The Exchange iMproving Unit: An Auditory Device for Directional Filtering

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There is a fundamental limitation inherent in standard hearing aid devices- due to the fact that they amplify all ambient noise, use in noisy environments is both irritating and isolating. The purpose of this project was to develop a device that would enable users to actively filter signals, directionally, to be more comfortable with more situations. This was developed by beamforming the harmonic components of the signal received from four microphones and rejecting components that originated from undesirable directions. The real-time processing was performed by an FPGA calculating phase shifts through an FFT and attenuating frequencies based on a localization and parameter-analysis algorithm that was refined through testing. The results indicate that this system is a viable solution to assist hearing aid users for conversational, meeting, and other spoken sources. The restrictions in the dynamic potential currently limit the quality of music and similar sounds, especially in increasingly louder environments. The benefits of this system over others, such as shotgun-microphone based aids is that this device can work with multiple voices, as in a group setting, and only needs to be set-up once in a new configuration of speakers. Although this device still has extensive refinement needed for future production, the essential parts of the device function independently.

Awards Won:

Second Award of $2,000