

# Analysis of Language Resources

Second Lecture  
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# What is meaning ?(Review)

- The meaning in language can be considered as being generated from...
- **1.Amodal theory** : the "association" of words, the space between terms
- **2.Multimodal theory** (Perceptual symbol theory, Embodiment theory, Simulation semantics) : the perception and the motion of the human body in the natural space
- Two conflicting viewpoints representing eternal battle inside the science of language ("Once forgotten, old ideas seem new."-Barsalou)

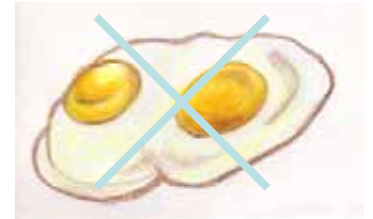
# Two Ways of Meaning-Processing

- **Multimodal** : Perceptual symbol theory, Mirror system, Affordance, Spatial indexing
- **Body Reaction**
  - “An alternative approach assumes that conceptual representations are grounded, at least to some extent, in sensory-motor systems.” (Barsalou)
- **Amodal** : Vector space model, including LSA (Latent semantic analysis)
- **Lexical co-occurrence**
  - “Language is a system of interdependent terms in which the value of each term results solely from the simultaneous presence of the others.” (Saussure)

# Perceptual Symbol theory

- “The ranger sees the eagle in the sky.”
- “The ranger sees the eagle on the branch.”
- **“A hen lays eggs.”**

The wings spread?



**One subconsciously imagines the latent meaning of a sentence.**

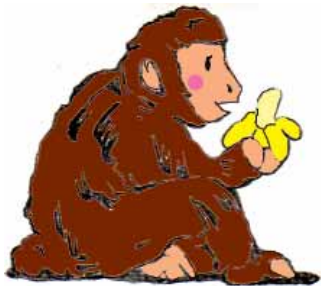
Rolf A. Zwaan, Robert A. Stanfield, and Richard H. Yaxley  
*Language Comprehenders Mentally Represent The Shapes Of Objects*

# Mirror System

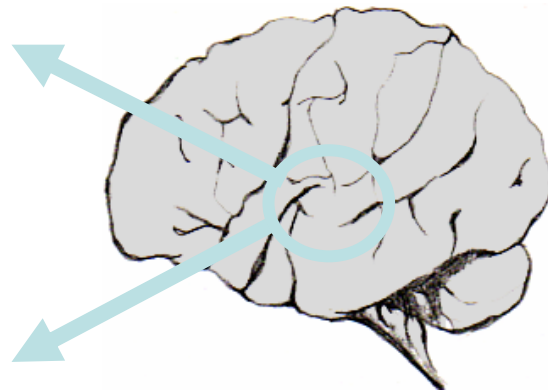
Neurons for processing the motor action language ?



Perception



Motion

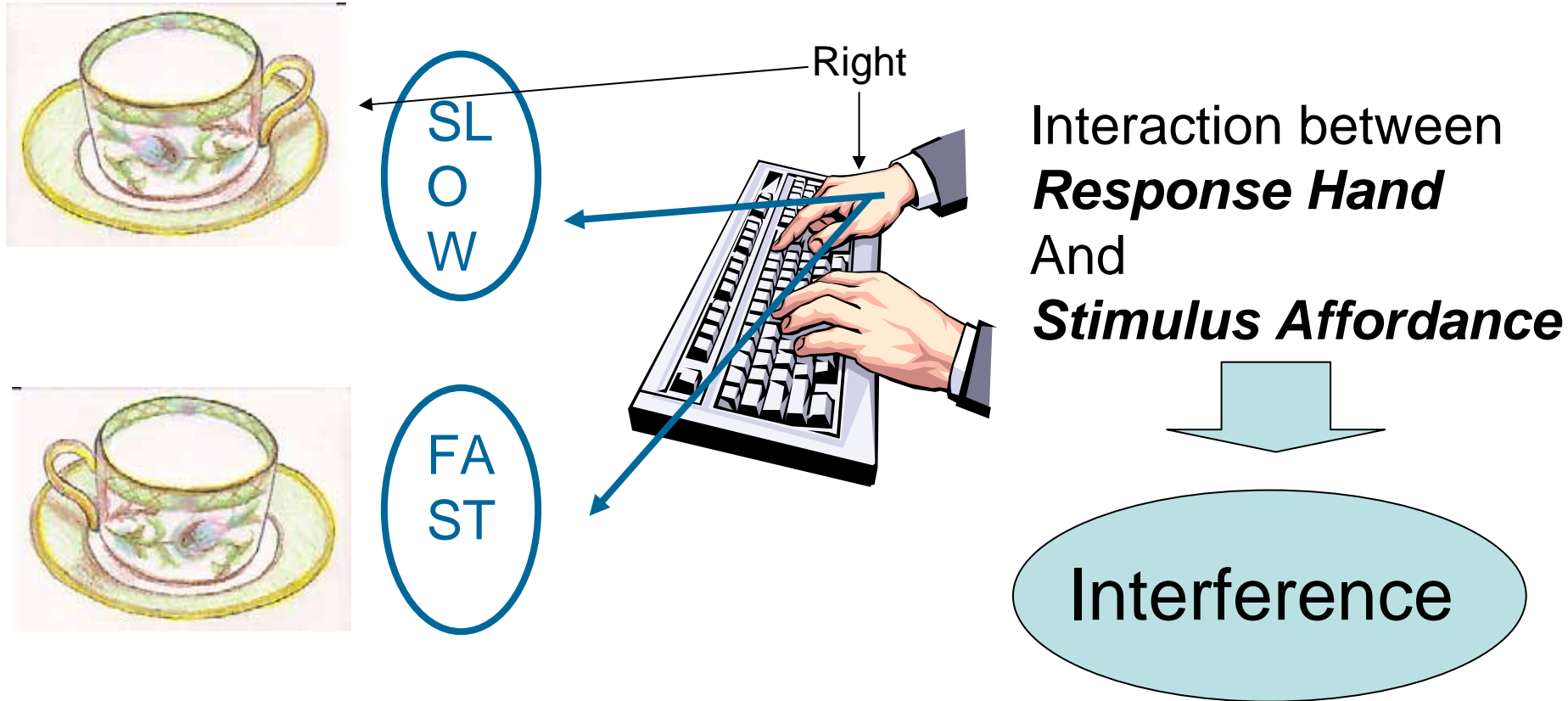


The neurons of the area F5 of macaque monkeys, motor systems for the goal-directed hand and mouth movement are also used in action perception.

Gallese , V., Fadiga, L., Fogassi, L., & Rizzolatti, G.. 1996. Action recognition in the premotor cortex. Brain 119: 593-609.

# Affordance

Reversed images (generating reversed affordance)

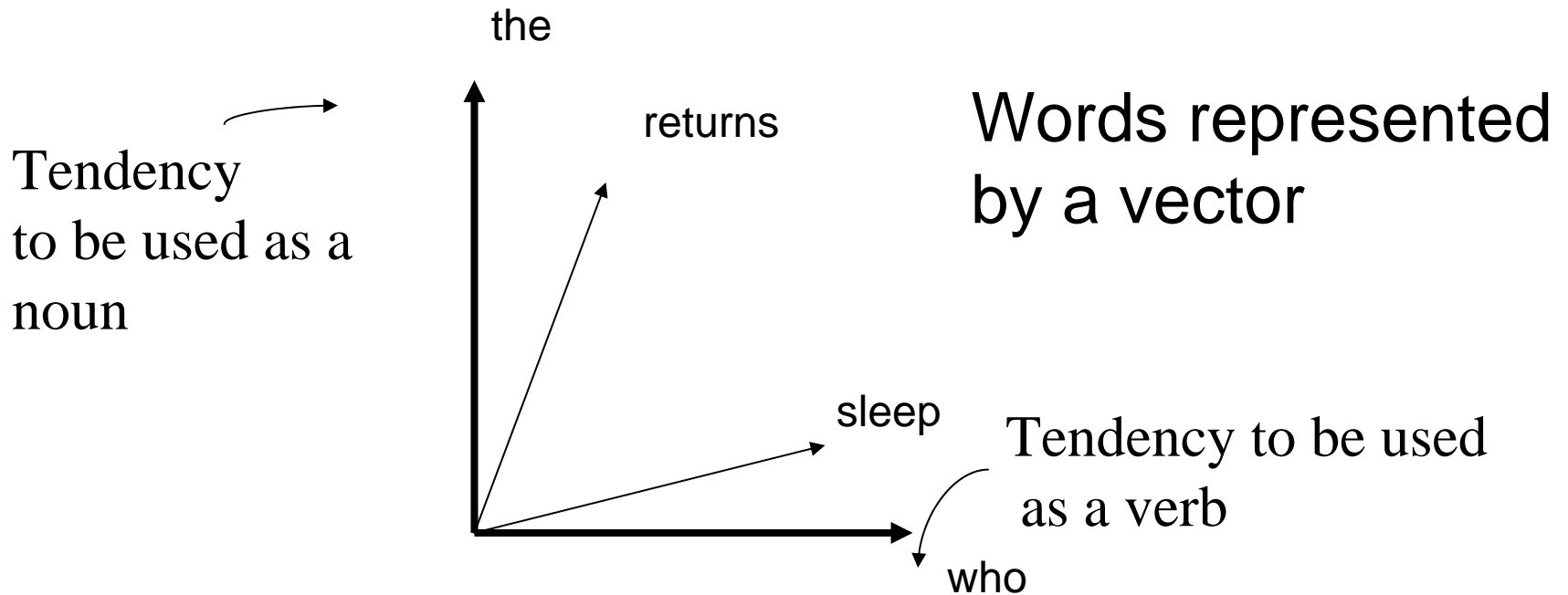


# Vector Space Model

## Lexical Co-occurrence Data

Example: Frequency of the bi-grams taken from a corpus

	*****	the	*****	who
*****				
returns		300		75
*****				
sleep		133		200
*****				



Correlation Coefficient: Cosine Value

$$corr(\vec{v}, \vec{w}) = \frac{\sum_{i=1}^N v_i w_i}{\sqrt{\sum_{i=1}^N v_i^2 \sum_{i=1}^N w_i^2}}$$

Inner product

Norm Product



# Manifestation of the Amodal theory group

- Each word or each sentence in a document can now be considered as a variable or an observation instance.
- It has been possible to find the meaning in a component that can be calculated from lexical co-occurrence data by using the probabilistic theory, such as LSA (Latent Semantic Analysis).
- With the vector space model, one can calculate and **SIMULATE** the meaning processing of the humans.

To be continued

# Summary

- The concrete examples of the multimodal theory and the amodal theory
- **Multimodal** (Body Reaction): Perceptual symbol theory, Mirror system, Affordance, Spatial indexing
- **Amodal** (Lexical Co-occurrence): Vector Space Model, LSA
- Both suppose that they have their own special way to simulate how we process the meaning.