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Influence of finger movement on friction and vibrations against textile fabrics

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The purpose of this study is to investigate the influence of finger orientation, i.e. lateral or anteroposterior, and of movement direction, i.e. proximal or distal on the friction and vibration behaviour against textile fabrics. Two different textile fabrics have been used with twenty volunteers in passive touch conditions in terms of sliding velocity and normal force. Whatever the finger orientation, the movement direction has no influence on the coefficient of friction and a slight influence on the induced vibrations. The movement orientation influences slightly the coefficient of friction but drastically the finger induced vibrations. A hypothesis to explain this mechanism is given.

Keywords: tribology, tactile, friction, finger, textile.

1. Introduction

Tactile perception is well know now to be influenced by friction and finger induced vibrations [1]. Fingerprint spatial period in interaction with surface spatial period play a role in induced vibrations [2]. Finger movement direction, proximal or distal for anteroposterior movement, has been shown in the literature to have an influence on the finger vibration and on perception [3]. The goal is to study the influence of finger movement direction in the case of different finger movement orientation, anteroposterior and lateral and the influence of the movement orientation especially for fibrous material contact.

2. Methods

Two textile fabrics has been used a plain woven fabric with a periodical structure with a spatial period in the same order as fingerprints and a Pekin fabric with linear bumps.
Twenty volunteers have followed the protocol in order to acquire the friction and normal forced and the induced vibrations of the finger moving on the textile surfaces. The volunteers have to control their normal force while the surface was moving under the finger which was fixed. The tactile tribometer was used in a previous study [4].

3. Results and Discussion

3.1. Friction value

In the case of lateral or anteroposterior movements, there is no difference between proximal or distal movement in terms of the coefficient de friction; this is in correlation with the literature [3, 5]. When comparing lateral and anteroposterior (AP) movement, the COF is slightly higher for AP than for lateral.

3.2. Induced vibrations

The vibration autospectra obtained from the different volunteers have the same overall evolution. As for the COF there is no difference between proximal or distal movements, but the autospectra are different in the case of a lateral and an AP movements. In fact, the induced vibrations are lower for AP than for lateral before approximately 80 Hz and higher after 80 Hz. After some additional experiments the hypothesis is the origin of this phenomenon is the finger biomechanics.

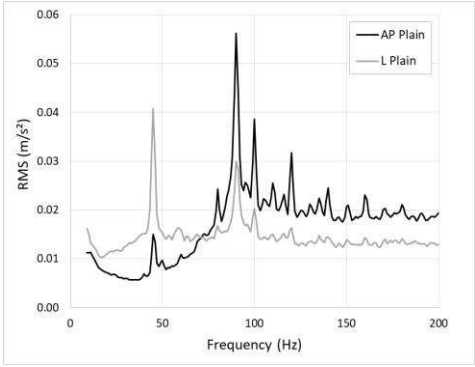

Figure 1: Autospectra of the root mean square of the acceleration due to finger vibration for lateral and anteroposterior orientations for the plain woven fabric.

4. References

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