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Research Topic for the ParisTech/CSC PhD Program
(one page maximum)

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Field (cf. List of fields below): Information and Communication Sciences and Technologies

Subfield: Computer Science, Virtual reality

ParisTech School:EcoleNationaleSupérieured'Artset MétiersParistech - ENSAM

Title:**Intuitive 3DInteractions for Mobile Mixed Reality**

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Short description of possible research topics for a PhD: (10-15 lines in English + optional figure)

Natural User Interfaces (NUI) aim to provide multimedia applications with natural and intuitive controlling operations, such as touch, sound and motion. To provide such interfaces, special devices are necessary to detect and recognize a human's natural input signal. In recent years, several interaction techniques have been developedusing human motion detection and recognition devices like Kinect or Leap Motion. However, such approachesare appliedonly in simple and controlled environments. Creating intuitive ways to interact with 3D content in a mobile mixed reality environment still one of the major challenges of current computer science. The aim of this PhD project is to investigate novel concepts to naturally interact with 3D virtual objects displayed on a see-through glass (e.g. Hololens). 3D gesture tracking / recognition based on machine learning approaches will be investigatedas well as the selection/manipulation of virtual objects in mixed reality context. An in-depth evaluation procedure on several use cases will be carried out in order to study how these approaches would affect the user's performances.

Required background of the student: (Which should be the main field of study of the applicant before applying)

The candidate should have aMaster degree or equivalent in computer science, or related disciplines. Required skills are experience in C++ software development, Machine learning and pattern recognition, applied mathematics, and a good command of English (reading/writing/speaking. In addition, the successful candidate will be highly self-motivated, passionate about his/her work, and has good ability to work both independently as well as in a team in a multidisciplinary environment.

A list of 5(max.) representative publications of the group: (Related to the research topic)

1. Cyrille Migniot, Fakhreddine Ababsa:Hybrid 3D-2D human tracking in a top view. J. Real-Time Image Processing 11(4): 769-784 (2016)

2. HajarHiyadi, Fakhreddine Ababsa, Christophe Montagne, El-Houssine Bouyakhf, FakhitaRegragui: Adaptive dynamic time warping for recognition of natural gestures. IPTA 2016: 1-6

3. M. Ali Mirzaei, Jean-RémyChardonnet, Frédéric Mérienne, A. Genty:Navigation and interaction in a real-scale digital mock-up using natural language and user gesture. VRIC 2014: 28:1-28:4

4. Hamid Hrimech, Leila Alem, Frédéric Mérienne: How 3D Interaction Metaphors Affect User Experience in Collaborative Virtual Environment. Adv. Human-Computer Interaction 2011