HapTex:A Database of Fabric Textures for Surface Tactile Display

【Main Content】:

This article presents a database of tactile textures, which is defined by the friction during the interaction between the bare hand and the real fabric. The application of the database is illustrated by a haptic texture modeling and rendering example that allows users to feel a virtual haptic texture on an electrostatic haptic display.

Figure 1. 120 kinds of fabrics for the establishment of tactile texture database. The fabrics are divided into ten categories (1-4: velvet, 5-31: cotton, 32-33: leather, 34-48: fiber, 49-57: chiffon, 58-73: wool, 74-85: nylon, 86-101: polyester, 102-108: linen, and 109-120: silk).

【Data Collection】:

- **A. Fabric Texture Samples**
- **B. Measurement Apparatus**
- **C. Recording Procedures**
- **D. Recorded Data**

【Electrostatic Tactile Display】:

For creating haptic textures of fabrics, an electrostatic tactile display was utilized, as shown in Figure 6. The haptic interface was composed of following three layers. The top layer is an optical positioning sensor (GSC0320, TMDTOUCH, China) with the accuracy of 0.01 mm for detecting the displacement of finger movement. The middle layer is a haptic capacitive touch screen panel (SCT3250EX, 3M Touch Systems Inc., US), which can generate the electrostatic tactile stimulation. The bottom layer is an LCD screen (Surface Pro 3, Microsoft, US) for displaying visually information of material. The previous works have indicated that the electrostatic tactile display device can render haptic textures of images and detailed shapes on the surface by modulating input voltage signals [22], [33], [34].

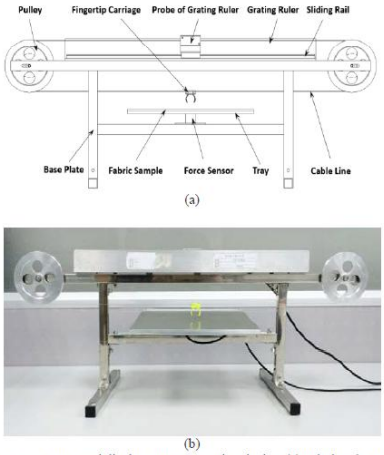

Figure 2. Force and displacement measuring device. (a) Whole schematic design of the measurement device. (b) Physical prototype of the measuring system.

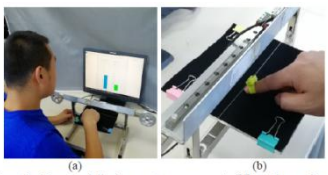

Figure 3. Force and displacement measurement of fingertip moving on fabric surface. (a) Full view of measurement. (b) Posture of fingertip scanning across a fabric surface.

Figure 7. A user interacted with the virtual haptic fabric texture via an electrostatic tactile display. (a) Full view of test. (b) Detailed view of experiencing a virtual tactile texture.