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Composition du Jury

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Résumé

Among the 5 senses, the sense of touch is between the most articulated and the least understood. While we are able to master the signals that underlie sight and hearing, rendering them using loudspeakers and visual interfaces, the mechanisms underlying the sense of touch are still largely unknown. Touch, originating by the contact between the skin and the explored surface and involving several types of stimuli, requires a strongly multidisciplinary approach and involves a wide range of disciplines, such as Medicine, Neurosciences, Psychology, Dynamics, Tribology, Materials Sciences, and beyond. Tribology and Dynamics are involved in the study of all those complex phenomena that occur at the contact and that generate mechanical stimuli such as Friction-Induced Vibrations and contact forces, at the origin of the stimulation of skin's mechanoreceptors. This Ph.D. thesis is collocated into a research line closely dedicated to the investigation of the role of Friction-Induced Vibrations (FIV) in mediating between the characteristics of surface textures and the way in which textures are perceived and discriminated. Analyses of vibrational stimuli originating from the exploration of periodic and isotropic textures have been carried out in the present work, revealing different key features in the discrimination of such textures. A tactile rendering device, named PIEZOTACT, has been developed to reproduce/mimic the FIV previously measured during the exploration of real surfaces, conducing as well campaigns on groups of volunteers, to evaluate their ability to discriminate real and simulated textures starting from the sole vibrational tactile stimuli. Finally, a multi-disciplinary collaboration with laboratories form Neurosciences and Psychology has been performed to evaluate the brain's response to the mechanical stimuli generated by the exploration of real and simulated surfaces.