

Improved sound processing for cochlear implants

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Aims: Four signal processing schemes currently under development aim to improve the perception of sounds, especially speech, for children and adults using the Nucleus cochlear implant system. The schemes are (1) fast-acting input-signal compression, (2) Adaptive Dynamic Range Optimisation (ADRO), (3) TESM, a scheme that emphasises transients in signals, and (4) DRSP, a strategy that applies different stimulation rates to selected sets of electrodes.

Methods: Each scheme has been implemented in real time, enabling implant users to gain listening experience away from the laboratory. Speech recognition by implant users with the experimental schemes is compared with their speech recognition using standard strategies, such as SPEAK and ACE.

Results: (1) With input compression, significant increases in speech recognition were obtained by users of modified Spectra and SPrint processors, particularly at low levels. (2) Similar benefits were obtained with ADRO, which adjusts the stimulation levels automatically to optimise audibility and listening comfort. (3) Results with TESM show that emphasis of transients can enhance speech perception. (4) Preliminary trials with DRSP suggest that it may be beneficial to apply higher stimulation rates on basal electrodes than on apical electrodes.

Conclusions: Each scheme shows promise for improving the performance of cochlear implants. Fast-acting input compression has been adopted in Cochlear's new ESprit 3G ear-level speech processor, with benefits similar to those reported for the experimental scheme. An enhanced compression scheme that reduces background noise is under development. Trials of ADRO have been successful with adults and, more recently, with children. ADRO is now available in the Cochlear programming system, and TESM may become available soon. Development of the DRSP scheme is continuing.



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