Title (tentative): Natural human-computer interaction in cooperative mixed reality

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Motivation and application domain
The application domain of this Thesis is the study of novel methods and technologies to achieve a Natural Human-Computer Interaction (HCI). In particular, scope of the work is to combine methods and tools from Computer Science and Computer Vision with methods from psychophysics in order to study the perception issues that arise when using HCI, in particular in virtual, augmented and mixed reality environments.

General objectives and main activities
The main objective of this thesis proposal is to start from a previously developed environment for natural interaction in a mixed reality environments and to develop a collaborative tool where people can act together by addressing several kind of tasks, e.g assembling 3D shapes. One of the aim of thesis will be to assess and compare different solutions for achieving natural interaction, e.g. the use of the Leap Motion device vs the use of the touch screen of a tablet. The main activities of the thesis will be: (i) to devise a task that could be completed in collaboration among users (e.g. in the field of educational games); (ii) to implement it by considering both a stereoscopic mixed reality environment (stereo TV, Leap Motion) and an augmented reality setup based on tablet; (iii) to assess and compare the two solutions.

Training Objectives (technical/analytical tools, experimental methodologies)
- Analysis of the state-of-the-art in natural human-computer interaction
- Development and implementation of innovative Computer Vision algorithms to obtain a robust tracking of the user (especially eye position tracking for a correct stereo visualization, and hand tracking for interaction)
- Working prototypes
- Qualitative and quantitative experimental evaluation of their functionalities are expected.

Place(s) where the thesis work will be carried out: DIBRIS

Additional information
Pre-requisite abilities/skills: Object oriented programming (C++ or C#), interest in experimental evaluation

Maximum number of students: 1