Improving Efficiency of Auditory Brainstem Response Audiometry Using an Adaptive Procedure

The solution is an algorithm that uses an adaptive Bayesian procedure to optimize the stimulus frequency and level for determining hearing threshold from ABR to improve efficiency of ABR audiometry.

What is the Problem?

Compared to infants with normal hearing, infants with hearing loss are more likely to experience abnormal cognitive development and delayed speech acquisition. Therefore, the early detection, diagnosis, and treatment of hearing loss is an important part of medical care for infants with hearing loss. However, since infants are not able to respond to typical behavioral procedures, clinicians must use electrophysiological methods, such as Auditory Brainstem Response (ABR), to diagnose hearing loss in infants. Unfortunately, ABR testing and other electrophysiological methods are time-consuming because each stimulus must be repeated multiple times and thus are not widely applicable in clinical settings.

What is the Solution?

The solution is an algorithm that uses an adaptive Bayesian procedure to optimize the stimulus frequency and level for determining hearing threshold from ABR to improve efficiency of ABR audiometry. The algorithm fits a Gaussian Process model across frequency and level of the initially collected data and provides the best updated estimate of the hearing threshold while reducing uncertainty. The adaptive procedure ranks the most informative stimulus conditions first, allowing it to intelligently sample the stimulus space. Since this technology uses a statistical model to estimate hearing threshold instead of human judgement, it will decrease variability while saving a significant amount of time.

What is the Competitive Advantage?

The competitive advantage of this technology lies in its ability to determine in situ the stimulus that will provide the best estimate of the hearing threshold from ABR audiology based on data collected earlier in the procedure. Without the need for human raters to determine thresholds, this technology offers decreased variability and reduced duration of measurements during ABR. The adaptive algorithm will enable a 5-fold increase in ABR efficiency, enabling a full diagnosis in a fraction of the time currently necessary for ABR audiometry. As the global hearing screening diagnostics market was valued at $5.5 billion in 2022 with an expected CAGR of 7.4%, there is a

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significant opportunity for this technology to advance the field of audiometry and hearing loss diagnostics.

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