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Visual magic: Changing an object just by watching
Visual illusion reveals neural codes for objects in the brain

Abstract—— We introduce a novel visual illusion in which prolonged viewing of an object alters the apparent shape and material of the subsequently viewed object. Analyses of this 'Object Aftereffect' support the idea that the human brain can recognize a complex 3D object from a collection of simple image features, without reconstructing geometrical 3D structure of the object. This finding makes it easier to understand neural codes for objects in the brain, and enables us to control visual appearance of objects by manipulating image features. It will also be useful for improving the current object recognition algorithms to a more human-centered method.

The Object After-Effect (OAE)
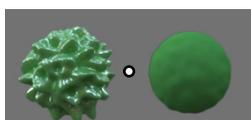
Adaptation
After viewing objects with different shape and material
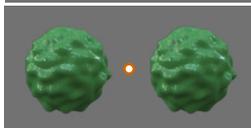
Test
Show two identical objects, then...
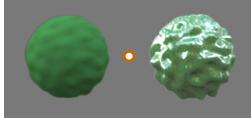
Perception
They appear to have different shapes and materials.

Adaptation to image feature causes the OAE.

OAE occurs for daily objects too. (pear -> apple)

Adapt. **Test** **Percept.**

The Object Aftereffect is robustly induced even when the test object is shown at distant locations from the adapting object.

The OAE is caused by changes in the properties of high-level neural mechanisms that process information over a large area of the visual field. Moreover, these mechanisms represent low-level image features.

Image-Based Object Recognition in the human brain
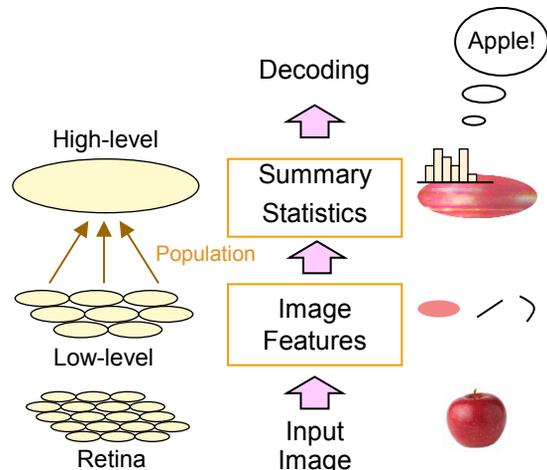
Analyses of the object aftereffect support the notion that the human brain recognizes a 2D object and its shape and material based on the statistical properties of a population of low-level image features. Like recent machine-vision models for general object recognition, this strategy requires shallow neural computations

Related works

[1] I. Motoyoshi, "Visual aftereffects in 3D shape and material of a single object," *Journal of Vision*, 12(9): 229, 2012.
[2] I. Motoyoshi, "Broad spatial tunings of the object aftereffect: Evidence for global statistical representations of 3D shape and material," *Perception*, 41, 17a, 2012.
[3] I. Motoyoshi, "Visual aftereffects in natural object categories," in *Proc. Vision Sciences Society Annual Meeting*, 2013.

Contact

Isamu Motoyoshi   Sensory Representation Research Group, Human and Information Science Laboratory
E-mail : motoyoshi.isamu{at}lab.ntt.co.jp (Please replace {at} with @)