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MODEL-BASED ANALYSIS AND DESIGN OF PIEZOELECTRIC VARIABLE-FRICTION TACTILE DISPLAYS

Kwon Joong Son*[1] and Keehoon Kim[2]

[1] American University in Dubai
P.O. Box 28282, Dubai, United Arab Emirates
kson@aud.edu

[2] Korea Institute of Science and Technology
Hwarang-ro 14-gil 5, Seoungbuk-gu, Seoul 136-791, Republic of Korea
khk@kist.re.kr

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A variable-friction tactile display (VFTD) refers to a surface haptic device which can produce an adjustable friction force on a fingertip touching and exploring the tactile display. A controllable friction can be generated with squeeze-film damping effects induced by ultrasonic flexural standing waves in piezo-metal or piezo-glass composite plates. Typical plate-type VFTDs operated at ultrasonic frequencies have vibration nodes, but the presence of zero-amplitude nodes limits the use of the entire surface as a haptic display. Hence the current research by the authors aims to effectively eliminate such uncontrollable friction zones on the tactile display. Theoretical, experimental and computational work has been carried out to design the piezoelectric-glass unimorph plate as a VFTD. Finite element simulations have been performed for the designed piezoelectric composite structure, and the simulation results are in good agreement with vibration test results.

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