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Titel des Beitrags: A model of the auditory nerve for acoustic- and electric excitation.

Abstract: Auditory nerve fibers (ANF) convey information about sound to the central nervous system. For both normal hearing subjects and cochlear implant patients the most drastic step of sound coding for neuronal processing is when the analog signal is converted into discrete nerve-action potentials. As any information lost during this process is no longer available for neural processing, it is important to understand the underlying principles of sound coding in the intact auditory system and the limitations in the case of direct electrical stimulation of the auditory nerve. Here we focus on a model of spiral ganglion type I neurons with Hodgkin-Huxley type ion channels, which are also found in cochlear nucleus neurons. Depending on the task, we model the neurons at different levels of detail. Our results show that for acoustic stimuli, the model provides realistic refractoriness and generates more realistic spike trains compared to a spike generator with absolute and exponentially decaying refractoriness added. Not surprisingly, speech discrimination in electrical hearing is lower than in acoustic hearing. On the other hand, the analysis of transmitted information shows that the temporal precision of coding seems to be very high because at levels well above threshold, action potentials are elicited quasi-deterministic by the electrical stimuli. We argue that CIS strategies a) waste as much as 50

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