INTRODUCTION

Statistical aspects of images are cues for texture discrimination and segmentation. In pre-segmented patches (VSS 2003), discrimination of local 1st order structure (luminance: LUM) and local 4th order structure (isodipole textures: EVEN), despite its visual saliency. This and other evidence suggests that symmetry detection uses a different computational substrate than processing of local statistical structure. Here we compare the relationship of these three statistical image classes to segmentation.

RESULTS FROM INDIVIDUAL SUBJECTS

For EVEN and SYM, the HALF background results in an intermediate fraction correct. For LUM, fraction correct is high (.72) for the SAME background, and near perfect (.98) for the GRAY background.

What about the Reaction Time?

Image classes or background conditions that had a higher fraction correct had shorter reaction times.

STIMULI & METHODS

**TASK: Which one of the four arrays is different?**

Stimuli contained four arrays: three distractor arrays colored at random, and a single target array, drawn from one of three images classes illustrated below. Each image class was defined by a single statistical attribute: luminance (LUM), local fourth-order correlation (EVEN), or long-range statistics (SYM).

**Local Area & Stimulus Duration**: Stimuli consisted of four 8x8 arrays of black and white checks (check size 20 min, test distance 102 cm). Arrays were presented for either 4 degrees of fixation along the central axis (Fix) or 4 degrees of fixation along the central axis (Nonfix). Each stimulus duration was 100 ms.

**Procedural Details**: Feedback during practice (1-2 hrs) only.

**Cambridge Research VSG2/5 system**

RESULTS

Data are averaged across subjects at an intermediate c=0.5 (c = 1 corresponds to all-white, fully-even, or completely symmetric). Values of c were chosen to span the range of psychophysical performance.

**Image Classes and Background Conditions**

LUMINANCE  EVEN  SYMMETRY

**Localization vs Segmentation**

N = 5 trained subjects

4 A-Four Conditions

Stimulus Duration: 100 ms.

4 Cueing Conditions

SAME (No Cue) Red Vertical Bar Red Horizontal Bar

Frame

RESULTS

Fraction correct for LUM was highest overall, regardless of cueing. The Frame cue elicited the highest fractions correct for all image classes. For LUM/SAME, fraction correct was .72, and increases with the Frame cue to .86, comparable to the LUM/GRAY (GR) condition reported above.

V-Bar and H-Bar conditions localize but don’t segment. They do not result in an improved FC for LUM, EVEN, or SYM, as we expected from the lack of an effect of positional uncertainty. However, H-Bar does result in an improved FC for the 1D-correlated images. This suggests an orientation-specific interaction between the H-Bar cue and the horizontal one-dimensional correlation structure of the 1D-correlated images.

SUMMARY & CONCLUSIONS

- Segmentation effects are graded. Even for image statistics that support segmentation, segmentation cues (GRAY bkgd, Frame cue) further enhance performance.
- Symmetry, while visually salient, does not support segmentation by itself.
- Detection of both local and long-range image statistics is unaffected by positional uncertainty.

**OTHER DETAILS**

Examples of each image class were generated with a range of statistical structure: "c" (c = 0 corresponds to randomness, and c = 1 corresponds to all-white, fully-even, or completely symmetric). Values of c were chosen to span the range of psychophysical performance.

Contrast: 1.0; Luminance: 47 cd/m2

Frame cue elicited the highest fraction correct for the 1D-correlated images.

This suggests an orientation-specific interaction between the H-bar cue and the horizontal one-dimensional correlation structure of the 1D-correlated images.

**METHODS**

N = C trained subjects

4 A-Four Conditions

Stimulus Duration: 100 ms.

4 Cueing Conditions

SAME (No Cue) Red Vertical Bar Red Horizontal Bar

Frame

RESULTS

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