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Spatio-Temporal Coding of Speech Sounds in Mammalian Auditory Cortex

Christoph. E. Schreiner, Sarah Wong, Steven W. Cheung
University of California, San Francisco
W.M. Keck Center, HSE 824 Box 0732 513 Parnassus Avenue
CA94143 San Francisco, USA
Phone:(415) 476-2591
Fax: (415) 476-1941
Email: chris@phy.ucsf.edu

The representation of synthetic and naturally spoken CV-syllables was investigated in the core auditory cortex of cats and squirrel monkeys. Some of the animals were trained to discriminate between the different CV sounds. The distributed representation of the stimulus properties across the tonotopic axis was characterized by spatially discrete and temporally synchronized sequences of activation. The sequence of activation was determined by the main changes in the spectro-temporal envelope of the signal, i.e., by the main energy modulations at the plosives and the onset of voicing. Details of the distributed representations depended on the receptive field parameter distribution in each individual animal. The pattern is highly dependent on stimulus intensity resulting in strong shifts of the activation pattern similar to those for changes in pure-tone intensity. By contrast, the presence of background noise has a much smaller effect on the activity distribution! until extensive suppression of the activation is achieved. The cumulative differences in firing rate and timing in response to different CVs parallel perceptual differences between CVs. Some differences between trained and untrained animals were seen, however, the overall representation of sounds was very similar.
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