Integrated Pragmatic Values (Potts 2005)

Lecture Notes, LING 590

Feb. 23, 2009

> As part of linguistics and philosophy of language, pragmatics does not provide detailed explanations of how interpretation works in actual practice. This is a problem for cognitive and social psychology. For this reason it seems futile for linguists to seek a formal pragmatics. *Bach (1999)*

[I've removed the Sidney Harris cartoon, to which Potts alludes in his paper, from the web version for copyright reasons. The original can be found on Harris's website at http://www.sciencecartoonsplus.com/gallery/math/math07.gif .]

1. FORMALIZING GRICEAN MAXIMS

General Scenario

We plan to buy plane tickets to visit Barbara. *Q(uestioner)* asks *A(nswerer)*:

(1) Where does Barbara live?

Scenario 1

- *A* knows which country Barbara lives in, but not which city. *A* says:

(2) She lives in Russia.

- *Q* concludes: *A* had no more specific information.

Scenario 2

- *A* knows Barbara's exact street address. *A* says:

(3) She lives in Moscow.

- *Q* does not conclude: *A* had no more specific information.

1.1. The Standard Gricean analysis

<u>*Scenario 1*</u>

Q thinks: *A* uttered (2) rather than the more informative:

(2′) She lives in Moscow.

(2′) is relevant to the conversation and (2′) ⊦ (2), so *A* must have been obeying a Gricean maxim by not uttering (2′). Because it's equivalent in manner and relevance and offers greater Quantity, *A* must have been obeying the Maxim of Quality. Therefore, *A* either believed (2′) to be false, or does not have evidence to believe it is true. Of course, *A* also did not utter (2″)

(2″) She lives in St. Petersburg.

or indeed any other similar statement, and it can't be the case that *A* thinks all of them are false (or else Barbara couldn't actually live in Russia). Therefore *A* must lack evidence for (2′).

<u>*Scenario 2*</u>

Q thinks: *A* uttered (3) rather than the more informative:

(3′) She lives on Tallinskaja Street in Moscow.

(3′) isn't notably worse in manner, and (3′) ⊦ (3), so *A* must have been obeying a Gricean maxim by not uttering (3′). But in fact, because I want to buy a plane ticket, it doesn't especially matter what street she lives on, and thus (3′) would violate the Maxim of Relevance.[1] Therefore I shouldn't conclude anything about whether *A* believes (3′) or not, as that doesn't bear on why *A* chose not to say it.

[1] Or Quantity ("do not say more than is required")? See below.

2. THE SETUP

2.1. *Our model*

$$W = \{w_1, w_2, w_3, w_4, w_5, w_6, w_7, w_8\}$$

⟦*B. lives in Russia*⟧				⟦*B. lives in America*⟧			
⟦*B. lives in Moscow*⟧		⟦*B. lives in Petersburg*⟧		⟦*B. lives in New York*⟧		⟦*B. lives in Northampton*]	
w_1	w_2	w_3	w_4	w_5	w_6	w_7	w_8

⟦*Where does Barbara live?*⟧ = $\{p_{st} \mid \exists x : x$ is a city . $p = \lambda w$. Barbara lives in x in $w\}$ =

$$\left\{ \begin{array}{c} [\![\textit{Barbara lives in Moscow}]\!], [\![\textit{Barbara lives in Petersburg}]\!] \\ [\![\textit{Barbara lives in New York}]\!], [\![\textit{Barbara lives in Northampton}]\!] \end{array} \right\} = \left\{ \begin{array}{c} \{w_1, w_2\},\{w_3, w_4\} \\ \{w_5, w_6\},\{w_7, w_8\} \end{array} \right\}$$

2.2. *Knowledge/belief states of* Q *and* A

Belief state of *Q* = the worlds compatible with what *Q* believes = *W*
Belief state of *A* ...

- Scenario 1: "*A* knows which country Barbara lives in, but not which city." ≡ the belief state of *A* is $\{w_1, w_2, w_3, w_4\}$

- Scenario 2: "*A* knows Barbara's exact street address." ≡ the belief state of *A* is $\{w_1\}$

2.3. *Modeling propositions (thus belief states) with probability distributions*

P is a probability distribution iff

- $P(W) = 1$
- $P(\{w\}) \geq 0$ for all $w \in W$
- $P(\{w_1, w_2\}) = P(\{w_1\}) + P(\{w_2\})$ for all $w_1, w_2 \in Q$

A probability distribution P mimics a proposition *q* iff

- $P(\{w\}) = 0$ if $w \notin q$
- $P(\{w\}) = P(\{w'\})$ for all $w, w' \in q$

which is to say

- $P(\{w\}) = 1/|q|$ for all $w \in q$

e.g. the P that mimics ⟦*Barbara lives in Russia*⟧ = $\{w_1, w_2, w_3, w_4\}$ is $\begin{bmatrix} \{w_1\} & \rightarrow & .25 \\ \{w_2\} & \rightarrow & .25 \\ \{w_3\} & \rightarrow & .25 \\ \{w_4\} & \rightarrow & .25 \\ \{w_5\} & \rightarrow & 0 \\ \{w_6\} & \rightarrow & 0 \\ \{w_7\} & \rightarrow & 0 \\ \{w_8\} & \rightarrow & 0 \end{bmatrix}$

3. THE PAYOFF

3.1. Provisional updating of belief states

Suppose I do not know exactly how many cats Ed has. (For simplicity, let's assume Ed lives in a town where owning more than four cats is illegal, and I believe Ed is law-abiding.)

- my belief state = ⟦*Ed has exactly zero cats*⟧ ∪ ⟦*Ed has exactly one cat*⟧ ∪ ⟦*Ed has exactly two cats*⟧ ∪ ⟦*Ed has exactly three cats*⟧ ∪ ⟦*Ed has exactly four cats*⟧
- P = [{0 cats} → .2, {1 cat} → .2, {2 cats} → .2, {3 cats} → .2, {4 cats} → .2]

<u>*Scenario A*</u>: You assert: "Ed has exactly two cats." I think you're trustworthy.

- my belief state = ⟦*Ed has exactly two cats*⟧
- P = [{2 cats} → 1]

<u>*Scenario B*</u>: You assert: "Ed has exactly two cats." I'm not 100% sure I should believe you.

- my belief state = unchanged?
- P = [{0 cats} → .05, {1 cat} → .05, {2 cats} → .8, {3 cats} → .05, {4 cats} → .05]

<u>*Scenario C*</u>: You assert: "Ed has two cats." I think you're trustworthy.

- my belief state = ⟦*Ed has exactly two cats*⟧ ∪ ⟦*Ed has exactly three cats*⟧ ∪ ⟦*Ed has exactly four cats*⟧
- P = [{2 cats} → .8, {3 cats} → .1, {4 cats} → .1]
  (to change if you continue "in fact, exactly two" or "in fact, he has four")

3.2. Formalizing Gricean maxims

(4) The Maxim of Quality: Try to make your contribution one that is true.

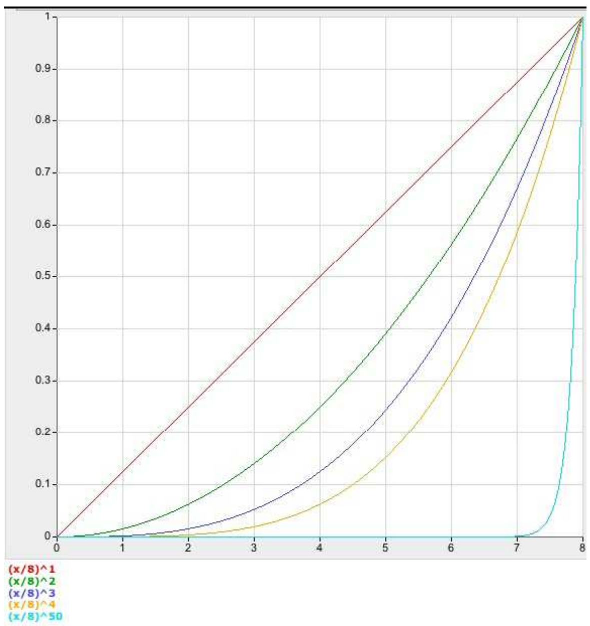
Old system (roughly): A asserts p if $P_{\text{A's belief state}}(p) = 1$
New system: A asserts p if $\text{Quality}_C(p)$ is sufficiently high in the context C, where

$$\text{Quality}_C(p) = [P_{\text{A's belief state}}(p)]^n$$

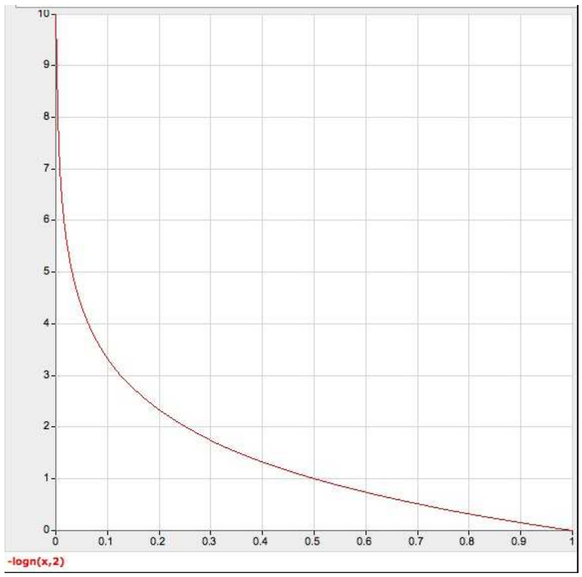
(and we'll use $n = 4$)

(5) The Maxim of Quantity: Maximize the information in your contribution.

$$\text{Quantity}_C(p) = -\log_2 P_{\text{Q's belief state}}(p)$$



$y = x^n$, for n = 1, 2, 3, 4, 50



$y = -\log_2(x)$

(6) Quality Quantity Rating (or QQ-Rating)

$$QQ_C(p) = \text{Quality}_C(p) \cdot \text{Quantity}_C(p)$$

3.3. Putting the formalism to work

Scenario 1

- *Q* doesn't know anything about where Barbara lives.

  $P_{Q\text{'s belief state}}(\{w\}) = .125$ for all $w \in W$

- *A* knows which country Barbara lives in, but not which city.

  $P_{A\text{'s belief state}}(\{w\}) = .25$ for all $w \in \{w_1, w_2, w_3, w_4\}$

Proposition	**Quality-rating**	**Quantity-rating**	**QQ-rating**
⟦*B. lives in Moscow*⟧	$[P_A(p)]^4 = .5^4 = .0625$	$-\log_2 P_Q(p) = -\log_2(.25) = 2$	$.0625 \cdot 2 = .125$
⟦*B. lives in Petersburg*⟧	.0625	2	.125
⟦*B. lives on Tallinsk.*⟧	$.25^4 = .00390625$	$-\log_2(.125) = 3$	.01171875
☞ **⟦*B. lives in Russia*⟧**	$\mathbf{1^4 = 1}$	$\mathbf{-\log_2(.5) = 1}$	**1**
⟦*B. lives somewhere*⟧	1	$-\log_2(1) = 0$	0

Scenario 2

- *Q* doesn't know anything about where Barbara lives.

  $P_{Q\text{'s belief state}}(\{w\}) = .125$ for all $w \in W$

- *A* knows Barbara's exact street address.

  $P_{A\text{'s belief state}}(\{w\}) = 1$ for w_1, 0 otherwise

Proposition	**Quality-rating**	**Quantity-rating**	**QQ-rating**
☜⟦*B. lives in Moscow*⟧	1	2	2
⟦*B. lives in Petersburg*⟧	0	2	0
💣 **⟦*B. lives on Tallinsk.*⟧**	**1**	**3**	**3**
⟦*B. lives in Russia*⟧	1	1	1
⟦*B. lives somewhere*⟧	1	0	0

(7) The **relevance-ranking** of propositions with respect to a question Q is the numerical ordering induced by Ans, except that we throw out (do not rank) a proposition *p* iff there is a distinct proposition *q* with the same Ans value as *p* but a lower Quantity value than *p*.

Ans: the cardinality of the set of propositions in the question consistent with the answer.

Note: "where" = "what street": $\left\{ \begin{matrix} \{w_1\}, \{w_2\}, \{w_3\}, \{w_4\} \\ \{w_5\}, \{w_6\}, \{w_7\}, \{w_8\} \end{matrix} \right\}$

"what city": $\left\{ \begin{matrix} \{w_1, w_2\}, \{w_3, w_4\} \\ \{w_5, w_6\}, \{w_7, w_8\} \end{matrix} \right\}$

"what country": $\left\{ \begin{matrix} \{w_1, w_2, w_3, w_4\} \\ \{w_5, w_6, w_7, w_8\} \end{matrix} \right\}$

(8) **Maximally-felicitous utterances**
The set of maximally felicitous utterances in C is set of utterances whose propositional content have the highest QQ-rating of all the relevance-ranked propositions in C.

<u>*Scenario 1*</u>

Proposition	**Quality-rating**	**Quantity-rating**	**QQ-rating**	**Relevance**
⟦*B. lives in Moscow*⟧	.0625	2	.125	1
⟦*B. lives in Petersburg*⟧	.0625	2	.125	1
⟦*B. lives on Tallinsk.*⟧	.0039	*3*	.0118	*1*
☞**⟦*B. lives in Russia*⟧**	**1**	**1**	**1**	**2**
⟦*B. lives somewhere*⟧	1	0	0	4

<u>*Scenario 2*</u>

Proposition	**Quality-rating**	**Quantity-rating**	**QQ-rating**	**Relevance**
⟦*B. lives on Tallinsk.*⟧	1	*3*	3	*1*
☞**⟦*B. lives in Moscow*⟧**	**1**	**2**	**2**	**1**
⟦*B. lives in Petersburg*⟧	0	2	0	1
⟦*B. lives in Russia*⟧	1	1	1	2
⟦*B. lives somewhere*⟧	1	0	0	4