Influence of finger movement direction on friction induced vibrations and perception of textured surfaces

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Abstract

Natural tactile exploration of a surface can be considered as a procedure to make a classification in a thermal dimension, i.e. warm/cool, and in three mechanical dimensions, i.e. softness/hardness, roughness/smoothness and stickiness/slipperiness. From this exploration, we are able to discriminate and recognize materials and textures. During tactile evaluation, finger can act in different ways, it can be static or scan the surface with various trajectories, velocities or normal forces.
By varying finger movement, finger-surface interaction changes and can be observed by skin deformation depending. The fingerprints interaction with the surface texture can be more or less significant depending on the hardness of the texture and on the spatial periods of the fingerprints and texture.

A previous study has shown the finger induced vibrations are higher for a lateral than for an anteroposterior movement below a frequency threshold approximately at 75 Hz, and lower for higher frequencies (1). However, this result was observed for a given velocity, normal force and finger angle.

This study has been extended to characterize the difference of finger induced vibrations for back and forth movement for both lateral and anteroposterior directions by considering the influence of sliding velocity but also finger angle perpendicularly to the surface and normal load. With the difference of finger induced vibrations, the perception of textured surfaces can also differ. In this study, the ability to discriminate textured surfaces is assessed using lateral and anteroposterior movement.
(1) Camillieri B, Bueno M-A. Influence of Finger Movement Direction and fingerprints Orientation on Friction and Induced Vibrations with Textile Fabrics. Tribol Lett. 2021;69:143.

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