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Spike frequency adaptation is a possible mechanism for control of attractor preference in auto-associative neural networks.[1] JAMES ROACH, LEONARD SANDER, MICHAL ZOCHOWSKI, Univ of Michigan - Ann Arbor — Auto-associative memory is the ability to retrieve a pattern from a small fraction of the pattern and is an important function of neural networks. Within this context, memories that are stored within the synaptic strengths of networks act as dynamical attractors for network firing patterns. In networks with many encoded memories, some attractors will be stronger than others. This presents the problem of how networks switch between attractors depending on the situation. We suggest that regulation of neuronal spike-frequency adaptation (SFA) provides a universal mechanism for network-wide attractor selectivity. Here we demonstrate in a Hopfield type attractor network that neurons minimal SFA will reliably activate in the pattern corresponding to a local attractor and that a moderate increase in SFA leads to the network to converge to the strongest attractor state. Furthermore, we show that on long time scales SFA allows for temporal sequences of activation to emerge. Finally, using a model of cholinergic modulation within the cortex we argue that dynamic regulation of attractor preference by SFA could be critical for the role of acetylcholine in attention or for arousal states in general.

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