Questions in a Dynamic Perspective

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Outline and Program

- formal semantics
- dynamic semantics
  » questions and answerhood
  » information exchange
- conclusions

» please interrupt!
Classical Semantics

- meaning equals truth- or satisfaction-conditions
- knowing the meaning of an indicative sentence equals knowing the conditions under which it is true

- logico-philosophical tradition
- Frege, Russell, Wittgenstein, Tarski, Montague
- knowledge, truth, and inference
- distinguish between various possibilities
Satisfaction Semantics

- $M, g, \vec{e} \models \phi$

- models or situations
- variables or indices
- indefinites or pronouns
Grice’s Program

- combine logical semantics with pragmatic reasoning

(1) John switched off the light. He entered the room.
(2) John entered the room. He switched off the light.
(3) If everybody had a beer, everybody had one.
(4) If someone had a beer, everybody had one.
(5) You may have an apple or a pear.
(6) You may have an apple and you may have a pear.
Dynamic Semantics

- the interpretation of utterances depends on the context of utterance
- and they are intended to change the context of utterance

(7) I lost a marble. It is probably under the sofa.
(8) It is probably under the sofa. I lost a marble.

(9) Mary’s head was chopped off but even so it kept smiling.
(10) Mary was decapitated but even so it kept smiling.
Dynamic Issues

• anaphora
• presupposition
• epistemic modalities
• discourse relations
• questions and answers
Motivating Examples

(11) John has children, and all of his children are bald.
(12) All of John’s children are bald and ? he has children.

(13) John married Jane and he regrets that he married her.
(14) John regrets that he married Jane and ? he married her.

(15) Your wife is now cheating on you, while you don’t know it.
    ? And your wife is now cheating on you, while you don’t know it.

(16) John left. Mary started to cry. (weak-hearted Mary ;-)
(17) Mary started to cry. John left. (hard-hearted John ;-)
Update Semantics

• the meaning of an indicative *utterance* resides in its update potential

• of what interlocutors believe to be the common ground

≫ of what interlocutors believe they commonly assume to be true
≫ of what interlocutors believe they commonly assume to be at issue
**Interrogative Semantics**

- meaning equals answerhood-conditions
- knowing the meaning of an interrogative sentence equals knowing the conditions under which it is (fully) answered

- logico-philosophical tradition
- Hamblin, Karttunen, Groenendijk and Stokhof
- answerhood and question entailment
- distinguish between various *sets* of possibilities
Indifference and Answerhood

- intensional models $\mathcal{M}$ so that $\mathcal{M}_w$ is an extensional model

- $\llbracket \phi \rrbracket_{\mathcal{M},g} = \{ \bar{\alpha}w \mid \mathcal{M}_w, g, \bar{\alpha} \models \phi \}$ (content of $\phi$)

- $D(S) = \{ w \mid \exists \bar{\alpha} : \bar{\alpha}w \in S \}$ (data of $S$)

- $A(S) = \{ \{ w \mid \bar{\alpha}w \in S \} \mid \bar{\alpha}v \in S \}$ (p’ble answers)

- $I(S) = \{ \langle v, w \rangle \mid \exists \bar{\alpha} : \bar{\alpha}v \in S \land \bar{\alpha}w \in S \}$ (indifference)

- $\phi \models_{\mathcal{M},g} \psi$ iff $I(\llbracket \phi \rrbracket_{\mathcal{M},g}) \subseteq I(\llbracket \psi \rrbracket_{\mathcal{M},g})$ (support)

$\gg$ (pseudo-)partitions model the uncertainty (lack of data) and the worries (lack of indifference) of an agent

- the partition theory links logic with decision theory
Logical Space

Nirvana: no assumptions, no needs
Pragmatic Space

- Will I go to the party? $?xCx := \text{who come?}$

\[
\begin{array}{c|c}
\neg \exists x Cx & Ca \land \neg Cb \\
\hline
\neg Ca \land Cb & \forall x Cx \\
\end{array}
\]

$?Cb := \text{does } b \text{ come?}$

$?Ca := \text{does } a \text{ come?}$
Answerhood and Entailment

- $p \land q \models p$
  $\forall x C x \models C a$

- $p \land q \models ? p$
  $\forall x C x \models ? x C x$

- $? p \land ? q \models ? p$
  $? x C x \models ? C a$

- $? p \models \top$

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Update Semantics

- the meaning of an interrogative *utterance* resides in its update potential

- $S[\phi]_{M,g} = \{\vec{\alpha}\vec{e}w \mid \vec{e}w \in S \& M_w, g, \vec{\alpha} \models \vec{e} \phi\}^*$

  $T^* = \{\vec{e}w \mid \vec{\alpha}\vec{e}w \in T\}$ for the longest $\vec{\alpha}$: $D(T) = D(T^*)$

- relevance taken from a global, not local, perspective
Relevance and the Logic of Conversation

- Grice maxims for a rational and cooperative conversation
- quality, quantity, relation, manner

- a *general*, but not a *specific* assumption of rationality and cooperativity (it is based upon them, but not limited to them)

- a game of information exchange consists in trying to get one’s own questions answered in a reliable and preferrably pleasant way
Optimal Inquiry

- given a set of interlocutors $A$ with states $(\sigma)_{i \in A}$ a discourse
  $\Phi = \phi_1, \ldots, \phi_n$ is optimal iff:

  - $\forall i \in A$: $D([\Phi]) \cap D(\sigma_i) \models \sigma_i$ (relation)
  - $\bigcap_{i \in A} D(\sigma_i) \models D([\Phi])$ (quality)
  - $\Phi$ is minimal (quantity)
  - $\Phi$ is well-behaved (manner)

- with epistemic logical and decision-theoretic freedom
- we get informativity, non-redundancy, consistency, and congruence implicatures
An Optimal Exchange

\[ \sigma = \{ [s] \cap [\neg t], [\neg s] \cap [\neg t] \} \]
\[ \tau = \{ [s] \cap [t], [s] \cap [\neg t] \} \]
\[ CG_0 = W \]

(18) A: Does Sue come? \[ CG_1 = \{ iw \mid i = w(s) \} \]
B: Yes. \[ CG_2 = \{ iw \mid i = w(s) = 1 \}^* \]
\[ = [s] \]

Does Tim come? \[ CG_3 = \{ iw \mid w \in [s] \& i = w(t) \} \]
A: No. \[ CG_4 = \{ iw \mid w \in [s] \& i = w(t) = 0 \}^* \]
\[ = [s] \cap [\neg t] = \sigma' = \tau' \]
Global Perspective

• relatively standard picture
  – pose questions you have
  – answer them to the best of your knowledge
  – question – answerhood relations
  – congruence

• our picture is much more general
Extensions (1): Subquestions

(19) A: Who were at the awards?
   Who of the Bee Gees?
   B: Robin and Barry but not Maurice. (POP)
   A: Who of the Jackson Five?
   C: Jackie, Jermain and Mike, but not Marlon and Tito. (POP)
   A: Who of Kylie Minogue?
   D: Kylie Minogue. (POP)

- subquestions used to answer superquestions
- but they are invisible in partitions
Extensions (2): Counterquestions

- ‘side sequences’ (Jefferson 1972, Clark 1996)

(20) *Waitress:* What’ll ya have girls?

   *Customer:* What’s the soup of the day?

   *Waitress:* Clam chowder.

   *Customer:* I’ll have a bowl of clam chowder and a salad with Russian dressing.

- discourse local versus epistemic global view
Almost, but not Anything, Goes

(21) A: Will Arnold come?
    B: Will you come?
    A: Yes.
    B: Then I don’t know.
    A: Oh, sorry, I am confused, I cannot come.
    B: Then I still don’t know about Arnold.

- that sounds pretty confused
- a nephew of Moore’s paradox?
Extensions (3): Conditional Questions

(22) A: If we throw a party tonight will you come?  
     B: Yes! (If you throw a party tonight I will come.)  
     B: No! (If you throw a party tonight I will not come.)  
     B: There will be no party.

(23) A: If it rains, who will come?  
     B: John and Mary but not Dick and Trix.  
     B: It won’t rain.
Conditional Questions (cont’d)

(24) A: Do you go to the party?
    B: If I go to the party, will prof. Schmull be there?

• indeed B may not be interested in the question whether prof. Schmull comes if she doesn’t come herself.
Extensions (4): Superquestions

- actual world: \[\begin{array}{c}
  & \\
  & \\
  & \\
\end{array}\] (agent A is at a1)

A and B’s information and indifference is characterized as:

- \(\sigma = \{ \{\begin{array}{c}
  & \\
  & \\
  & \\
\end{array},\begin{array}{c}
  & \\
  & \\
  & \\
\end{array}\},\{\begin{array}{c}
  & \\
  & \\
  & \\
\end{array},\begin{array}{c}
  & \\
  & \\
  & \\
\end{array}\}\} \]

- \(\tau = \{ \{\begin{array}{c}
  & \\
  & \\
  & \\
\end{array},\begin{array}{c}
  & \\
  & \\
  & \\
\end{array}\}\} \}

(25) A: Am I on a black square? B: I don’t know. A: On which square am I? B: You’re on a1. POP A: Then I am on a black square. POP

- result: \(\sigma' = \tau' = \{ \{\begin{array}{c}
  & \\
  & \\
  & \\
\end{array}\}\} \} \)
Superquestions (Cont’d)

• scenario: the party may be visited by me, and the professors Aims, Baker, Charms, Dipple, and Edmundson: $2^5 = 32$ possibilities

• since my decision depends on that of the others that reduces for me to $2^4 = 16$

• I prefer to speak to $A$ and otherwise $C$, but I know that if $B$ is there she will absorb $A$ if $B$ doesn’t absorb $C$, that is, if $C$ is not absorbed by $D$

if neither $B$ and $C$ are present, $D$ will absorb $A$

• if this ain’t human, it is academic at least
Will I Go to the Party?

\[
\begin{array}{|c|c|c|c|c|}
\hline
 & C\&D & C\&\neg D & \neg C\&D & \neg C\&\neg D \\
\hline
A\& B & - & + & - & - \\
A\&\neg B & + & + & - & + \\
\neg A\& B & - & - & - & - \\
\neg A\&\neg B & - & + & - & - \\
\hline
\end{array}
\]

(26) \((A \text{ AND } (\neg B \text{ AND } (D \rightarrow C)) \text{ OR } (B \text{ AND } C \text{ AND } \neg D)) \text{ OR } (C \text{ AND } \neg B \text{ AND } \neg D)\)?

(27) Will I like the party?

(28) Who come?
Conclusions

• the Gricean program is still actual
• it extends beyond mere indicative utterances
• local compositional semantics for questions and answers
• in Gricean combination with a global, epistemic pragmatics

• we have presented only a program here
• understanding actual interpretation and choice of strategies requires much more work