


Gaze  Com


## Seeking Effective Markers for Gaze Guidance

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## Gaze Guidance

Barth et al 06

- **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

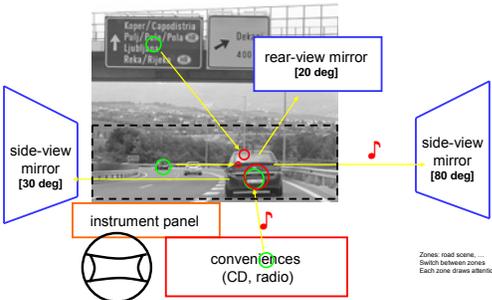
(gain experience!)

- **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



Zones: road scene... Switch between zones. Each zone draws attention differently.

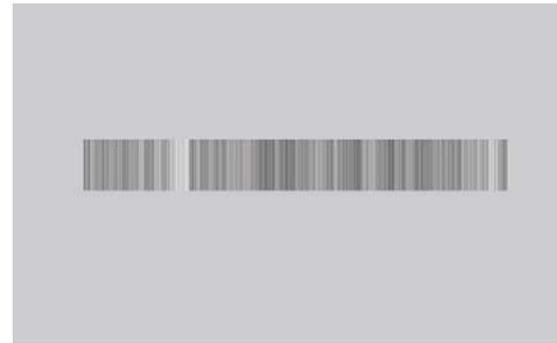
## General Aspects

Temporal	Attentional	Spatial
<b>Marker Frequency</b> second - minutes	<b>Eye tracking</b> off-the shelf	<b>Range</b> eye-, head movements <u>eccentricity dependent</u>
<b>Marker Occurrence</b> sequential simultaneous (overload?)	<b>Attention</b> saccadic behavior	<b>Location</b> stationary <u>unpredictable</u> <u>accuracy of landing</u>
<b>Response Urgency</b> immediate later	<b>Cue</b> visual auditory	<b>Appearance</b> <u>display (pixel) control</u> context dependent

## Using Broadband (1/f) Noise



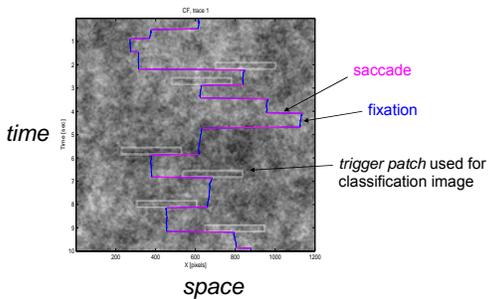
Flickering bar code to mimic dynamic input  
(single frame=10ms)



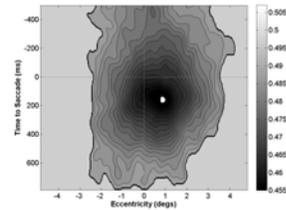
→ 1 trial = 10 seconds  
(fast fissioning – slow rolling)

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

(1/f: Field 87, Burton & Moorhead 87)

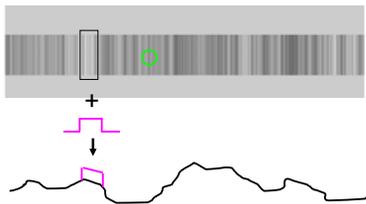


## Free Viewing



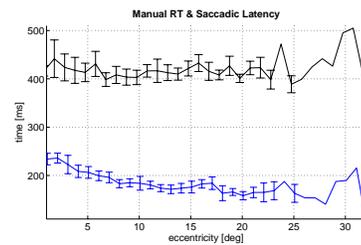
Trigger/random patch classification: ROC area up to 0.62  
(real scenes: 0.63-0.64)  
→ Movie a useful approximation to real-world moving input

## Visual Search for Markers



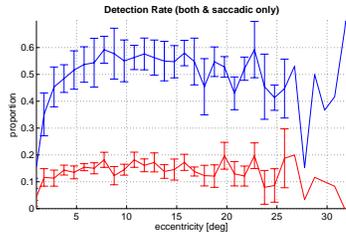
- 300ms, 1 deg width, ca. 3/trial
- Amplitude eccentricity-dependent (exp)
- Subtle: takes a few trials

## Reaction Times



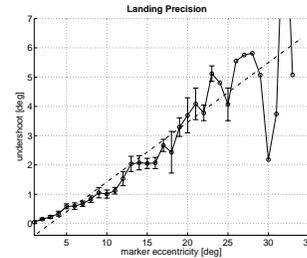
→ equal or even decreasing RT for increasing eccentricity!

## Detection Rate



- roughly equal
- However: low-luminance markers less well detected
- marker should have a limited luminance range

## Saccadic Undershoot



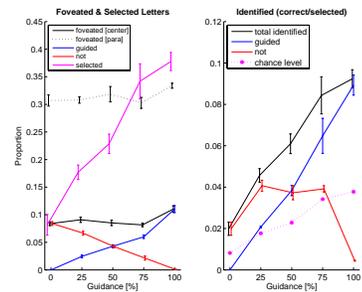
- place marker beyond target by ca. 15% (radially)

## Search and Identify



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

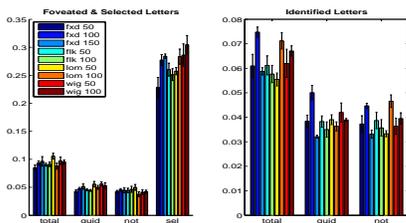
## Guidance 0-100



- 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)