TRIBOLOGICAL INTERACTIONS RELATED TO THE TACTILE PERCEPTION OF DETERMINISTIC MICRO-TEXTURED SURFACES

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ABSTRACT
In recent years, industrials paid a growing attention in qualifying and even predicting the tactile perception of their products. Surface texturing offers a reliable route to control surfaces tactile perception but relation between textured surface topography and tactile perception remains still unclear. Moreover, while tactile perception originates from the transmission of friction forces and friction induced vibrations to mechanoreceptors located in the dermis, a better understanding of the fingerpad/surface tribologic interaction is needed. Recently, many efforts were made to correlate friction forces to textures parameters on the one hand [1], and textures parameters to tactile perception on the other hand [2]. Nevertheless, few studies have been conducted to link together textures, fingerpad/surface tribo-response, and perception [3]. The current study aims at investigating both the tactile perception of micro-textured regular surfaces, and the *in vivo* mechanical interaction between the fingerpad and these surfaces. A panel of 52 polymeric textured surfaces were produced by the coupling of photolithographic and replication methods. All textures are defined by a regular hexagonal network of cylindrical micro-dots varying in diameter (from 12 to 905 µm), spacing (from 50 to 1,814 µm), and height (from 4 to 73 µm). Two subsequent tasks of texture perception characterization were conducted with 20 young volunteers. The first task resulted in subdividing the whole surfaces panel according to 3 perceptual categories: rough, slippery, and vibrating textures (Fig. 1). The second task led to quantify the level of perceived roughness, slipperiness and vibration of each textures. In parallel, *in vivo* friction tests were conducted with a young participant using a setup dedicated to active-touch experiments [4]. Measurements of friction coefficient and friction induced vibration were performed when participant's fingerpad rubbed the various textures under 0.4 N normal load and 30 mm/s sliding speed.

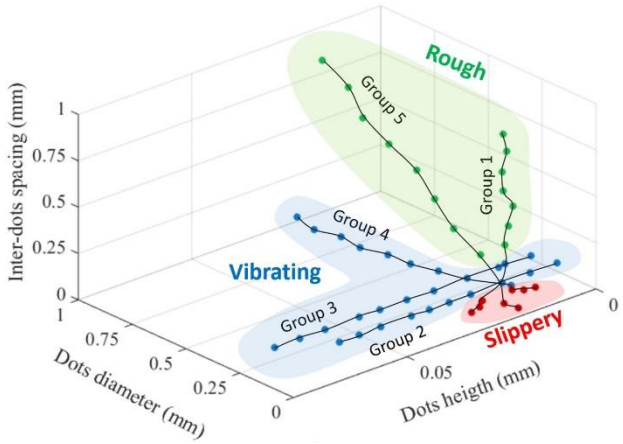

Fig.1: *Perception categories related to texture parameters*

For the 3 textures categories, results indicate significant relationships between (i) perception scores, (ii) friction coefficient and/or friction induced vibration levels, (iii) and surface texture parameters.

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