Mobile Research Interface for **Cochlear Implants**

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2016

TORONTO



Cochlear Implant Laboratory

Overview

2012 (yesterday)



2016 (today)





PDA-based SDIO interface

Smart Phone/Tablet-based USB/Wi-Fi interface





UTDallas CRSS-CILab Interface Board

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Wi-Fi

USB

Cochlear Implant Laboratory

Real-time Cochlear Implant Sound Processor Advanced Combination Encoder Algorithm



Processing Unit



ELECTRIC PROCESSING

Hardware – Interface Board



Features

- Supports unilateral, time-synchronized bilateral stimulation
- Electric alone and electric + acoustic stimulation (EAS).
- Supports two operational modes:
 - Real-time: Similar to a clinical body-worn processor to conduct experiments in free field. Smartphone/tablet acts as a processor. Suitable for take-home field trials.
 - Sench-top: allows platform to be used in bench-top (offline) mode to conduct experiments in laboratory (e.g., using MATLAB) for acute studies.
- Flexibility in implementing sound coding algorithms as Apps
- Programming flexibility MATLAB, C, C++, JAVA, C#, LabView
- ♦ Wireless (Wi-Fi) link + USB interface.
- Idea can be extended to iphones, windows-based phones/tablets

Available Software Suite (UTDallas, CRSS-CILab)

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CI2016



Android-based apps for field trials

Evaluation

♦ Six post-lingually deafened adult CI users

Assessment of speech recognition accomplished with adult minimum speech test battery (MSTB) for adult CI recipients.

♦ Clinical Processor(s) – Free field evaluation

♦ CCI – RT Processor (PC) – Free filed evaluation

60 dB SPL in a double-walled sound-booth

♦ CCI – Benchtop Processor (PC) – Direct Connect mode

♦ All devices were programmed with ACE sound coding strategy

Subject ID	Gender	Age (yrs)	Implant + Processor	Configuration	# of electrodes	Implant experience
S1	F	62	CI512 + N5	Unilateral	20	7 yrs
S2	F	63	L: CI512 + N5 R: Freedom CI24RE CA + N5	Bilateral	L: 22 R: 20	L: 5 yrs R: 4 yrs
S3	М	52	Freedom CI24RE + N5	Unilateral	21	5 yrs
S4	М	75	L: CI512 + N5 R: CI512 + N5	Bilateral	L:21 R: 22	L:2 yrs R:3 yrs
S5	F	60	L: Freedom Cl24RE CA + N6 R: Freedom Cl24RE CA + N6	Bilateral	L: 22 R: 22	L: 6 yrs R: 5 yrs
S6	Μ	72	L: Freedom Cl24RE CA + N5 R: Freedom Cl24RE CA + N5	Bilateral	L: 22 R: 22	L: 6 yrs R: 2 yrs

Results



Conclusions and Future Directions

Flexible research interface developed to carry out a wide variety of acute and chronic experiments.

- Supports easy development and quick evaluation of new research ideas without learning advanced programming skills.
- Results from preliminary study indicate equivalent performance to the clinical processor; ensures reduced/limited platform impact.
- CRSS-CILab will distribute the platform to research laboratories.
- ♦ CRSS-CILab will extend idea to iphones, & mobile widows-based systems.



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