marker of jokes, but a conversational option akin to speech (G. Jefferson, 1979).
- Problems:
  1. No theory of context beyond adjacency.
  2. No semantics developed, which leads to explanatory poverty (case study: laughter, lecture 4).

Conversation Analysis IV

3. CA is wedded to the idea that one speaker at a time is a fundamental *norm* of conversation. This is problematic once one considers multimodal interaction.

Basic perspective and aims I

- The need for a synthesis—a synthesis that can strive to account for dialogical relevance:
  1. An *(inter)active* stance (Today)
  2. Compositional analysis of content that can deal with generalized quantification (Tomorrow)
  3. Conversational structure which underwrites the meaning of non-sentential utterances. (Wednesday)
  4. How content emerges from meaning, *if* it does.: need to develop approach where Self/other communication management is a natural option as success. (Wednesday)
  5. All conversation takes place as part of (sequences of) Language Games. (Wednesday)

What is this course about? Multimodality and Lifespan perspective I

- The Turing test is unimodal.
- BUT interaction from (more or less) birth to (more or less) death is multimodal

Interaction in the lifespan: some examples I

- baby laughing at torn paper: `https://www.youtube.com/watch?v=RP4abiHdQpc`
- Neuer negative laugh: When Neuer laughed the message was a clear "no".
  Journalist: 3-man defense an option?
  Neuer: (laugh) [Süddeutsche Zeitung, 25.2.2020]

Interaction in the lifespan: some examples II

- baby shaking head to refuse: `https://tenor.com/view/baby-shaking-head-gif-10171651`
- Adult head shake:

(6) a. A: (1) Do you want some coffee? / (2) You don't want some coffee?

b. B:  (= head shake)

What is this course about? Multimodality and Lifespan perspective I

- So on that score Alan Turing (2:54 hours marathon runner) didn't get the test quite right
- The last two lectures are about the challenges of multimodality and a lifespan approach
- On the one hand multimodality requires a yet richer notion of context to deal with the visual and the emotional.
- Laughter, smiling, frowning etc all have propositional content ((Ginzburg, Mazzocconi and Tian, 2020), lecture 4) but also clear emotive effects that we want to capture.

What is this course about? Multimodality and Lifespan perspective II

- and early language is a lot of context and less language, which in some crucial respects allows us to have a simpler picture (of grammar),

(7)

Mother: what is it?
Child: that door.
Mother:hmm?
Mother:what is it?
Child: duck.
Mother:do you want to look at the duck?
Mother:hmm?
Child: door.
Mother:well open the door then. (Arano1, Manchester Corpus, (Rowland et al., 2003))

What is this course about? Multimodality and Lifespan perspective III

- Use single words to express complete dialogue moves by relying on context:

(8) CHI: bike yyy .
pho: ˈbæk ˈbæbæ
sit: CHI picks up toy bike
MOT: oh your bike . (Naima at 1;1.25)

(9) sit: book reading activity. CHI: baby . MOT: and there's a baby . CHI: sleeping . pho: ʃLiːpi MOT: yes the baby is sleeping . MOT: on the bed . (Naima at 1;2.23)

(10) MOT: who's that coming in the door? CHI: Daddy . MOT: yes that's right . (Naima at 0;11.28)

Taking dialogue to the brain I

- At the other end of the age span forces us to contend with something dynamic semantics rarely does—how to contend with memory fragility:

(11) (A) ERDÖS: Where are you from?
MATHEMATICIAN: Vancouver
ERDÖS: Really? Then you must know my friend Elliot Mendelson.
MATHEMATICIAN: (pause) I am your friend Elliot Mendelson.

(12) (B) PAR: I can picture &=points:forehead whatever things that I'm still seeing or whatever.
PAR: but I don't know what to call it.
PAR: that's [/] that's what's whatever.
PAR: when I go to heaven it's gonna be &=looks:down &=head:shakes fine &=laughs.

Taking dialogue to the brain II

- Still at an early stage in this work, but it leads to quite radical conclusions.
- Combining E and I language;
- Concretely thinking of context in terms of brain networks, which we think is fruitful *an sich* since it emphasizes thinking of context both locally (STM, working memory) and long-term, but as a highly structured unit.
- But also allows thinking of conversations as on and off episodes of interactions with our fellow animates.
- important for long-term interaction, social meaning …

Basic Strategy

- TTR (Cooper, 2005; Cooper, 2012; Cooper and Ginzburg, 2015): ontology for the world, for grammar, for interaction
  1. Semantics: Constructing an ontology for explicating semantic entities: events, propositions, questions,...
  2. Grammar: using this ontology to explicate speech events (utterances) and their types (Saussurean signs)
  3. Interaction: using the ontology to explicate what contexts are and how they change in interaction.
- TTR grounds KoS, a theory of cognitive states in interaction.

Dialogue Gameboards I

- Context in KoS (Ginzburg, 1994; Larsson, 2002; Purver, 2006; Fernández, 2006; Ginzburg and Fernández, 2010; Ginzburg, 2012)
- instead of a single context, analysis is formulated at a level of cognitive states, one per conversational participant.
- Each state has a private part and a part where publicized information is kept track of:

$$\begin{bmatrix} \text{dialoguegameboard} : \text{DGBtype} \\ \text{private} : \text{Private} \end{bmatrix}$$

- Our focus is on understanding the structure of the publicized part, the dialogue gameboard (DGB).
- The simplest view of what this should consist of, going back to Montague (1974), is one which specifies the existence of a speaker, addressing an addressee at a particular time.

Dialogue Gameboards II

- One can represent that as follows (we will shortly explain what this amounts to formally):

$$\begin{bmatrix} \text{spkr} & : \textit{Ind} \\ \text{addr} & : \textit{Ind} \\ \text{u-time} & : \textit{Time} \\ c_{\text{utt}} & : \text{addressing(spkr,addr,u-time)} \end{bmatrix}$$

- A really crucial point about the assumption that the DGB is not a shared entity (in other words rejecting talk of *the* context) is that there can be differences across participants in their view of the interaction.
- And this can be externalized in terms of clarification interaction, which can apply even to apparently shared information:

(13) a. (On the phone) A: Who's calling?
b. (In traffic) A: Are you honking at me?

Dialogue Gameboards III

- The need for DGBs to specify both shared information but also potentially information about which clarification is required is a point we will return to several times.
- Call it an *Interactive Stance*.
- We will see its impact on the theory of quantification tomorrow.

Dialogue Gameboards IV

- Since Montague and Kaplan there has been realization that the scope of publicized information is quite a bit wider than speaker, addressee, time.
- We assume the following structure for the DGB, which we will motivate extensively throughout the course:

DGBType $=_{def}$

spkr : Ind	*turn*
addr : Ind	*owner-*
utt-time : Time	*ship*
c-utt : addressing(spkr,addr,utt-time)	
Facts : Set(Proposition)	*shared assumptions*
VisSit : [InAttention : Ind]	*visual field*
Pending : list(locutionary Proposition)	*ungrounded utts*
Moves : list(illocutionaryProposition)	*grounded utts*
QUD : poset(Question)	*qs under disc*
Mood : Appraisal	*face*

Dialogue Gameboards V

- And here we would like to emphsize that two of these contextual parameters two, *VisSit* and *Mood*, are probably **never** entirely identical across participants.

Dialogue Gameboards VI

- Distinct interlocutors do not share the same pair of eyes—much of the time interlocutors have each other as their focus of attention.
- But there are various devices such as pointing or the verbal *Look!* to effect alignment.
- Nor do they register the same public ‘face’.

The Dialogue GameBoard

- The visual situation is a key component in interaction from birth (see Tomasello, 1999, Chap. 3), playing a major role in interlocutor *attention* (Mundy and Newell, 2007), itself a corner stone for discourse participation and pointing, as discussed tomorrow by Andy.
- **FACTS** represents the shared knowledge conversationalists utilize during a conversation. More operationally, information a conversationalist can use embedded under presuppositional operators.
- **MOVES**: useful to single out LatestMove, a distinguished fact that characterizes the most recent move made.
- The main motivation—to segregate from the entire repository of presuppositions information on the basis of which coherent reactions could be computed.
- Later on see that keeping track of more than just the latest move can be useful.

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 *downdated*.
- There are additional, indirect ways for questions to get added into QUD, the most prominent of which is during clarification interaction.
- Being maximal in QUD (MAX-QUD) corresponds to being the current ‘discourse topic’ and is a key component in the theory.

Type Theory with Records as logical framework

- We begin to clarify what these representations we have been using are.
- We use Type Theory with Records (TTR) to build the semantic ontology (entities, events, propositions, questions,...), grammatical rules, and to write conversational rules.

Witnessing as classification

- The most fundamental notion of TTR is the typing *judgement* $a : T$ classifying an object a as being of type T.

(14) a. s : SIT
b. b : IND
c. $s : run(arg1_{IND} : b, arg2_{TIME} : t)$
d. s : run(b,t)

Records and Record Types

- A record is a set of fields assigning entities to labels, partially ordered by a notion of *dependence* between fields. Its general form is as in (15a):

(15) a. $\begin{bmatrix} l_1 = val_1 \\ l_2 = val_2 \\ \dots \\ l_n = val_n \end{bmatrix}$

b. $\begin{bmatrix} \text{x} & = & 2 \\ \text{e-time} & = & \text{2AM, June 20, 2022} \\ \text{e-loc} & = & \text{Nome} \\ \text{c}_{temp-at-in} & = & \text{sit1} \end{bmatrix}$

Records and Record Types

- Together with records come record *types*. A record type is simply a record where each field represents a judgement rather than an assignment, as in (16).

(16) $$\begin{bmatrix} l_1 : T_1 \\ l_2 : T_2 \\ \dots \\ l_n : T_n \end{bmatrix}$$

Records and Record Types

- Record types allow us to place constraints on records.
- The basic relationship between the two is that a record r is of type RT if each value in r assigned to a given label l_i satisfies the typing constraints imposed by RT on l_i.
- More precisely,

(17) The record:

$$\begin{bmatrix} l_1 & = a_1 \\ l_2 & = a_2 \\ \dots & \\ l_n & = a_n \end{bmatrix} \text{is of type:} \quad \begin{bmatrix} l_1 & : T_1 \\ l_2 & : T_2(l_1) \\ \dots & \\ l_n & : T_n(l_1, l_2, \dots, l_{n-1}) \end{bmatrix}$$

iff $a_1 : T_1, a_2 : T_2(a_1), \dots, a_n : T_n(a_1, a_2, \dots, a_{n-1})$

Records and Record Types

- The record:

$$\begin{bmatrix} x & = & 2 \\ \text{e-time} & = & \text{2:00AM, June 20, 2022} \\ \text{e-loc} & = & \text{Nome} \\ c_{temp-at-in} & = & \text{sit1} \end{bmatrix}$$

  is of the type

$$\begin{bmatrix} x & : & \text{Ind} \\ \text{e-time} & : & \text{Time} \\ \text{e-loc} & : & \text{Loc} \\ c_{temp-at-in} & : & \text{temp\_at\_in(e-time,e-location,x)} \end{bmatrix}$$

  only if:

  2 : Ind; 2:00AM, June 20, 2022 : Time; Nome : Loc; sit1 : temp_at_in(2:00AM, June 20, 2022, Nome, 2)

An event

- A situation with a woman riding a bicycle would then be a record $\begin{bmatrix} \ldots & \\ x & = a \\ c1 & = p1 \\ y & = b \\ c2 & = p2 \\ time & = to \\ loc & = lo \\ c3 & = p3 \\ \ldots & \end{bmatrix}$ of type $\begin{bmatrix} x & : IND \\ c1 & : woman(x) \\ y & : IND \\ c2 & : bicycle(y) \\ time & : TIME \\ loc & : LOC \\ c3 & : ride(x,y,time,loc) \end{bmatrix}$

  such that: a:IND; p1: woman(a); b: IND; p2: bicycle(b); to : TIME; lo : LOC;p3: ride(a,b,to,lo);

Conversational Rules I

- We characterize dialogue regularities in terms of *conversational rules*.
- Conversational rules are mappings between two cognitive states the *precond(ition)s* and the *effects*.
- Notationwise a conversational rule will be specified as in (18a). We will often notate such a mapping as in (18b):

(18) a. $r : \begin{bmatrix} \dots \\ \text{dgb1} : \text{DGB} \\ \dots \end{bmatrix} \mapsto \begin{bmatrix} \dots \\ \text{dgb2} : \text{DGB} \\ \dots \end{bmatrix}$

b. $\begin{bmatrix} \text{pre(conds)} : \text{RType} \\ \text{effects} : \text{RType} \end{bmatrix}$

Greeting

- An initiating greeting typically occurs dialogue initially.
- The primary contextual effect of such a greeting is simply providing the addressee with the possibility of reciprocating with a counter-greeting.
- A countergreeting simply grounds the original greeting, requires no response, nor has other contextual effects.

Greeting

- The conversational rule associated with greeting:

$$\begin{bmatrix} \text{pre}: & \begin{bmatrix} \text{spkr: Ind} \\ \text{addr: Ind} \\ \text{moves} = \langle\ \rangle : \text{list(IllocProp)} \\ \text{qud} = \langle\ \rangle : \text{list(Question)} \\ \text{facts} = \text{commonground1} : \text{Prop} \end{bmatrix} \\ \text{effects}: & \begin{bmatrix} \text{spkr} = \text{pre.spkr} : \text{Ind} \\ \text{addr} = \text{pre.addr} : \text{Ind} \\ \text{LatestMove} = \text{Greet(spkr,addr)}:\text{IllocProp} \\ \text{qud} = \text{pre.qud} : \text{list(Question)} \\ \text{facts} = \text{pre.facts} : \text{Prop} \end{bmatrix} \end{bmatrix}$$

Participant sensitive conversational rules I

- Conversational rules can come in two flavours, rules that each interlocutor applies in the same way to their cognitive state (*participant neutral*), as we have just seen.
- And rules that are specified only for particular interlocutors (*participant sensitive*).
- The latter kind of specification is, in principle, more general and is particularly important for an algorithmic perspective involving generation see e.g., (Larsson, 2002; Cooper, 2016).

Participant sensitive conversational rules II

- We exemplify a participant sensitive rule that relates to one of the most basic communicative interactions from infancy, namely visual attention directing, where A directs B to an object *o* (Lücking, 2018).
- This is a visual situation update rule, analogous to the MOVES update rules above.
- The sole difference is that in this case B needs to modify her visual situation so that it includes *o* as the visual focus, whereas A must already have updated his visual situation to effect such an act.
- The notation we use for such rules is exemplified in (19a), where the rule applies to the dialogue gameboard of current addressee, with the obvious change in the case where it applies to the current speaker. (19b) provides the specification for visual situation update rule:

Participant sensitive conversational rules III

(19) a.
$$\begin{bmatrix} \text{tcs} = \begin{bmatrix} \text{dgb} : \text{DGBType} \\ \text{private} : \text{Private} \end{bmatrix} : \text{TCS} \\ \text{B} = \text{dgb.addr} : \text{IND} \\ \text{B.pre} = \text{T1} : \text{DGBType} \\ \text{B. effects} = \text{T2} : \text{DGBType} \end{bmatrix}$$

b. Visual situation update:

$$\begin{bmatrix} \text{tcs} = \begin{bmatrix} \text{dgb} : \text{DGBType} \\ \text{private} : \text{Private} \end{bmatrix} : \text{TCS} \\ \text{B} = \text{dgb.addr} : \text{IND} \\ \text{B.pre} : \begin{bmatrix} \text{o} & : & \text{Ind} \\ \text{LatestMove} = \text{DirectAttention(spkr,addr,o)} & : & \text{IllocProp} \end{bmatrix} \\ \text{B.effects} : \begin{bmatrix} \text{VisSit.InAttention} = \text{o} : \text{Ind} \end{bmatrix} \end{bmatrix}$$

Plan for the rest of the course

1. Lecture 2: QNPs in dialogue (Lücking and Ginzburg, 2022); Reference and pointing (Lücking, 2018)
2. Lecture 3: Characterizing the response space of questions (Ginzburg, Yusupujiang et al., 2019); Non-sentential utterances (Ginzburg and Miller, 2019); Language games and their types (Wong and Ginzburg, 2018)
3. Lecture 4: Head shaking (Lücking and Ginzburg, 2021); laughter, smiling, sighing (Ginzburg, Mazzocconi and Tian, 2020; Mazzocconi, Tian and Ginzburg, 2020)
4. Lecture 5: The earliest grammars and how questions get learnt (Moradlou, 2019; Moradlou et al., 2021); Dialogical context and the structure of memory (Bastin et al., 2019; Ginzburg and Lücking, 2020)

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