Sonderforschungsbereich/Transregio 31 “Das aktive Gehör”

E I N L A D U N G

zum Vortrag im Rahmen des Seminars des SFB/TRR 31

Freitag, 11. Dezember 2009, 14 Uhr c.t.

im Raum G26.1 – 010
Rechenzentrum der Universität Magdeburg
und
im Raum W2 1-143, Universität Oldenburg
(per Videoübertragung)

“Listening to auditory cortex: neural correlates of complex sound perception”

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We are able to recognize and understand speech across many different speakers, voice pitches and listening conditions. However, the acoustic waveform of a sound (e.g. for example the vowel “ae”) will vary considerably depending on the individual speaker. Moreover, the ear itself will filter the sound in a location-dependent fashion, and the “ae” may be embedded in a cacophony of other, background sounds in our often cluttered acoustic environments. Because we can perceive the pitch, timbre and spatial location of a sound source independently, it seems natural to suppose that cortical processing of sounds might separate out these attributes. However, recordings made in primary and secondary cortical areas of the ferret suggest that neural encoding of pitch, timbre and location is highly interdependent. Moreover, sensitivity to these sound percepts was distributed throughout the cortical fields examined. In order to investigate whether these distributed responses might underlie pitch perception, we compared the performance of ferrets trained in a pitch discrimination task to the pitch discrimination abilities of auditory cortical neurons.

To achieve a more robust decoding of the neural responses, we developed a population neurometric analysis, with which we decoded the activity of ensembles of simultaneously recorded units. We found several parameters of the ensemble response to be informative; both spike count vectors and relative response latency vectors encoded stimulus pitch just as effectively. Our results thus suggest that count or latency based population codes could equally well account for the animal’s pitch discrimination ability. Neural populations capable of discriminating pitch as well as the animal did could be found throughout all five areas investigated. While these studies show that any of the 5 areas of ferret cortex could support the animal’s pitch judgment, further work is required to ascertain which, if any, of these fields make an essential contribution to pitch perception. To address this question we are currently recording local field potentials and single neuron spiking activity from the auditory cortex of freely moving ferrets while they discriminate the pitch of artificial vowel sounds.