Introducing Dialogue Games

Day 2

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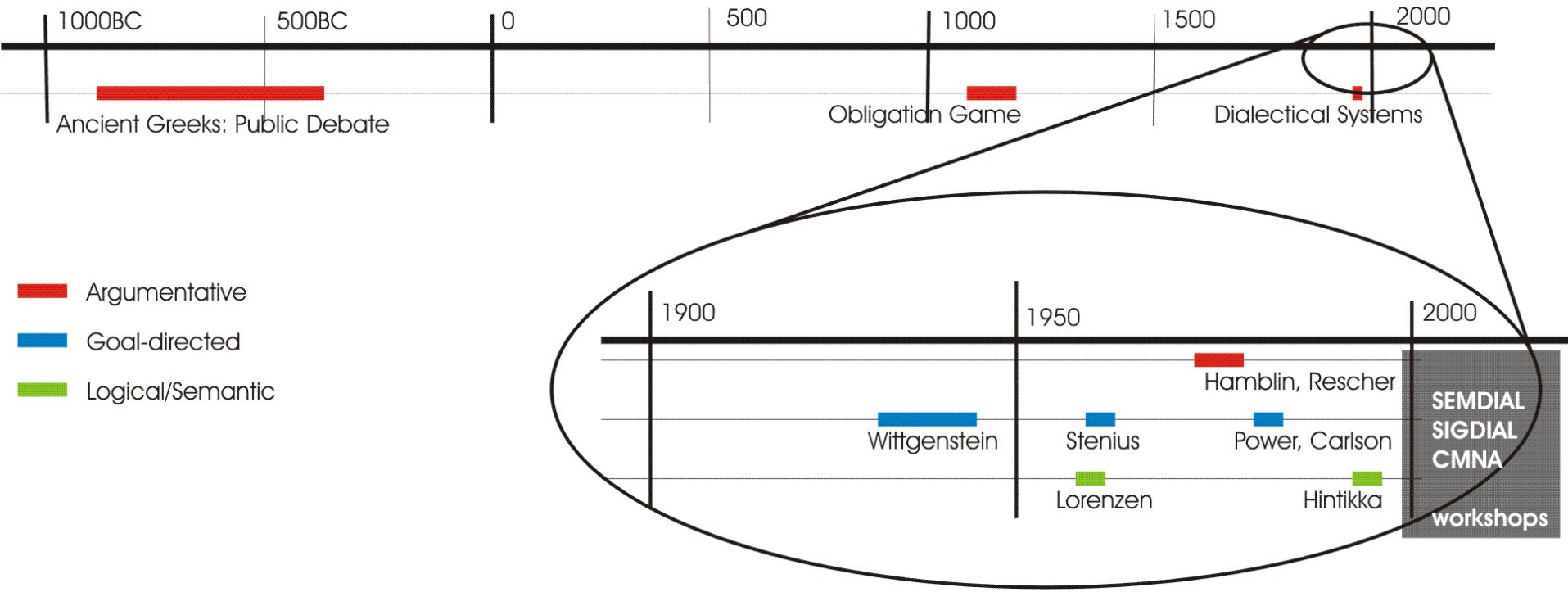
Course Plan

- **Yesterday**:
  - Why study dialogue?
  - What is a dialogue game?
  - Historical overview – argumentative dialogue
- **Today**:
  - Historical overview – task-oriented/goal-directed dialogue
  - Goal-directed dialogue between software agents
  - Following rules in dialogue (Grice)
  - Final part historical overview: logical/semantic games
- **Friday**:
  - Open issues/challenges and demos

Dialogue Game - Chronology



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Wittgenstein (1889 - 1951)

- Language game
  - Primitive forms of language or primitive languages
  - Language use as situated in practical activity (without reference to mentalistic notions/complex processes of thought)
  - Each language game as a language in its own right (with family resemblances to other language games).
  - Show that certain philosophical problems disappear: “Der Fliege den Ausweg aus dem **Fliegenglas** zeigen.”

Example (Brown book pp. 77-81)

- Augustinus: learning to speak = learning the names of things

- Builder A and helper B
- B has to reach A building stones (cubes, bricks, slabs, …)
- Language: “cube”, “brick”, “slab”
- Imagine society in which this is the entire language
- Learning through example (pointing), punishment, reward, …

Example (Brown book pp. 77-81)

- Does “brick!” mean the same in our language? Or is it “Bring me a brick!”. Does it make sense to ask for the mental states of the interlocutors to answer this question?

- Extension: “Five slabs!”
- Teaching of the numerals “five”: pointing to five slabs, cubes …
- Introduced an entirely different kind of instrument into the language
- Pointing to shape versus number, what does it exactly in terms of mental acts
- Difficult to formulate, but we can understand the difference in terms of the surrounding of the act in the use of the language.

Erik Stenius (1911 - 1990)

Mood and Language-game (1967)

- You eat the cake now.
- Eat the cake now!
- Are you eating the cake now?

- It is the case P
- Let it be the case P!
- Is it the case P?
- P = that you eat the cake

The Problem

- A sentence can be viewed as consisting of a sentence radical (“that …”) and a modal element/mood.
- The meaning of the sentence radical can be given in terms of W’s picture theory or modern truth-conditional formal semantics.
- What is the meaning of the modal element?

The Problem

- Performative hypothesis – disguised statements:
  - I hereby ask you whether you are eating your cake.
  - I tell hereby tell you to eat your cake.
  - I hereby state that you are eating your cake now.

Language games

- Wittgenstein: meaning of a word is its use in language.
- S. follows W. in sketching a simplified language game to get a better understanding of the modal element/mood

Report-game

- **R1**: Write one of the letters “P” or “Q” to the left of one of the letters “a”, “b” or “c”, according to whether the object denoted by one of the latter letters has the property denoted by “P” or “Q” (in this position).

- Learning and use phase.

Command-game

- **R2**: Give the object denoted by the “a”, “b” or “c” the property corresponding to “P” or “Q”, according to whether a “P” or a “Q” stands to the left of this letter.

Combined Game

- Write “I” on the slip if report-game is being played.
- Write “O” on the slip if the command-game is being played.

Combined Game

- **Def**: A sentence-radical is called “true” if what is described really is the case; otherwise it is “false”.

- **R3**: Produce a sentence in the indicative mood only if its sentence radical is true

- **R4**: React to a sentence in the imperative mood by making the sentence-radical true.

Complications

- Does saying something false mean that one isn't speaking English? Is R3 a semantic rule?
- Report *ought to* be a symptom of the state-of-affairs it was agreed to be a symptom of.
- It defines the meaning in the sense that it is the rule on which the speaker was conditioned and on which s/he is expected/ought to act.
- Compare it with an illegal move in chess and cheating in poker.
- Preservative rules versus constitutive ones. (preservation as a game of communication)

Complications

- Should the rules be formulated in terms of belief rather than truth?
- **R3’**: Produce a sentence in the indicative mood only if you *believe* its sentence radical to be true.
- But what about correction if we have R3’?
- Consider: It rains, but I don’t belief that it rains.
- Now consider a man who can’t speak a falsehood.
- But, it is impossible to always follow R3.

Complications

- How many moods are there? Should we distinguish “P” from “I believe that P”?
- Occassional language-games: e.g., language use in the theatre. Pretend indicatives, imperatives, …

Goal-directed Dialogue Games

- An implemented dialogue game (Power, 1979)
- Goal-directed: “A speaker is not just putting a meaning into words, he is also trying thereby to do something to achieve a purpose. And a hearer has not understood a remark unless he has perceived its purpose as well as its literal meaning.”

Why an implementation?

- “First [computer models] give quick accurate feedback on the coherence, completeness, and detailed consequences of a theory. Theories of cognitive processes are necessarily complicated, and are likely to be too complicated for the unaided human intelligence to cope with. Second, computer models are an appropriate medium of expression for a theorist who believes the mind is a computational system.” Power (1979:109)

The program – Setting - World

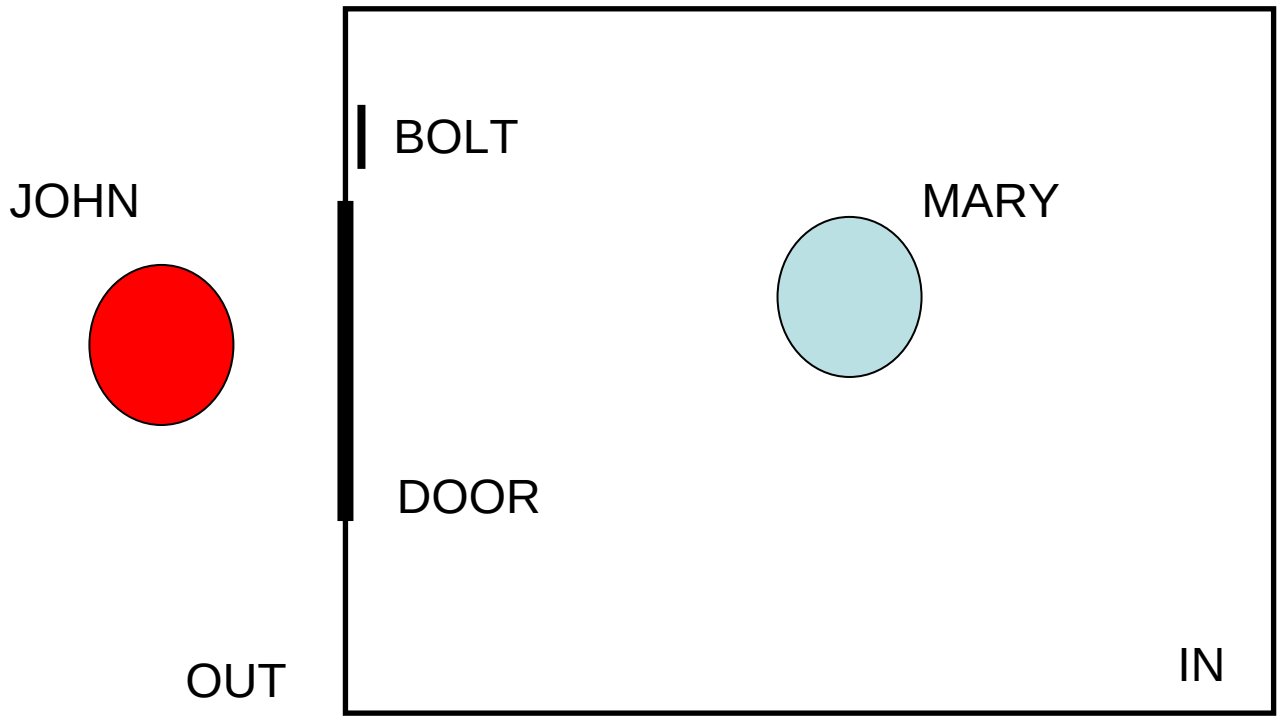
- Objects = John, Mary, a door, (a bolt)
- State = position of objects:
  - For robots: IN/OUT
  - For the door: OPEN/SHUT
  - For the bolt: UP/DOWN
- Actions
  - For robots: MOVE
  - For the door: PUSH
  - For the bolt: SLIDE

The program – Setting - World

"Laws of nature":

- If robot MOVE, then position robot changes provided that door OPEN.
- If robot PUSH door, then position door changes provided that bolt UP.
- If robot SLIDES bolt, then position bolt changes provided that robot is IN.

The program – Setting - World



Program – Setting - Robots

- Each robot's **mind** consists of:
  - Goal (planning tree)
    - John's goal: JOHN IN
    - Mary's goal JOHN IN
  - Procedure execution stack
  - Beliefs (about regularities in the world)
    - John:
      - If a robot MOVES, nothing happens
      - If a robot PUSHES the door, the door changes position
      - If a robot SLIDES the bolt, nothing happens
    - Mary:
      - If a robot MOVES, it changes position provided the door is OPEN.
      - If a robot PUSHES the door, the door changes position.
      - If a robot SLIDES the bolt, nothing happens.

Program – Setting - Robots

- Each robot has **capabilities** for:
  - Perception:
    - John: SEE
    - Mary: -
  - Action:
    - John: MOVE, SLIDE
    - Mary: MOVE, SLIDE, PUSH

A conversation - 1

- John: Mary
- Mary: Yes
- John: I want to suggest a goal
- Mary: Go ahead.
- John: Will you help me get in?
- Mary: By all means.
- John: Shall we make a plan?
- Mary: John.
- John: Yes.

A conversation - 2

- Mary: May I ask you something?
- John: Go ahead.
- Mary: Are you in?
- John: No.
- Mary: Shall we make a plan?
- John: Okay.
- Mary: John.
- John: Yes.
- Mary: May I ask you something.
- John: Go ahead.

A conversation - 3

- Mary: Is the door open?
- John: No.
- Mary: I suggest that we get the door open and then you move.
- John: Mary
- Mary: Yes
- John: I want to explain something.
- Mary Go ahead.
- John: If one moves, nothing happens.

A conversation - 4

- Mary: I disagree. If one moves when the door is open one changes position.
- John: I see.
- Mary: I suggest that we get the door open and then you move.
- John: All right.
- Mary: Shall we make a plan?
- John: Okay.
- Mary: I suggest that I push the door.

A conversation - 5

- John: All right.

  The state of the world changes

- Mary: I want to tell you something
- John: Go ahead.
- Mary: I have pushed the door.
- John: I see
- Mary: Let’s asses the results of my action

A conversation - 6

- John: Okay.
- Mary: Nothing has happened.
- John: Mary.
- Mary: Yes.
- John: I want to tell you something.
- Mary: Go ahead.
- John: The door is open.
- Mary: I see. The door has changed position.

A conversation - 7

- John: Yes.
- Mary: The door is now open.
- John: Right.

The state of the world changes

- John: I want to tell you something.
- Mary: Go ahead

A conversation - 8

- John: I have moved.
- Mary: I see.
- John: Let’s assess the result of my action.
- Mary: Okay.
- John: I have changed position.
- Mary: John.
- John: Yes.
- Mary: I want to tell you something.

A conversation - 9

- John: Go ahead.
- Mary: You are out.
- John: I disagree. I have changed position.
- Mary: Yes.
- John: I am in now.
- Mary: right.

Procedures

- Planning
  - CHOOSEGOAL
  - ACHIEVEGOAL
  - FINDPLAN
  - …
- Conversational:
  - ANNOUNCE
  - AGREEGOAL
  - AGREEPLAN
  - ASK
  - TELL
  - DISCUSS
  - ASSESS

ACHIEVEGOAL M

- Start with G:=M
- 0. Identify current goal G
- 1. If action G, check whether it can be performed directly. If so, perform it and remove.
- 2. If state G, test whether it holds. If so, remove it. If main goal, exit.
- 3. Else, select plan P to achieve G. If there is no plan, remove G and its sister and record failure, and go to 0. If G is main, return FAIL.
- 4. Attach P to G and return to 0.

Revised ACHIEVEGOAL

- 1. a) If G is assigned to your partner, wait until he tell you he performed it. b) If G is assigned to you, perform it. Then tell your partner that you performed it and initiate a conversation to assess the result (assuming the supergoal of G is joint).
- 3. If G is your responsibility, select a plan to achieve it. If G is joint, have a conversation to agree a plan.

Revised FINDPLAN

- If the goal is joint, find the robot who can perform the plan to achieve the goal.

Calling Conversational Procedures

- CHOOSEGOAL
  - Try achieve main goal M on your own (individual ACHIEVEGOAL)
  - Secure cooperation through AGREEGOAL. If answer “yes”, label M as a joint responsibility and call joint ACHIEVEGOAL. If the answer is “no”, do nothing.

Conversational Procedure AGREEGOAL (S1,S2,G)$\Rightarrow$A

- S1 composes sentence S asking for help with G
- S2 decodes S, obtaining a value for G. If it is identical with his own main goal, he gives A the value “yes”, if not, “no”. If A is “yes”, the variable A of CHOOSEGOAL is also set to “yes”. S2 utters A and exits from AGREEGOAL
- S1 reads A and exits returning A to the procedure which called AGREEGOAL.

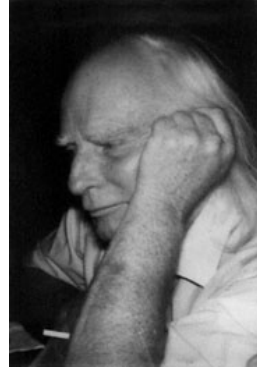
Conversational Procedure ASK(S1,S2,Q)

- S1 composes S which expresses question Q and utters it.
- S2 reads U and obtains a value for Q. He records that S1 cannot see the object in Q, and then inspects the world to see if Q is true. If he finds no information, he says “I don’t know”, otherwise “yes” or “no” as appropriate.
- S1 reads S2’s reply and updates his world model appropriately. If it is “I don’t know, he records that S2 cannot see the object mentioned in Q”.

Limitations

- How flexible is the application of rules in a dialogue? – a query into the very nature of dialogue games
- Grice's theory of conversational implicatures as set out in his lecture on 'Logic and Conversation'.

Herbert Paul Grice (1913 - 1988)



- Studied and taught in Oxford until 1967.
- Belonged to the group of ordinary language philosophers which was lead by J.L. Austin (1911 - 1960).
- 1967 – 1979: Professor of Philosophy at Berkeley, California (continued to teach until 1987).
- Some Important Contributions:

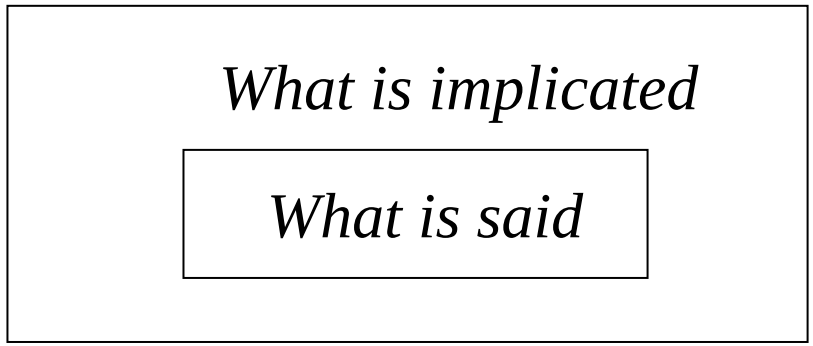
  - 1967 William James Lectures at Harvard University entitled Logic and Conversation (introducing the notion of conversational implicature).
  - Meaning (1957): The distinction between natural and non-natural meaning and the definition of the latter.

Logic and Conversation

- Published in full in 1989 in Studies in the Way of Words, Harvard University Press.

- It consists of 7 sections, section 2 also bearing the title Logic and Conversation. Section 2 was previously published in 1975 and 1978.

How does meaning emerge in conversation?



Literal Meaning & Implicature

- **A**: How is C getting on in his job?
  B: Oh quite well, I think; he likes his colleagues and he hasn't been to prison yet.
- >> C is the sort of person likely to yield to temptation from his occupation

  >> C's colleagues are very unpleasant etc.

To understand what was said know (1) the meaning of the words, (2) the identity of *he*, (3) the time of utterance.

Conversational Implicature

Based on a principle which governs conversation:

The cooperative Principle: Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged.

The Maxims and their categories

Quantity

- Make your contribution as informative as is required (for the current purpose of the exchange)
- Do not make your contribution more informative than is required

Quality

- Try to make your contribution one that is true
  - Do not say what you believe to be false
  - Do not say that for which you lack adequate evidence

Moore's Paradox: It is raining, but I do not believe that it is raining.

The Maxims and their categories

Relation

- Be relevant

Manner

- Avoid Obscurity of expression
- Avoid Ambiguity
- Be brief (avoid unnecessary prolixity)
- Be orderly

Conversation as Rational Action

- **Quantity**. Example A helps B to mend a car. If B needs 4 screws, A is expected to hand 4, not 2, or 6.
- **Quality**. If A asks for salt, A does not expect B to hand A the sugar.
- **Relation**. If B needs a screw, B does not expect that A will hand B a hammer, remote control,…
- **Manner**. Expect that from the way you carry out your action it is clear what contribution you are making.

Motivation

- Why do we obey the cooperative principle and its subservient maxims?

- Grice's "answer": if one is interested in communicating/conversation (giving and receiving information from others and influencing their behaviour and being influenced), then one has interest in people behaving according to the principle and its maxims.

Conversational Implicatures

How can participants behave in the light of the maxims?

- Quietly violate them. One is liable to the accusation of being misleading.
- Opt out explicitly. “I cannot say more. My lips are sealed.”
- Faced by a clash (e.g., between quantity and quality).
- **Flout** a maxim. The maxim is being **exploited**.

Conversational Implicatures

- A man who, by (in, when) saying (or making as if to say) that p has implicated q, may be said to have conversationally implicated that q, provided that

  (1) he is to be presumed to be observing the conversational maxims, or at least the Cooperative Principle;

  (2) the supposition that he is aware that, or thinks that, q is required in order to make his saying or making as if to say p (doing so in those terms) consistent with this presumption; and

  (3) the speaker thinks (and would expect the hearer to think that the speaker thinks) that it is within the competence of the hearer to work out, or grasp intuitively, that the supposition mentioned in (2) is required.

Conversational Implicatures

- S implicates q by saying p to H if

  1. S and H presume that S acts in line with the maxims and principle
  2. q is required to maintain that 1. holds.
  3. S believes that H can work out step 2., and S believes that H believes S believes that H can work out step 2.

- H can use the conventional meaning of the words, the principle and maxims, the context, background knowledge, the assumption that the aforementioned information is shared.

Examples

- **Group A** (no direct violation)

  A: I am out of petrol

  B: There is a garage around the corner

  A: Smith doesn’t have a girlfriend these days

  B: He has been paying a lot of visits to New York lately

- **Group B** (clashes)

  A: Where does C live.

  B: Somewhere in the South of France

Examples

- **Group C**: (exploitation)

  “Dear Sir, Mr. X’s command of English is excellent, and his attendence at tutorials has been regular. Yours etc.”

  A: Is p the case?
  B: Yes, because r and what’s more C told me …

  A: X is a fine friend.

  You are the cream in my coffee

Examples

A: Mrs X. is an old bag

B: The weather has been quite delightful this summer.

I sought to tell my my love, love that never told can be.

Miss X sang “Home Sweet Home” vs.

Miss X produced a series of sounds that corresponded closely with the score of “Home Sweet Home”

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http://mcs.open.ac.uk/pp2464/dialogueGames/campinas.html