Visuo-haptic 3D interaction with virtual environments

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**Motivation and application domain**
Visuo-haptic interaction with virtual environments has wide range of applications, from telemanipulation, training of skilled movements, assessment of human perceptual and motor performance and neurorehabilitation. Until recently, these applications required expensive, dedicated devices. However, low-cost stereo displays and haptic robots are now commercially available, which might greatly extend the range of possible applications.

**General objectives and main activities**
The goal of this thesis project is to develop a novel experimental apparatus that integrates a stereo display and 2D/3D haptic devices. The device will be used to simulate manipulation activities like surgical procedures and to carry out experimental investigations on visuo-haptic perceptual interaction and visuo-motor control performance. The work will have a technical part (integration of stereo display and haptic device) and an experimental part (visuo-motor action and visuo-haptic interaction).

**Training Objectives (technical/analytical tools, experimental methodologies)**
- Integration of stereo display and haptic/robotic devices
- Design simple 3D stimulations for haptic interaction
- Conducting experiments with healthy subjects
- Analysis of perceptual and movement data with MATLAB

**Place(s) where the thesis work will be carried out:** Neurolab – DIBRIS (Pad. E, II piano) e PSPClab – DIBRIS (via Opera Pia 11a, III piano)

**Additional information**
Pre-requisite abilities/skills: Interest in experimental activities with human subjects; programming skills in MATLAB and C++ are highly desirable.

Maximum number of students: 2