ACTive Implant for Optoacoustic Natural sound enhancement

SEVENTH FRAMEWORK PROGRAMME

Project Aim

The aim of the project is to develop a novel type of cochlear implant. This is a medical device which is used to restore auditory sensations for hearing-impaired listeners.

The implant consist of several parts, most important is the electrode, which is placed into the inner ear, namely into the cochlea. Currently available solutions use electric stimulation in order to trigger the available spiral ganglion neurons. ACTION will instead use optoacoustic stimulation to trigger the available residual hair cells. To this end, very small lasers - so called VCSELs - will be placed into the cochlea to stimulate the hair cells using the optoacoustic effect.

Abstract

The ACTION project builds on the recent discovery that relatively low levels of pulsed infrared laser light are capable of triggering activity in hair cells of the partially hearing (hearing impaired) cochlea and vestibule. So far the excessively large volume of optical fibre systems and external light sources used for studies prevented the practical use of this discovery for long term implants. ACTION aims to develop a self-contained, smart, highly miniaturised system to provide optoacoustic stimuli directly from the electrode array of a cochlear implant system. The resultant neural cell response will be electrically recorded and direct feedback to the light source will be provided to enable automated, objective hearing threshold assessment and optimisation of sound feature coding enhancements.

Optoacoustic Stimulation

Optical neurostimulation has attracted major attention during the last few years mainly in the US. However, the approach of direct neural stimulation requires very high levels of power which make it very difficult to implement in a device. Moreover, the laser stimulus evokes an acoustic response in partially hearing ears even for relatively low power pulses. ACTION focuses on the exploitation of this proven optoacoustic effect to create a short-term realisable device with an achievable power budget. Based on light pulses in the nanosecond range, we will create a device suitable for hearing assessment and sound clarity enhancement in the partially hearing cochlea.

For additional information, please contact info@action-project.eu or visit our website at www.action-project.eu

Project Partners

MED-EL, CSEM SA, Medizinische Hochschule Hannover, Teknologian tutkimuskeskus VTT Oy, SUSS MicroOptics SA, VERTILAS GmbH, STMicroelectronics

The research leading to these results has received funding from the European Union Seventh Framework Programme FP7/2007-2013 under grant agreement FP-ICT-611230.