Lecture 5: OT Semantics/Pragmatics

The Aim

Bringing together:

- The tradition of *Radical Pragmatics*
- The view of *Optimality Theory*

Advantages

For *Radical Pragmatics*	For *Optimality Theory*
Improved analyses	New applications
theoretical stringency	Motivating the constraints
the emergence of iconicity	New ideas about grammaticalization and language change

Outline

1. Meaning and Interpretation
2. Blocking and global theories of language
3. Literalism vs. contextualism
4. Optimality Systems
5. The Motivation for Strong Bidirectionality
6. Weak Bidirectionality and Constructional Iconicity
7. Example: Negative Strengthening

1 Meaning and Interpretation

The observation: Linguistically encoded information doesn't fully specify the truth conditions of a sentence.

- Katz & Fodor (1963): A full account of sentence interpretation has to include more information than that of syntactic structure and lexical meaning.

  a. *Should we take the lion back to the zoo?*
  b. *Should we take the bus back to the zoo?*

- Psycholinguistics: Mental models, situation structure,...
  The tones sounded impure because the hem was torn.

The tones sounded impure because the hem was torn.

Theoretical Models

- Kaplan's distinction between *character* and *intension*

  intension = character(c)

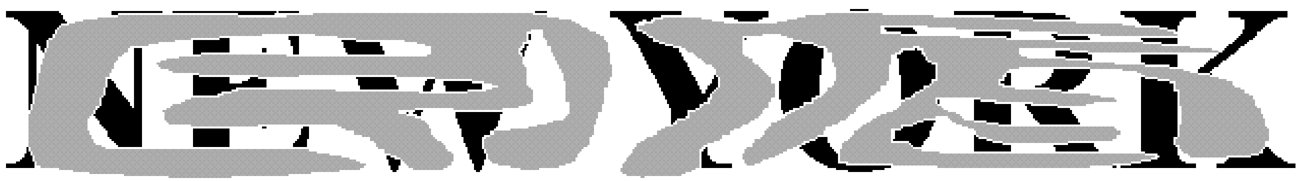
- **Radical Underspecification View**

  Underspecified representations + contextual enrichment (Hobbs 1983, Alshawi 1990, Poesio 1991, Pinkal 1995, etc.)

  => Find optimal enrichments!

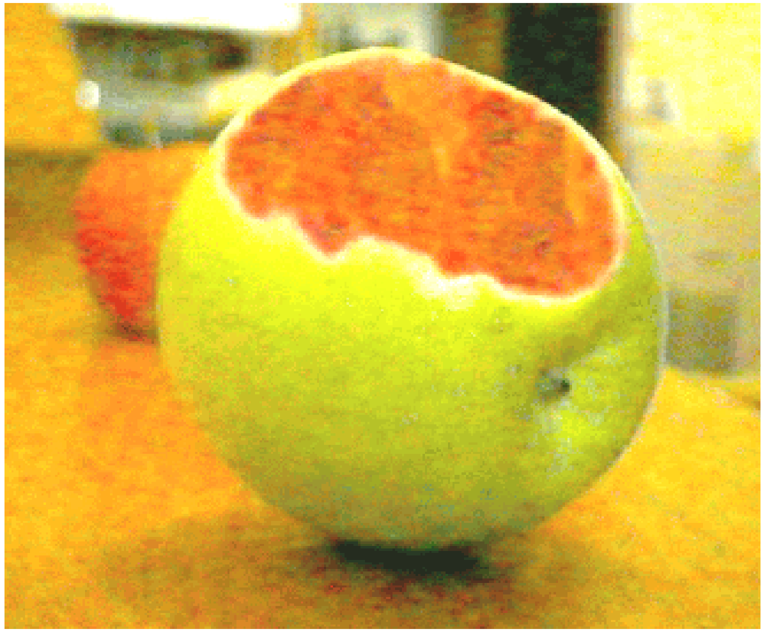
SCOTTISH PIPER

Example: Pattern underspecification and completion



Linguistic example: Attributive modification

- *a red apple* [red peel]
- *a sweet apple* [sweet pulp]
- *a reddish grapefruit* [reddish pulp]
- *a white room/ a white house* [inside/outside]



A red apple?

What color is an apple?

Q_1 What color is its peel?

Q_2 What color is its pulp?

Other examples from lexical pragmatics

– John ate breakfast [this morning; in the normal way]	free enrichment
– Every boy [in the class] is seated	domain restriction
– Peter began a novel [to read/ to write]	Pustejovsky
– I‘m parking outside [my car]	deferred inference
– Max is tall [for a fifth grader]	comparison class
– What color is a red nose, red flag, red bean?	Herb Clark
– This apple is red [on the outside]	

2 Blocking and global theories of language

Local Theories

The (grammatical) status of a (linguistic) object LO is decided exclusively considering properties of LO, and the properties of other linguistic objects LO' are completely irrelevant for this decision.

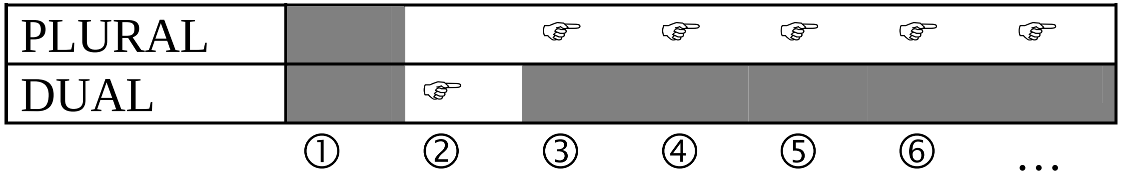
Examples: Traditional Generative Linguistics, Model Theoretic Semantics.

Global Theories (Competition-based)

There are different linguistic objects in competition. The winner of the competition suppresses the other competing candidates, ruling them out from the set of well-formed linguistic objects.

Examples: Early Structuralism (Saussure), Field Theories, Prototype Theories, Optimality Theory, Connectionism.

Blocking



The value of a German or Latin **plural** is not the value of a Sanskrit plural. But the meaning, if you like, is the same. In Sanskrit, there is the dual. Anyone who assigns the same value to the Sanskrit plural as to the Latin plural is mistaken because I cannot use the Sanskrit plural in all the cases where I use the Latin plural.

If you take on the other hand a simple lexical fact, any word such as, I suppose, **mouton** (French) may have the same meaning as **sheep** in English. However, it doesn't have the same value. For if you speak of the animal on the hoof and not on the table, you say sheep. It is the presence in the language of a second term (mutton) that limits the value attributable to sheep.

Notes taken by a student of Saussure's lectures [4 July 1911]

3 Literalism vs. contextualism

The Gricean picture: Literalism

- Using the meanings of the words plus the syntactic structure of the sentence, a minimal proposition for capturing the literal meaning of the sentence can be determined
- Context-dependencies of literal meaning can only arise from indexical expressions.
- No semantic underdetermination is involved, no unarticulated constituents*.
- Pragmatic mechanism of contextual strengthening (Conversational implicature)

* This term refers to the idea of explaining the near equivalence of sentences such as ‘it is raining’ and ‘it is raining here’ by assuming an unarticulated constituent of place in the first sentence. It is a *constituent*, because there is no truth-evaluable proposition unless a place is supplied (since rain occurs at a time in a place). It is *unarticulated*, because there is no morpheme that designates that place (Perry 2003)

Conversational Implicatures: Some Standard Examples

(Q1) Some of the boys are at the party

=> Not all of the boys are at the party

(*Scalar implicatures*, Gazdar 1979)

(Q2) Rick is a philosopher or a poet

=> Rick is not both a philosopher and a poet

(*Scalar implicatures*, Grice 1968; Atlas and Levinson 1981)

(Q3) Rick is a philosopher or a poet

=> Rick may (not) be a philosopher; Rick may (not) be a poet

(*Clausal implicatures*, Gazdar 1979; Atlas and Levinson 1981)

(I1) If you mow the lawn, I'll give you $5

=> If and only if you move the lawn, will I give you $5

(*Conditional perfection*, Geis & Zwicky, 1971)

(I2) John unpacked the picnic. The beer was warm.

=> The beer was part of the picnic.

(*Bridging*, Clark & Haviland, 1977)

(I3) John said 'Hello' to the secretary and then he smiled

=> John said 'Hello' to the female secretary and then he smiled

(*Inference to stereotype*, Atlas & Levinson 1981)

The neo-/post-Gricean picture: Contextualism

- **Basic ideas**
  - Using the meanings of the words plus the syntactic structure of the sentence, it is not possible to calculate the literal meaning of the sentence. Some kind of underdetermined representation can be computed only.
  - Semantic underdetermination and the existence of unarticulated constituents are postulated.
  - The mechanism of pragmatic interpretation is crucial both for determining what the speaker says and what she means.

- **Explicature**: what the speaker says. Truth-conditional pragmatics
- **Implicature**: what the speaker means (conversational implicature in the narrower sense)

- **Variants of contextualism**
  - Neo-Gricean theories (Horn, Atlas)
  - Relevance theory (Sperber, Wilson, Carston)
  - Presumptive meanings (Levinson 2000)
  - OT pragmatics

Levinson’s typology of implicatures

- The Q-heuristics: (*For the relevant salient alternates*) W*hat isn’t said is not the case.*
    - Scalar implicatures

      some of the boys came => not all of the boys came
    - Clausal implicatures

      If John comes, I'll go => maybe he will, may be he won't

- The I-heuristics: *What is expressed simply is stereotypically exemplified*
    - *kill => stereotypical interpretation*
    - Conditional perfection (*B*, *if A => B iff A*)
    - Bridging inferences
    - **Negative strengthening**
    - The effect of “neg-raising”

- The M-heuristics: *What is said in an abnormal way isn’t normal*
    - **Pragmatic effects of double negatives**
    - Periphrastic alternatives to simple causatives

Remark: Levinson tries to turn this heuristic classification scheme into a general theory by stipulating a ranking Q > M > I. We accept the classification schema but not the theory. (Instead, we consider M as an *epiphenomenon* that results from the interaction of Zipf's two "economy principles").

Neo-Gricean theories and optimization (Atlas & Levinson, Horn)

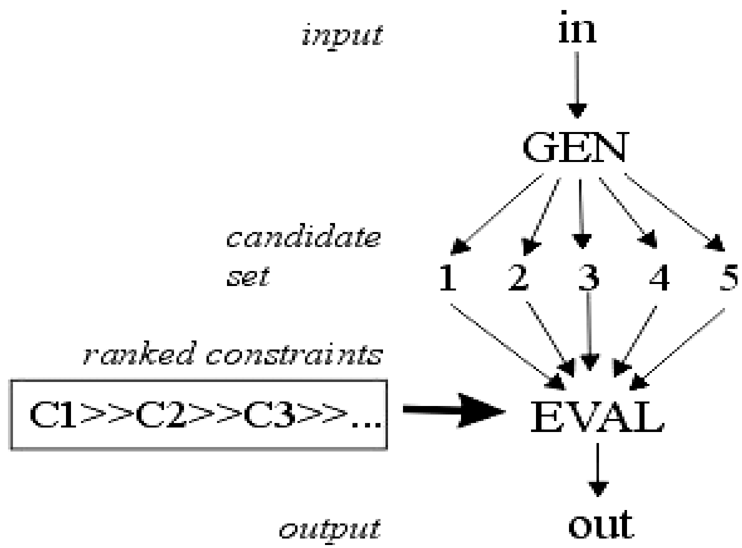
I-principle (termed R by Horn)	Q-principle
Quantity 2, Relation	Quantity 1
Say no more than you must (given Q) (Horn 1984)	*Say as much as you can (given I)* (Horn 1984).
Read as much into an utterance as is consistent with what you know about the world (bearing the Q-principle in mind). [Levinson 1983: 146f.]	*Do not provide a statement that is informationally weaker than your knowledge of the world allows, unless providing a stronger statement would contravene the I-principle* [Levinson 1987: 401]
Conditional perfection, *neg-raising*, bridging	Scalar implicatures
Seeks to select the most *harmonic* interpretation	Can be considered as a blocking mechanism
Interpretive Optimization	**Expressive Optimization**

4 Optimality Systems

Basics

- An optimality system O is an triple $\langle$**GEN**, C, $>>\rangle$ where

  - **GEN** is a relation — Universal basis
  - C is a set of functions from **GEN** to $\underline{\underline{N}}$ — universal constraints
  - $>>$ is a linear ordering on C — language-particular ranking



- The ranking $>>$ of the constraints constitutes a well-founded preference relation $<_O$ between pairs π of **GEN** (read $<_O$ as *less costly* or *more harmonic*):
  $\pi <_O \pi'$ iff there is a $c \in C$ such that $c(\pi) < c(\pi')$ and for all $c' >> c$: $c'(\pi) = c(\pi)$

Definition (unidirectional and bi-directional optimality)

Let $O = \langle \mathbf{GEN}, C, >> \rangle$ be an OT-system. Assume that GEN reflects the direction of interpretation; for example with $\langle a, b\rangle \in \mathbf{GEN}$ assume that a is a syntactic form and b a semantic form.

- A pair $\langle a, b\rangle$ is called *Hearer optimal* w.r.t. O iff

  (i) $\langle a, b\rangle \in \mathbf{GEN}$

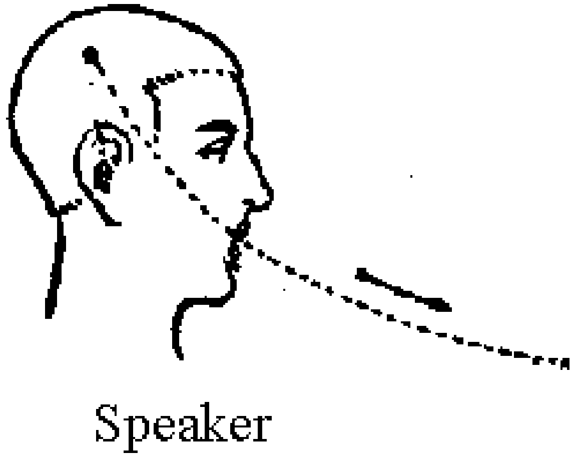
  (ii) there is no b' such that $\langle a, b'\rangle \in \mathbf{GEN}$ and $\langle a, b'\rangle <_O \langle a, b\rangle$

- A pair $\langle a, b\rangle$ is called *Speaker optimal* w.r.t. O iff

  (i) $\langle a, b\rangle \in \mathbf{GEN}$

  (ii) there is no a' such that $\langle a', b\rangle \in \mathbf{GEN}$ and $\langle a, b'\rangle <_O \langle a, b\rangle$

- A pair $\langle a, b\rangle$ is called (*strongly*) *optimal* w.r.t. O iff it is both Speaker and Hearer optimal.



Phonology, Morphology:
Prince & Smolensky (1989);
McCarthy & Prince (1993); …

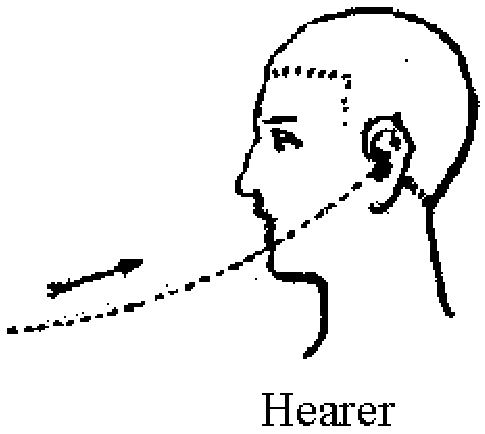
Syntax: Grimshaw (1997);
Bresnan (1999); …

Optimal Generation

Semantics: de Hoop & de Swart (1999) ; de Hoop & Hendriks (2001)

E.g. Domain Restrictions:

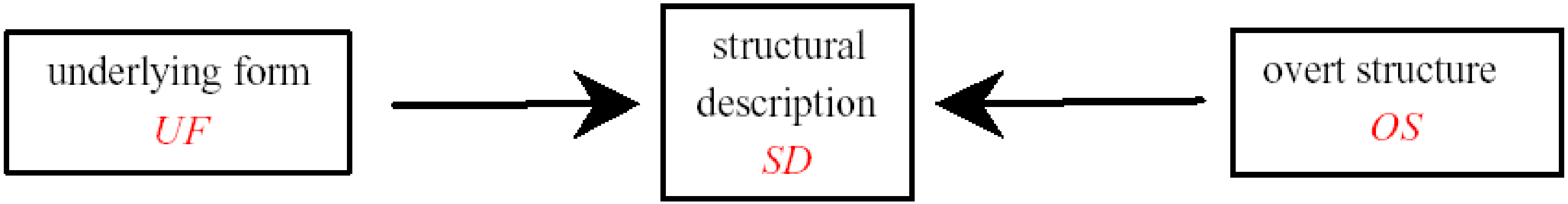
- *Most linguists sleep at night*
- *Most linguists drink at night*



Optimal Interpretation

5 The Motivation for Strong Bidirectionality

In overcoming the lag between production and comprehension, a kind of bootstrap mechanism seems to apply that makes crucially use of the *robustness* of comprehension, an issue that is substantial for the OT learning theory (Smolensky 1996, Tesar & Smolensky 2000).



productive parsing (*production mode*) *interpretive parsing* (*comprehension mode*)

The discrepancy between interpretive parsing and productive parsing triggers learning.

- After learning, the two modes of assigning structure to inputs, productive and interpretive parsing, coincide.

Symmetry

The proposed theory of learning leads to the stabilization of SYMMETRY:

If in comprehension, some overt form OS leads to an underlying form UF, then in the generation mode, the same UF leads back to the original OS. As a consequence, all hearer-optimal pairs are strongly optimal!

This seems to hold for two kinds of learning:

(A) Auto-associative learning
(extracting structure from the input pattern)
e.g. Tesar & Smolensky (2000).

(B) Pattern association (learning the relation between two sets of independent stimuli)

Pattern association

- A set of pairs of patterns are repeatedly presented. The system is to learn that when one member of the pair is presented it is supposed to produce the other. In this paradigm one seeks a mechanism in which an essentially arbitrary set of input patterns can be paired with an arbitrary set of output patterns.
- For example, input patterns can be lexigrams (e.g. senseless syllables), and output patterns can be pictures of fruits. Assume a 1-1 correspondence between syllables and pictures.
- If subjects are qualified to match Stimulus A to B and then, without further training, match B to A, they have passed a test of symmetry.
- Children as young as 2 years pass the symmetry test! (Green 1990). Hence, bidirectionality seems to build in the basic learning mechanism.

Again, the result is SYMMETRY: If a => b then b => a, and vice versa. As a consequence, all hearer-optimal pairs are strongly optimal! The same for Speaker-optimal pairs.

Kanzi - a Monobo Monkey

Sue Savage-Rumbaugh was trying to teach Kanzi's mom, Matata, a symbolic language.

Kanzi sat on her lap during these sessions. And while Matata did poorly, Kanzi learned.

Kanzi's knowledge was reciprocal. There was no need taught her separately to produce and to comprehend.

6 Weak Bidirectionality and Iconicity

Blocking is not always total. Classical examples are as follows:

- Morphological blocking
  - furious - *furiosity – fury
  - fallacious - *fallacity – fallacy

- Blocking of interpretations
  - *I ate pork/?pig*
  - *Some persons are forbidden to eat beef/?cow*
  - *The table is made of wood/?tree*
  - *I see/?smell what you mean*

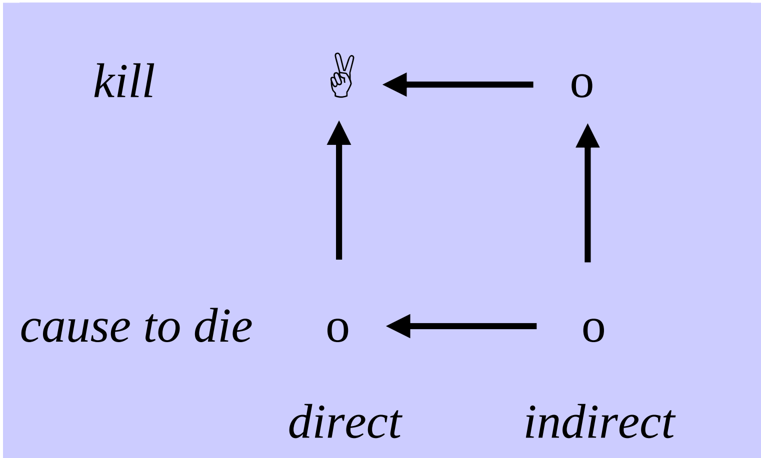
Example: strong bidirectionality and total blocking

- **GEN =** { ⟨*kill*, *direct*⟩, ⟨*kill*, *indirect*⟩ , ⟨*cause to die*, *direct*⟩, ⟨*cause to die*, *indirect*⟩ }
  (Semantics with underdetermination)

- Markedness constraints for forms and interpretations
  - ⟨*kill*, *int*⟩ < ⟨*cause to die*, *int*⟩ (since *kill* is the lighter form)
  - ⟨*form*, *direct*⟩ < ⟨*form*, *indirect*⟩ (since *direct* is the more salient interpretation)

- McCawley's pair:

  Bill killed the Sheriff
  Bill caused the Sheriff to die



- The solution concept of *strong optimality* accounts for total blocking.
  It does not account for partial blocking! Look for other solution concepts!!

Weak bidirectionality (super-optimality)

There is a conception of bidirectional optimization, called super-optimality, which can account for constructional iconicity. This conception makes use of recursion.

Let $\Omega = \langle \mathbf{GEN}, C, >> \rangle$ be an OT-system. Then a pair $\langle a, b \rangle$ is super-optimal w.r.t. Ω iff

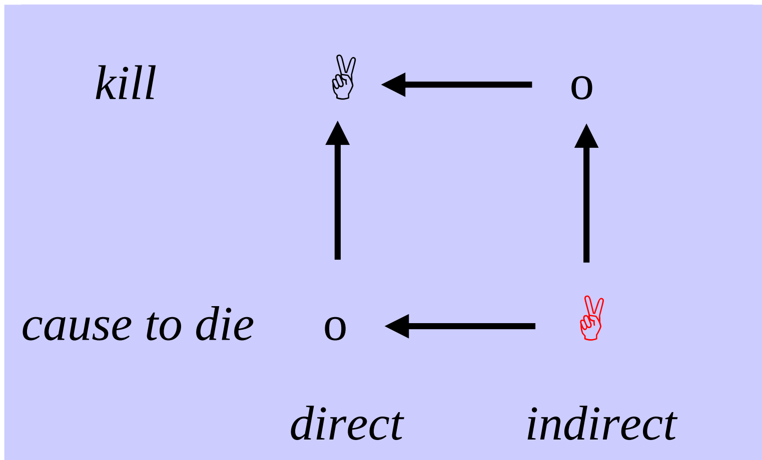
(1) $\langle a, b \rangle \in \mathbf{GEN}$

(2) there is no super-optimal $\langle a, b' \rangle < \langle a, b \rangle$

(3) there is no super-optimal $\langle a', b \rangle < \langle a, b \rangle$

John McCawley's example again:

Bill killed the Sheriff
Bill caused the Sheriff to die



Krifka’s example: How much precision is enough?

Krifka’s Observation

- Vague interpretations of measure expressions are preferred if they are short Precise interpretations of measure expressions are preferred if they are long

A: The distance between Amsterdam and Vienna is one thousand kilometers.
B: #No, you’re wrong; it’s nine hundred sixty-five kilometers.

A: The distance between A and V is nine hundred seventy-two kilometers.
B: No, you’re wrong; it’s nine hundred sixty-five kilometers.

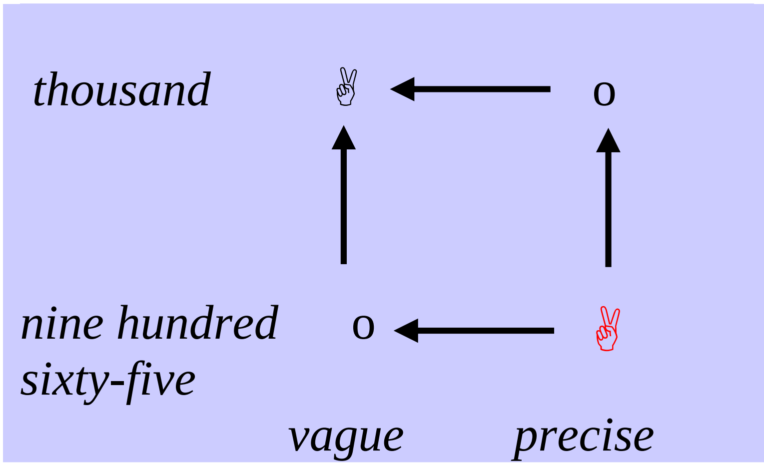
Street sign in Kloten, Switzerland.

Explanation

- Markedness constraints for forms and interpretations

  - $\langle \mathit{form}, \mathit{int} \rangle < \langle \mathit{form}', \mathit{int} \rangle$ iff *form* is lighter than *form*'
  - $\langle \mathit{form}, \mathit{int} \rangle < \langle \mathit{form}, \mathit{int}' \rangle$ iff *int* is less precise than *int*'

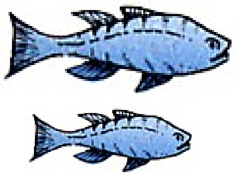
- Weak Bidirection

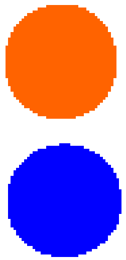


➔ Generalization: Constructional Iconicity in Natural Language

Constructional Iconicity (or Horn's division of pragmatic labor)

Unmarked forms tend to be used for unmarked situations and marked forms for marked situations. (Levinson's M-principle)

- MAYERTHALER ZICK  ZACK

- BERLIN & KAY MOLA  MILI

- ARGUMENT LINKING (Uszkoreit, Bresnan, Jackendoff, Kiparski, …)

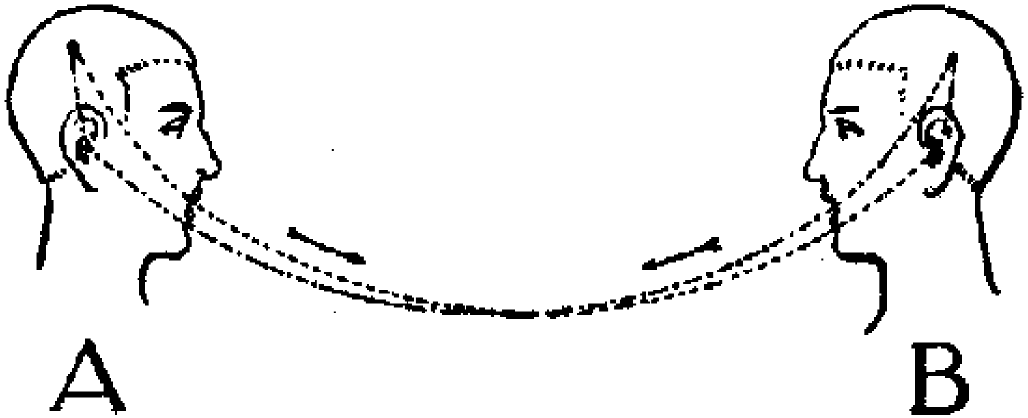
  Agent > Instrument > Recipient/Experiencer > Theme > Location
  Subject > Object$_d$ > Object$_i$ > Oblique

Harmonic alignment

Economy and Language

(I) Economy plays a crucial role in online interpretation and production (e.g. in explaining garden path effects). (Standard OT, Levinson)

(II) Economy constitutes *languages* as conventional systems. (Horn, Zipf)



Georg K. Zipf (1949)

Human Behavior and the Principle of Least Effort. Addison-Wesley. Cambridge 1949.

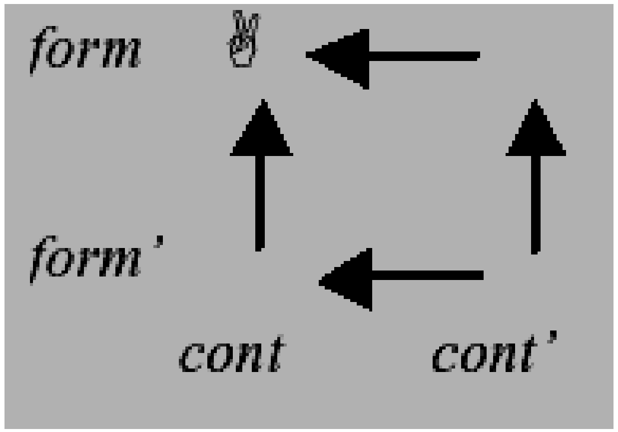
Two basic and competing forces	
Speaker's economy	Hearer's economy
Force of unification	Force of diversification

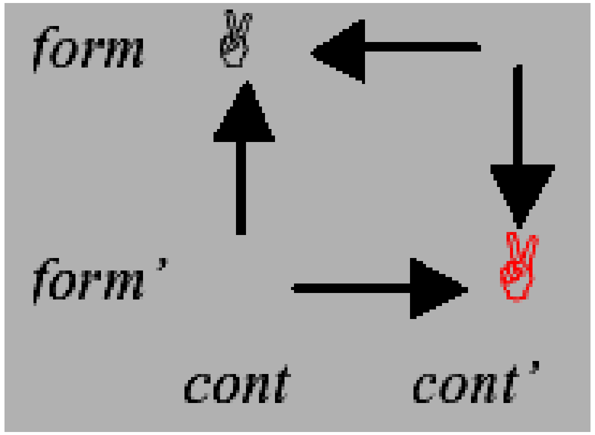
- The two opposing economies are evolutionary forces
- They are balanced during language evolution.

Why two conceptions of Bidirectionality?

- Strong Optimality as a synchronic law (describing an equilibrium that results from successful learning)

- Weak (Super-) Optimality as a diachronic law (describing the probable outcomes of language evolution under highly idealized conditions)

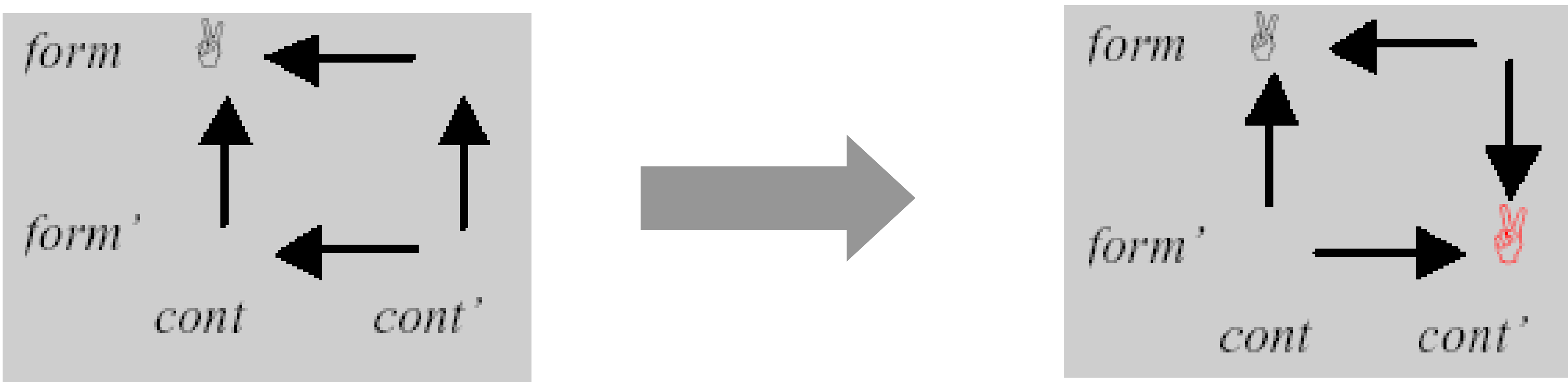




Calculating super-optimal solutions

Jäger (1999), Dekker & van Rooy (1999), Beaver (2002) have proposed procedures that update preferences in OT systems such that

(i) optimal pairs are preserved
(ii) a new optimal pair is produced if and only if the same pair was super-optimal at earlier stages.



The evolutionary grounding of weak bidirection

There are many different ways to realize a evolutionary perspective. Different versions highlight the role of *correlations*, *learning*, *mutations*, and the *initial state*, respectively.

- Van Rooy (2002): *Signalling games and evolutionary stable Horn-strategies.*
- Jäger (2002): *Learning constraint sub-hierarchies. The Bidirectional Gradual Learning Algorithm.*
- Blutner, Borra, Lentz, Obdeijn, Uijlings, and Zevenhuijzen (2002): *Signalling Games: hoe evolutie optimale strategieën selecteert.*

Basic Ideas

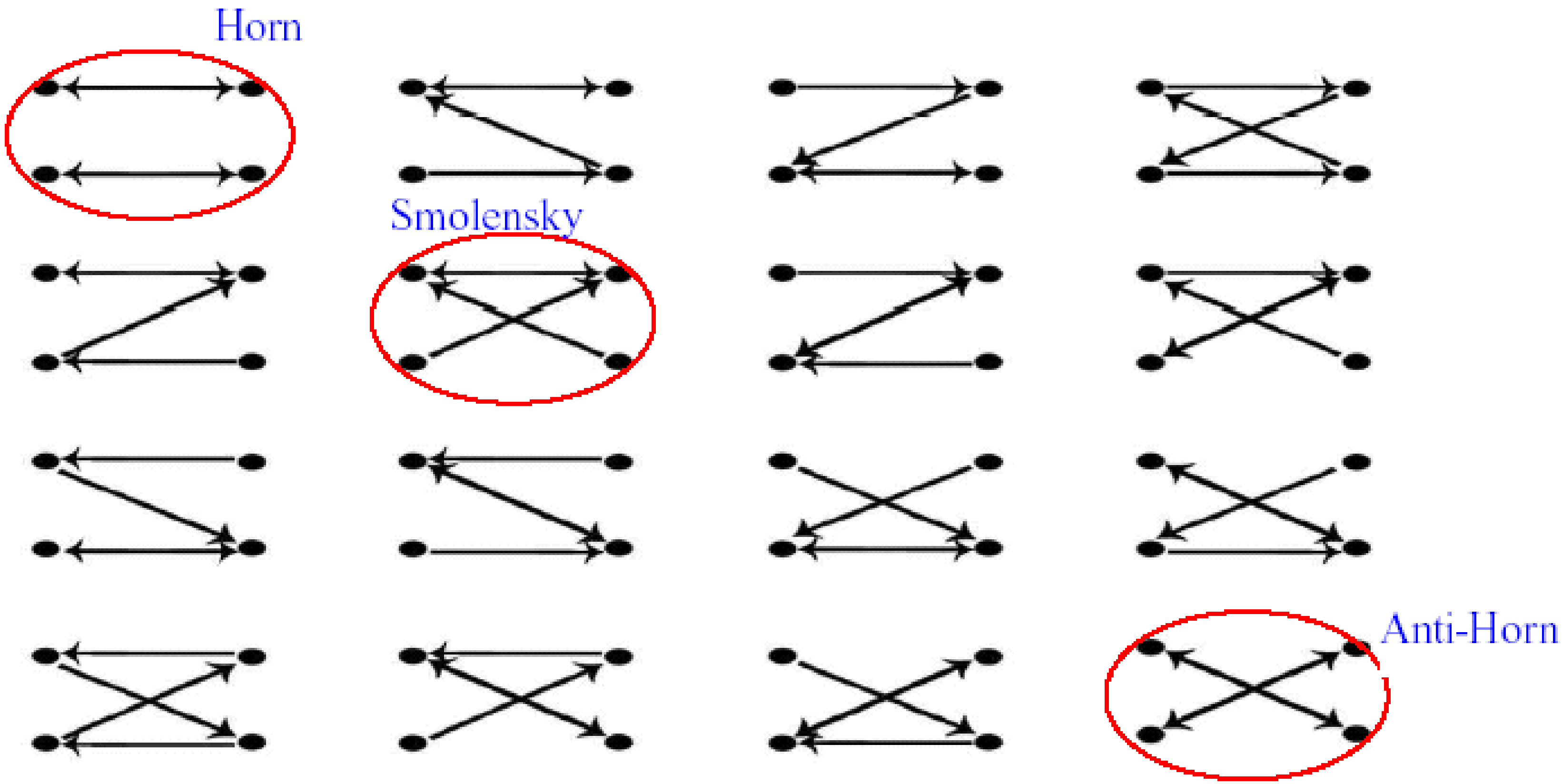
- Each agent is described by an OT-system $O = \langle \mathbf{GEN}, C, >> \rangle$. Within the population Gen and C are fixed, >> may vary.
  Each agent X determines a *speaker's strategy* S_X : Contents => Forms
  and a *hearer's strategy* H_X : Forms => Contents

- In pairwise interactions between an agent *a* (in the role of the speaker) and an agent *b* (in the role of the Hearer) an utility/fittness function U is realized:
  $U(a,b) = \Sigma\, P(i)\, [\, \delta(H_b(S_a(i)), i) - k(S_a(i))],$
  where $\delta(x,y) = 1$ if $x = y$, 0 elswhere. P(i) probability of "content" i, k(f) cost of signal f.

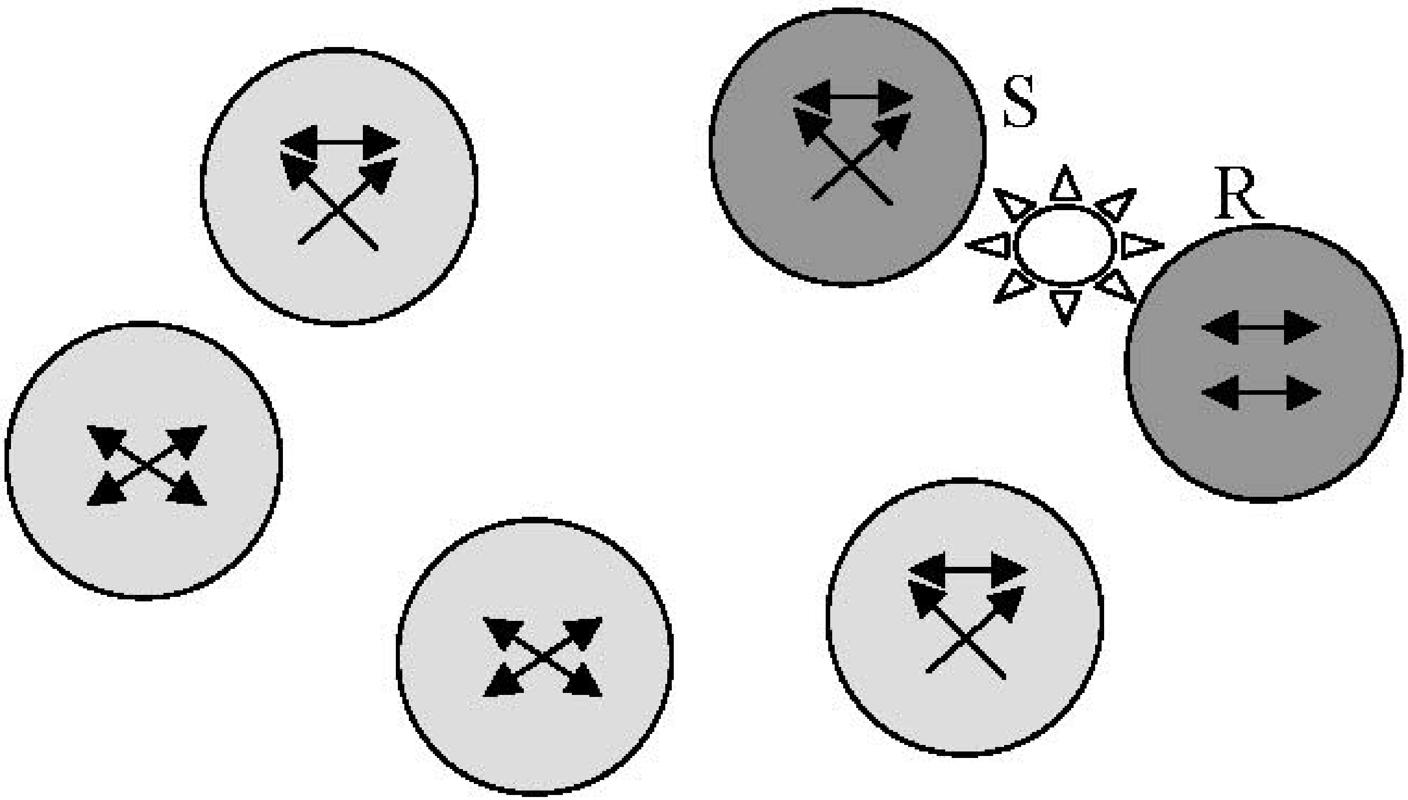
- The agents of the population randomly encounter one another in pairwise interaction. Each organism plays only one, but leaves its offspring behind, where the number of offspring is determined by the utility value U(a, b). Mutations change the strategies played by some elements of the population. After many plays of the game, a strategy yielding a higher number of expected offspring will gradually come to be used by larger and larger fractions of the population.

The pool of possible strategies

for an OT-system with GEN = {⟨*f*, *c*⟩, ⟨*f*, *c*'⟩, ⟨*f*’, *c*⟩, ⟨*f*’, *c*'⟩}

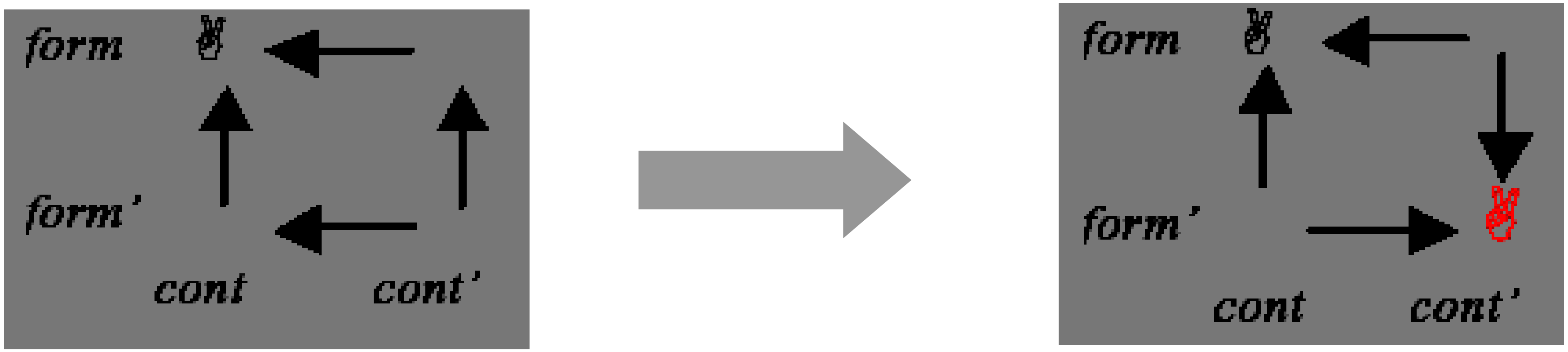


Population and pairwise interaction



Results

- Horn and Anti-Horn are the only strategies (OT-systems) that are evolutionary stable
- Starting with a uniform *Smolensky* population will always result in a pure *Horn* population supposed P(*c*) > P(*c*’) and k(*f*) < k(*f*’)



- Mixed populations develop into pure Horn populations (supposed P(*c*) > P(*c*’) and k(*f*) < k(*f*’))

7 Example : Negative strengthening

What are the effects of **negating** gradable adjectives?

(1) I'm not happy ☺ 😐 ☹

a. *Entailment:* It isn't the case that I'm happy

b. *Implicature*: I'm unhappy

c. *defeasibility*: I'm not happy and not unhappy

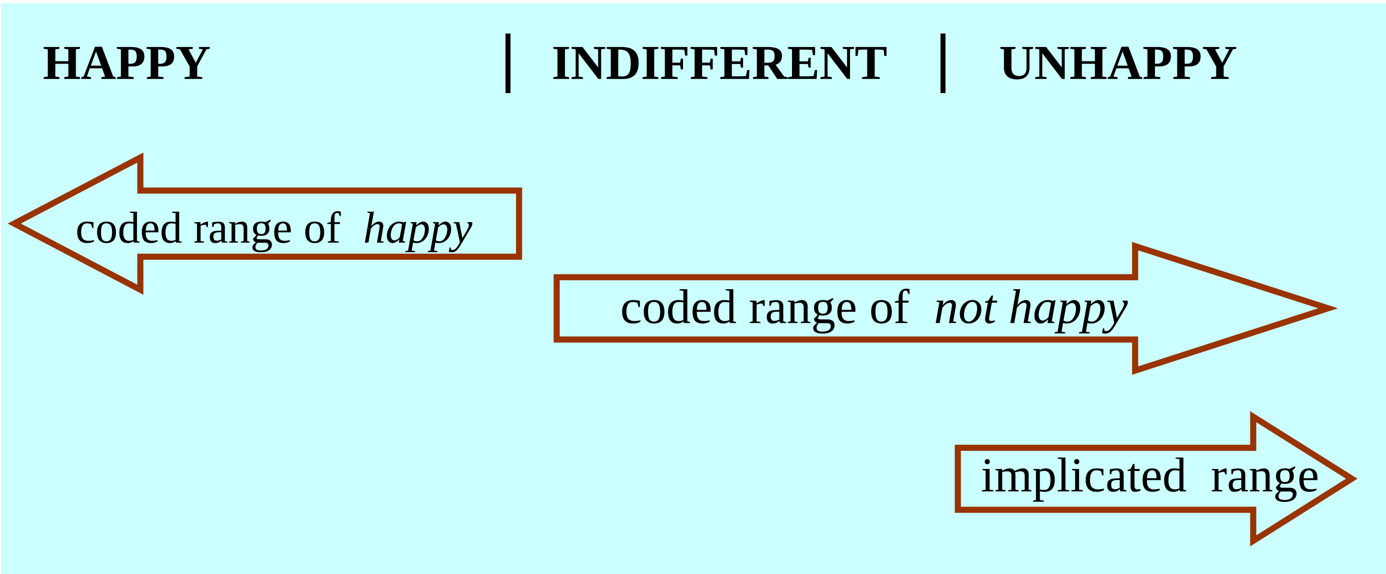


Fig.1 Contradictories implicating contraries

The described effect of strengthening is restricted to the positive (unmarked) elements of antonym pairs!

Litotes

(2) I'm not unhappy ☺ 😐 ☹

a. *Entailment:* It isn't the case that I'm unhappy

b. *Implicature*: I'm rather happy (but not quite as happy as using the expression *"happy"* would suggest)

c. *defeasibility*: I'm not unhappy, in fact I'm happy

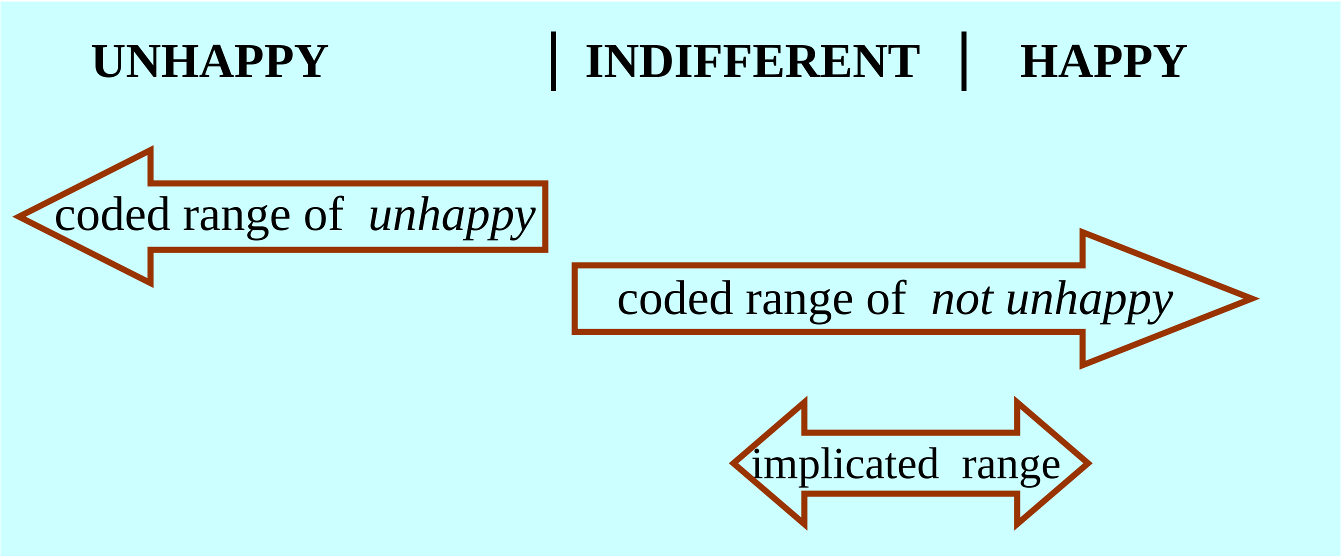


Figure 2: Litotes: when two negatives don't make a positive

Theoretical Assumptions

- The coded range of form-interpretation pairs is due to a three-valued logic: *not* corresponds to weak negation and *un*- to strong negation.

- The number of the involved negation morphemes determine the markedness of the forms

$$\langle \mathit{form}, \mathit{int}\rangle < \langle \mathit{form}', \mathit{int}\rangle \text{ iff}$$
$$\mathit{form} \text{ contains less negation morphemes than } \mathit{form}'$$

- The markedness of interpretations decreases towards the ends of the scale (and is maximum in the “neutral” middle)

$$\langle \mathit{form}, \mathit{int}\rangle < \langle \mathit{form}, \mathit{int}'\rangle \text{ iff}$$
$$\mathit{int} \text{ is closer to the end of the scale than } \mathit{int}'$$

Super-optimal pairs