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Two-dimensional encoding and adaptation in the songbird auditory forebrain TATYANA SHARPEE, KATHERINE NAGEL, ALLISON DOUPE, University of California, San Francisco — Neural adaptation is crucial for many auditory tasks, such as speech recognition, where robust performance is achieved over a wide range of signal-to-noise ratios and in the presence of 1/f- type noise. While faithful high-rate sampling can work well in the presence of noise which is largely uncorrelated between successive signal samples, alternative strategies might be needed to achieve reliable performance in the presence of strongly correlated noise. We studied how neurons in songbird auditory forebrain region (field L) encode temporal modulations of the amplitude of band-limited sounds using an information- theoretic method for finding relevant stimulus dimensions [1]. We robustly found that neurons in field L perform temporal processing based on simultaneous sampling of locally smoothed values of log-amplitude and its time-derivative. Either one of the two stimulus features could play the dominant role in neural response. We conclude with a theoretical explanation for the optimality of such signal processing strategies in situations where noise and signals have comparable correlation times. [1] T. Sharpee, N.C. Rust, W. Bialek, Neural. Computation 16, 223 (2004).

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