Differential Feature Crowding

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INTRODUCTION

■ Background
  ▶ Crowding: distractor-induced elevation of identification thresholds for cued targets [1]
  ▶ Studied extensively for letters [4] and, to a lesser extent, for orientation [3, 1]
  ▶ Circumstantial evidence for crowding in other features [2, 5]

■ Questions
  ▶ Crowding in other features?
  ▶ If so, how do the effect strengths compare to each other?

■ Experiment
  ▶ Study how distractors affect identification of orientation, size, hue and saturation

METHODS & MATERIALS

■ Stimuli

1: Fixation (100 ms)

4: Target + Distractors (200 ms)

2: Reference (400 ms)

5: Mask (100 ms)

3: Mask (100 ms)

6: Fixation (until response)

Figure 1: Schematic illustration of a hue judgment trial

■ Tasks

Judge whether centre item (target) is:
  ▶ tilted left or right from vertical reference (orientation)
  ▶ smaller or larger than reference (size)
  ▶ redder or greener than gray reference (hue)
  ▶ more or less saturated than reference (saturation)

■ Procedure

  ▶ Match distractor variation magnitude over features (prior to experiment proper)
  ▶ Measure 75% identification thresholds as function of distractor spacing (at eccentricities 0, 6, 10 deg.)

■ Rationale

  ▶ In case of crowding, thresholds will increase as spacing decreases
  ▶ Larger total threshold elevation (ceiling/floor ratio) means stronger crowding

RESULTS & DISCUSSION

Figure 2: Identification threshold as a function of spacing (at eccentricities 0, 6, 12 deg)

Figure 3: Threshold elevations (ceiling/floor ratios)

■ Foveal crowding: None

■ Peripheral crowding:
  ▶ Found in all tested features
  ▶ Strongest for orientation
  ▶ Weaker for size
  ▶ Weakest for hue and saturation

■ Further research

  ▶ Study a broader range of eccentricities
  ▶ Study stimulus size (in)dependence
  ▶ Assess findings in light of Pelli et al.’s crowding criteria [4]

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REFERENCES