

Perception

Contents:

- Basic processing
- Object and face recognition
- Motion perception
- Attention and performance (in [Attention](#) file)

Sensation vs Perception

Perception would be the analysis of the information we receive and sensation is the way our sensorial receptors represent our physical external reality. When talking about sensation we think about the detection of stimuli but without the attaching any meaning (without interpretation). Sensation by itself it is not useful we need some processing.

On the other hand, perception comes with a conscious analysis that provides meaning to the external world we experience. It is the way we organize and process the information.

Environment (detection) → Transduction (physical to electrical energy) → Transmission → Processing (Integration & Interaction)

Stimulus energy → Sensory Receptors → Neural Impulses → Brain

Perception is the process being done in the brain, it rather more **information processing** than a reflection of the physical reality through our visual system (proximal Stimulus). **THE** reality (Distal Stimulus) is different than **MY** reality.

Proximal Stimulus: The amount of energy we gather about the physical world (e.g. the amount of photon we receive and interpret that an object reflects). It works with incomplete information: (a) Perception completes information + (b) we perceive beyond reality.

Distal Stimulus: The amount of energy a object emits/reflects.

For example, when reading we can get the last and first letters of a word and our brain can fill up the rest.

Automatic or Intentional Processes

Perception has the goal of reducing uncertainty based. This is a volitional/intentional process. We do without any command. Perception is suboptimal in terms of accuracy but adaptatively in terms of survival (e.g. we can be much more responsible to a visual stimuli that looks like a tiger, or like a cat get scared of a cucumber thinking its a snake (i.e. first you flee and then you think). Animal do not want slower processing traded with a greater accuracy.

A little bit of Attention

Attention is a process of perceptual focus that can increase one's awareness of a certain stimuli that is surrounded of other stimuli that are more diffusely perceived.

- **Primary attention (reflex):** physiological response that the body has to a stimulus that attracts our attention
- **Secondary Attention (selective):** implies that our mechanism responsible for attention consciously "selects" the stimuli in which focus

Types of Systems that receive information

- **Interoceptive sensory systems:** the state of the bodies and information about internal changes in our body (e.g. having to pee)
- **Proprioceptive sensory systems:** Information about the position in space and the movement of different parts of the body. Our body **in** the environment (e.g. balance, *I know I'm walking*)
- **Exteroceptive sensory systems:** The classical 5 senses that allow us to experience our environment (sight, smell, hearing, touch, taste). The input comes from the outside.

The exteroceptive senses mainly detect energy (sight, hearing) or matter (touch, smell, taste). These are the type of receptors and what they detect:

- Chemoreceptors: Chemical molecules in the air/water
- Touch receptors: Mechanical pression on the skin. There are several for this sense (pressure, fine touch, temperature and pain)
- Mechanical receptors: The pression derived from sound waves in the tympanum
- Photoreceptors: Electromagnetic radiation (light)

Cerebral Cortex and Receptors

Our perceptual experience occurs in different areas of our cerebral cortex (there are several different areas for our systems and senses).

IMAGES OF THE DIFERENT RECEPTORS AND THEIR PARTS

Pain it different!

Because it is an essential function for survival it is faster than other senses. There are the nociceptors, nerves that directly go to the spinal cord. Sometimes we can move faster than we process the pain (form part of our perceptual experience) upon reaction to a needle or fire.

When the information comes to the brain it becomes an active process that generates a perceptual experience, we make sense of the external world.

Anatomy of the eye

In the retina (mainly the fovea) there are two visual receptor cells that are in charge of the vision.

- Cones (color vision):

Used for color vision, sharpness of vision and vision at higher light levels. They react to certain wavelengths and thus we are able to interpret color (the psychological definition of color).

- Rods (motion detection)

Vision in dim light and movement information.

Parts:

- Retina
- Fovea
- Blind Spot: where the optic nerve is located

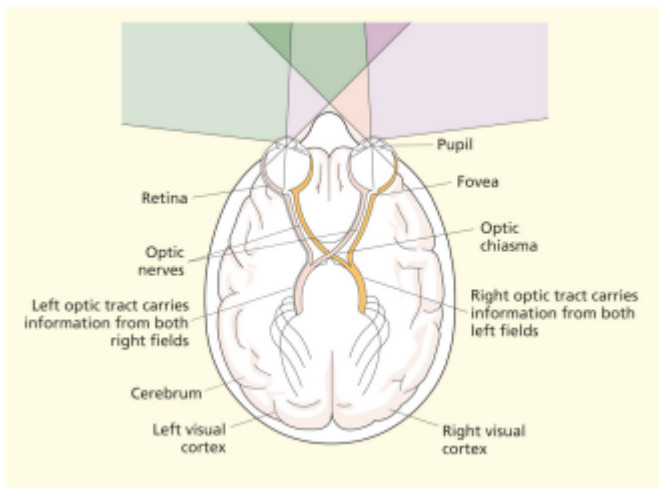
Optical Nerves and Pathways

NOT THAT MUCH IMPORTANT

There are two optic nerves, one to each eye, each nerve is divided into two. One half channels the information from the left side of our visual space (i.e. what we see on the left) and the other half the information from the right.

At the optic chiasma, the two halves that take the information from one side of our visual space are joined and go to the opposite hemisphere of the brain.

That is, all the information that comes from our left is channeled into one half of each optical nerve. These halves then join (Right Optic Tract) and go to the right side of our brain. The same happens to the right, the two halves are joined (Left Optic Tract) and go to the left hemisphere:



On the above figure we can see that each optic nerve is divided (there are two colors). The right halves of each channel join, the same goes to the other side.

As explained on *CP a student's handbook*:

"Each eye has its own optic nerve and the two optic nerves meet at the optic chiasm. At this point the axons from the outer halves of each retina proceed to the hemisphere on the brain hemisphere on the same side, whereas those from the inner halves cross over and go to the other hemisphere. As a result, each side of visual space is represented within the opposite brain hemisphere. Signals then proceed along two optic tracts within the brain. One tract contains signals from the left half of each eye and the other signals from the right half."

Furthermore there are two main pathways (not to be confused with the division made to process the right and left part of our vision), the P and M pathways.

Bottom-Up & Top-Down perception

Bottom-Up: the receptors are stimulated but we don't have any further context to interpret what we are looking at.

Top-Down: we are making sense of a certain stimuli based on the environment. Without the context a stimuli can not be interpreted. This kind of perception is conceptually driven, when changing the context the interpretation can change. Thus, a previous experience we have can alter how we perceive a stimuli.

Moreover, more information can make us draw more complex conclusion about what we see.

Object and Face recognition

There are 4 recognition process:

- Pattern Recognition
- Perceptual Organization
- Object Recognition

- face Recognition

The world provides us with too much information and we try to make sense (organization, coherence, structure, essential info) of it through these processes.

Gestalt Principles

The brain goes through a process of information restructuring and tries to find a shape. This shape does not really meet a "trigonometrical analysis" but rather tries to meet some sort of known pattern that we have previously seen.

This brain tries to find a normal relation between the figure and the background (making a distinction between) (e.g. a table is the object and everything else is the background).

The main principle of Gestalt is "the whole is greater than the sum of its parts". When we see an object by parts and we piece them together we can form a complex shape in our mind. There is a figure-ground **segmentation**, the figure is perceived as having a distinct form or shape whereas the ground lacks form.

This organization about what we see is natural and intrinsic to our brain (argued by gestaltists).

Gestalt Perceptual Organization

Qualities (defined as laws) about what we see can help us organize what we see:

- Proximity
- Similarity
- Continuation
- Closure