Kabartgac: An Electronic Ring that Helps Visually Impaired to Sense 2D Pictures via Vibrations

Selay, Bahadir Alp (School: Izmir Ataturk High School)

This project aims to allow visually impaired people to use their hands to feel various graphics and pictures encountered in everyday life. There is a sculptural technique known as "relief" which offers the ability to feel pictures with hands, and there are special books and alphabets designed for the visually impaired, but graphics encountered everyday are generally not designed in this way. “Kabartgaç” means “Relief Creator” in Turkish. In the current version of the project, when the user drags a finger over a picture shown on a phone or tablet screen, the user feels the brightness differences in the picture via a vibrating electronic ring worn on the same finger. In order to serve this purpose, a ring-worn microcontroller based system using a vibrating motor was fabricated. The ring receives commands from a custom application running on the smartphone which was also created for this project. In order to verify the effectiveness of the system, two different pattern identification tests were performed by 16 users who were prevented from seeing the screen, and achieved a success rate of 87.5%. In order to be useful in the field, the system must be useable on printed patterns which are not displayed on a touch screen. For this purpose, the concept developed in Kabartgaç project will be expanded to multiple wearable electronic rings which can sense the light/dark patterns being traced by the fingertips, using light sources and sensors located on the rings. The rings will provide localized tactile feedback representing the picture being explored by the user. Another embodiment using an array of sensors, light sources, and tactile feedback motors is also under development.

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