The Nature of the Complicated Fabric Textures: How to Represent in Primary Visual Cortex

Authors : J. L. Liu, L. Wang, B. Zhu, J. Zhou, W. D. Gao

Abstract : Fabric textures are very common in our daily life. However, we never explore the representation of fabric textures from neuroscience view. Theoretical studies suggest that primary visual cortex (V1) uses a sparse code to efficiently represent natural images. However, how the simple cells in V1 encode the artificial textures is still a mystery. So, here we will take fabric texture as stimulus to study the response of independent component analysis that is established to model the receptive field of simple cells in V1. Experimental results based on 140 classical fabric images indicate that the receptive fields of simple cells have obvious selectivity in orientation, frequency, and phase when drifting gratings are used to determine their tuning properties. Additionally, the distribution of optimal orientation and frequency shows that the patch size selected from each original fabric image has a significant effect on the frequency selectivity.