proposition sujet de stage **2016 - 2017**
MASTER Recherche

Titre du stage : Assembly/Disassembly operation simulation by hand gestures recognition

Laboratoire(s) d'accueil : G-SCOP

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Description du sujet

Simulations closely related with virtual reality (VR) environments represent important research subject. An important role is played by assembly/disassembly (A/D) operations in the initial stages of the product design, such as: production, ergonomics, training, health, service or recycling stages. Literature reports many methods used for analysis and different simulation applications which use information referring to components mating. However, the existing platforms of A/D simulation by hand gestures recognition are often badly integrated in the Product Development Process (PDP) because they do not take account of the physiological state of the operator for varied conditions of request (postures, efforts, fatigue, injury…)

In this context, the main objective of this research is to improve the robotised A/D process simulation through better haptic devices integration including physiologic data. To this end, a series of tests with 6 degrees of freedom (DOF) haptic device Haption Vitruose 3D and “ElectroMyoGraphy” (EMG) data are necessary. The aim is to provide a robust acquisition technology associated to an appropriated EMG signal processing, based on the use of EMG network sensors (localisation on the skin, tolerance in wrong positioning, optimal number of electrodes) in order to improve the time delay of detection for the separation and the classification of different hand gestures. A model including the physiologic state of the operator, including the quantification of the muscular/neural fatigue for example, for planning and simulation of A/D operations have to be proposed as well. It will be based on the Digital Mock-up (DMU) of the mechanical assemnlies (units). The model will be validated via its integration in a constrained virtual environment allowing the simulation of A/D operations within the framework of the existing data-processing environment, as its integration in the PDP.

The proposed subject falls under a common set of themes of research, within Research action, Authoring Augmented Reality (WP2), “Real-time capture and simulation of the real world” of the PERSYVAL Lab (http://www.persyval-lab.org/index.html).