

Psychology 101

Action – Perception – Cognition

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Action-perception coupling

« Classical » psychology (cognitivist approach)
Perception \Leftrightarrow Cognition \Leftrightarrow Action

Coupling between action and perception

Action for perception

Move head to perceive depth

Manipulate object to perceive its shape

Perception for action

Adjust arm and hand motion to grasp an object

Ecological theory of perception - J.J. Gibson

Co-evolution between the animal
and its environment

Direct perception

« Information pick up »

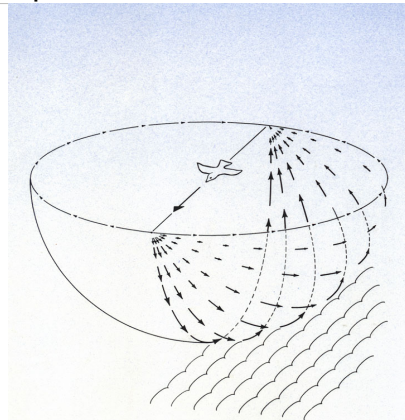
Visual perception

Perception of optical flow

Extract invariants

Example :

direction of motion =
fixed point in the optical flow



Sight

Visual field is about 180°

Focus of attention

Visual acuity: 0.04mm at 50cm

Peripheral perception

Less sensitive to colors,
More sensitive to motion

Perception of color, motion, depth

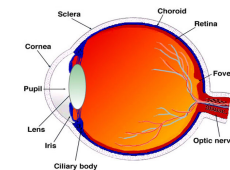
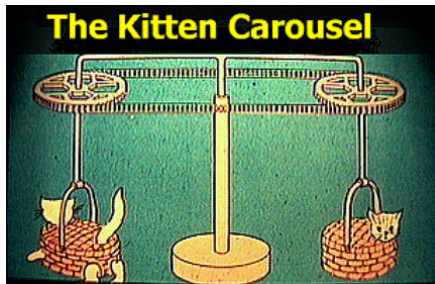


Fig. 4. Vertical sagittal section of the adult human eye.

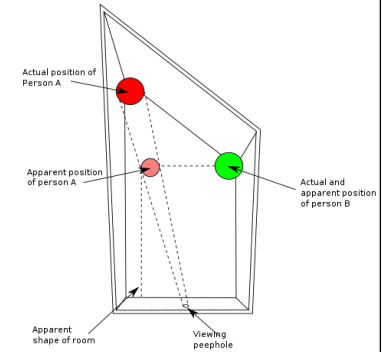
Held & Hein (1963) Kitten Carousel

The role of experience in perceptual-motor development



Self-produced movement and concurrent visual feedback are essential for the development of visually guided behavior

Depth illusion: Ames room



Hearing

Very large sensitivity range

Hearing without listening
« Cocktail-party » effect

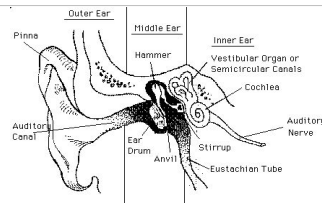
Masking effects

Distance between sources

Distance between peak frequencies

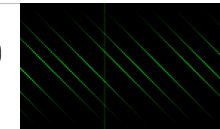
Localizing a source

Correlation with visual localisation

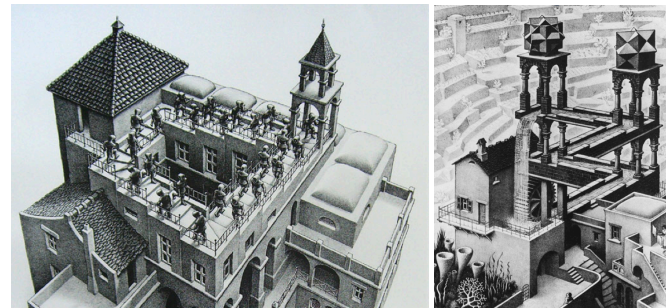


Auditory illusion: Shepard-Risset tones

A sound that (seems to) always go down

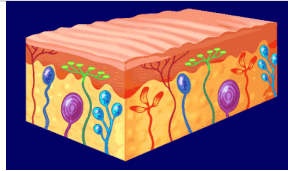


Audio equivalent to Escher's stairs or fountain



Touch

Touch: 6 types of sensors
 Hot, Cold, Pain
 Pressure, Touch (2 sensitivities)



Proprioception
 Configuration of one's body in space,
 used to perceive, e.g., the shape of an object

Kinesthesia
 Tension of one's muscles,
 used to assess the weight or resistance of an object

Motor system

Controlling a gesture: target pointing

Fitts' law

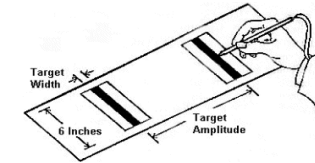
$$MT = a + b \log(1 + D/W)$$

MT, movement time

D, distance to target

W, width of target

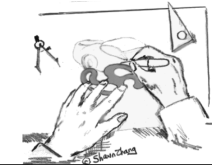
a, *b*, empirically determined constants



Bi-manual control (Guiard)

Non dominant hand: sets the context

Dominant hand: acts within that context

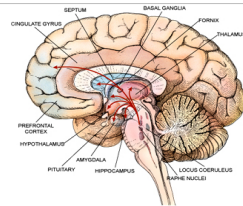


Memory and learning

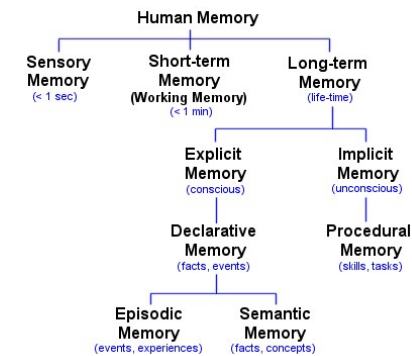
Short-term memory
 Working memory
 Low capacity (7 ± 2)
 Short-lived (10-30s)

Long-term memory
 Infinite capacity
 Unlimited duration
 Associative access

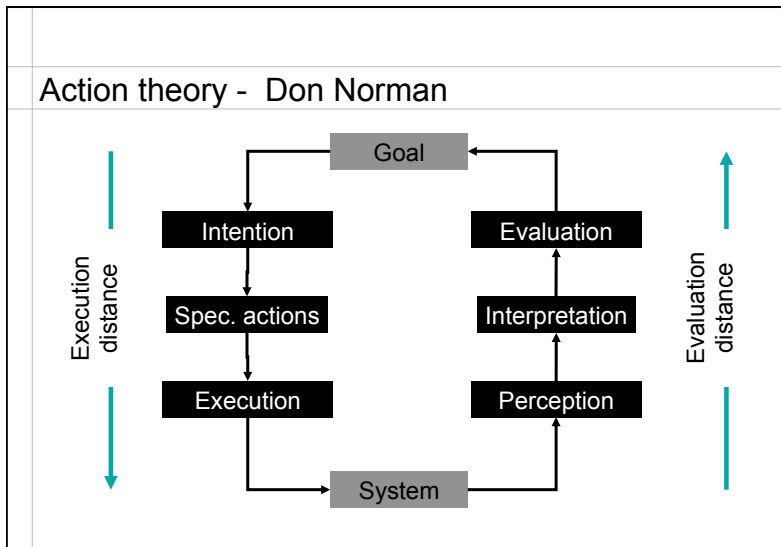
Repetition reinforces memory and learning



Different types of memory



<http://www.human-memory.net/types.html>



Plans and Situated Action (Suchman)

Humans do not always act according to a pre-made plan

Action is *situated*
 The plan is revised / adapted according to the local situation

Example: empty printer

- add paper
- print to another printer
- give up printing

