Wireless earbuds for low-cost hearing screening

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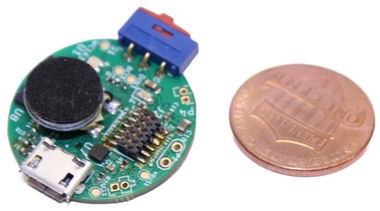
Motivation

- **5.3%** of world is estimated to have hearing loss.
- Hearing loss screening is important to ensure timely access to healthcare and foster cognitive development.
- Hearing loss screening devices are prohibitively expensive **($8,000)**, limiting their uptake by low and middle-income countries.

Contribution

- We created OAEbud, a low-cost ($28) earbud to perform hearing loss screening.



Background

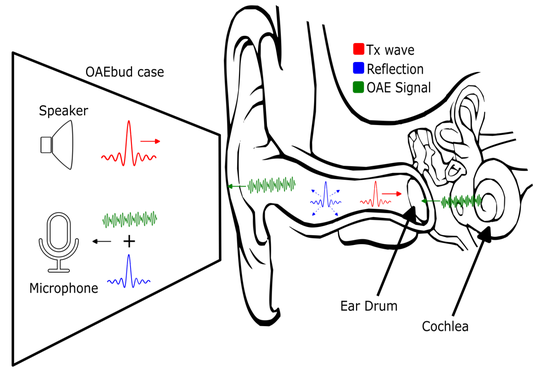
- Hearing loss screening works by detecting **Otoacoustic emissions (OAEs).**
- Tones transmitted into ear canal; reflections picked up from the cochlea.

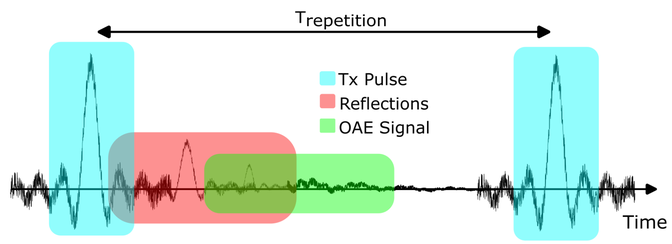
Pulse Sequence Stimulus

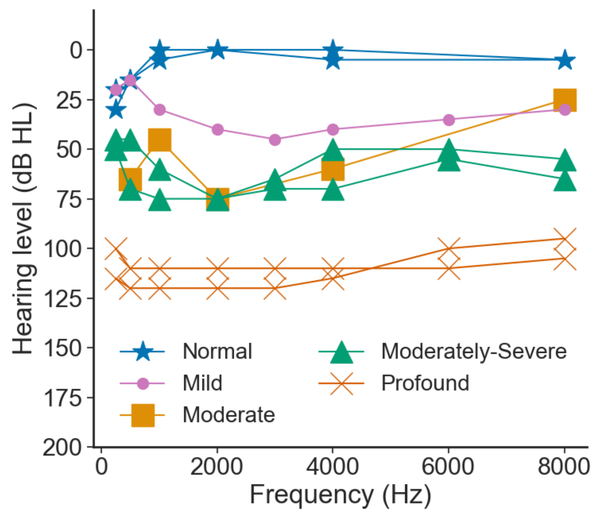
- 500 μs duration broadband pulse
- 0-5 k*Hz* bandwidth
- ~60 second test duration; 3300 pulses

Clinical Study

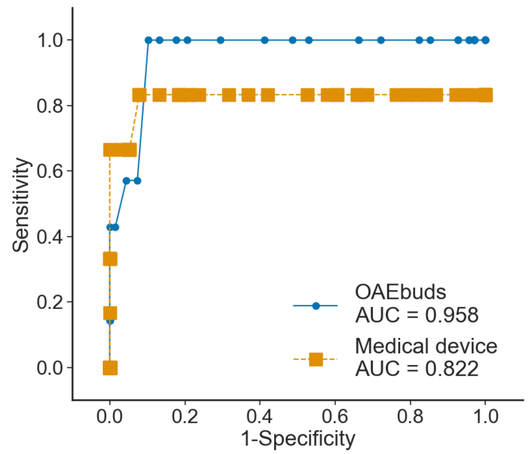
- Tested device on 28 ears
- 6 ears with hearing loss
- Frequency bands analyzed:
  - 700-1250 Hz
  - 1250-1750 Hz
  - 1750-2500 Hz
  - 2500-3500 Hz
  - 3500-4500

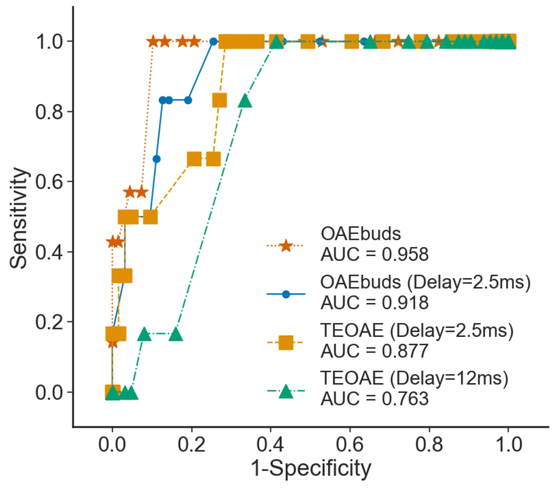






Results





Conclusion

OAEbuds can perform hearing loss screens at a level comparable to existing medical devices while being orders of magnitude more affordable.