Title (tentative): Peripersonal space assessment in mixed reality environments

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Motivation and application domain
Virtual reality allows us to investigate human perception in new, immersive and specific ways. In this thesis, a mixed reality system, where participants can perceive virtual contents between them and the display for natural interaction with virtual objects (Solari et al, 2013), will be used. The aim is to investigate predictions from a recently introduced computational model of embodied consciousness (Rudrauf et al, 2017), combining projective geometry and optimization theory.

General objectives and main activities
The main objective of this thesis proposal is to start from standard experimental techniques, in particular by addressing approaches that have been previously used to analyse the peripersonal space, and to adapt them in order to characterize perception and action in the peripersonal space as a function of perspective changes. This work should lead to the publication of a paper in an international conference. The main activities of the thesis will be the following: (i) study of the state-of-the-art in evaluation of peripersonal space perception; (ii) development of a set of experiments, by taking into account the specific features of the available mixed reality environment; (iii) experimental sessions to characterize the role of the projective frame in the calibration of perception and action in peripersonal space as predicted by the model.

Training Objectives (technical/analytical tools, experimental methodologies)
- Refinement of an available mixed reality environment;
- Analysis of the state-of-the-art of visual perception;
- Development of a set of innovative experiments to be carried out by using the developed MR system (e.g. reaching, blind reaching);
- Experimental sessions with human participants to test the hypotheses.

Place(s) where the thesis work will be carried out: DIBRIS (Genova) and Swiss Center for Affective Sciences at Biotech Campus (Geneva, Switzerland)

Pre-requisite abilities/skills: Object oriented programming (C++ or C#), interest in experimental evaluation, and good background in mathematics and computer graphics (preferred)

Maximum number of students: 2