IARIA Cognitive 2015
Nice, France, March 24, 2015

Cognitive Context: Information + Environment + Emotion + . . . What else?

Victor Raskin
Julia Taylor
Purdue University
Vincent Gripon
???

Cognitive Computing

- American Intiative" IJCC*CI:
  - Mathematicalization in First order logic
  - Diverse computation
- IARIA:
  - No clear vision yet
  - Need to work it out

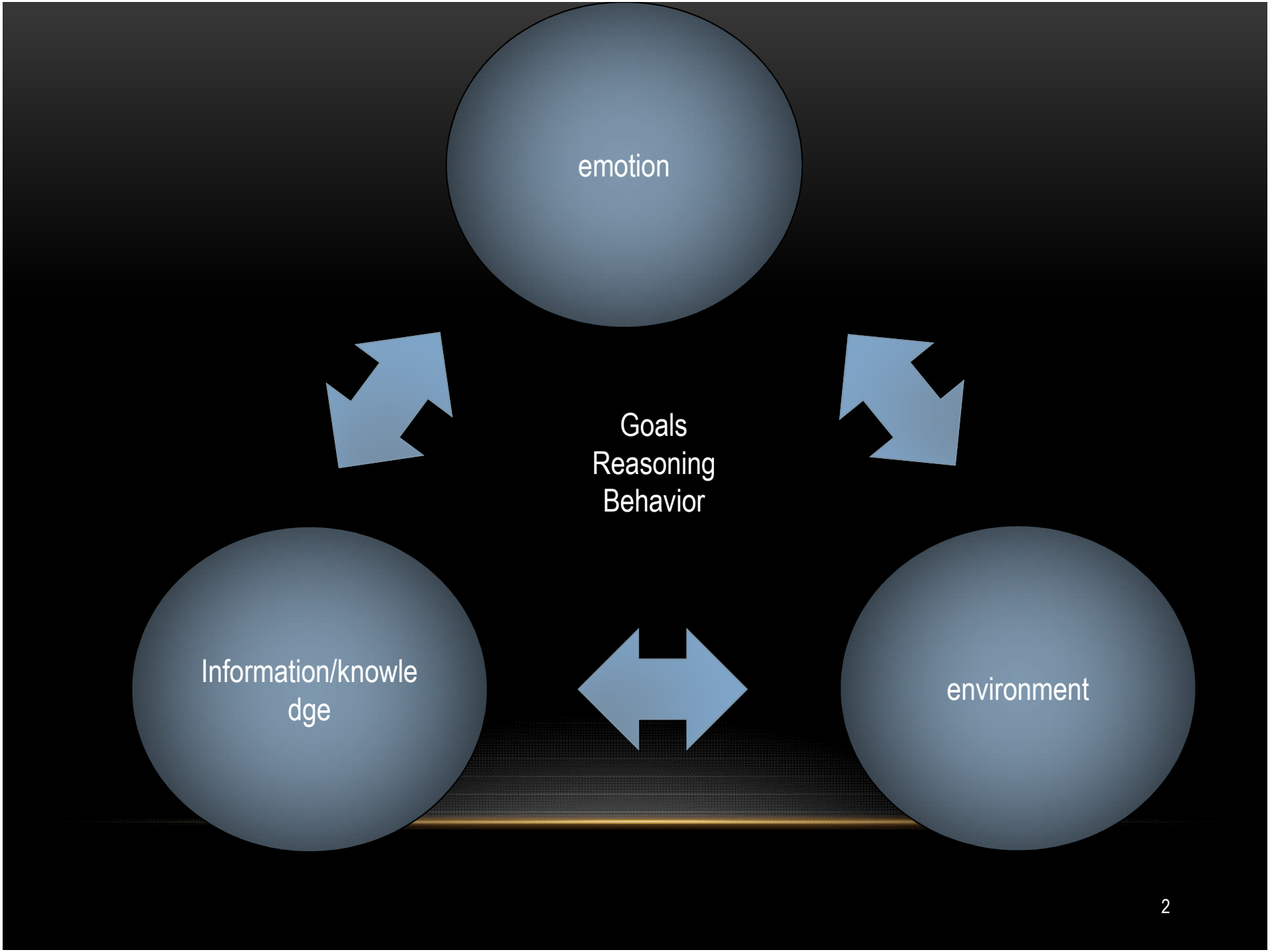
Cognitive Computing

- Cognitive Computing:
  - Computer knows what it is doing
  - Knowledge-based
  - Semanticalization
  - Computing self-awareness

COGNITIVE CONTEXT: INFORMATION + ENVIRONMENT + EMOTION + .. WHAT ELSE?

Julia Taylor

Purdue University

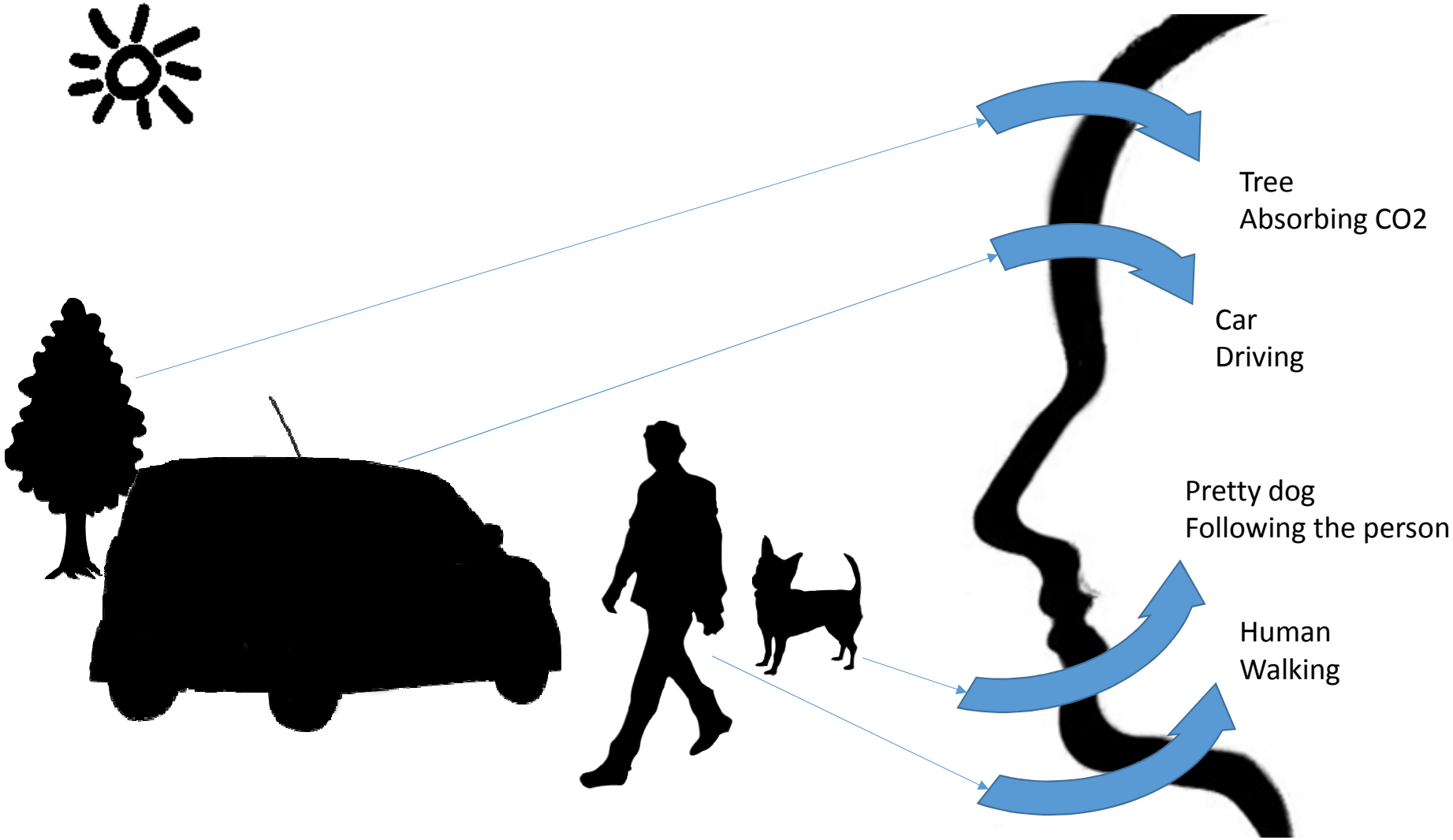

emotion
Goals
Reasoning
Behavior
Information/knowle
dge
environment

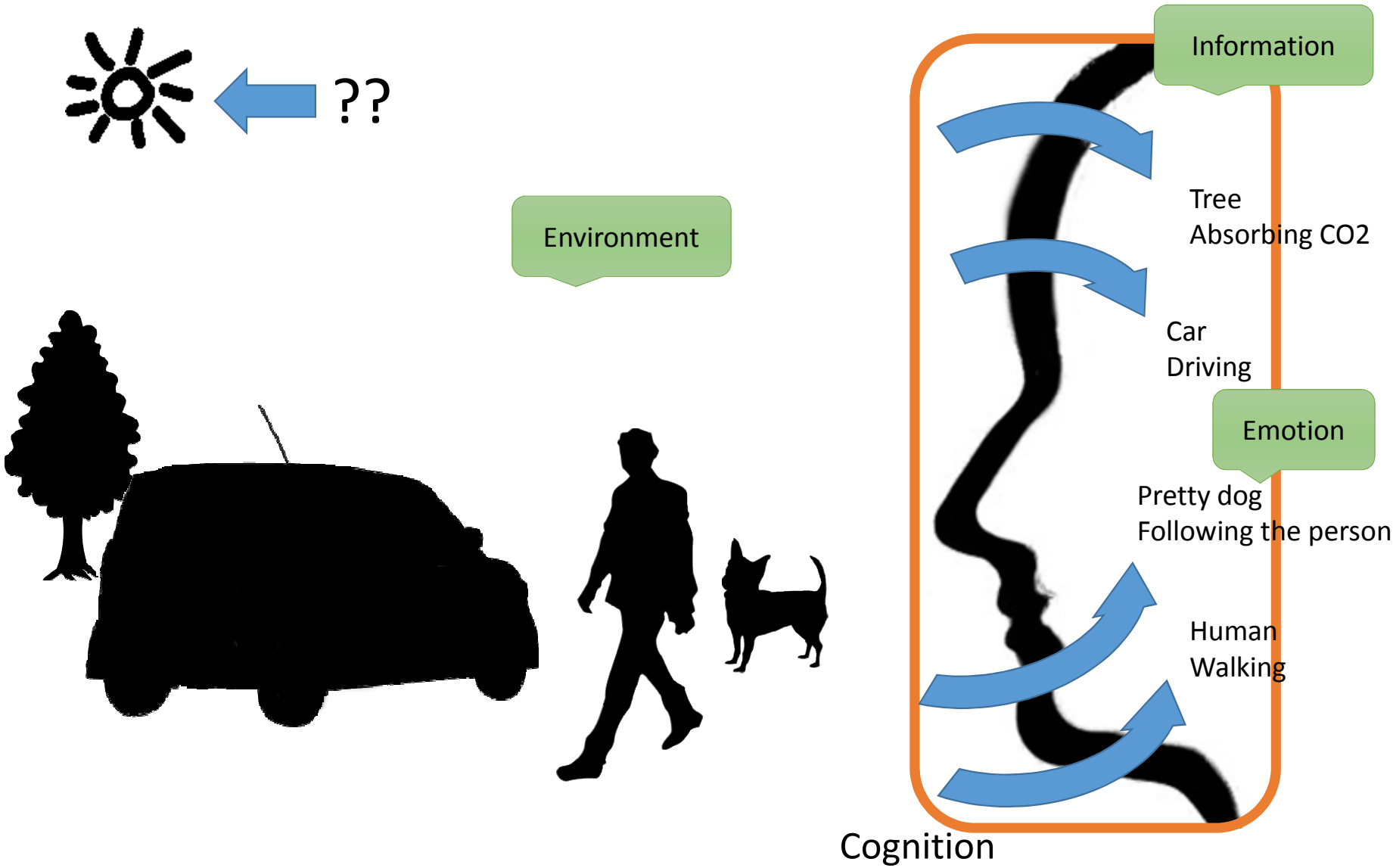
WHAT IS NEEDED TO ANSWER THE QUESTION?

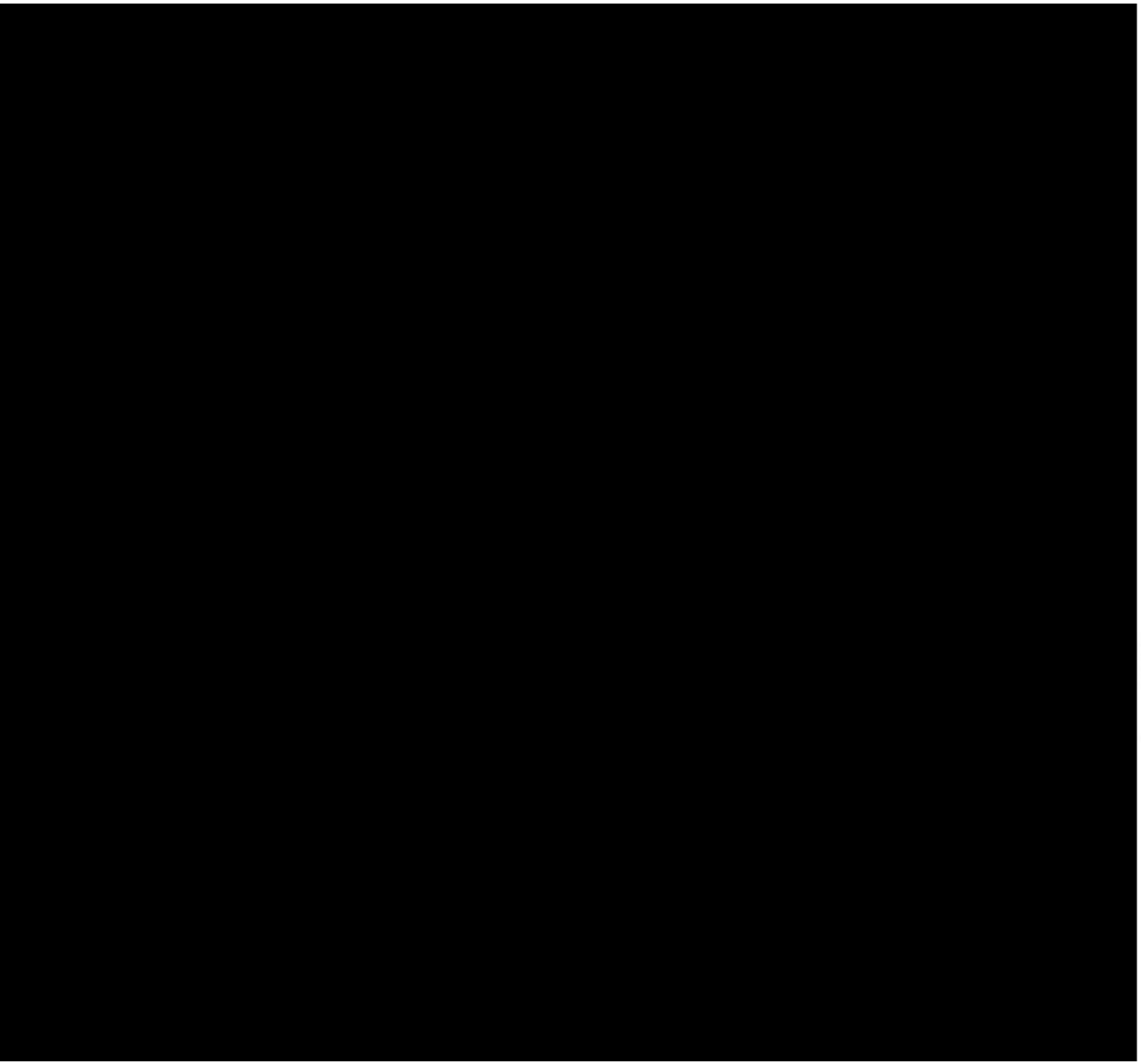
Projection of the subjective cognition

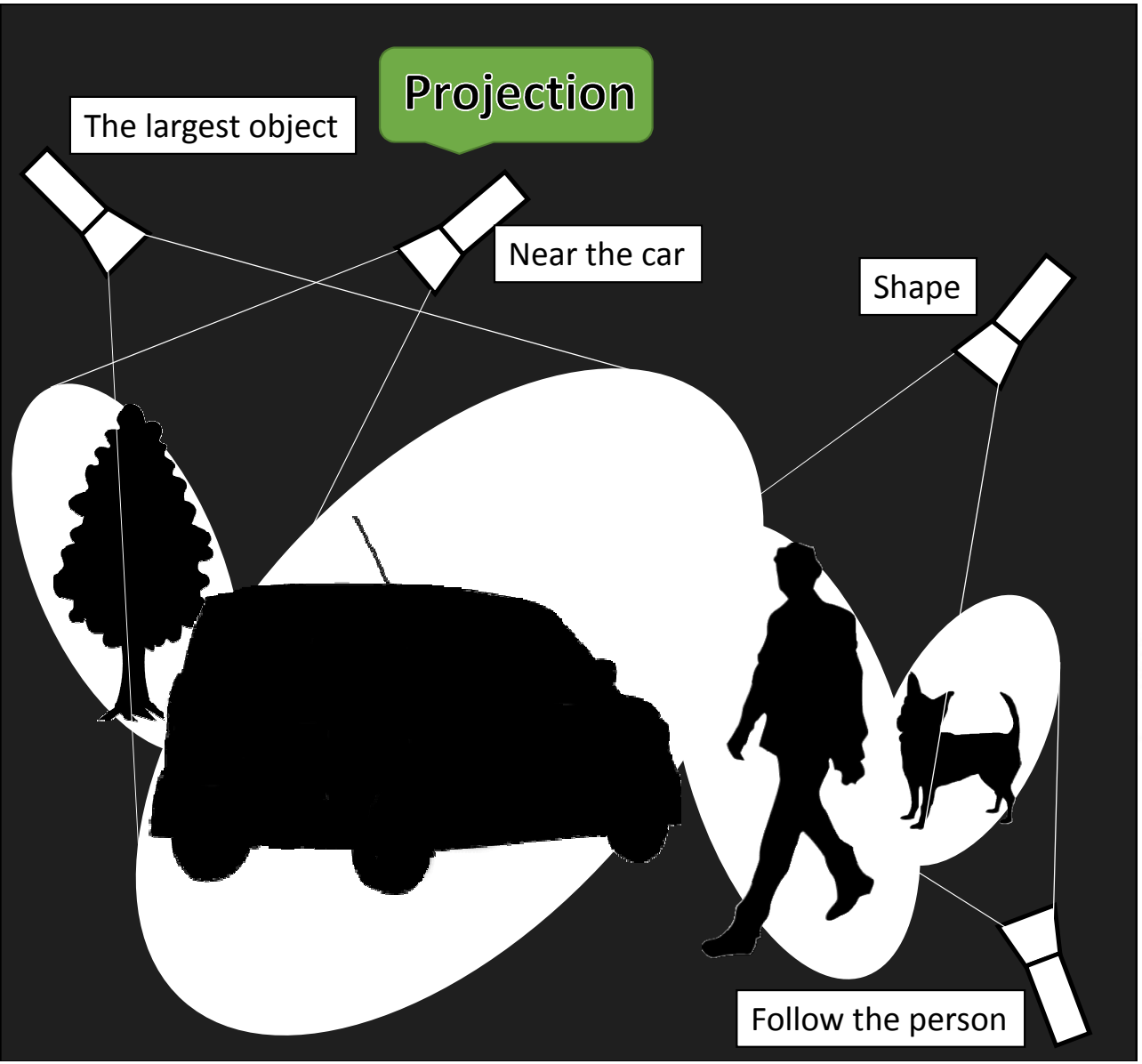
the influence of subjective attitude in interaction
as an additional cognitive context

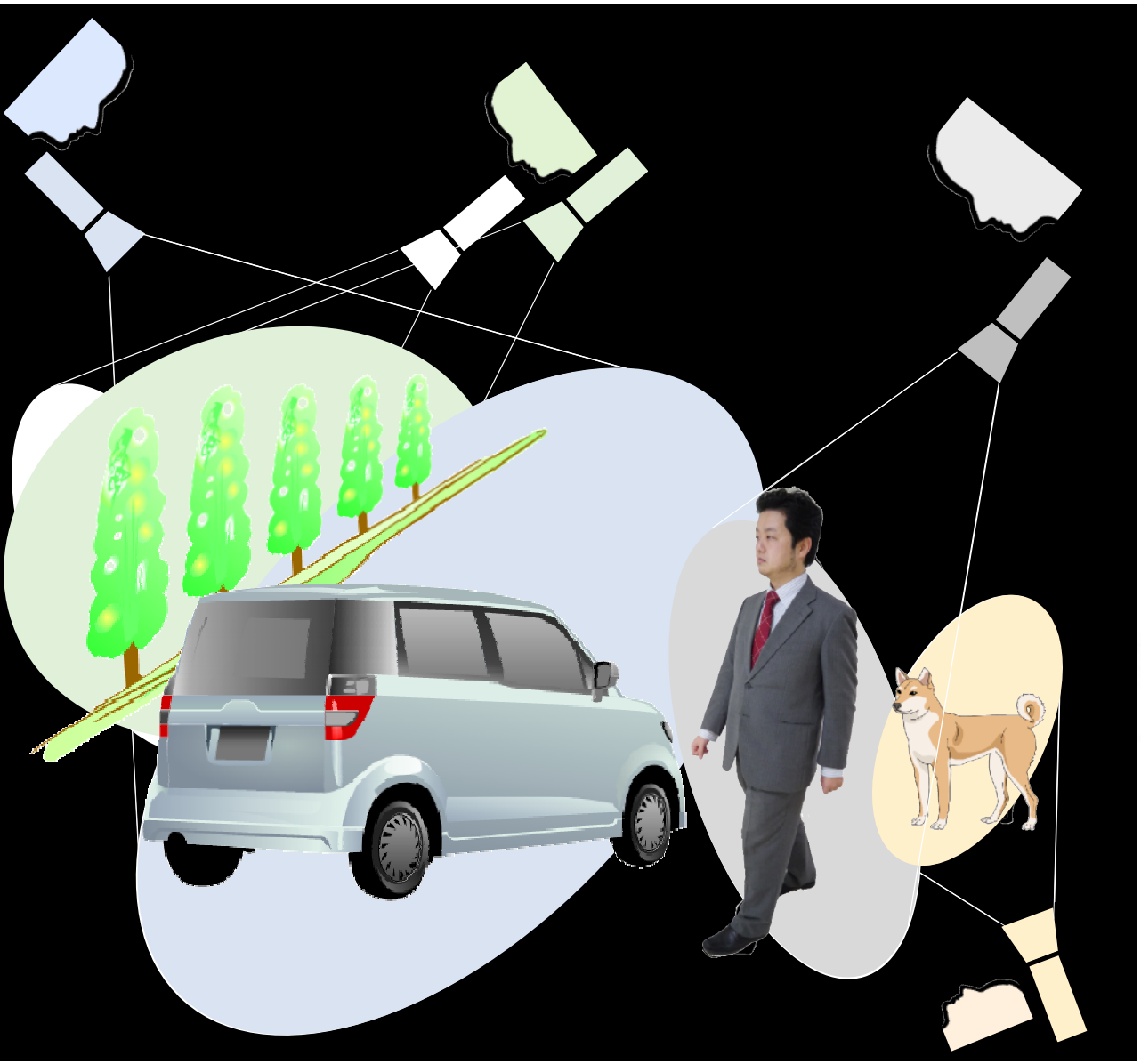
Yoshimasa Ohmoto
Kyoto University, Japan

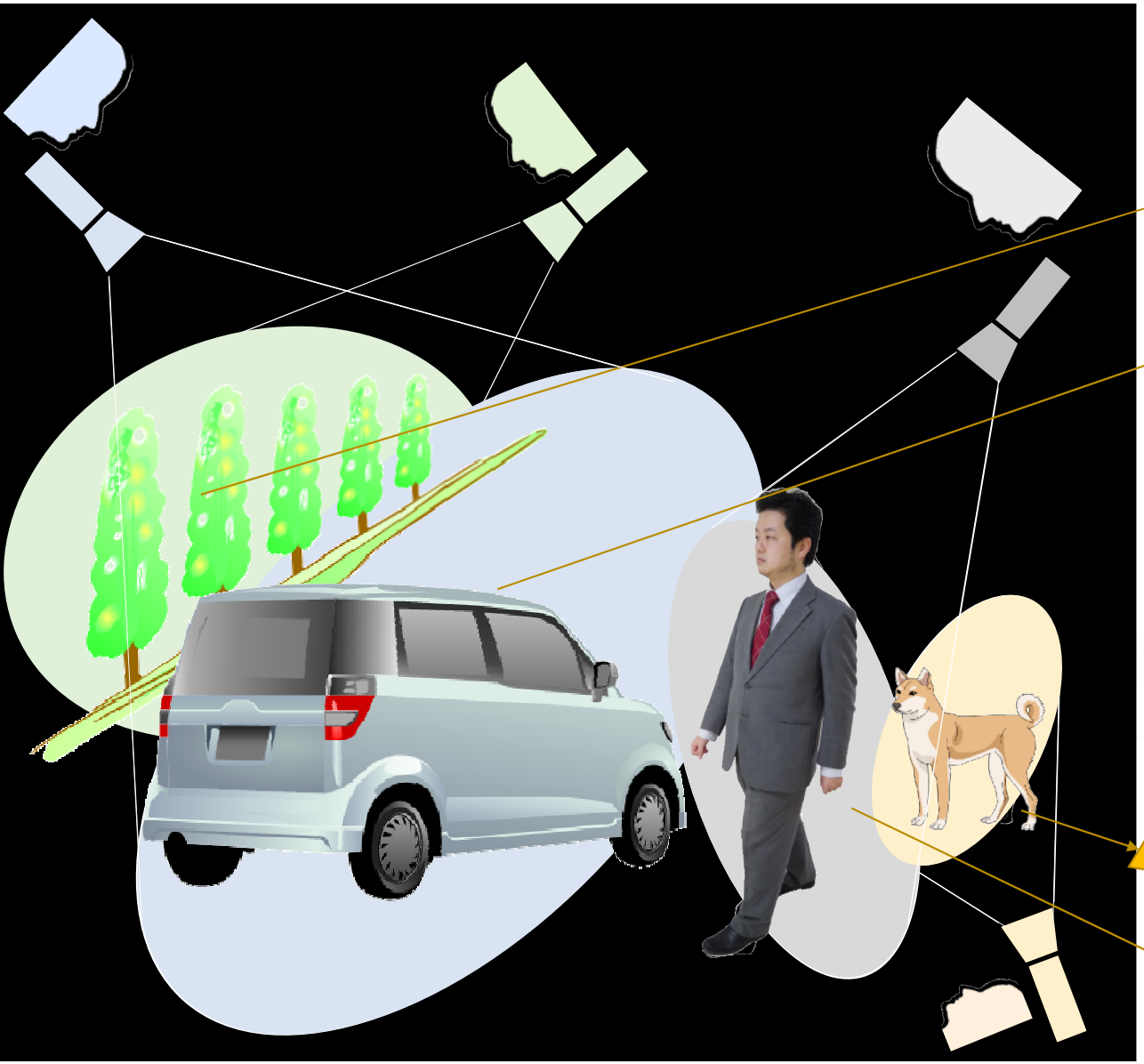

Tree
Absorbing CO2
Car
Driving
Pretty dog
Following the person
Human
Walking


??
Environment
Information
Tree
Absorbing CO2
Car
Driving
Emotion
Pretty dog
Following the person
Human
Walking
Cognition




Projection
The largest object
Near the car
Shape
Follow the person





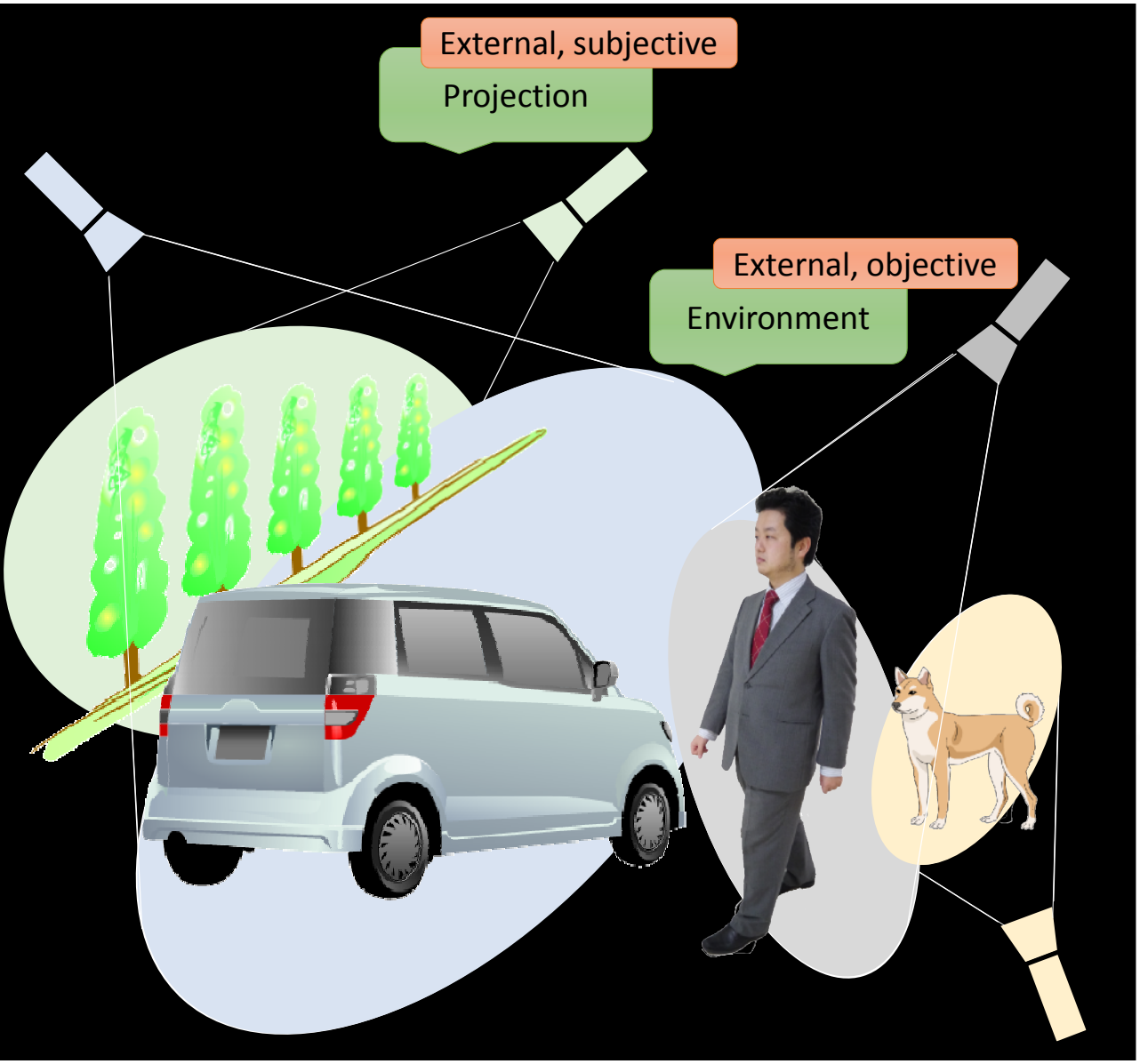
Different cognition!

Road side trees
Absorbing CO2

Small hatchback car
On the way home

Cute dog
Following but not a pet

This is "me"
Walking across the road



Internal, objective

Information

Road side trees
Absorbing CO2

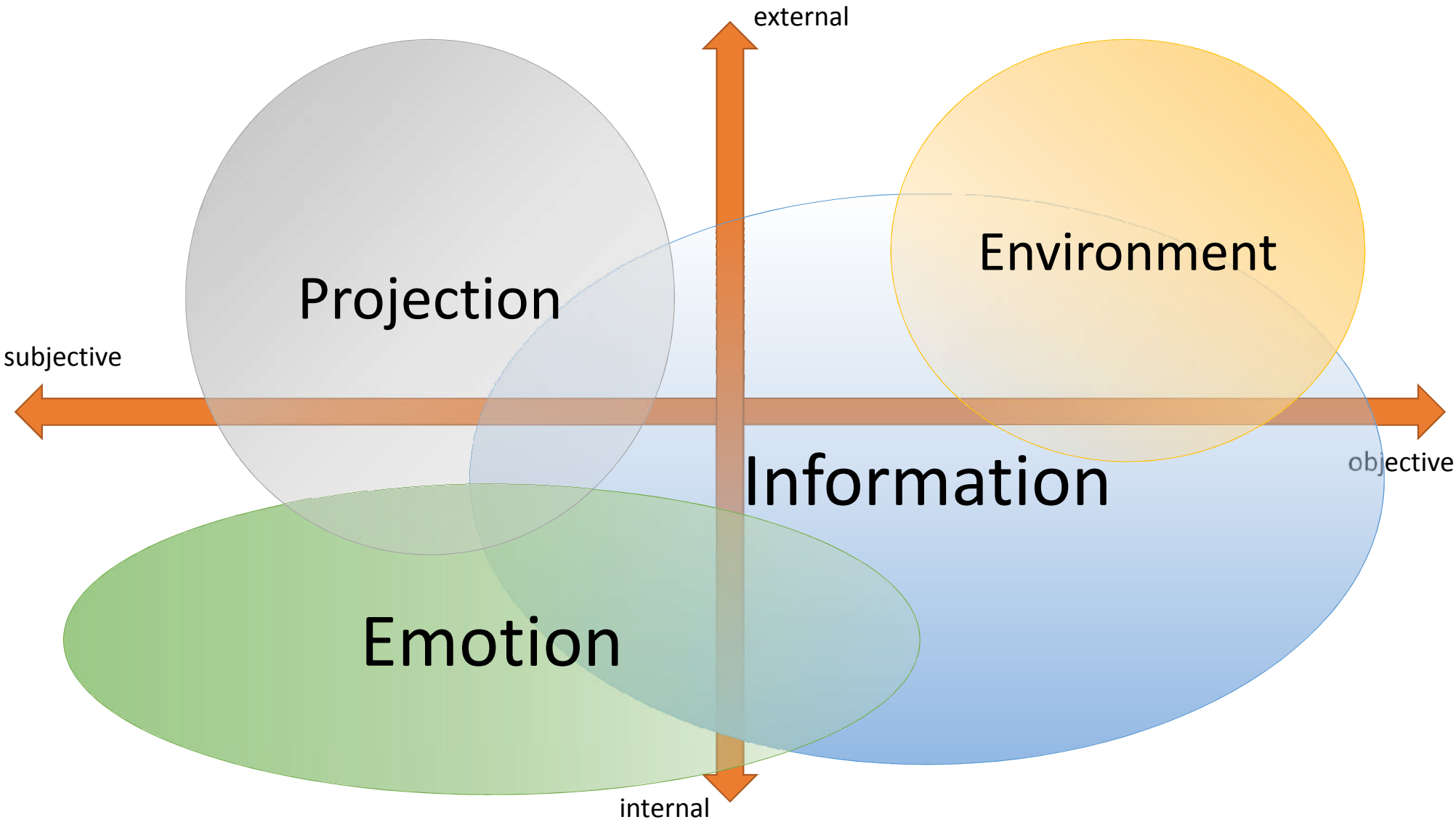
Small hatchback car
On the way home

Internal, subjective

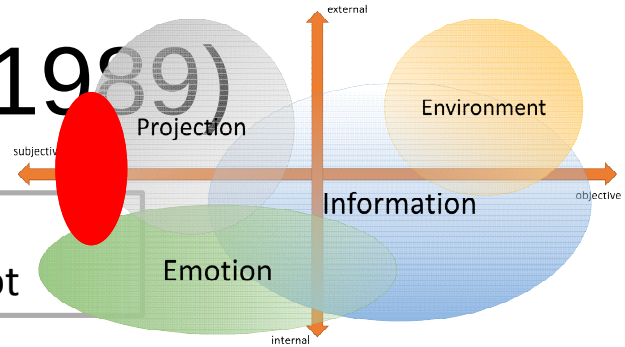
Emotion

Cool dog
Following **but not a pet**

It is "me"
Walking **across the road**


external
Projection
Environment
subjective
objective
Information
Emotion
internal

The mental stances (Dennett, 1989)



When the guardian robot stands by a gate,
a person who try to pass the gate is caught by the robot

Intentional stance

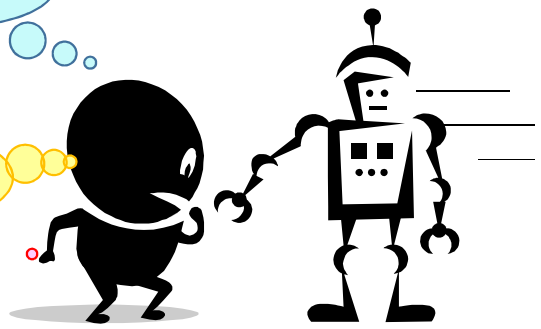
The robot think "I do not permit the passage because this gate is now broken."

Design stance

When the sensors of the robot detect a person, the robot catches me.

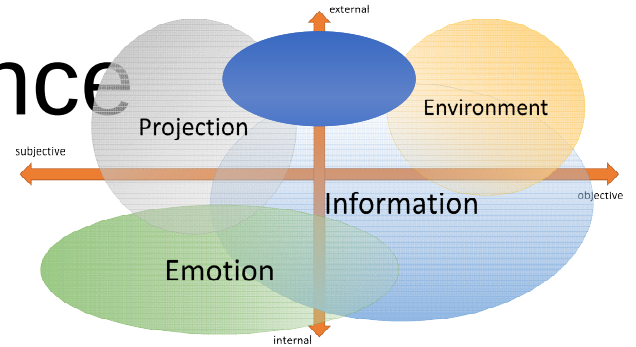
Physical stance

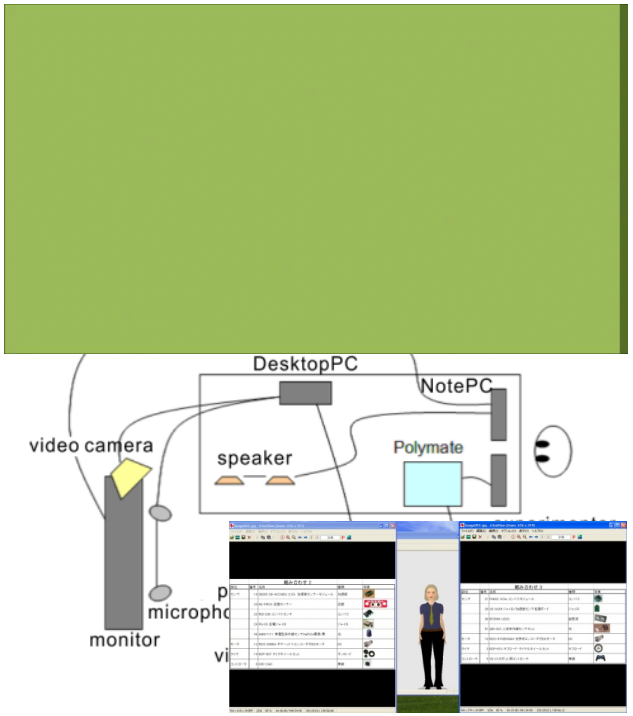
The actuator and the computer controls the robot body.



Dynamic estimation of preference

- We proposed a method to dynamically estimate which factors were emphasized for decision-making.
  - Using keywords, nodding, SCR, electrocardiogram, skin temperature
- We could estimate the preference of the participants in human-agent interaction.
  - The participants were satisfied with the support of the agent based on the method.
- In many cases, the agent's expressions obviously influenced for their interpretations of task elements.
  - Participants designed a mobile robot.
  - They are influenced for the interpretations of the parts.





Is information encoding in the brain analogic or digital ?

Vincent Gripon

Mar. 24th, 2015

Analogic vs. digital

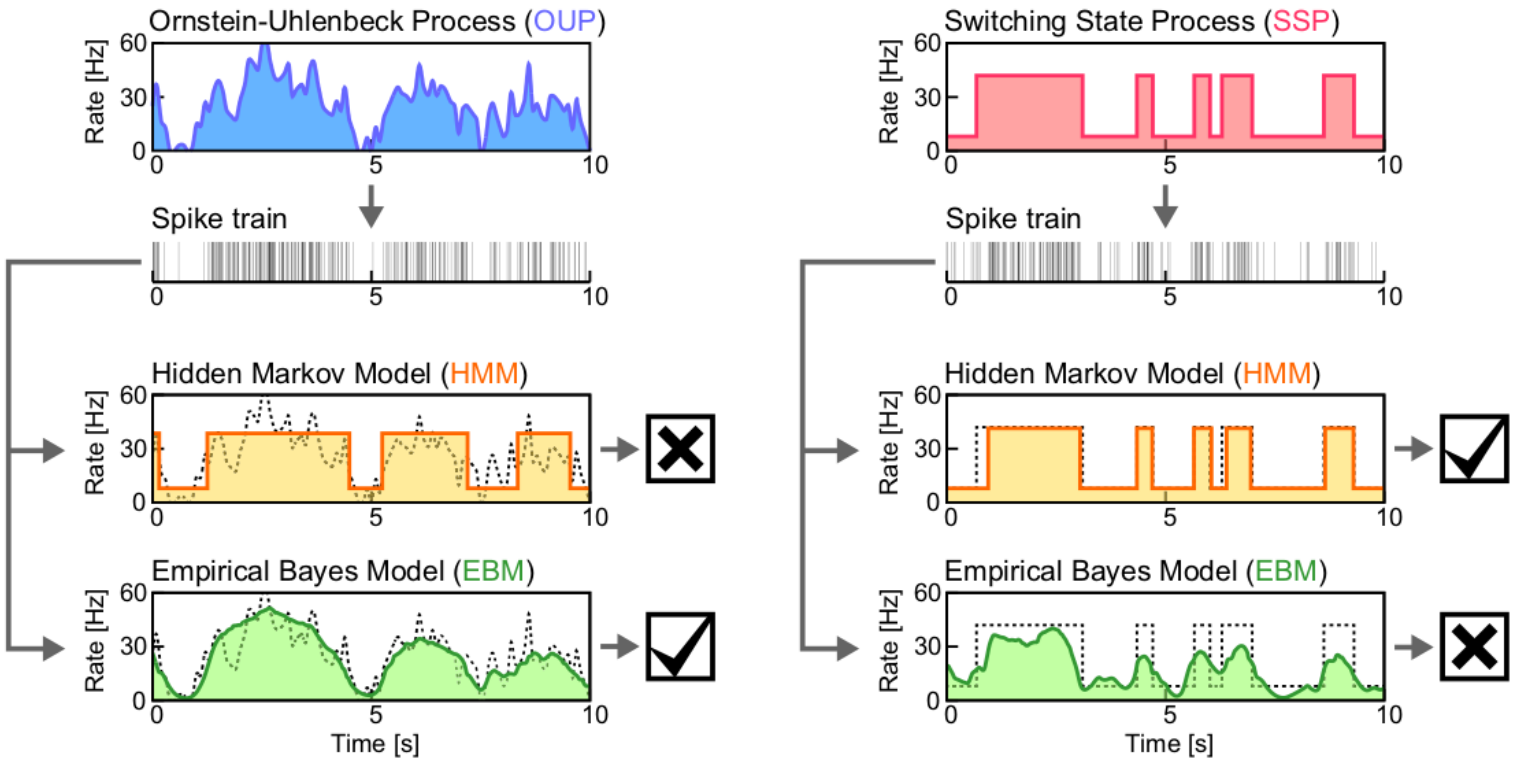


Image from Y. Mochizuki and S. Shinomoto, "Analog and digital codes in the brain", Physical Review, 2014.

Analogic vs. digital

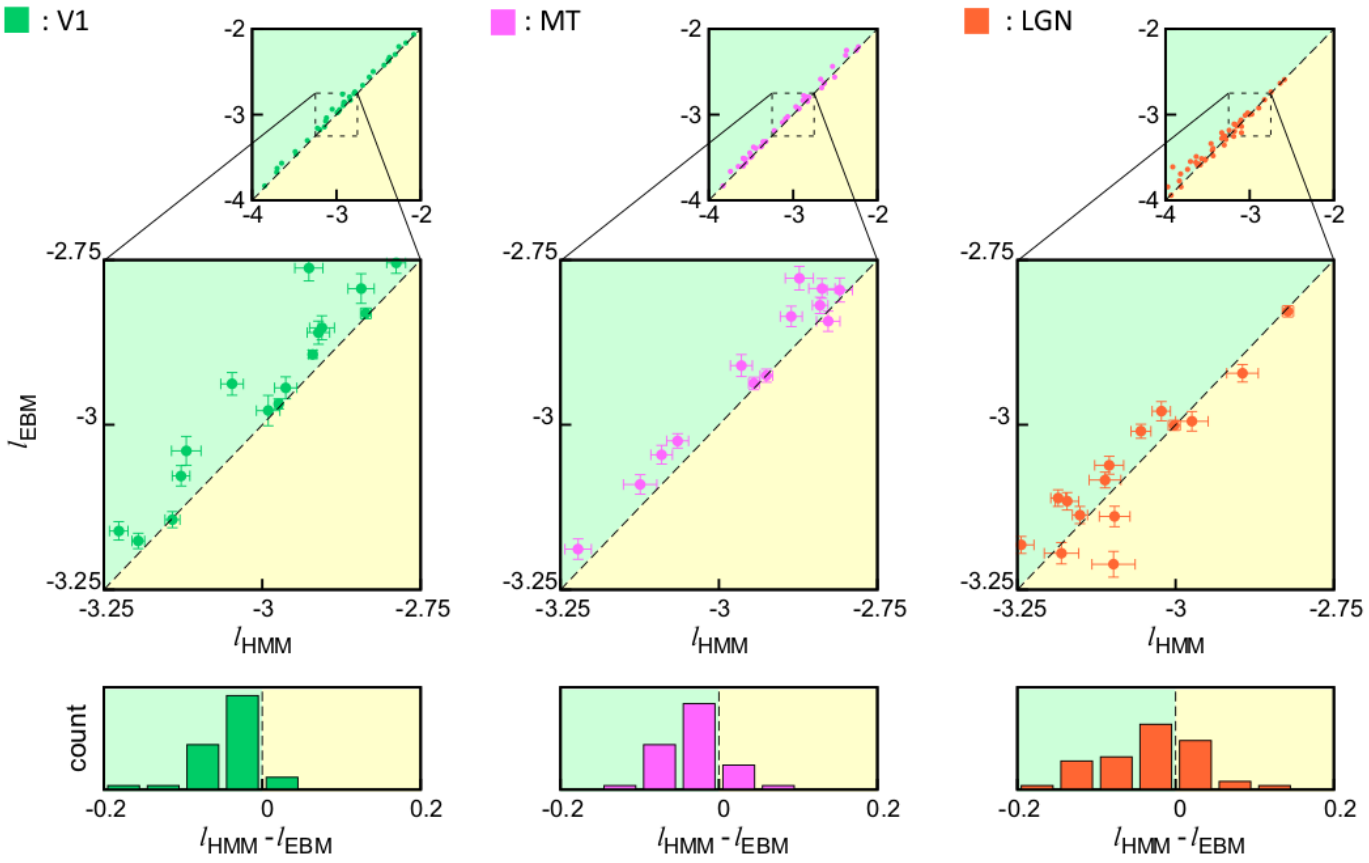


Image from Y. Mochizuki and S. Shinomoto, "Analog and digital codes in the brain", Physical Review, 2014.

Analogic arguments

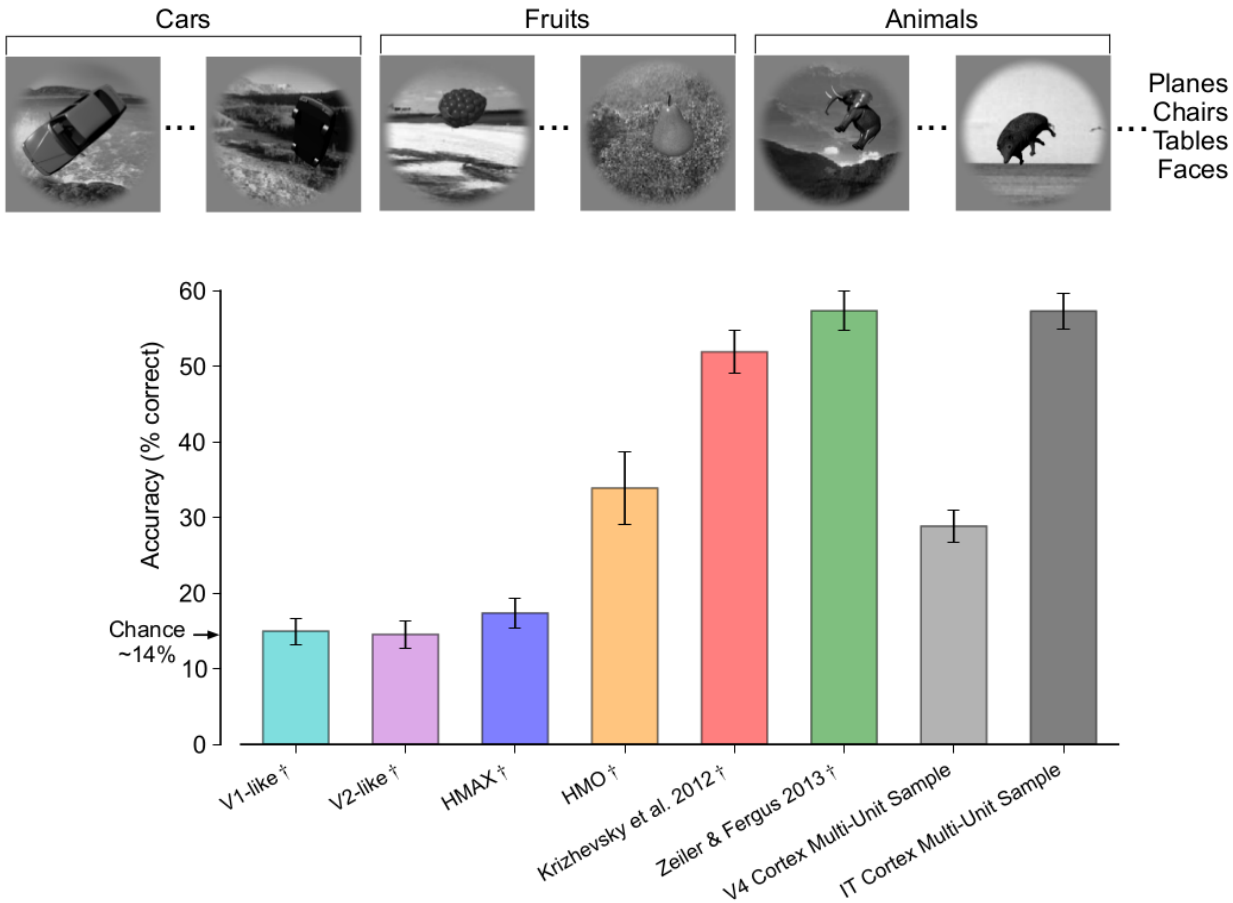
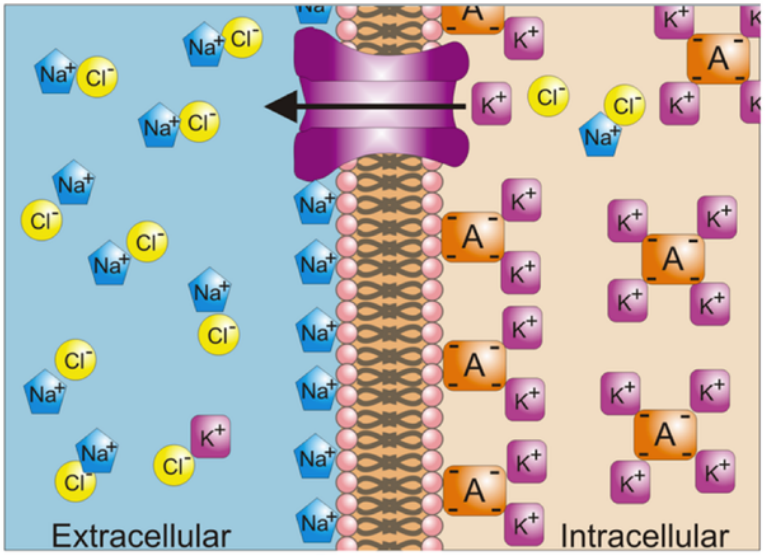


Image from C. F. Cadieu et al., "Deep neural networks rival the representation of primate IT cortex for core visual object recognition", PLoS computational biology, 2014.

Digital arguments



"The probability that a synapse fails to release neurotransmitter in response to an incoming signal is remarkably high, between 0.5 and 0.9"

"The spontaneous firing of spikes accounts for almost 80% of the metabolic energy consumed by the brain"

Quotations from S. B. Laughlin, T. J. Sejnowski, ‘‘Communication in neuronal networks’’, Science, 2003.

Analogic or digital...

Analogic	Digital
Performance in learning	Performance in storing
Robust when one component fails	Robust when all components are unreliable
Useful for signal processing	Useful for information processing
Sensori motor inputs are analogical	Language is digital
Model low-level	Model high-level

...or both ?

Image from "How to grow a mind: Statistics, structure, and abstraction", Tenenbaum et al., Science 2011.

...or both ?

Image from "How to grow a mind: Statistics, structure, and abstraction", Tenenbaum et al., Science 2011.