

Vibrotactile Representation of Three-Dimensional Shape and Implementation on a Vibrotactile Pad

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Representing visual information to visually disabled persons is a great challenge in the field of human computer interface (HCI). The technology based on a tactile vision substitution system (TVSS) device has become a promising solution to this problem. This kind of device allows visually disabled persons to perceive specific visual information through tactile stimuli. Research on such a device also has potential social and economic impacts on normal individuals. We propose to develop a system in which the three-dimensional (3D) shape of an object is acquired and transformed into a vibrotactile stimulus. The tactile representation procedure includes three steps: Firstly, the shape-from-shading (SFS) algorithm is adopted to extract the 3D shapes of an object. Then, specific contour lines are extracted for shape representation. Finally, the contour lines are mapped into a vibrotactile array (20×20), and the factors corresponding to the lines are actuated using variable spatiotemporal vibration parameters. The preliminary experimental results suggest that subjects could successfully identify the difference in contour, and shape perception can be facilitated by adjusting the vibration parameters.

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