Design of control signal of a tactile device for textile fabric rendering

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Abstract

Tactile simulation of textile fabrics holds significant potential in various applications, such as e-commerce of garments, furnishing, seat or wall covers for home or transport, etc or virtual prototyping.
However, the tactile rendering should be sufficiently close to real surfaces, and the designer or the manufacturer should be able to easily simulate the surfaces, i.e. should be able to build or complete its own tactile database. Therefore, the process used to build the database, i.e. to add a control signal for the given tactile simulator, should be systematic, from the real surface characterization to the control signal, and without any interaction with a human as a tactile sensor. This needs a specific protocol to be established, independently from the human, but according to the choice of the tactile simulator.

In this project, the tactile device, named STIMTAC (1), is similar to a touchpad; it's principle used the ultrasonic vibration technology inducing a change of the friction between the finger and the surface of the stimulator relative to the finger displacement and then simulating a texture.

A set of 6 textile fabrics representing a wide range of textile surfaces has been chosen and characterized in a tribological point of view following a specific method of measurement using an artificial finger previously developed (2). Then, an adapted signal processing procedure has been developed to convert the normal and friction forces relative to time in a command signal for STIMTAC creating at the end 6 virtual tactile surfaces
In another part, sensorial analysis campaigns were conducted: firstly, to cluster the real fabrics according to their tactile attributes and the most discriminative was the rough/smooth and to compare real and virtual fabrics, and finally to compare real and virtual fabrics as regarding their roughness.

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