Haptic stimulation during virtual reality interactions aimed at tactile and proprioceptive feedbacks

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Abstract

This thesis project focuses on the rôle of vibro-tactile stimulation in the integration of tactile and proprioceptive information, in order to extract important parameters for haptic stimulation in virtual reality. The data collection will be carried out on healthy adult participants. The tactile and proprioceptive perception of the participants will be evaluated through questionnaires and psychophysical assessments. Touch-induced physiological vibrations will be measured using an accelerometer system positioned on the participants' hand and forearm and muscle activity will be recorded using electromyography (EMG). The participants' movements will be captured by video and analysed by a tracking system developed by the company V.RTU. The pressure exerted during the touch will be recorded with a force cell, electrodermal activity and temperature will also be collected. Different specific experiments will be performed. A first approach will be to ask participants to perform tactile and proprioceptive explorations in order to collect data on the integration of information. Different tactile environments and textures will be explored. A second approach will explore the sensations induced by vibro-tactile stimulation via a haptic device proposed by the company V.RTU at the level of the hand and wrist, during tactile exploration in a natural environment and an augmented reality environment. This study will explore the role of physiological vibrations in tactile and proprioceptive integration, in order to model these vibrations for application in a multisensory context in virtual reality. Psychophysical evaluations will in turn allow the modelling of vibrations to be refined.

Keywords: Haptic, Touch, Proprioception, Multisensory Integration, Virtual Reality, Augmented Reality

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