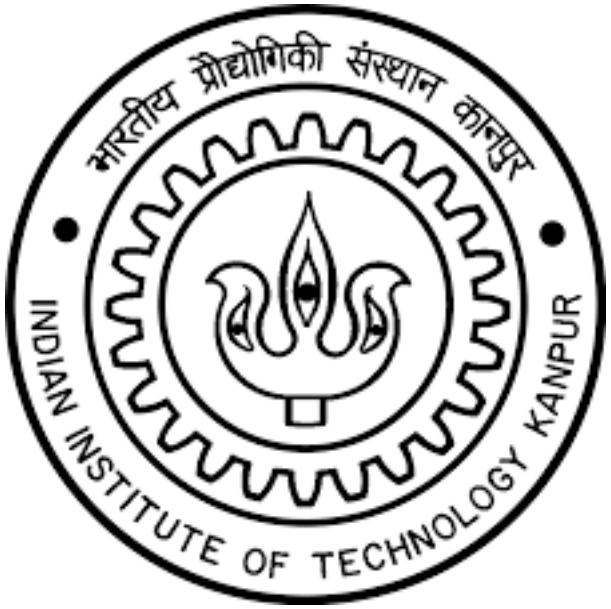

Indian Institute of Technology
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Presents

Course Title:

Basic Cognitive Processes

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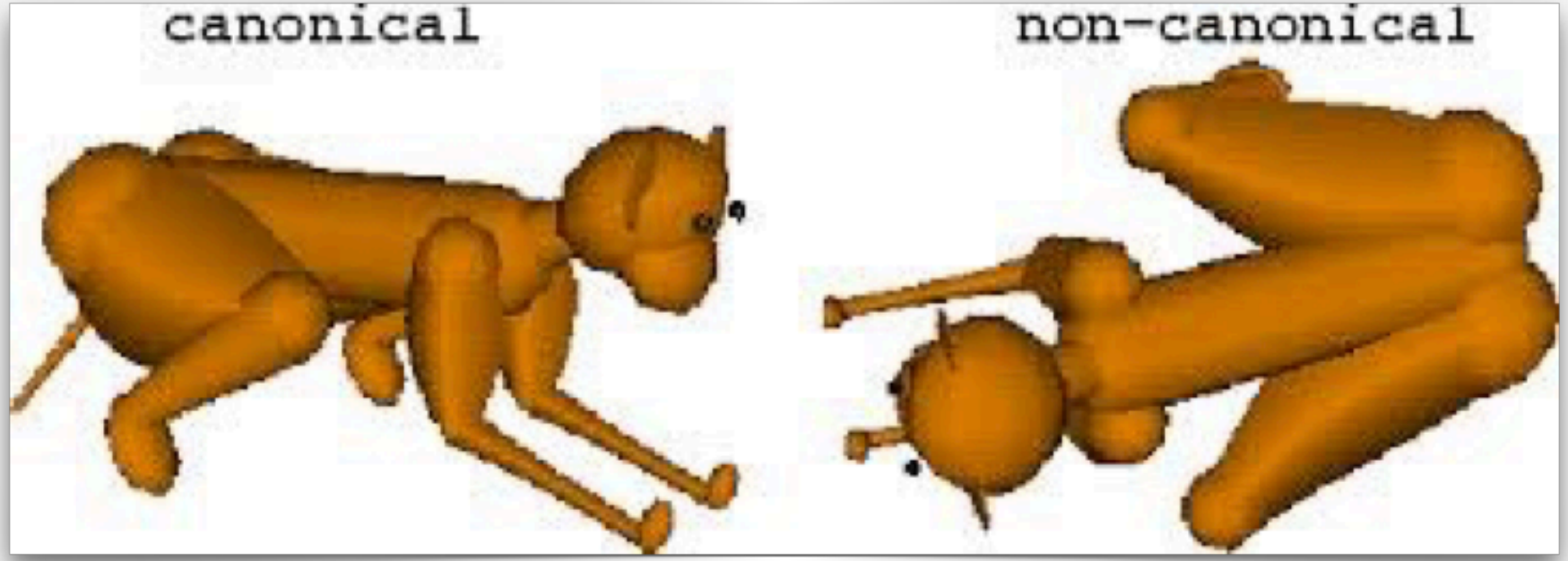
Lecture 15: Representation in Perception

Representation: The Currency of Cognition

- An important aspect of all cognition, or more precisely the INPUT to the functional architecture of the human MIND.
- A ***mental representation*** is anything that allows us to think about, visualise & make judgments concerning physical objects or scenes in their absence.
- It is important to refer to the **function** of the mental representation, when talking about it. for e.g. recognition.

- Consider this example:
  - To solve the problem of recognition, which includes (identification, categorisation & discrimination; Liter & Bulthoff, 1998); one has to principally rely on the encoding of spatial information derived through perceptual experience (Wallis & Bulthoff, 1999).
  - Recognition is only successful if a mental representation can be matched with current contents of perceptual experience.
  - One of the requirements of this process is that it should be flexible.
    - A flexible mental representation of objects/scenes must be insensitive to variations in illumination, viewing conditions & other factors.



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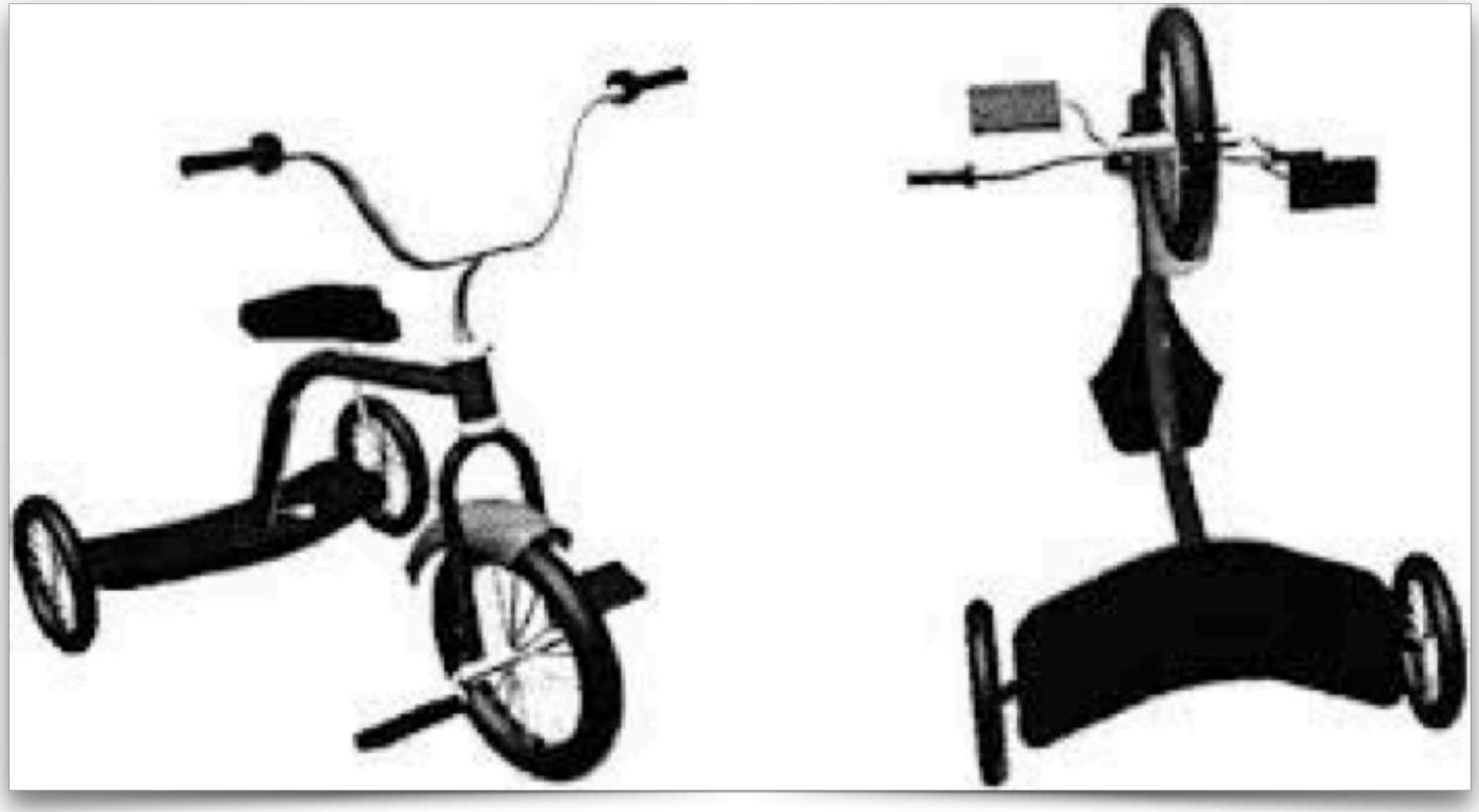

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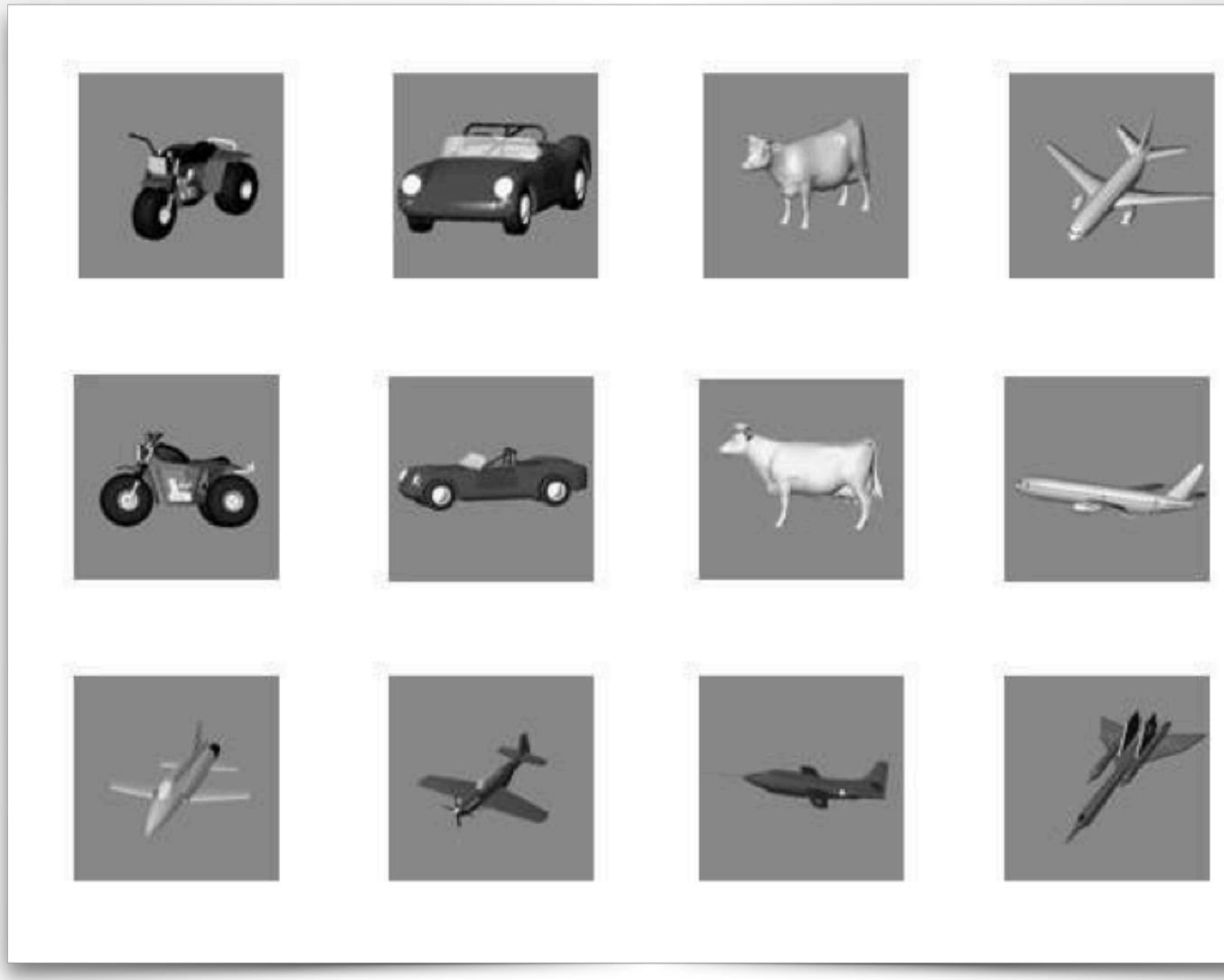

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- Such flexibility may theoretically be achieved either by a transformation of the representation to match the contents of perceptual encoding or

- by a transformation of perceptual encoding to match the representation.

- Which of the two transformations is more prominent in human recognition?

- While empirical philosophers like John Locke tried to solve by proposing the existence of of both simple ideas (yellow, hot, sweet) and complex ideas (conjunctions of simple ideas) & deducing that:

  - all knowledge is based on experience and complex entities or objects are essentially combinations of qualities derived through sensory experience.

- Another possible example is evident in David Marr's theory of object encoding.
    - In Marr's view the final (3D) representation of an object is a product of a so called 2.5D sketch that only specified the depth distances & orientation changes directly visible to the observer.
    - Furthermore the 2.5D sketch is formed from a combination of even more basic detail derived from visual cues such as stereopsis, motion parallax, kinetic depth cues etc.
    - Eventually, the 2.5D sketch is used to form a complete 3D representation of an object.

- Final words on representation:
  - If we begin with the assumption that the content pf the representation is determined by qualities of sensory experience; &
  - that, perception is contained to lie within certain invariant bounds (of sensory experience);
  - then these boundaries may be reflected by the properties of representation & consequently recognition performance.

- There are two possibilities to consider here:
  - If no processing of sensory experience occurs; then the representation is tied to the sensory properties of the retinal image or optical array that brought about the representation.
  - Or, perception may be an analytical process wherein, symbolic descriptions of what we see are actively produced.

- The ability to generalize or to overcome variations in appearance during identification & recognition will depend on the extent of processing that occurs during perception and the kinds of information extracted.
    - there is also a possibility that during recognition a stored representation is adjusted to form a match with a current stimulus.

- A possible solution:
  - Neither, retinal images always form the basis of mental representation nor perception is always analytical.
    - there is a middle path:
  - mental encoding need not be elaborated to the extent that the true nature of 3D objects are faithfully represented and that the limitations of perception may be reflected in the nature of spatial encoding.

To Sum Up

- We talked about the notion of representation in cognition in general and perception in particular.
- We talked about how the representations might be built, i.e. via sensory experience or analytical processes.
- We discussed the consequences of either approach towards representation.