**How is Information Coded in Turtle Visual Cortex?**
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Visual stimuli evoke a propagating wave of activity in the visual cortex of freshwater turtles. One goal of our team is to develop general quantitative techniques and tools for analyzing such waves in neural structures. We developed a wave subspace technique that extracts the wave component from noisy data and applied this technique to cortical respones in both real cortices and in large-scale models of turtle visual cortex. A data visualization tool, DAVIS, was developed to allow investigators to study the details of cellular activity during simulated waves in our large-scale model. A second goal, understanding the cellular mechanisms that underlie waves, was pursued using large-scale models. Detailed analysis of specific cortical synapses in controlling wave activity reveals that a feedforward circuit involving geniculate synapses on pyramidal cells and a specific population of inhibitory interneurons, the subpial cells, controls the formation and speed of waves. A feedback circuit involving pyramidal cell collaterals and horizontal cells controls wave duration. A third goal, understanding the functional significance of waves, was pursued by characterizing the information content of waves. We represent wave dynamics as an arc (a β-strand) in a two-level, low dimensional phase space. Analysis of the β-strands demonstrates that maximal information about stimuli in visual space is contained within the first 200 ms of the response. Future work will analyze how turtles use the information contained in waves in both the cortex and optic tectum to carry out visual guidance tasks, such as catching fish.

## Project Website

http://cortex.cs.utsa.edu/research/turtle

## Publications

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