STUDENT PROJECT offered at the Institute for Neurobiology

EBERHARD KARLS UNIVERSITÄT TÜBINGEN

Student project in Spatial Cognition

Perceptual (visual) metrics of the egocentric space.

Background. Perspective is an obvious property of visual/spatial perception, especially at long distances. It is well known that our representation of the three dimensional space is non-Euclidean - computations show that the geometry of perspective spaces is considerably different from that of Euclidean space (Erkelens, 2015). Alley experiments performed early in the nineteenth century have been instrumental in hypothesizing curved (e.g. hyperbolic) visual spaces (Luneburg, 1950). Currently, the 'perspective space' is assumed as an appropriate model for how we perceive orientations and angles.

In this project, using virtual reality (Unity Engine) together with a stereoscopic presentation device (Oculus Rift), it should be tested how (accurate or distorted) subjects generate horizontal as well as vertical straight lines within a dark and complete featureless 3D space (room). Thus, subjects have to move and arrange virtual point-lights (e.g. Blumenfeld, 1913) in order to align them into straight lines. Using several distances of such virtual lines (composing a three dimensional mesh) this experimentation should serve to prove the perspective space model as valid (or not).

Project(s).

- Develop and program an experimental setup (psychophysically) by using virtual reality technology together with Unity (unity).
- Learn to use psychophysics and a spatial task to investigate the visual-perceptual metrics.
- Learn to create and to run psychophysical experiments as well as data processing by the use of MatLab.
- Analyze behavioural data empirically and graphically and perform statistical tests to extract meaningful effects.

Methods. Visual psychophysics, statistics, and programming of experiments and scripts for analysis & data presentation.

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Level. The project is planned as BSc-project but can be easily extended to a MSc-project.

References.

Blumenfeld, W. (1913). Untersuchungen über die scheinbare Grösse im Sehraume [Studies on apparent sizes in visual space]. Zeitshrift für Psychologie, 65, 241-404.

Erkelens, C.J. (2015). The perspective structure of visual space. i-Perception, 6(5), 1-13.

Koenderink, J.J., Van Doorn, A.J., & Lappin, J.S. (2000). Direct measurement of the curvature of visual space. Perception, 29(1), 69-79.

Luneburg, R. K. (1950). The metric of binocular visual space. JOSA, 40(10), 627-642.

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