HearTouch is a portable electronic device that uses the sense of touch to help the deaf and hard of hearing communicate. Our product has a very small footprint and is meant to fit snugly in an armband pouch - the same ones used for holding MP3 players while exercising. This comfortable and unobtrusive design allows for high ease of use. A small, rechargeable lithium-ion battery provides the power. To deliver the translation to the end device, we have developed an Android application that converts incoming speech to Morse code and then sends this to a microcontroller, which vibrates the patterns on the user’s arm.

Due to its flexibility, other applications can be designed for the HearTouch hardware that utilize touch in order to help those with other disabilities. For instance, we envision a GPS-based Android application that can provide turn-by-turn directions from vibrational motors. This could be integrated into white canes used for the blind. The versatility of this device can offer a range of products and open a whole new market for affordable solutions to sensory loss.

Background and Motivation

Hearing loss is a serious problem affecting millions of individuals worldwide. Existing solutions for hearing loss include hearing aids and cochlear implants. These, however, can be very costly and may require invasive surgery. HearTouch is radically different. While other devices attempt to repair or recover a lost sense, we seek to take advantage of an entirely separate sense – touch.

Abstract

HearTouch is a portable electronic device that uses the sense of touch to help the deaf and hard of hearing communicate. Our product has a very small footprint and is meant to fit snugly in an armband pouch - the same ones used for holding MP3 players while exercising. This comfortable and unobtrusive design allows for high ease of use. A small, rechargeable lithium-ion battery provides the power. To deliver the translation to the end device, we have developed an Android application that converts incoming speech to Morse code and then sends this to a microcontroller, which vibrates the patterns on the user’s arm.

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System Overview

Hardware

- **IOIO Microcontroller**
  - Designed for Android
  - Bluetooth support
- **LilyPad Vibe Board**
  - Vibrational motor
  - 20 mm outer diameter
- **Polymer Lithium Ion Battery**
  - Rechargeable 3.7 V, 2000 mAh battery
  - Over 10 hours of estimated usage per charge
- **Power Cell - LiPo Charger/Booster**
  - Boosts voltage from 3.7 V to 5 V
  - Charges battery via micro-USB

Software Details

1) Convert incoming speech into text with Android’s Voice Typing feature
2) Tokenize words into constituent letters and then into Morse code
3) Send patterns to IOIO microcontroller over Bluetooth
4) Output signal to motor (IOIO code)

Morse code chosen for several reasons:
- Easy to learn
- Less complicated and more compact hardware
- Possible to change speed for varying levels of experience

Future Work

- More efficient voice recognition
- More robust microcontroller
- Filter out background noise
- Smaller physical size
- Stronger and faster motors
- Usability testing
- Expand to other senses

Acknowledgements

We would like to thank the following individuals:
- Professor Luke Theogarajan
- Dr. Ilii Ben-Yacov
- Jon Waltman
- Aaron Bluestone

Sponsored and Mentored by Professor Luke Theogarajan
Department of Electrical and Computer Engineering
University of California at Santa Barbara