Language Games
Technieken van de Artificiële Intelligente 2
Joris Bleys
Language Games

- Ludwig Wittgenstein (1889-1951)
- Builder’s Language

The language is meant to serve for communication between a builder A and an assistant B. A is building with building-stones: these are blocks, pillars, slabs and beams. B has to pass the stones in the order in which A needs them. For this purpose they use a language consisting of the words “block”, “pillar”, “slab”, “beam”. A calls them out; - B brings the stone which he has learnt to bring at such-and-such a call.
The Language Game Paradigm

- Language is a self-organizing dynamic adaptive system

- A language game is a routinized local interaction between any number of participants in a shared context in which the speaker(s) tries to achieve a communicative goal

The Naming Game
Naming Game

- Played at population level
- Develop a lexicon
- Goal: identify an object in the context by means of verbal communication
Naming Game

Naming Game


Naming Game

Speaker

Nihat
Erik
Zheng
Frederik
Ludwig

Hearer

Nihat
Erik
Zheng
Frederik
Ludwig
Lexicon

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## Lateral Inhibition

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# Lateral Inhibition

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Competition for a Meaning

Figure 2. Evolution of word-meaning relations for... The graph shows the average use of all the words per 10 games. One word (wogglesplat) comes out as the winner.

Population flux

A Proof of Convergence

The Discrimination Game
Discrimination Game

- Played at individual level
- Develop ontology of agent
- Goal: find a category that discriminates the topic from the other objects in the context
Saliency

Discrimination Tree

[RED 0-1]

obj-1 obj-2 obj-3 obj-4
Discrimination Tree

[RED 0-1]
obj-1 obj-2 obj-3 obj-4

[RED 0-.5]
obj-1 obj-2 obj-4

[RED .5-1]
obj-3
The Guessing Game
(The Talking Heads)
Guessing Game

- Played at population level
- Develop ontology + lexicon of agent
- Goal: identify an object in the context by using categorization by means of verbal communication
Guessing Game

Guessing Game

Speaker

[H 0-1]

[H 0-1]

[H .5-1]

[H 0-.5]

Hearer

[H 0-1]

[H 0-1]

[H .5-1]

[H 0-.5]

Guessing Game

Guessing Game

The Guessing Game
(Colour Categories)
Guessing Game

Speaker

Hearer

Guessing Game

Guessing Game

Colour Categories

- Each category has a focal point
- Each category classifies all points for which no other focal point is closer
- Categories can adapt to another stimulus
Colour Categories

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Colour Categories

• Each category has a focal point
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• Categories can adapt to another stimulus
Colour Categories
Colour Categories
Influence of Language on Category Acquisition

- Model A: Language has direct influence on category acquisition
- Model B: Language has no influence on category acquisition

Resulting Categories

Model A

Model B
Measures of Model A

The diagram illustrates the measures of Model A over the number of games played. The x-axis represents the number of games, while the y-axis shows the success and measures.

- Discriminative
- Communicative (lenient)
- Communicative (strict)
- Average number of categories
- Average number of forms
Measures of Model B

The graph shows the success measures and measures of Model B over the number of games. The success measure is plotted on the y-axis, and the number of games is plotted on the x-axis. The graph includes lines for different measures:

- Discriminative
- Communicative (lenient)
- Communicative (strict)
- Average number of categories
- Average number of forms

The graph indicates how these measures change as the number of games increases.
Strict vs Lenient Interpretation

- lenient: hearer chooses object closest to prototype of interpreted category
Strict vs Lenient Interpretation

- **lenient**: hearer chooses object closest to prototype of interpreted category
- **strict**: in addition to lenient: plays discrimination game on the lenient topic and checks whether resulting category is equal to interpreted category