● **Segmentation of object motion: matching psychophysics and computational models**
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We present a set of research methods and experimental data on the perception of object-motion with concurrent self-motion. Research on visual computation of multiple motion patterns is scarce. This is mainly due to the complexity of stimulus generation, control, and related facilities. To throw light on the visual perception of simultaneous movements, we are working on a project involving empirical testing of a motion algorithm. Two methods are used: psychophysical and computational (computer simulation). Psychophysics experiments allow a general description of the human visual task, eg by determining object-motion detection thresholds. The same visual input, as used with human participants, is then processed by a computational algorithm. This algorithm works through two main levels. First, an optic-flow description is extracted from the set of frames. Second, models of areas MT and MST, as proposed by Sejnowski, are then applied. The outputs from psychophysics experiments (thresholds) and from model computations (confidence rates) are then compared. An interactive process may then start: modifications of the computational model can be tested against further experiments with human participants, thus allowing a step-by-step improvement of the computational model through empirical testing.

● **Trajectory misalignments depend on the orientation of the moving elements**
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A dot moving behind an occluder does not show the misalignment typical of the Poggendorff illusion (Watamaniuk, 1998 *Investigative Ophthalmology & Visual Science* **39**(4) S1075). It was hypothesised that a moving element with an orientation axis (eg a bar) might show a different pattern of results. In two different conditions a bar moved along a direction collinear to its orientation axis, or along a direction at 45° with respect to its orientation axis. In a control condition, a moving dot was also used. In all conditions, the direction of motion was at 45° with respect to the sides of the occluder. The moving elements reappeared after the occluder with a direction offset which was varied randomly and the observers had to report if the direction was above or below the regular direction. The bar moving along the collinear axis yielded the most accurate performance. The moving dot yielded an intermediate performance and the bar moving at 45° with respect to the orientation axis yielded the worst performance. Interestingly, in this condition the errors were towards the component of motion parallel to the sides of the occluder. Therefore the orientation of the moving element has a large effect on the trajectory misalignment.

● **Comparison of methods for the detection of alphanumeric symbols**
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In previous papers we used psychophysical methods (Biondini, Mattiello, and Pescio, 1996, in *Proceedings of II Workshop on Cybernetic Vision, 9–11 December, Sao Carlos, Brazil* pp 89–92) and the Hamming distance (Mattiello, Pescio, and Lado, 1999 *Perception* **28** Supplement, 148) to analyse the distinctive features of alphanumeric patterns generated at random on a 3×5 matrix. Having obtained these data, we are now interested in analysing the recognition of those patterns by using a three-layer neural network of the backpropagation type. A problem arises here from the reduced size of the matrices where, in some cases, a single bit could represent an important feature. The entry layer reflected the size of the matrix; the hidden layer, containing the internal representation of the features, was made up of 20 units; and the exit layer was made up of 26 units, one for each letter of the alphabet. Once the network was trained with both clearly identifiable and other distorted patterns corresponding to the same letter, we found that the network displayed its own criterion. Although this criterion did not necessarily coincide with that of the majority of the observers who took part in the first experiment, the network always responded correctly to the prototype patterns, and to similar patterns in the case of the distorted ones. This leads us to postulate that the criterion adopted by the network was also based on the distinctive features of each character.

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