Seeking Effective Markers for Gaze Guidance

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Gaze Guidance

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Goal: To guide a viewer’s focus to salient spots by markers (gaze-capturing events)

Applications: car cockpit, medical image analysis, Virtual Reality, PC monitor,…

Two separate processes:
1) Predicting salient spots (algorithm, network, collected ‘fixations’)
2) Leading gaze toward those spots

Existing (Rudimentary) Guidance (on a PC monitor)

• Word editor: blinking cursor (effective)
• Desktop: blinking icons for incoming mail, dialog entries, security updates,…
• Advertisement banners (irritating)

→ desired marker characteristic:
  effective but not irritating

• 2 crucial issues: eccentricity & attention

Gaze Guidance for PCs (gain experience!)

• Cursor: make size eccentricity-dependent! (gaze-contingent)
• Event notification: likewise
• Site anchors: place gaze anchors for better orienting (eccentricity-dependent)

→ reverse to gaze-contingent displays, but does not require high tracking precision (2 degree could suffice)

Guidance for the Car Cockpit

divide visual field into zones

General Aspects

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<th>Attention</th>
<th>Spatial</th>
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<td>Eye tracking</td>
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<td>Marker Occurrence</td>
<td>Attention</td>
<td>Location</td>
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<td>sequential, simultaneous</td>
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<tr>
<td>General Aspects</td>
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Using Broadband (1/f) Noise

- Flickering bar code to mimic dynamic input
- 1 trial = 10 seconds (fast flicking – slow rolling)

...taken from a 1/f-noise image

- Trigger/random patch classification: ROC area up to 0.62 (real scenes: 0.63-0.64)
- Movie a useful approximation to real-world moving input

Free Viewing

Visual Search for Markers

- 300ms, 1 deg width, ca. 3/trial
- Amplitude eccentricity-dependent (exp)
- Subtle: takes a few trials

Reaction Times

- equal or even decreasing RT for increasing eccentricity!
Detection Rate

- Detection Rate (both & saccadic only)
- Detection Rate (roughly equal)
- However: low-luminance markers less well detected
- Marker should have a limited luminance range

Saccadic Undershoot

- Place marker beyond target by ca. 15% (radially)

Search and Identify

- Letter: 6/trial, 500ms, very low contrast
- Identification by mouse-menu
- Guidance by marker (0-100%, blockwise)

Guidance 0-100

- Foveation hardly increases, but identification does (parafovea suffices)

Marker Variations

- Motion, temporal gap sizes

- Motion is a bit better
- Optimal temporal gap size: 100ms

Recommendations

- **Range**: Compensate decline in peripheral acuity with increasing amplitude (exp)
- **Location**:Compensate saccadic undershoot by placing marker ca. 15% beyond target
- **Appearance**:
  - Use limited variability for luminance marker
  - Optimal temporal gap ca. 100ms (to avoid forward-masking)