How Top-Down and Bottom-up Information Streams Interact With Each Other To Form Visual Perception

four variants in the literature
- anatomical (equating top-down influences with the feedback activity in a processing hierarchy)
- cognitivist (equating top-down influences with hypothesisor expectation-driven processing)
- perceptual or gestaltist (equating top-down influences with contextual modulation of perceptual items)
- dynamicist (equating top-down influences with the enslavement of local processing elements by large-scale neuronal dynamics)

Top-down Stream

is based on

refers to an information stream that contributes based on prior experiences, current personal and behavioral sets, and future expectations and modifies the processing of the presented stimulus.

- Prior knowledge & experience
- Current perceptual task
- Future expectations

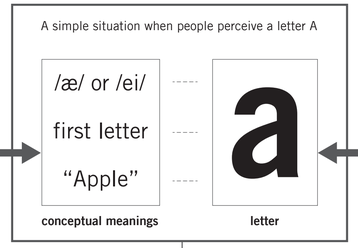
send

Efference copy — cancel out sensation of object movement that is due to

refers to a copy of the motor instruction to execute an eye movement.

search the stimilus in prior knowledge and retrieve relative information

A simple situation when people perceive a letter A



recognize the physical shape and seperate it from the background

update / reinforce

refers to a long-term improvement in performance on a visual task.

Perceptual learning

trigger

change the tuning properties and activity of

affect the stimulus selectivity during

an example of

Visual Perception

refers to the process of integrating the incoming input and our preexisting knowledge that exists in all contexts

enhance / suppress

Spatial attention / Selective attention

refers to attention that involves directing attention to a location in space and select behaviourally relevant stimuli and to analyse specific parts of the visual field.

Object-oriented & Feature-oriented attention

refers to attention that highlight the discriminability of features belonging to the same object (object-oriented attention) or components sharing similar properties (feature-oriented attention), such as colour, orientation or direction of movement.

help stabilize

Attention window

frame the incoming information for

Visual processing

hierarchical view of

Stimulus — are captured by → **Eye movements** — support and adjust

refers to an energy change(light) which is registered by the senses(vision) and constitutes the basis for perception.

are classified as

Saccadic eye movements

are very rapid jumps of the line of sight made periodicallyat most about four times each second but usually much less frequently.

used to bring images of chosen objects to the fovea, the central region of the retina where resolution of fine visual detail is at its best.

Smooth eye movements

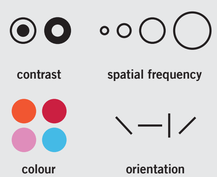
are slower, continuous movements designed to track smooth motion of retinal images produced either by the motion of objects or by motion of the eye itself.

used to prevent rapid motion of the retinal image, which would blur the visual array and impair acuity.

Low-level visual processing

happens at primary visual cortex (V1)

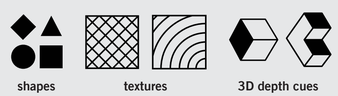
Low-level vision involves the representation of elementary features, such as local color, luminance or contrast.



Mid-level visual processing

happens at visual area 2 to visual area 4 (V2 - V4)

Mid-level vision is the representation of conjunctions of elementary features and properties such as surfaces, higher order image statistics, disparity and intermediate shape features.



High-level visual processing

happens at ventral pathway

High-level vision is considered to reflect abstraction of the visual input into categorical or semantic representations that enable classification or identification.

Bottom-up Stream

refers to an information stream that captures the input present in the visual image itself and conveyed through the senses

Source:
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