1493: CCI-MOBILE: BILATERAL AND BIMODAL SYNCHRONIZATION WITH THE CI/HA RESEARCH PLATFORM

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While speech understanding for cochlear implant (CI) users in quiet is relatively effective, listeners experience difficulty in identification of speaker and sound location. Previous studies have reported improved localization and better speech perception when the CI is coupled with a second CI or hearing aid in the contralateral ear. This is referred to as bilateral or bimodal presentation of speech [1,2].. A major obstruction to accurate source localization for bimodal and bilateral CI users is the distortion of interaural time and level difference cues (ITD and ILD), and limited ITD sensitivity [3]. Hence, it is necessary to develop and test algorithms that provide better localization and sound source identification cues. Various CI research interfaces developed by either academic or industry sponsored research teams support proposed signal processing and psychoacoustic investigations but have limited ability to efficiently validate bimodal and/or bilateral algorithms. Platforms that support bimodal testing are either not portable or only provide limited features due to proprietary parameters/routines. Thus, the open-source, portable signal processing platform, CCi-MOBILE developed by UT-Dallas, enables electric and acoustic bilateral stimulations simultaneously, providing researchers the freedom to explore new technology and scientific paradigms. In the present work, we will provide verification of synchronized bilateral (electric-electric) and bimodal (electric-acoustic) output in an authenticated and efficient manner to support localization algorithmic and experimental investigations.

The verification test paradigm analyzes left and right RF channels captured using CCi-MOBILE via CI24RE implant emulators which mimic the functionality of the intracochlear electrode array. CCi-MOBILE captures audio in real-time through two behind the ear (BTE) microphones via an audio codec and streams the digitally processed signal through a UART port to the computing platform (PC/ smartphone). Sound processing routines send the RF data through the UART port to RF coil to deliver biphasic pulses in a continuous interleaved manner (CIS). Results are verified using an oscilloscope to demonstrate the left and right output signals superimposed on each other, proving evidence of simultaneous CI/CI and CI/HA synchronization. Similarly, bimodal stimuli synchronization will be verified by comparing the Electric and Acoustic Stimulation (EAS) outputs on an oscilloscope to demonstrate equalization of the input and output time delay for both channels.

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