Game Theoretic Pragmatics

Day 5

Extensions of the Optimal Answer Model

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Course Outline

1. Introduction and Motivation
2. The Basic Iterated Best Response Model
3. The Basic Optimal Answer Model
4. Aspects of Bounded Rationality
5. Some Extensions of the Optimal Answer Model

Optimal Answer Approach

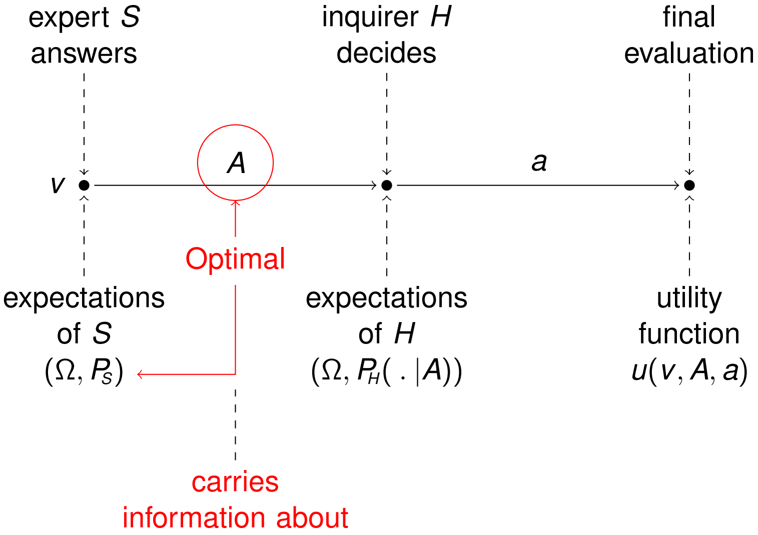
Explanation of Implicatures, [Benz and van Rooij, 2007]

Optimal Answer Approach

1. Start with a signalling game $\mathcal{G}$ in which the hearer makes his choice on the basis of literal meaning.
2. Impose pragmatic constraints and calculate optimal speaker strategy S by backward induction.
3. Implicature $F +> Q$ is explained if for all possible speaker strategies S which satisfy backward induction:

$$S^{-1}(F) \Rightarrow Q. \tag{0.1}$$

The Optimal Answer Approach



Extensions to the Basic Model

Today, we see several extensions to the basic OA Model:

1. Suspension of implicatures in a preferential non–monotonic model.
2. Clarification request and noisy signalling strategies.

Models of Signalling Behaviour

GT Models

- non–evolutionary
  - online
    - immediate effects
    - two interlocutors
  - competence
    - several round of interaction
    - two interlocutors
- evolutionary
  - replication involving several generations
  - large populations (infinite)

Models of Signalling Behaviour

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Outline

1. Suspension and Nonmonotonicity
2. Efficient Clarification Requests and Expected Noise
3. Examples: Noisy Communication

Section 1

Suspension and Nonmonotonicity

[Benz, 2009]

Communicated Meaning

Grice distinguishes between:

- What is said.
- What is implicated.

Example 1

"Some of the boys came to the party."

- said: at least two came
- implicated: not all came

Defeasibility of Implicatures

1. Some of the boys came to the party.
   $+>$ Not all of the boys came.
2. Some, perhaps all of the boys came to the party.
   $+>$ It is possible that all came, and it is possible that not all came.
   $+> \Diamond$ all came & $\Diamond$ not all came.
3. I believe that some of the boys came to the party.
   $+> \Diamond$ all came & $\Diamond$ not all came.

A Hirschberg Style Example

Especially interested in:

1. A: Does this job candidate speak Spanish?
   1 He speaks Portuguese.
   $+>$ He does not speak Spanish.
   2 B: I know he speaks Portuguese.
   $+>$ B does not know whether he speaks Spanish.

2. A: How did the students do in the exam?
   1 B: Some students passed.
   $+>$ Not many passed.
   2 B: I know that some students passed.
   $+>$ B does not know whether many passed.

Suspension of Implicatures

Suspension and Cancellation

Example 2

"Some of the boys came to the party."

1. Cancellation:
   Some, in fact all, of the boys came to the party.
2. Suspension:
   Some, perhaps all, of the boys came to the party.

Gazdar's Incremental Account

Speaker has uttered A:

1. $e_0 := \{A\}$
2. e_1: Add all logical consequences to e_0.
3. e_2: Add all clausal implicatures which don't contradict e_1.
4. e_3: Add all scalar implicatures which don't contradict e_2.

Scalar implicatures are cancelled if they contradict logical consequences or clausal implicatures.

Suspension and Clausal Implicatures

a) stronger form	b) weaker form	c) implicature of weaker form
know *A*	believe *A*	$\Diamond A \wedge \Diamond\neg A$
necessarily *A*	possibly *A*	$\Diamond A \wedge \Diamond\neg A$
A and *B*	*A* or *B*	$\Diamond A \wedge \Diamond\neg A \wedge \Diamond B \wedge \Diamond\neg B$

1. Some, possibly all of the boys came to the party.
   $+>$ $\Diamond$ all came & $\Diamond$ not all came.
2. I believe that some of the boys came to the party.
   $+>$ $\Diamond$ all came & $\Diamond$ not all came.

Weak / Strong Implicature Distinction

[Sauerland, 2004]

1. In more recent papers, the distinction is drawn between:
   i. Weak Implicatures: Some $+> \neg\Box_S$ All.
   ii. Strong Implicatures: Some $+> \Box_S\neg$ All.
2. Rule: If consistent with what is known, draw strong implicature!

$\Rightarrow$ Cannot account for differences in Hirschberg–Style examples!

The Hirschberg–Style Example

Extension to Relevance Implicatures

1. A: Does this job candidate speak Spanish?
   1. He speaks Portuguese.
      $+>$ He does not speak Spanish.
   2. B: I know he speaks Portuguese.
      $+>$ B does not know whether he speaks Spanish.
2. A: How did the students do in the exam?
   1. B: Some students passed.
      $+>$ Not many passed.
   2. B: I know that some students passed.
      $+>$ B does not know whether many passed.

Problem

- Know does not create clausal implicatures.
- (Quality) $\Rightarrow$ Answers are equivalent.

The Non–Monotonic Component

Normality

A Classical Explanation

Scalar Implicatures

Example 3

"Some of the boys came to the party."

1. $\Box A(\forall) \rightarrow \mathrm{Utter}_S\ A(\forall)$ (Quantity)
2. $\mathrm{Utter}_S\ A(\exists)$ (fact)
3. $\neg\Box A(\forall)$ (follows from lines 1 & 2)
4. $\Box A(\exists)$ (follows from 2 and Quality)
5. $\Box A(\neg\exists) \vee \Box A(\exists \wedge \neg\forall) \vee \Box A(\forall)$ (Expert)
6. $\Box A(\exists \wedge \neg\forall)$ (follows from lines 3., 4., and 5.)

Expert: Assumption that the speaker is an expert, i.e. knows the true state of the world.

Compare also [de Jager, 2007].

A Classical Explanation

Suspension of Scalar Implicatures

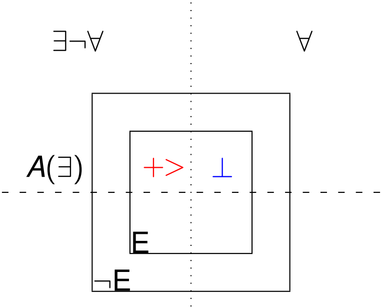
Example 4

"Some, perhaps all, of the boys came to the party."

1. $\Box A(\exists) \wedge \Diamond A(\forall)$ (logical form of utterance and Quality)
2. $\Box A(\neg\exists) \vee \Box A(\exists \wedge \neg\forall) \vee \Box A(\forall)$ (Expert)
3. $\Box A(\forall)$ (follows from previous lines)
4. $\Box A(\forall) \rightarrow \mathrm{Utters}_S\ A(\forall)$ (Quantity)
5. *Contradiction* (because speaker did not utter $A(\forall)$)
6. $\neg$(Expert) $\equiv \Diamond\neg A(\neg\exists) \wedge \Diamond\neg A(\exists \wedge \neg\forall) \wedge \Diamond\neg A(\forall)$
7. $\Box A(\exists) \wedge \Diamond A(\neg\forall) \wedge \Diamond A(\forall)$ (from the first and the previous line)

A Graphical Interpretation

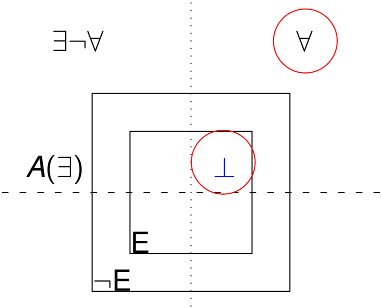
Scalar Implicature: speaker says $A(\exists)$.



$\bot \equiv$ contradicts maxims

A Graphical Interpretation

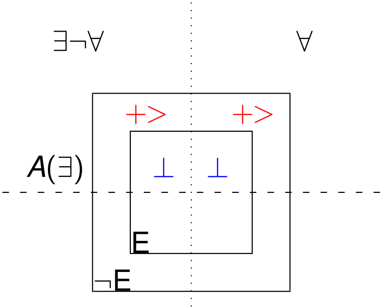
Cancellation: speaker says $A(\exists) \wedge \Box A(\forall)$.



$\perp \equiv$ contradicts maxims

A Graphical Interpretation

Suspension: speaker says $A(\exists) \wedge \Diamond A(\forall)$.



$\perp \equiv$ contradicts maxims

Normality

Definition 5 (Preferential Models)

Let $\mathcal{S}$ be the set of all support problems, then $\langle \mathcal{S}, \mathcal{C}, \sqsubseteq \rangle$ is a *preferential* model of support problems if

1. $\mathcal{C}$ a partition of $\mathcal{S}$,
2. $\sqsubseteq$ a well-founded linear order of $\mathcal{C}$.

We set

$$\mathrm{Min}(F) := \min\{C \in \mathcal{C} \mid \exists \sigma \in C \; F \in \mathrm{Op}_\sigma\}$$

with:

- Op_σ: optimal answers defined as before by backward induction;
- $\mathrm{Adm}_\sigma^{\mathcal{C}} := \{F \mid P_S^\sigma(F) = 1\} \setminus \{F \mid \exists C', \hat{\sigma} : \hat{\sigma} \in C' \sqsubseteq [\sigma]_{\mathcal{C}} \wedge F \in \mathrm{Op}_{\hat{\sigma}}\}$.
- $[\sigma]_{\mathcal{C}} := C$ iff $\sigma \in C$.

Normality

Definition 6 (The Principle of Normality)

Let $\langle \mathcal{S}, \mathcal{C}, \sqsubseteq \rangle$ be a preferential model of support problems, $F \in \mathcal{F}$, and $\sigma \in \mathrm{Min}(F)$, then an utterance of F implicates that H iff

$$\forall \hat{\sigma} \in [\sigma] \cap \mathrm{Min}(F) : \ A \in \mathrm{Op}_{\hat{\sigma}} \rightarrow P_E^{\hat{\sigma}}(H) = 1, \tag{1.2}$$

with $[\sigma]$ the set of all support problems that only differ in P_E from σ.

The Job Interview Example

The Job Interview Example

Example 7

H: Does this job candidate speak Spanish?

1. *S*: He speaks Portuguese.
   $+>$ He does not speak Spanish.
2. *S*: I know he speaks Portuguese.
   $+>$ *S* does not know whether he speaks Spanish.

Assumptions

1. There are two job candidates *a*, *b*;
2. *S* knows all about first candidate *a*;
3. *H* knows all about second candidate *b*;
4. Question is about first candidate *a*.

A Model I

Case $S(a)$ true; only un-boxed forms; speaker expert about candidate a.

$S(a)$	$P(a)$	$S(b)$	$P(b)$	$S(a)$	$P(a)$	$\neg S(a)$	$\neg P(a)$
+	+	+	+	1	1	·	·
+	+	+	−	1	0	·	·
+	+	−	+	1	1	·	·
+	+	−	−	1	1	·	·
+	−	+	+	1	·	·	1
+	−	+	−	1	·	·	1
+	−	−	+	1	·	·	1
+	−	−	−	1	·	·	1

1. All worlds equally probable
2. Spanish speaker much preferred over non-Spanish speaker.
3. Portuguese is a plus.

A Model II

Case $S(a)$ false; only un-boxed forms; speaker expert about candidate a.

$S(a)$	$P(a)$	$S(b)$	$P(b)$	$S(a)$	$P(a)$	$\neg S(a)$	$\neg P(a)$
$-$	$+$	$+$	$+$	·	1	1	·
$-$	$+$	$+$	$-$	·	1	1	·
$-$	$+$	$-$	$+$	·	1	1	·
$-$	$+$	$-$	$-$	·	1	1	·
$-$	$-$	$+$	$+$	·	·	1	1
$-$	$-$	$+$	$-$	·	·	1	1
$-$	$-$	$-$	$+$	·	·	1	0
$-$	$-$	$-$	$-$	·	·	1	1

Entries for modal sentences $\Box S(a), \Box P(a), \Box\neg S(a), \Box\neg P(a)$ for both tables identical to un-boxed forms.

Result

1. Predictions:
   1. $P(a)$ implicates that $\neg S(a)$;
   2. $\neg P(a)$ implicates that $S(a)$;
   3. $S(a)$ and $\neg S(a)$ do not lead to additional implicatures.
2. (Manner) implies modal forms will not be used.

$\Rightarrow$ No implicatures defined for modal forms.

$\Rightarrow$ Use of modal forms leads into contradiction.

$\Rightarrow$ Solved by dropping normality (= expert) assumption.

$\Rightarrow$ $\Box P(a)$ and $\neg$ (Expert) ($\equiv \Diamond\neg S(a) \vee \Diamond\neg P(a)$) implies $\Diamond\neg S(a)$.

Section 2

Efficient Clarification Requests and Expected Noise

Solving Ambiguities: Prashant Parikh

[Parikh, 2001]

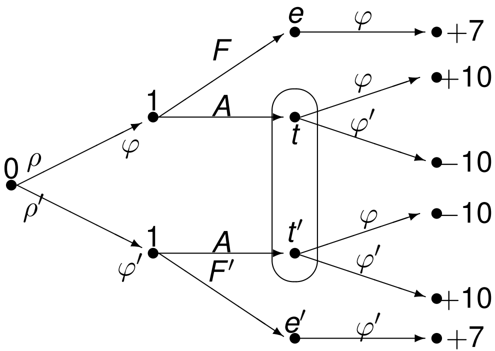
Example 8

1. Every ten minutes a man gets mugged in New York. (A)
2. Every ten minutes some man or other gets mugged in New York. (F)
3. Every ten minutes a particular man gets mugged in New York. (F')

Interpretations:

1. Every ten minutes one particular man gets mugged. (φ')
2. Every ten minutes there is some different person who gets mugged. (φ)

Parikh's Model



- φ': Every ten minutes one particular man gets mugged.
- For $\rho > \rho'$ the unique Pareto Nash equilibrium is:

S	φ	φ'
	A	*F'*

H	*A*	*F*	*F'*
	φ	φ	φ'

Explanation of Implicatures

1. Start with a signalling game $\mathcal{G}$.
2. Hearer can choose between many different interpretations of utterances, including their literal interpretation and their implicatures.
3. Impose pragmatic constraints and calculate the equilibria of this game which leads to a solution (S, H).
4. Implicature $A +> G$ is explained if the solution (S, H) satisfies

$$H(A) = G$$

i.e. if the hearer interprets A as meaning G.

Parikh's Disambiguation Principle

[Parikh, 2006, p. 111]

"[. . .] if ρ, ρ' are the shared probabilities of [S]'s intention to convey p, p′ respectively, and b, b′ are the respective marginal benefits of not conveying p, p′ explicitly then it can be shown that p is communicated with certainty if and only if ρ b > ρ' b′."

- In example: $b = b' = 10 - 7 = 3$.

$\Rightarrow$ $\rho > \rho'$ then simple, ambiguous *A* means φ with certainty!

The Challenging Example

Example 9 (Doctor's Appointment)

Background: John is known to regularly consult two different doctors, physicians A and B. He consults A more often than B.

S: John has a doctor's appointment at 4pm. He requests you to pick him up afterwards.

- Observation: *S* does not communicate that John is waiting at A's practice.
- Problem: Most frameworks support the following pragmatic principle:

  If utterance *U* has interpretation ϕ_1 and ϕ_2, and if interpretation ϕ_1 is more probable than ϕ_2, then the interpretation of *U* is ϕ_1.

Further Problem: Out–of–Petrol Example

Example 10 (Out of Petrol)

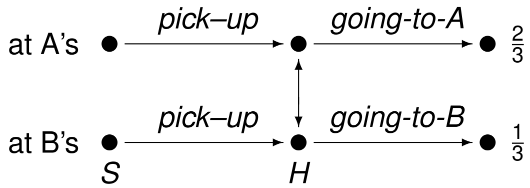
H is standing by an obviously immobilised car and is approached by *S*; the following exchange takes place:
H: I am out of petrol.
S: There is a garage round the corner. (*G*)
$+>$ The garage is open. (*R*)

Problem:

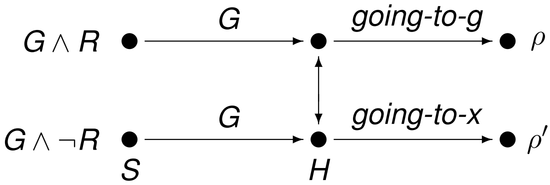
1. There seems to be no structural difference between the Out–of–Petrol example and the Doctor's Appointment example.
2. In both examples, there is no wider context which could be responsible for disambiguation.

Out–of–Petrol and Doctor's Appointment

- Doctor's Appointment:



- Out–of–Petrol:



Needed:

1. Explanation why *S*'s answer in the Doctor's Appointment example is not licensed.
2. What is the difference between the two examples?

Goal: Set up a general Model that

1. explains why the utterance in the Doctor's Appointment example is not communicating successfully.
2. predicts that the hearer reacts with a clarification request.

Some Intuition

1. The speaker mixed up private knowledge with common knowledge.
   $\Rightarrow$ Results in a mistake!
2. Hearer will react with a clarification request.

Efficiency of clarification requests:

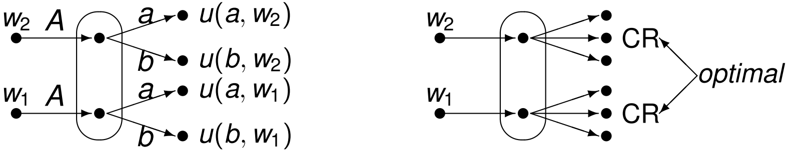
1. Costs of clarification requests are nominal.
2. Guarantee an unambiguous response.

Efficiency implies:

1. Better to reply with clarification request than to make risky choice.
2. But does not rule out all underspecified answers!

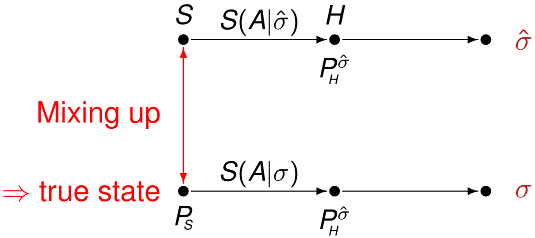
Efficient Clarification Requests

1. Natural reaction to Ambiguity: Clarification Request.
2. Clarification request efficient: Comes with nominal costs, guarantees maximal payoff.



Left: Without CR risky choice between *a* and *b*.

Noise Resulting from Speaker's Mistakes



- Optimal Assertions in σ: Set Op_σ
- Optimal Assertions in $\hat{\sigma}$: Set $\mathrm{Op}_{\hat{\sigma}}$
- Result of Mixing up: Speaker may produce assertions $\mathrm{Op}_\sigma \cup \mathrm{Op}_{\hat{\sigma}}$ in σ.

Uniquely Optimal Assertions

1. $\mathcal{N}_\sigma$: Set of possibly noisy assertions; e.g.

$$\bigcup\{\mathrm{Op}_{\hat{\sigma}} \mid \hat{\sigma} \text{ mixed up with } \sigma\}. \tag{2.3}$$

2. $\mathscr{B}(\sigma)$: Best actions given speaker's knowledge.
3. Set of actions which are speaker optimal in all situations σ in which A may be asserted by a perturbed or unperturbed speaker strategy:

$$\tilde{\mathscr{B}}(A) := \bigcap\{\mathscr{B}(\sigma) \mid A \in \mathcal{N}_\sigma\}. \tag{2.4}$$

4. Uniquely Optimal Assertions:

$$\mathrm{UOp}_\sigma := \{A \in \mathcal{N}_\sigma \mid \tilde{\mathscr{B}}(A) \neq \emptyset\}. \tag{2.5}$$

Efficient Clarification Requests and Best Response to Noisy Speaker Strategy

Assumption: Hearer can respond with efficient clarification requests CR:

- Clarification requests have nominal costs;
- Clarification requests can force the speaker to produce an $A \in \mathrm{UOp}_\sigma$.
- *Sufficient:* $\forall \sigma\, \mathcal{N}_\sigma \cap \mathrm{UOp}_\sigma \neq \emptyset$.

Then, the following hearer strategy is a Best Response to assertion A:

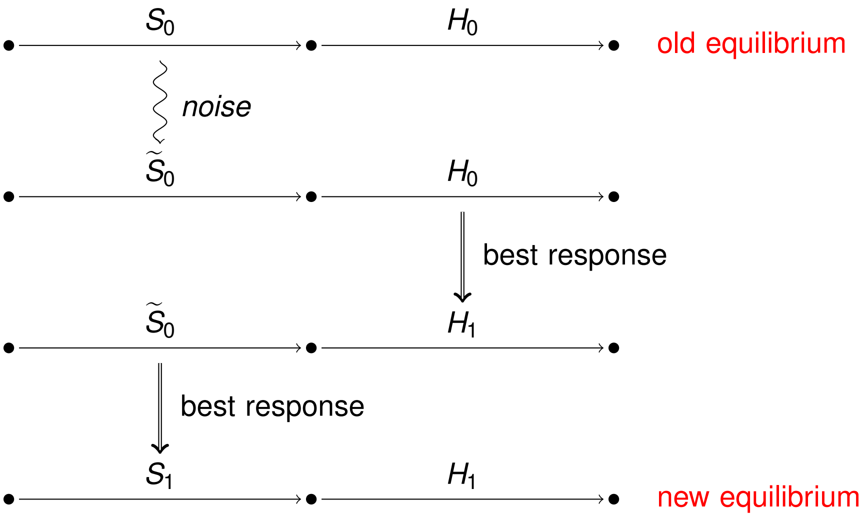
1. Choose some $a \in \tilde{\mathscr{B}}(A)$ if $\tilde{\mathscr{B}}(A) \neq \emptyset$,
2. Else responde with a Clarification request.

A New Equilibrium

This leads to a new equilibrium of unperturbed strategies:

- Hearer Strategy given A:
  - Choose some $a \in \tilde{\mathscr{B}}(A)$ if $\tilde{\mathscr{B}}(A) \neq \emptyset$,
  - Else responde with a Clarification request.
- Speaker Strategy given σ:
  - Choose answers from UOp_σ.

Iterated Best Response and Noise



Section 3

Examples: Noisy Communication

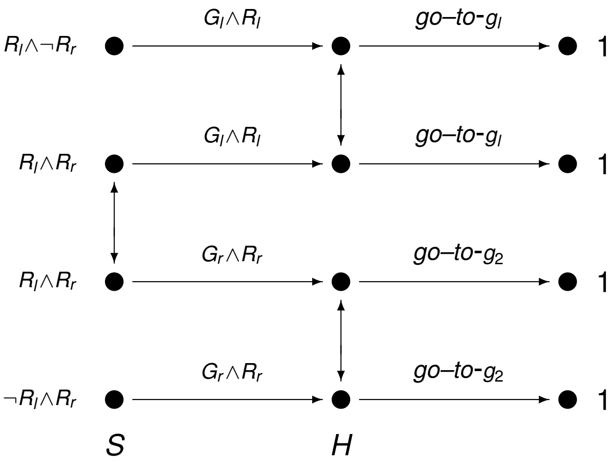
The Out–of–Petrol–Example

The Out–of–Petrol Example

Example 11 (Out of Petrol)

H is standing by an obviously immobilised car and is approached by *S*; the following exchange takes place:
H: I am out of petrol.
S: There is a garage round the corner. (*G*)
$+>$ The garage is open. (*R*)

Out–of–Petrol



Basic Observation I

Out–of–Petrol

$$\forall\sigma:\ \exists F(F \in \mathrm{Op}_\sigma \wedge G \lhd F) \Rightarrow R \lhd F. \quad (3.6)$$

- *G*: There is a garage round the corner.
- *R*: The garage is open.

- “$A \lhd F$” read: A is a sub-formula of F.

Basic Observation II

Doctor's Appointment

There exist support problems σ, σ' such that:

$$\exists F(F \in \mathrm{Op}_\sigma \wedge D \lhd F \wedge A \lhd F) \wedge \exists F(F \in \mathrm{Op}_{\sigma'} \wedge D \lhd F \wedge B \lhd F). \quad (3.7)$$

- *D*: Pick him up at the Doctor's practice.
- *A*: He is waiting at A's practice.
- *B*: He is waiting at B's practice.

- $A \lhd F$: *A* is a sub-formula of *F*.

Evaluation of Observations

1. In the Out–of–Petrol but not in the Doctor's Appointment example the utterance can be uniquely completed to an optimal answer.
2. Conclusion: There is a mechanism of unique optimal completion which is applied in the interpretation of the Out–of–Petrol example.
3. Prerequisite: The hearer H has to know the possible information states of the speaker and the possible optimal answers.
4. Hence: The hearer has to take the speaker's perspective into account in order to arrive at the implicature.

A Further Example

Standard Scalar Implicatures

1. All of the boys came to the party. ($F_{\forall}$)
2. Some of the boys came to the party. ($F_{\exists}$)
3. Some but not all of the boys came to the party. ($F_{\exists\neg\forall}$)
4. Not all of the boys came to the party. ($F_{\neg\forall}$)
5. None of the boys came to the party. ($F_{\neg\exists}$)

$$F_{\exists},\ F_{\neg\forall}\ \ +>\ \ F_{\exists\neg\forall}$$

Observation

1. $\{F \mid \exists\sigma\, F \in \mathrm{Op}_\sigma\} = \{F_\forall, F_{\neg\exists}, F_{\exists\neg\forall}\}$.
2. $F_\exists,\ F_{\neg\forall} \notin \{F \mid \exists\sigma\, F \in \mathrm{Op}_\sigma\}$.
3. Some and Not All are sub-forms of Some but not All:

$$F_\exists,\ F_{\neg\forall}\ \lhd\ F_{\exists\neg\forall}$$

Hypothesis

Speaker

1. Source of Noise: Speaker may delete *redundant* information.
2. Redundant: If all answers which contain F_1 also contain F_2, then it may happen that the speaker deletes F_2.

Hearer

If a non–optimal form G can be uniquely completed to an optimal super–form F, then G inherits the implicatures of F.

Principle of Optimal Completion

The Noise

Setting up the Model

1. Let $\mathcal{S}$ be a set of support problems which may only differ with respect to P_S.
2. Let $\lhd$ be a relation on $\mathcal{F}$ which is defined as by:

$$i)\ F \lhd F, \quad ii)\ G \equiv F_1 \wedge F_2 \,\&\, (F \lhd F_1 \vee F \lhd F_2), \text{ then } F \lhd G. \tag{3.8}$$

3. Then set:

$$\mathcal{N}_\sigma := \mathrm{Op}_\sigma \cup \{F \mid \exists G \in \mathrm{Op}_\sigma\ F \lhd G\}. \tag{3.9}$$

Derivation of Optimal Completion

With

$$\mathcal{N}_\sigma := \mathrm{Op}_\sigma \cup \{F \mid \exists G \in \mathrm{Op}_\sigma\; F \lhd G\}.$$

It follows that:

$$\begin{aligned}\mathrm{UOp}_\sigma &= \{F \in \mathcal{N}_\sigma \mid \tilde{\mathscr{B}}(F) \neq \emptyset\} \\ &= \{F \in \mathcal{N}_\sigma \mid \exists a \in \mathcal{A}\, \forall\sigma \forall G \in \mathrm{Op}_\sigma\, (F \lhd G \Rightarrow a \in \mathscr{B}(\sigma))\}.\end{aligned}$$

For $\mathcal{S}$ given, set

$$\mathrm{UOp} := \bigcup_{\sigma\in\mathcal{S}} \mathrm{UOp}_\sigma.$$

Lemma 12

Let $\mathcal{S}$ be a set of support problems with joint decision problem $\langle(\Omega, P_H), \mathcal{A}, u\rangle$. Assume furthermore that

1. *S is an expert for every $\sigma \in \mathcal{S}$,*
2. $\forall v \in \Omega\, \exists \sigma \in \mathcal{S}\, P_S^\sigma(v) = 1$.

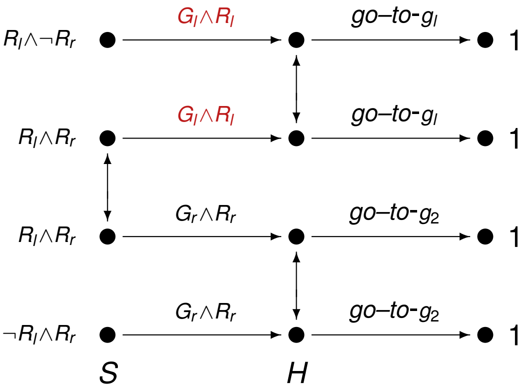
Let

$$\mathcal{N}_\sigma := \mathrm{Op}_\sigma \cup \{F \mid \exists G \in \mathrm{Op}_\sigma\ F \lhd G\}.$$

Then for $F \in \mathrm{UOp}$, $R \subseteq \Omega$ it follows that:

$$F +\!> R \text{ iff } \forall G\, (\exists \sigma\ G \in \mathrm{Op}_\sigma \wedge F \lhd G \Rightarrow G^* \cap G^+ \subseteq R).$$

Out–of–Petrol



Another Example: Bus Tickets

[Benz, 2008]

Example 13

H: Where can I get the bus tickets for the excursion?

1. *S*: Ms. Müller is sitting in office 2.07. (F_M)
2. *S*: Bus tickets are available from Ms. Müller. (F_H)
3. *S*: Bus tickets are available from Ms. Müller. She is sitting in office 2.07. (F_{MH})

Ω	H	M	go-to-2.07	**n**
w_1	$+$	$+$	1	ε
w_2	$+$	$-$	0	ε
w_3	$-$	$+$	0	ε
w_4	$-$	$-$	1	ε

$$\Rightarrow F_M \notin \{F \mid \exists\sigma\, F \in \mathrm{Op}_\sigma\}, \quad F_{MH} \in \{F \mid \exists\sigma\, F \in \mathrm{Op}_\sigma\}, \quad F_M \lhd F_{MH},$$

The Doctor's Appointment–Example

The Doctor's Appointment Example

Example 14 (Doctor's Appointment)

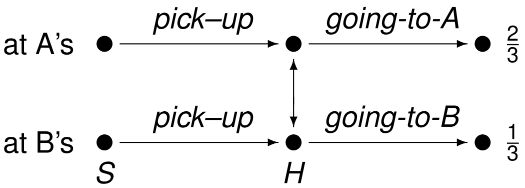
Background: John is known to regularly consult two different doctors, physicians A and B. He consults A more often than B.

S: John has a doctor's appointment at 4pm. He requests you to pick him up afterwards.

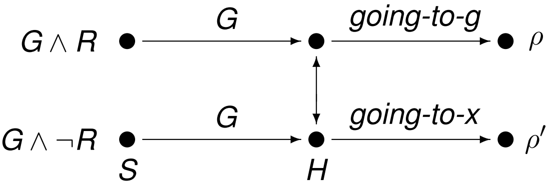
$+>^*$ John is waiting at A's practice.

Out–of–Petrol and Doctor's Appointment

- Doctor's Appointment:



- Out–of–Petrol:



The Noise

Assumptions:

- Identify Common Ground with hearer's information P_H;
- Speaker is expert, i.e. for all σ: $\exists v\, P_S^\sigma(v) = 1$.
- $\hat{\sigma}_1$: $P_H^{\hat{\sigma}_1}$(John was going to A's practice) $= 1$.
- $\hat{\sigma}_2$: $P_H^{\hat{\sigma}_2}$(John was going to B's practice) $= 1$.
- D is an optimal assertion in $\hat{\sigma}_1$ and $\hat{\sigma}_2$.
- σ: P_H^σ(John was going to A's practice) < 1 and P_H^σ(John was going to A's practice) < 1.

Mixing up the support problems means:

$$\mathcal{N}_\sigma = \mathrm{Op}_\sigma \cup \mathrm{Op}_{\hat{\sigma}_1} \cup \mathrm{Op}_{\hat{\sigma}_2}. \quad (3.10)$$

The union of the optimal answers in σ, $\hat{\sigma}_1$, $\hat{\sigma}_2$.

The Solution

- Hearer has to choose between two actions:

$$\textit{going-to-A} \;\text{ and }\; \textit{going-to-B}$$

- *going-to-A* is successful iff John was going to A's practice;
- *going-to-B* is successful iff John was going to B's practice;

Hence

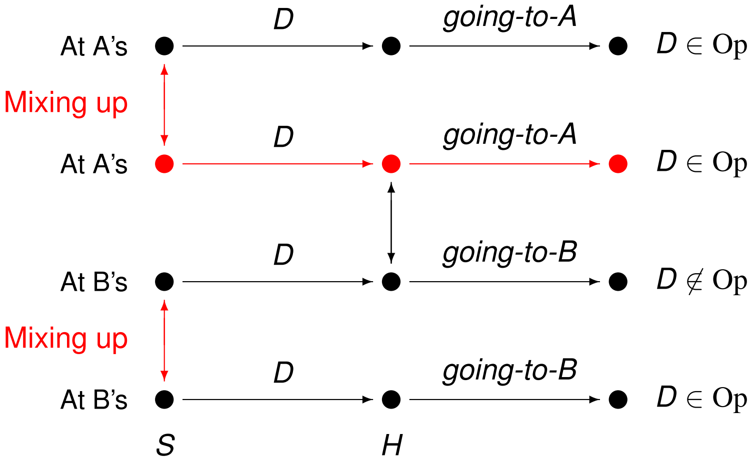
- $\mathscr{B}(\hat{\sigma}_1) = \{\textit{going-to-A}\}$ and $\mathscr{B}(\hat{\sigma}_2) = \{\textit{going-to-B}\}$.

and

$$\tilde{\mathscr{B}}(D) \subseteq \mathscr{B}(\hat{\sigma}_1) \cap \mathscr{B}(\hat{\sigma}_2) = \emptyset. \tag{3.11}$$

Prediction: Assertion D will be answered by a clarification request.

Graphical Representation

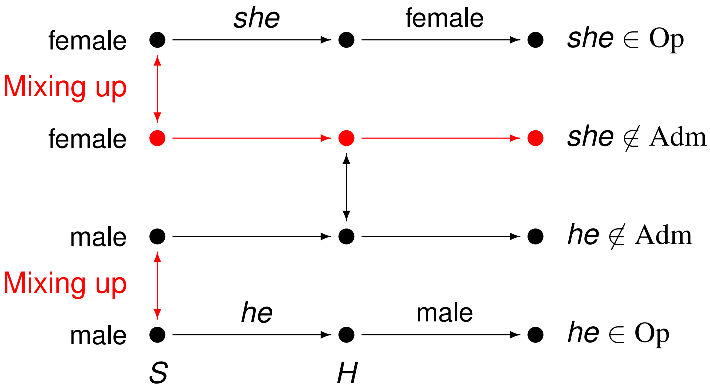


Examples with Accommodation

Accommodation I

Example 15

Smith entered the room. She was wearing a red dress.



Accommodation II

Example 16

Due to construction work this train is ending here. Please, follow the signs to the replacement bus service. We thank you for your understanding.

- Speaker wants to show that she is polite.
- Speaker implicates that the (A) need for construction work is a compelling reason for accepting the inconvenience of replacement services.

Accommodation II

Example 16

Due to construction work this train is ending here. Please, follow the signs to the replacement bus service. We thank you for your understanding. (TH)

- Speaker wants to show that she is polite.
- Speaker implicates that the (A) need for construction work is a compelling reason for accepting the inconvenience of replacement services.

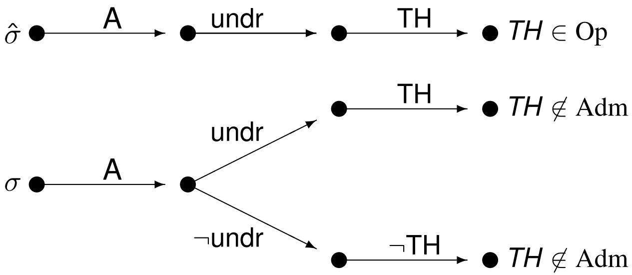
Accommodation II

Example 16

Due to construction work this train is ending here. Please, follow the signs to the replacement bus service. We thank you for your understanding. (TH)

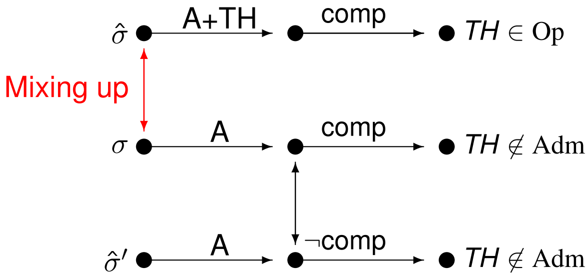
- Speaker wants to show that she is polite.
- Speaker implicates that the (A) need for construction work is a compelling reason for accepting the inconvenience of replacement services.

The Model I



- undr: Hearer has understanding (because argument *A* is compelling).
- TH: Thanks for understanding.

The Model II



- comp: The argument A is compelling ($\Rightarrow$ Hearer has understanding).
- TH: Thanks for understanding.

The Solution

- Hearer has to choose between two actions: *comp* and $\neg$*comp*.
- *comp* is successful iff argument *A* is compelling;
- $\neg$*comp* is successful iff argument *A* is not compelling;

Hence:

- $\{comp\} = \mathscr{B}(\hat{\sigma}), \mathscr{B}(\sigma)$
- $\{\neg comp\} = \mathscr{B}(\hat{\sigma}')$.

hence $TH \in \mathcal{N}_\sigma, \mathcal{N}_{\hat{\sigma}}$ but $TH \notin \mathcal{N}_{\hat{\sigma}'}$.

$$\tilde{\mathscr{B}}(TH) := \bigcap \{\mathscr{B}(\sigma) \mid TH \in \mathcal{N}_\sigma\} = \{comp\} \tag{3.12}$$

Prediction: *TH* will implicate that the argument is compelling.

The End

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