

A Neural Network Model for the Self-Organization of Cortical Grating Cells

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A neural network model with incremental Hebbian learning of afferent and lateral synaptic couplings is proposed, which simulates the activity-dependent self-organization of grating cells in upper layers of striate cortex. These cells, found in areas V1 and V2 of the visual cortex of monkeys, respond vigorously and exclusively to bar gratings of a preferred orientation and periodicity. Response behavior to varying contrast and to an increasing number of bars in the grating show threshold and saturation effects. Their location with respect to the underlying orientation map and their nonlinear response behavior are investigated. The number of emerging grating cells is controlled in the model by the range and strength of the lateral coupling structure.