PERCEPTUAL EVALUATION OF A BINAURAL BEAMFORMING ALGORITHM

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STARKEY HEARING TECHNOLOGIES

Introduction

One of the most common ways to improve listening in background noise is by using directional microphone arrays within hearing aids (or binaural hearing aids). Additionally, with the advent of wireless technology, microphone arrays across two hearing aids (bilateral binaural hearing aids) may be used to provide additional benefits for speech recognition.

The bilateral advantage for speech recognition in reverberant environments and a background of noise is very well documented for both listeners with and without hearing loss (Bronkhorst & Miguel, 1990). The magnitude of this bilateral advantage (7-dB) remains unchanged with bilateral and unilateral binaural or bilateral directional hearing aids (Koletsis, 2005). However, bilateral binaural hearing aids may be able to provide additional benefits for speech recognition.

Methods & Results

Localisation

- Participants were fit with standard 8% with an in-canal earmold.
- The hearing aids were programmed to the linear version of individual listener’s proprietary fitting formula for a flat 40-dB hearing loss.
- Three hearing aid conditions were tested:
  - Bilateral Omnidirectional (OD)
  - Bilateral Fixed Directional (FD)
  - Collocated Binaural Beamformer (BB).

Diagrams of the spatial release from masking are presented in Figure 1, 4, and 5. Legend in Figure 3.

Frontal Field Localisation

- 11-channel array
- Single word test, 40-dB S/N ratio
- 275 trials per hearing aid condition

Reference Angle (degrees)

- Participants identified the target speaker using a laptop for both localisation tasks. Training and reference were provided for each condition.

Discussion & Conclusions

- Speech release from masking is better in the three directional conditions (FD, BB and OD) compared to the OD condition.
- No significant difference existed between the three directional conditions.
- Segregation between the target stimuli and the masker may have been too great to tease out any benefits of the binaural-beamformer and specifically the high-pass binaural-beamformer.

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References