1110: CCI-MOBILE: MOVING TOWARDS EXPLORING ADVANCED RESEARCH PARADIGMS FOR COCHLEAR IMPLANT AND HEARING AID USERS

Ria Ghosh, Juliana N. Saba, Nursadul Mamun, Ramcharan Chandra Shekhar, Avamarie Brueggeman, Hussnain Ali, John H. L. Hansen
University of Texas-Dallas, Cochlear Implant Processing Lab, Center for Robust Speech Systems, Dallas, TX, USA

In spite of the tremendous growth in the number of cochlear implant (CI) and hearing-aid (HA) users over the last two decades, speech recognition performance of the devices being used has only seen modest gains relative to the pace of actual digital signal processing (DSP) and machine learning technologies. Hardware limitations to support sophisticated signal processing and stimulation strategies in real-time have limited most of these techniques to laboratory use. Thus, a portable processor capable of implementing and running take-home field trials with robust speech algorithms could help advance research ideas and test scientific hypotheses which in turn would improve the opportunity of migrating those research solutions to commercial applications. In our previous work, we developed a mobile research interface (CCi-MOBILE) for electric and acoustic stimulation to explore new research paradigms in studies involving CI and HA devices. In this present work, we elaborate on advanced capabilities of the CCi-MOBILE and its open-sourced nature t for research use.

The novelty and strength of CCi-MOBILE is that it allows the investigator to (i) control the signal at both ears with exquisite timing (bilateral), (ii) stimuli with precision to measure psycho-physical limits of performance and (iii) analyze real world listening situations in which complex signals are processed and the electrodes in the implant get stimulated in real-time. Since incoming signals can be analyzed together or separately, CCi-MOBILE allows for assessment of the capacity of subjects' inherent ability to use binaural cues and also, the potential limitations imposed by other CI processors. Furthermore, the platform provides the opportunity to introduce fine-tuning capabilities granting side-by-side comparisons to the CI-HA world by making adjustment controls available to researchers and clinicians, thus providing new opportunities for individualized parameter fittings. Additionally, the CCi-MOBILE platform is easily portable, allowing researchers to explore on-the-go parameter fittings in real world environments. This addresses a major outstanding problem in audiological practice, that is patients frequently complain that their CI or HA sounds fine when tested in controlled clinical space/booth, but changes completely in real world environments. Another important feature of the platform is that it can be configured to drive two hearing-aids and two cochlear implants simultaneously (bimodal) due to the availability of dual channels of synchronized acoustic stimulation in addition to the electric stimulation.

To effectively implement automated speech technology applications optimized for CI-HA sound encoding, the CCi-MOBILE offers high-performance computing capabilities for efficient data-transfer and quick evaluation in laboratory as well as take-home for use in every listening-environments. As of today, 25 CCi-MOBILE platforms have been produced and shared with various research-labs worldwide. All software including support module code as well as sample development module are made open-source, while the hardware is available for subscription. We propose to use this opportunity to develop a "streamlined" approach of lab-to-world strategy development to provide CI-HA users a better user- experience.

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