Université catholique de Louvain **UCL**

ECOLE POLYTECHNIQUE DE LOUVAIN
Doctorat

Invitation à la soutenance publique de thèse

pour l'obtention du doctorat en Sciences de l'Ingénieur

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Fingertip skin as an optimal interface to manipulate objects: the role of moisture

Humans constantly interact with objects by touching, displacing, or manipulating them, and tactile information from the fingertip skin is of primary importance in this process. The skin is a viscoelastic tissue that contains thousands of mechanoreceptors, which are stimulated by skin deformation and provide information about a touched surface or an object held. To optimally control arm movement or fingertip force during object manipulation, the central nervous system (CNS) integrates this tactile information.

In this thesis, a « bottom-up » approach has been used to describe the link between skin mechanical properties and brain motor control of movement. Skin mechanical deformation at the interface between the fingertip and a glass surface and the effect of moisture content has been first addressed. The effect of interaction force components and moisture on the surface skin deformation has been analyzed and the results show that the moisture content can strongly influence skin properties. Then a task-specific instrument to measure skin moisture during object manipulation has been developed and the coefficient of friction at the interface between the fingers and an object held in precision grip has been studied. We show that the effect of the normal force and moisture content on the fingertip friction highlights the optimal moisture value that maximizes the coefficient of friction. These results provided us with a new technique to continuously measure the fingertip friction. Finally, this thesis presents an experiment investigating the effect of the fingertip moisture content on the grip control during dexterous manipulation and we show that the fingertip moisture is optimally modulated during object manipulation.

Jeudi 20 mai 2010 à 17h30

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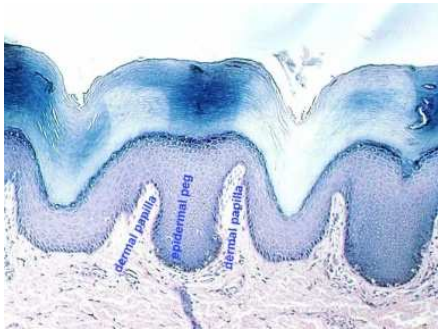

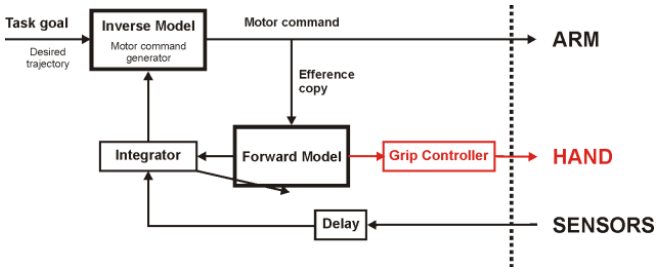

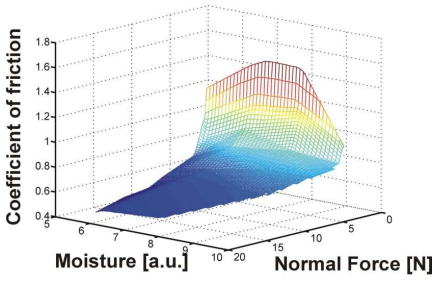

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