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Advancing the Arizona State University Knowledge Enterprise

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Resonant Vibration Haptic Display

Haptic displays have promising applications in assistive devices for the visually impaired. However, current versions of this technology remain confined to low resolution tactile replications of images, and thus provide limited usefulness. Conventional haptic displays use motors or electrodes to convert images to touch, using an interface that is applied to the user's skin. In the case of the electrode approach, placement of the interface is often limited to the tongue. The individual motors or electrodes that make up the interface can only be made so small, and each must have their own individual corresponding controller. This extra bulk results in increased size requirements. These limitations severely restrict the amount of visual information which can be translated, because the resolutions of the tactile interfaces are often dismal (around 20x20). Therefore, there is a need for haptic displays capable of conveying visual information at higher resolutions.

Researchers at Arizona State University have developed a haptic display powered by resonant vibrations. Instead of an interface comprising motors or electrodes, this technology uses an array of pins. These pins do not require individual controllers, so they are disposed at significantly greater densities than motors or electrodes. The pins vibrate in response to the output of a speaker. Different images are recreated on this interface by taking advantage of different resonant frequencies of the pins. In addition to being able to support much higher resolutions (e.g. 640x480), the technology exhibits cost savings because each pin no longer requires its own controller.

Potential Applications

- Assistive devices for visually impaired
- Other sensory device applications for:
  - Military
  - Diving
  - Vehicles

Benefits and Advantages

- Higher resolutions – overcomes the resolution limitations of approaches which use vibrational motors or electrodes
- Versatile placement – interface is not limited to being placed on the tongue, unlike conventional electrode displays
- Cheaper – motor or electrode elements require a controller for each individual element, while a single speaker can support an entire interface

For more information about the inventor(s) and their research, please see

Dr. Angela Sodemann's Directory Page