
GLOSSARY

The *parameters outside the eye* display features, such as colour or edges, which are detected by *feature detectors* of several kinds **inside the eye**. A *cue* is the sum or count of the responses of one kind of feature detector in a local region of the eye and is therefore an abstracted part of the local region of the *image*. A cue, like a neuron, has its own quality (referring to the feature detected), a quantity (from the size of the sum) and a position on the eye. The bee detects the cue, not the original feature detectors. There is an order of preference to the known cues. The coincidence of the several different cues in a local region of the eye is remembered as a *landmark label*.

For humans, the *centroid* is the unique position of the centre of gravity on which a pattern balances on a pivot. For bees, the centroid is the position of the centre of gravity of the sum of the feature detectors that compose one cue in a local region of the eye. Bees learn centroid positions.

Configurational means laid out spatially like a picture.

Disruption of a pattern is roughly equal to the total length of edges. The motion of the eye over the disruption generates the modulation of the receptors.

The *feature detectors* are the units of perception of modulation, edge orientation, black, white or colour. They are small, about 3 ommatidia long on the retina, and all respond independently in parallel. The bee detects the cue, not the individual feature detectors, which are lost in various summations to form cues.

The *field* of a filter or neuron is the region in space and time within which a signal is detected.

A *filter* is a stage of processing in a model. It usually represents a neuron or group of neurons broadly tuned to detect a feature or cue. It can be represented as a mathematical operator that is multiplied or convolved with an input pattern to yield a signal that is passed on to the next stage of processing.

Fixation is a rigid holding of one position in stationary flight, usually with a high frequency of wing beat while apparently looking at a small spot, a contrast or a hole to fly through.

A *fixed* pattern—as opposed to a *shuffled* one—has the pattern fixed, as seen from the choice point of the bee.

A *generalised parameter* is one that is recognised in a context other than in the training pattern. Originally, it was merely in a different position on the target, but later it was in a different pattern.

A *hub* is the centre of a pattern of radial or tangential edges.

The *image* from the bee's point of view is the pattern of excitation in the array of receptors.

The *label* is the group of cues in a local region of the eye by which the bee recognises a landmark.

The *layout* of the image, features, cues or labels means the arrangement in space.

The *modulation* of a receptor is the change in the light intensity in the receptor and the consequent electrical signal. Modulation is directly related to the length of edge in the field.

Orientation of an edge is usually the angle to the vertical in a vertical plane. The orientation cue is the sum of the responses of the edge orientation detectors in a local region of the eye and, like all the cues, is independent of other properties of the pattern such as shape, continuity of edges or division into separate areas. Within the local region of the eye, the average orientation has a retinotopic position that bees can be trained to remember.

Orthogonal edges are at right angles to each other.

A *parameter* is a scalar or vector measurement of some aspect of the pattern outside the eye—for example, the area or total length of edge.

The *patterns* are displayed on the *targets* during training and tests.

Place for bees is a geocentric term, like the place on a map; *position* and *direction* are usually retinotopic terms on account of the radial arrangement of visual axes. *Location* or *position* refers to the position of a cue on the target, a shift in position of a pattern or a shuffle of the locations of boxes, targets or bars during training and tests.

Point of choice is the place where the bee detects a cue and makes a choice by moving away from or towards the next target.

A *retinotopic* memory is one that is laid out behind the retina to correspond with the layout of the pattern.

A *sign stimulus* is an older and more general term that is not restricted to vision—for example, it can be used in relation to the call of a bird. It is the human idea of the essential stimulus, not the parameters or the cue detected by the feature detectors.

A *template* is a hypothetical mechanism that detects a fairly complicated pattern. It can be innate or learned. In vision, a spatial copy is usually implied.