A Cross-Cultural Test of the Independence of the Representation of Generalized Cone Dimensions

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Background

- Generalized cones provide a good approximation of large-scale recurring elements in the world:
  - Geons distinguished by non-accidental (= viewpoint invariant) differences in the attributes of a generalized cone:
    1. Cross Section: Straight vs. Curved
    2. Axis: Straight vs. Curved
    4. Termination of Geon when Nonparallel: Truncated vs. Pointed vs. Rounded
  - Both humans (Stanckiewicz, 2002) and cells in macaque IT cortex (Kayaert, Biederman, & Vogels, 2005 [above left]) have been shown to be independently sensitive to dimensions of generalized cones, such as axis curvature, aspect ratio, and taper

The Question

Would people raised in a much less “geonic” environment show the same sensitivity?

Experimental Task: texture segregation

- Subjects had to divide the display into two groups
- Feedback was given after each trial in the form of a green line over the correct divide
- “Noisy” displays were shown in different sessions to some subjects

Control: could this effect be due to low-level cues?

- Took orientation and intensity feature values from Itti & Koch saliency map, fed them to a simple classifier
- Compared mean and variance of each side of the image, given each divide, and chose the divide that gave the maximum difference (shown in green)

Results

Western

Himba

Conclusions

- Even though the results in the “Regular” condition could be attributed to low-level features, the results in the “Noisy” condition could not
- Since both “Noisy” and “Regular” runs showed the same pattern, we conclude that the same mechanism is at work in both
- Humans are independently sensitive to dimensions of generalized cones, even after growing up in markedly different visual environments

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