Probabilsitic approach and active perception

Jacques Droulez

Team overview

We are interested in three dimensional object perception. More specifically, our research focuses on the way the set of sensory-motor information is integrated by the brain to elaborate a coherent representation of objects and of their geometrical properties. Our working hypothesis is that perception - in particular the visual perception - cannot be understood in isolation; the perception is always guided and modified by subject's action. As a consequence, we are also investigating several aspects of motor control and action planning. These studies give us insight on how perception, i.e. representations extracted from sensory-motor information, can be pertinent for action. Our methods include psychophysical experiments, brain functional imagery, modelling and simulation works performed in collaboration with robotics labs.

Techniques used

Psychophysics and experimental psychology,
Mathematical modelling and robotics,
Functional neuroimagery

Bibliography

Bullot, N. & Droulez, J. (2008) Keeping track of invisible individuals while exploring a spatial layaout with partial cues: location-based and deictic direction-based strategies. Philosophical Psychology, 21(1):15-46.

Colas, F., Droulez, J., Wexler, M. & Bessière, P. (2007) A unified probabilistic model of the perception of three-dimensional structure from optic flow. Biological Cybernetics 97:461-477.

Devisme, C., Drobe, B. Monot A. & Droulez, J. (2008) Stereoscopic depth perception in peripheral field and global processing of horizontal disparity gradient pattern. Vision Research 48(6):753-764.

Laurens, J. & Droulez, J. (2007) Bayesian processing of vestibular information. Biological Cybernetics, 96 :389-404

Morvan, C. & Wexler, M. (2005) Reference frames in early motion detection. Journal of Vision, 5, 131-138.

Toffin, D., McIntyre, J., Droulez, J., Berthoz, A., Kemeny, A. (2003) Perception and reproduction of force direction in the horizontal plane. J. Neurophysiol. 90: 3040-3053.

J. Van Boxtel, M. Wexler & J. Droulez (2003) Perception of plane orientation from self-generated and passively observed optic flow. Journal of Vision 3(5) : 318-332.

Zhong, H., Cornilleau-Pérès, V., Cheong, L.F.; Yeow Meng;, G. Droulez, J. (2006) The visual perception of plane tilt from motion in small field and large field: psychophysics and theory, Vision research, 46 (20) 3494-3513.

Wexler, M. (2005) Anticipating the three-dimensional consequences of eye movements. PNAS , 102 : 1246-1251

Wexler, M. and van Boxtel J.A. (2005) Depth perception by the active observer. Trends in Cognitive Science, 9 (9) 431-438.

Website

http://www.lppa.college-de-france.fr/