Biomorphic Electronic Implementation of the Cochlea

A novel biomorphic electronic implementation of the mammalian hearing organ has been developed. As a true biomorphic design, it perfectly mimics the excellent sensory properties of this organ. The range of application comprises biomorphic simulation of hearing impairment, hearing sensor units for robots, and (in future), biomorphic hearing implants.

Keywords	Biomorphic cochlea model, silicon Hopf cochlea realisation, hearing sensor, hearing impairment modeling, active tuning of hearing, hearing implants
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Reference	R. Stoop et al., Phys. Rev. Lett, in Press (2007) R. Stoop and A. Kern, Proc. Natl. Acad. Sci. USA 101, 9179 (2004) A. Kern and R. Stoop, Phys. Rev. Lett. 91, 128101 (2003)
Background	A realistic electronic model of the cochlea is highly desirable in the development of advanced hearing aids such as cochlear implants and in technologies such as robotics where an analysis of the auditory scene is often required. In the past, several attempts have been made to build an electronic cochlea mimicking the physiological response characteristics of the biological cochlea. However, the responses measured on such implementations significantly differ from physiological measurements.
Invention	The invention is an electronic biomorphic cochlea which demonstrates an almost perfect agreement with biology. By virtue of its biomporphic design, the constructed cochlea can be actively tuned towards selected objects of the auditory scene. Thus it can overcome the well-known cocktail-party obstacle of hearing.
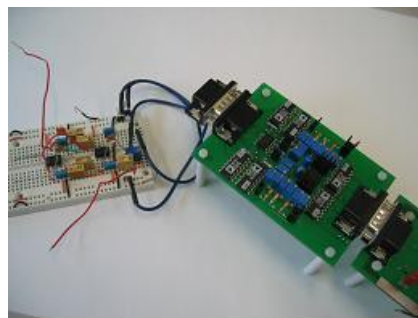
Fields of Use	Robotics; Biomorphic simulations of hearing impairment; Integration of the sensor into cortico-sensory loops needed for active hearing.
Patent Status	Patent filed
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