

Active Perception-Based Haptic Texture Sensor

Aiguo Song*, Yezhen Han, Haihua Hu, Lei Tian and Juan Wu

School of Instrument Science and Engineering, Southeast University,
Nanjing 210096, P. R. China

(Received May 21, 2012; accepted September 4, 2012)

Key words: texture sensor, haptic feedback robot, haptic display, active perception

Surface texture is one of the important cues for human beings to identify objects. Haptic texture measurement is necessary for object recognition by touch. This paper presents a novel design of a haptic texture sensor by imitating human active texture perception. A thin polyvinylidene fluoride (PVDF) film is used as the sensitive element to fabricate a high-accuracy, high-speed-response haptic texture sensor, and a mechanism is designed to produce the relative motion at a certain speed between the haptic texture sensor and the surface of the perceived object with constant contact force. Thus, the surface texture property can be measured as the output charge of the PVDF film of the sensor induced by the small height/depth variation of the moving object surface. The experiments reveal that the proposed active haptic sensor is effective in detecting the feature signals of surface texture, and the measurement signal can be used not only for the classification of the object surfaces, but also for haptic texture display in virtual reality.

*Corresponding author: e-mail: a.g.song@seu.edu.cn