Docket #: S16-272

Personalized neuromodulation therapy for treating tinnitus and other conditions

Stanford researchers in the Tass Lab have patented a device and algorithm designed to optimize Acoustic Coordinated Reset (CR) stimuli for individualized tinnitus treatment. It quickly selects and calibrates CR treatment tones based on a patient's specific hearing loss, tinnitus frequency, and neuronal subpopulations. This personalized approach can also adjust stimuli as tinnitus frequency changes during therapy. The technology can be implemented as a stand-alone device or integrated into hearing aids, smartphones, or tablets. Developed to improve tinnitus therapy, it also has potential applications in tinnitus diagnostics and treating other neural synchrony disorders, such as depression.

Stage of Research
The inventors recently demonstrated that stimuli tailored to individual hearing levels and incorporating specific frequency spacing better target affected neuronal subpopulations, yielding the largest effects on tinnitus. Future research will explore if these optimized stimuli can shorten therapy duration, enhance benefits, or both, compared to non-optimized stimuli. It is anticipated that this personalized approach will increase the number of patients whose tinnitus is eliminated, reduce symptoms in remaining patients, and decrease therapy duration.

Applications

- **CR therapy for tinnitus** - personalized acoustic treatment based on an individual patient's tinnitus frequency and any associated hearing loss, with potential implementation as:
    - a stand-alone sound stimulator

    - software integrated into another device or component (e.g., firmware for a hearing aid or an application for a smart phone or tablet)
    - component for EEG data analysis
- **CR sound stimulation for potential future applications**, including:
    - tinnitus diagnostics
    - neuromodulation therapy for other disorders of neuronal synchrony, such as depression

Advantages

- **Improved therapeutic outcome** - personalized CR tone spacing for tinnitus is related to significantly better therapeutic outcome based on re-analysis of existing clinical data
- **Fast calibration** - algorithm provides a small number of possible CR tones, enabling quick calibration that is practical for a clinical setting
- **Adapts to existing hardware** - CR treatment could be provided by stand-alone device or implemented through software integrated into an existing hearing aid, smartphone or other digital device such as a tablet.
- **Objective assessment** - device could be used to record stimulation induced effects to assess and re-calibrate treatment

Patents

- Published Application: WO2018031215
- Published Application: 20190201657
- Issued: 10,933,213 (USA)

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