

Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en Sciences de l'Ingénieur

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Finger pad mechanics, tactile signals and dexterous manipulation

Touch allows us to perceive the physical properties of the surrounding world. The numerous tactile afferents innervating the hand faithfully capture the complex mechanical interactions between the fingertips and the environment. Despite the critical importance of tactile information in a variety of tasks, the way the brain acquires and uses this information is still unclear.

This thesis explores tactile interactions from a biomechanical point of view. First, we present a new method to quickly measure friction at the fingertip-object contact while capturing its dependence on the normal contact force. Due to the compliant nature of the fingertips, localized slips occur at the fingertip contact under tangential loading. We examine how this *partial slip* phenomenon is related to the subjective perception of fingertip slip. We show that subjects can anticipate full slip and propose a new slip detection mechanism. To test this mechanism during manipulation, we develop the ActiveTouch manipulandum, which can image the fingertip contact and record fingertip interaction forces. Preliminary experiments confirm the presence of partial slips during manipulation. We suggest that these slips may help the brain to acquire information on the contact friction and the dynamics of the manipulated object. Finally, we investigate how tactile afferent responses recorded *in vivo* are related to skin strain patterns measured within the fingertip contact.

This work contributes to the fundamental understanding of the biomechanical behavior of fingertips contacting objects in active and passive conditions. This thesis provides useful information for the design of haptic systems and somatosensory neuroprostheses.

Lundi 27 novembre 2017 à 16h30

Auditoire BARB 93
Place Sainte Barbe, 1
1348 Louvain-la-Neuve



Membres du jury :

Prof. Jean-Louis Thonnard (UCL), promoteur
Prof. Philippe Lefèvre (UCL), promoteur
Prof. Christophe De Vleeschouwer (UCL), président
Prof. Thomas Pardoën (UCL), secrétaire
Prof. Ingvars Birznieks (UNSW Sydney, Australia)
Prof. Hannes Saal (University of Sheffield, UK)
Dr. Benoit Delhaye (University of Chicago, USA)
Prof. André Mouraux (UCL)