SILICON MODELS OF EARLY AUDITION

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Abstract

This dissertation describes silicon integrated circuits that model known and proposed physiological structures in the early auditory system. Specifically, it describes silicon models of auditory-nerve response, of auditory localization in the barn owl, and of pitch perception. The integrated circuits model the structure as well as the function of the physiology; all subcircuits in the chips have anatomical correlates. The chips, two of which contain over 100,000 transistors, compute all outputs in real time, using analog, continuous-time processing. In most respects, chip responses approximate physiological or psychophysical response of the modeled biological systems. The dissertation also describes a novel nonlinear-inhibition circuit, which is a key component of two of the silicon models.

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