



Analysing Rapid Serial Visual Presentation Designs by their Eye-gaze properties

Mark Witkowski and Bob Spence

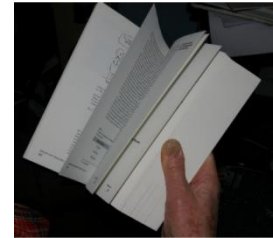
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**Presented at: Eye Tracking: Why, When, and How?
TU Dresden, 23-24 August 2012**

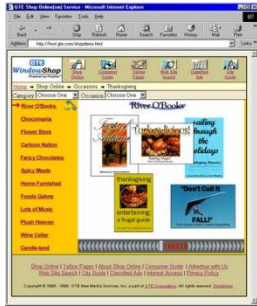
What is RSVP?

- Rapid presentation of images to best effect
- Typified by the “riffle” effect
- Loads of uses and design options
- Ability to see/identify images very fleetingly
 - Huge body of evidence from psychology
 - But what if you blink or glance away?
 - Attentional blink
- Performance and Aesthetic issues
- Gaze to understand and analyse

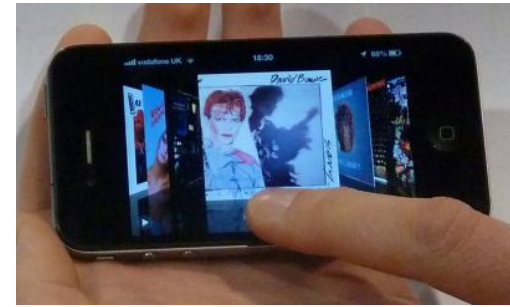


What is RSVP used for?

Gift Selection



Music



Video editing



Courtesy Whittenburg, MERL

Mobile devices



Product location



Design Questions

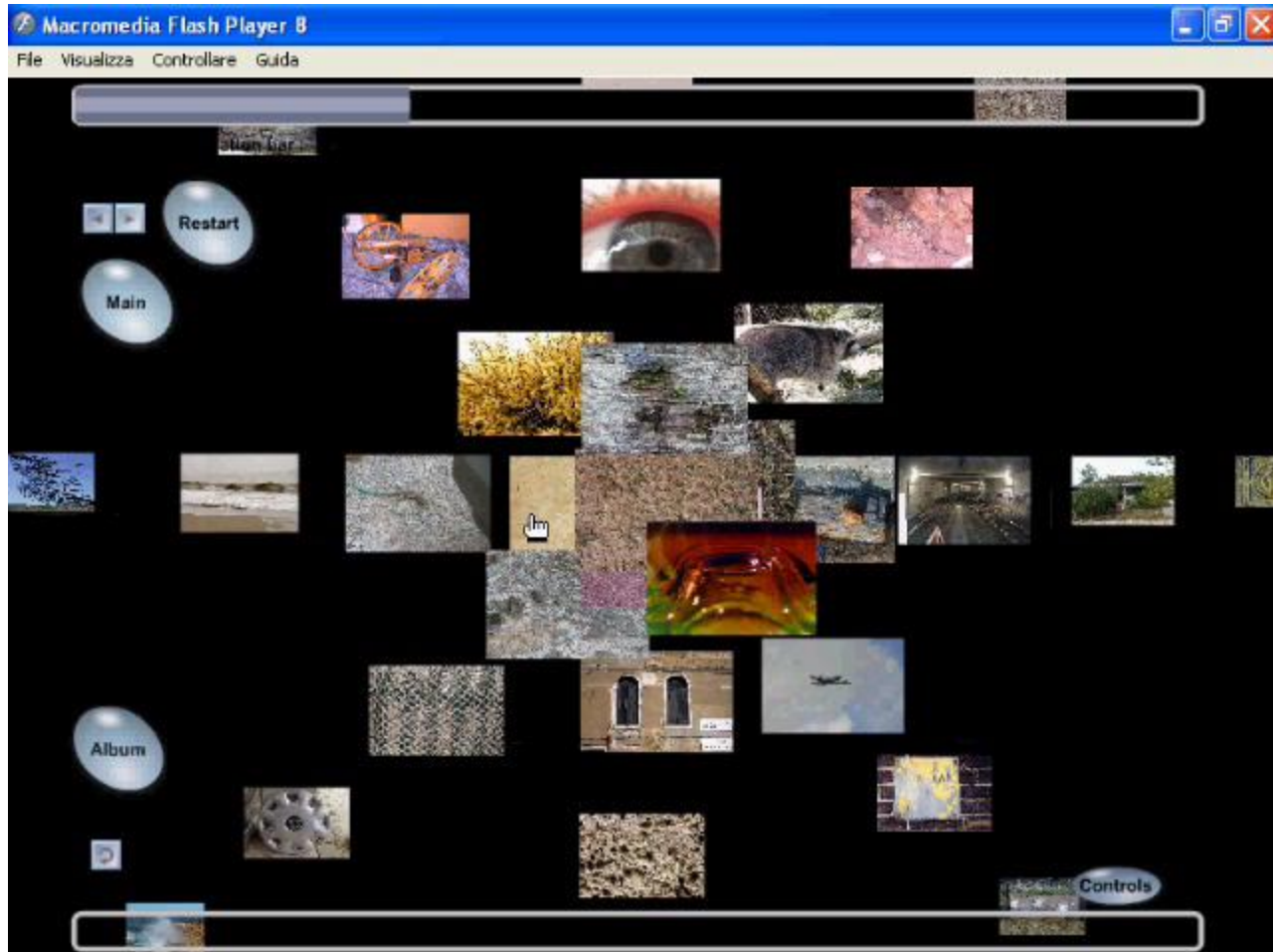
- What is the most effective visual style?
- How quickly can images be presented?
- How big should images be?
- Manual or automatic rate and speed selection?
- Number of images on screen simultaneously?
- Effect of image overlap?

Some RSVP Examples (1)



Slideshow, 2x2, Diagonal, Stream, Ring, Tile
64 images, ~10/sec

Some RSVP Examples (2)



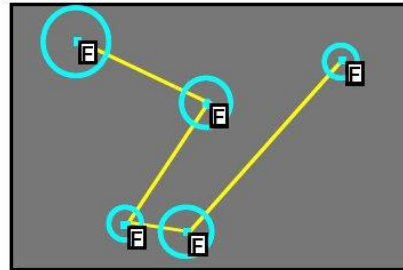
Volcano mode “with cats”
Shot mode

Courtesy Corsato et al (2008), Università di Pavia

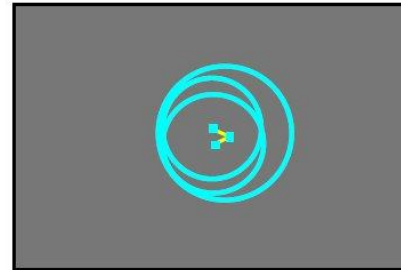
Eye-gaze Questions

- Does gaze strategy change with mode?
- Is gaze strategy constant over time?
- Does gaze strategy vary between people?
- What does gaze analysis tell us?
 - Does it correlate with performance?
 - Does it correlate with satisfaction?
- Can it help us with RSVP mode design?

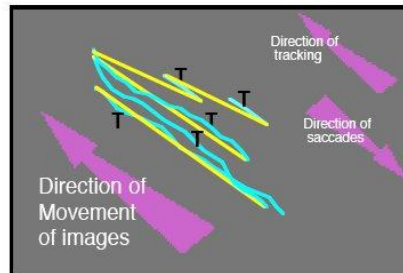
Gaze “primitives”



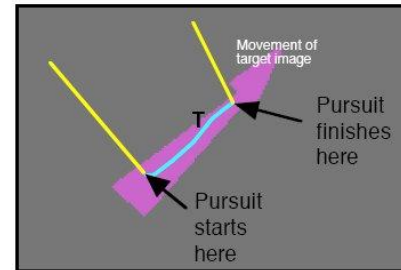
(a) **Visual Search.** The user is **searching** for a ‘target’ or simply **exploring** an image. Fixations are denoted ‘F’ and their durations indicated by the diameters of circles. Saccades are shown yellow



(b) **Steady Gaze.** The user is concentrating attention at essentially one location, with negligible saccadic activity. Fixations are essentially co-located and their duration is indicated by circle size.



(c) **Nystagmus.** Gaze tries to ‘keep up’ with the continuous stream of images. T indicates tracking.

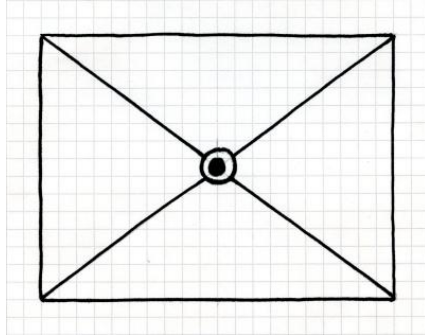


(d) **Visual pursuit:** Following a saccade, gaze tracks a (possible) target image

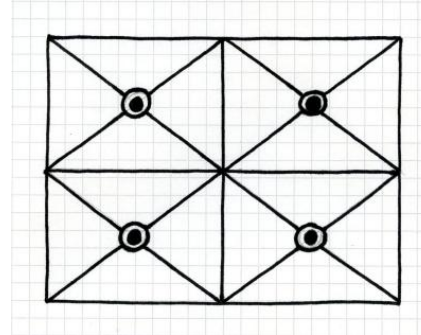
Visual tracking

RSVP Modes we Investigated

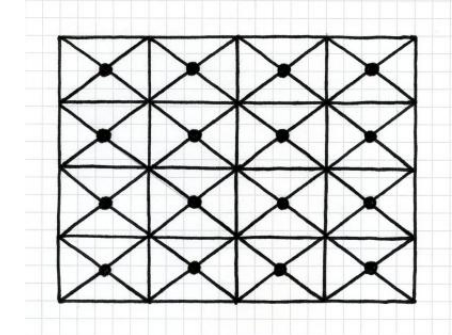
Slideshow (steady gaze)



2x2 (Search to Steady)

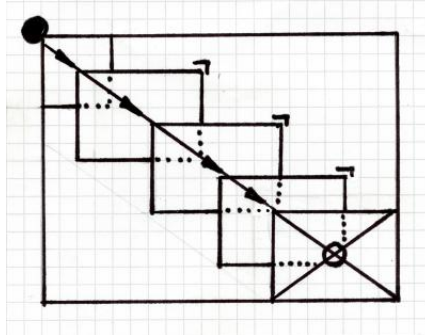


Tile (Visual Search)

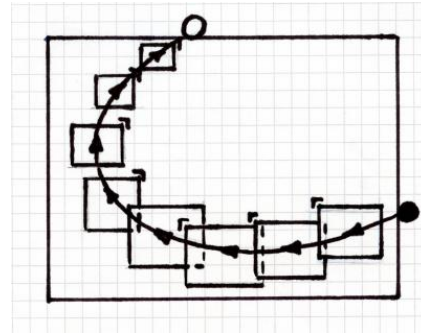


**Static
Modes**

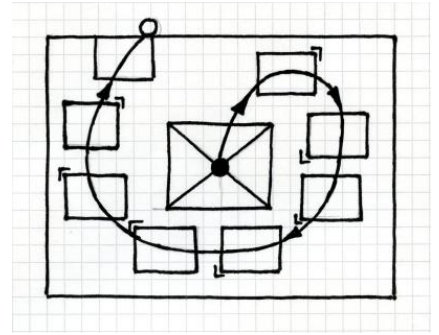
Diagonal (nystagmus/steady)



Stream (nystagmus only)

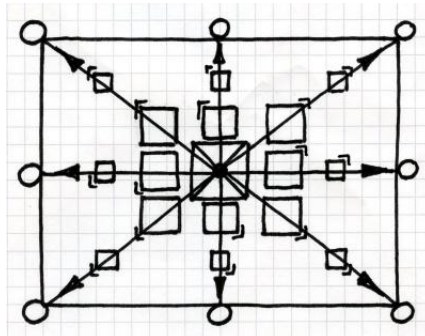


Ring (steady gaze)

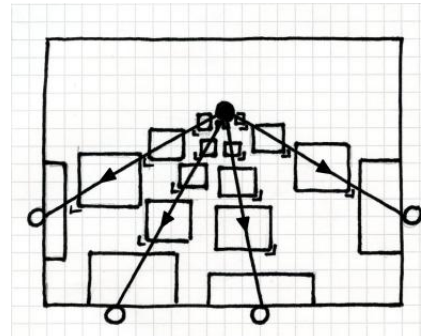


**Moving
Modes**

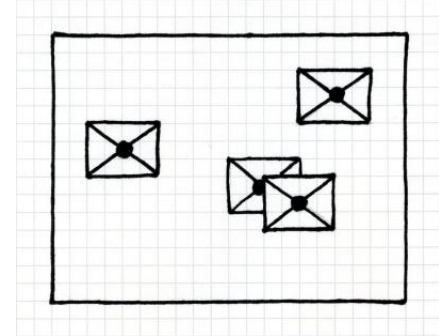
Volcano (steady & tracking)



Shot (search & tracking)



Collage (search?)



**Multiple
Entry/
Exit
Modes**

RSVP Modes we Investigated

Slideshow (steady gaze)



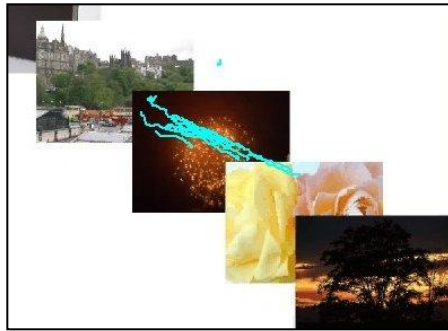
2x2 (Search to Steady)



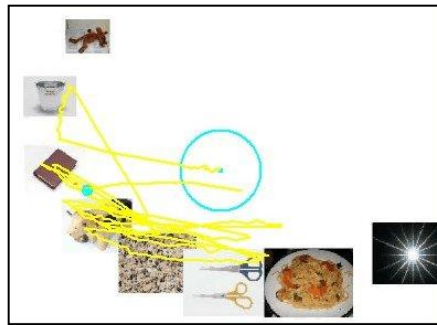
Tile (Visual Search)



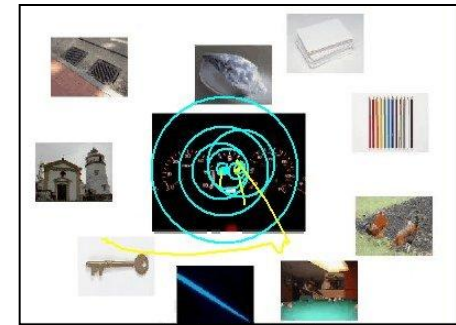
Diagonal (nystagmus/steady)



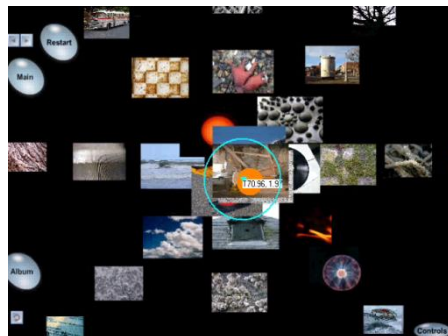
Stream (nystagmus only)



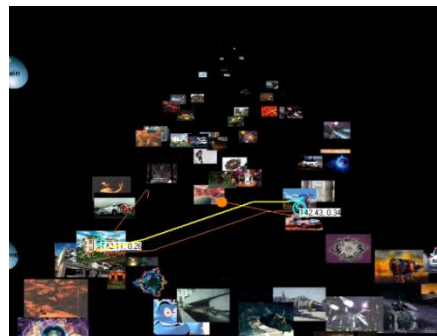
Ring (steady gaze)



Volcano (steady & tracking)



Shot (search & tracking)



Collage (search?)



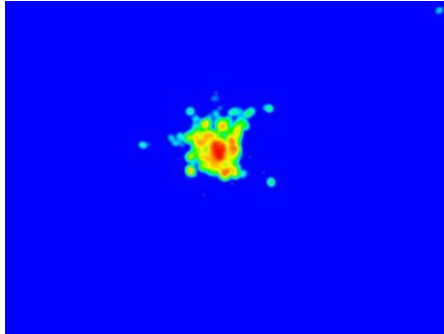
Static
Modes

Moving
Modes

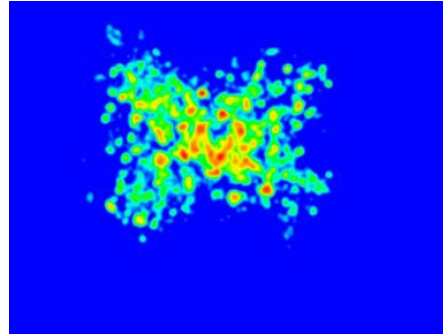
Multiple
Entry/
Exit
Modes

RSVP Modes we Investigated

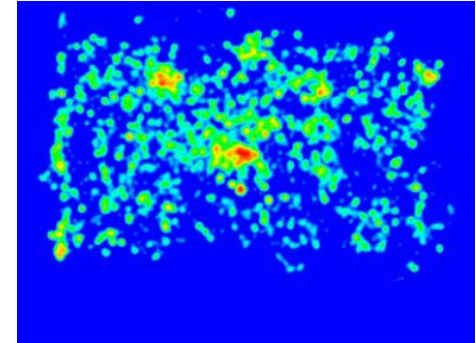
Slideshow (steady gaze)



2x2 (Search to Steady)

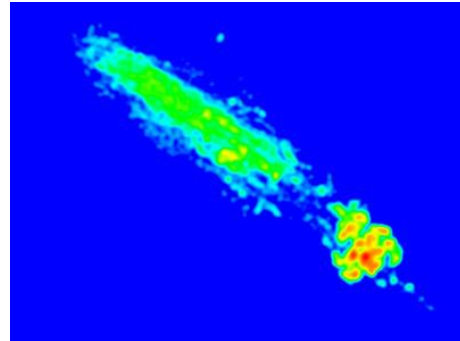


Tile (Visual Search)

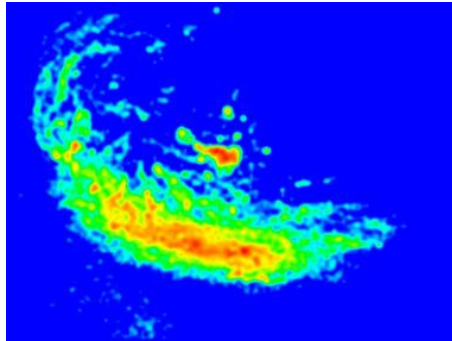


**Static
Modes**

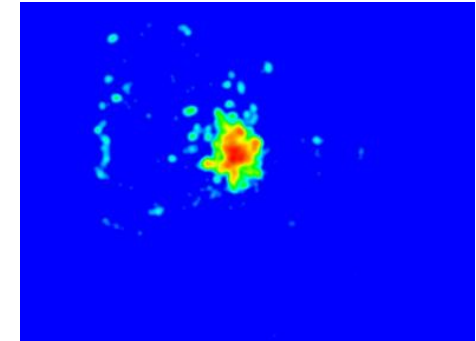
Diagonal (nystagmus/steady)



Stream (nystagmus only)

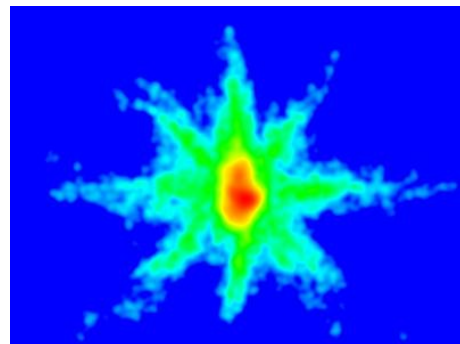


Ring (steady gaze)

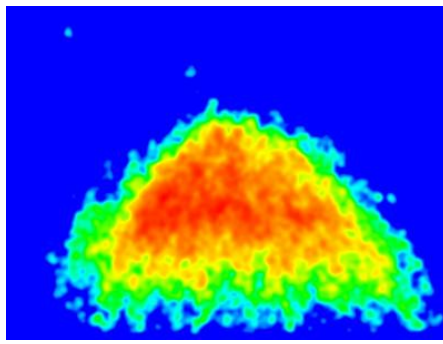


**Moving
Modes**

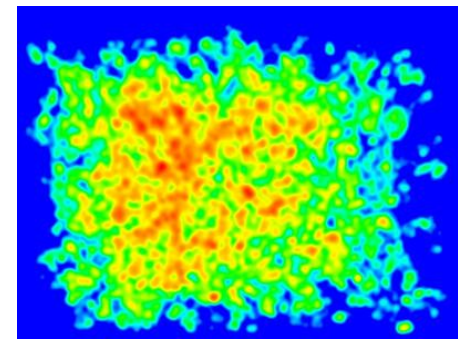
Volcano (steady & tracking)



Shot (search & tracking)

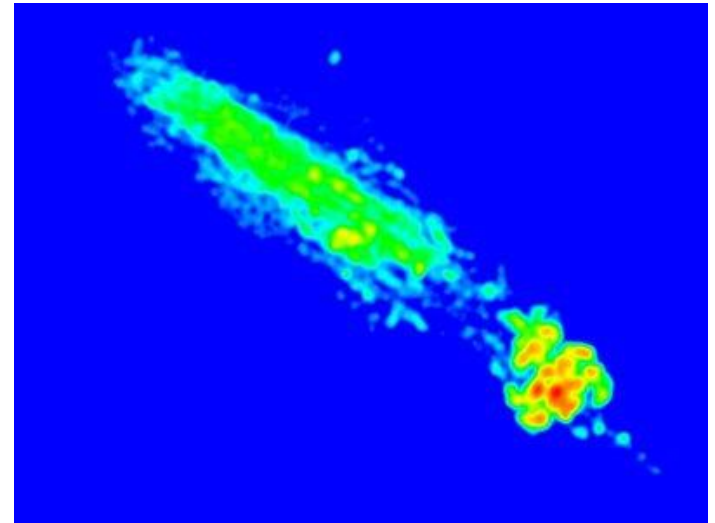


Collage (search?)

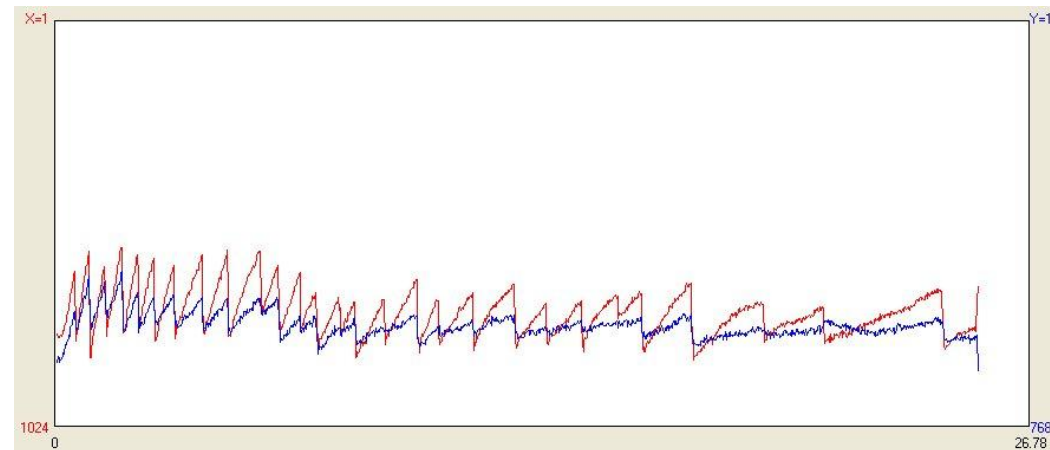


**Multiple
Entry/
Exit
Modes**

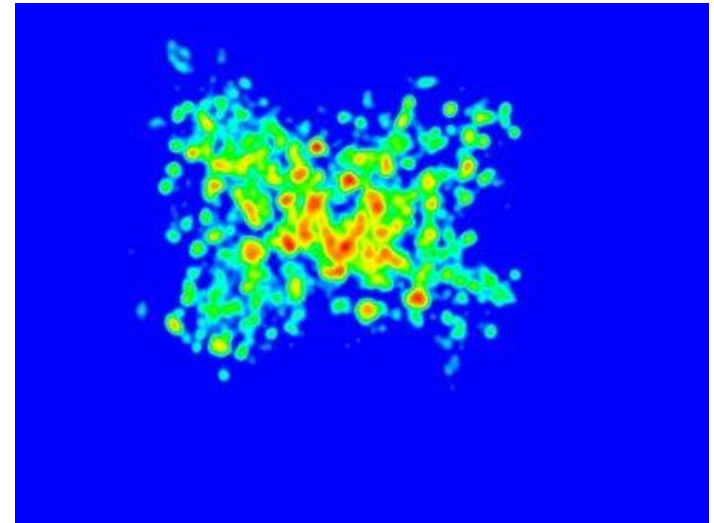
Example



Diagonal mode
Rapid movement, fixed exit
Nystagmus ► fixed
Tends to Slideshow



Best and Worst



(45 traces, 10 subjects)

2x2 mode

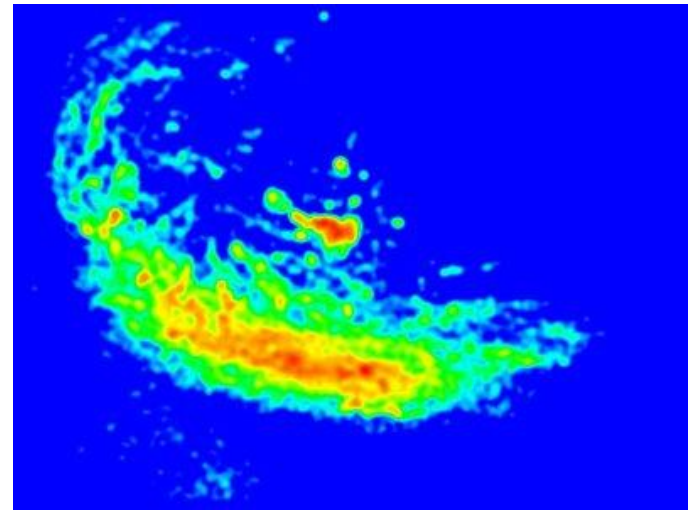
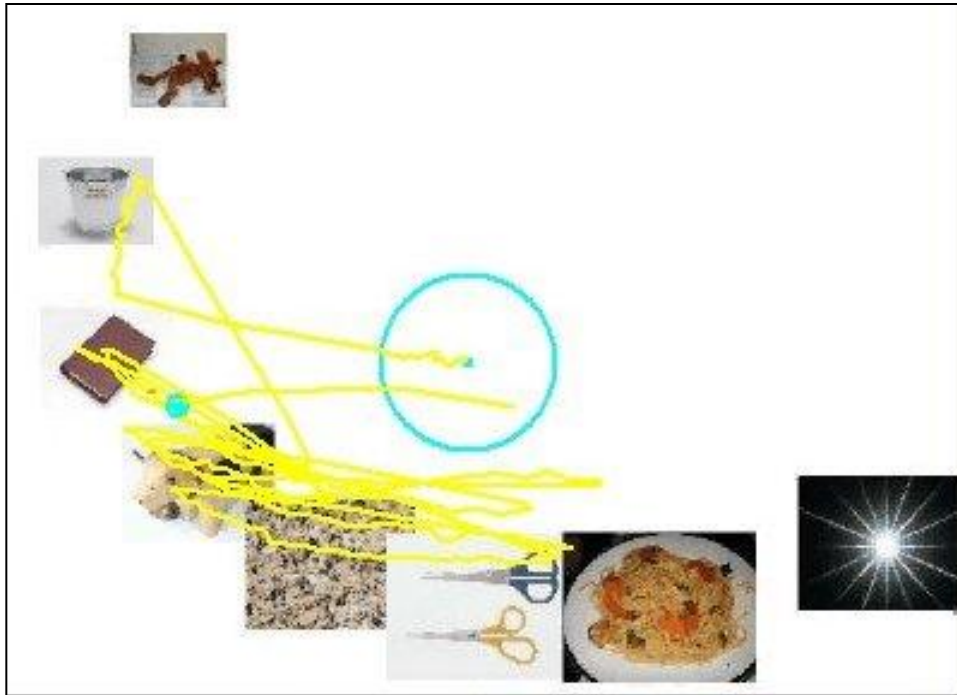
Extended time/image

Allows foveation

Target always in peri-fovea

50% ► <5% (vs Slideshow)

Worst



Stream mode
Rapid moving target
Continuous nystagmus
Disliked the most

What Does Gaze Tell Us?

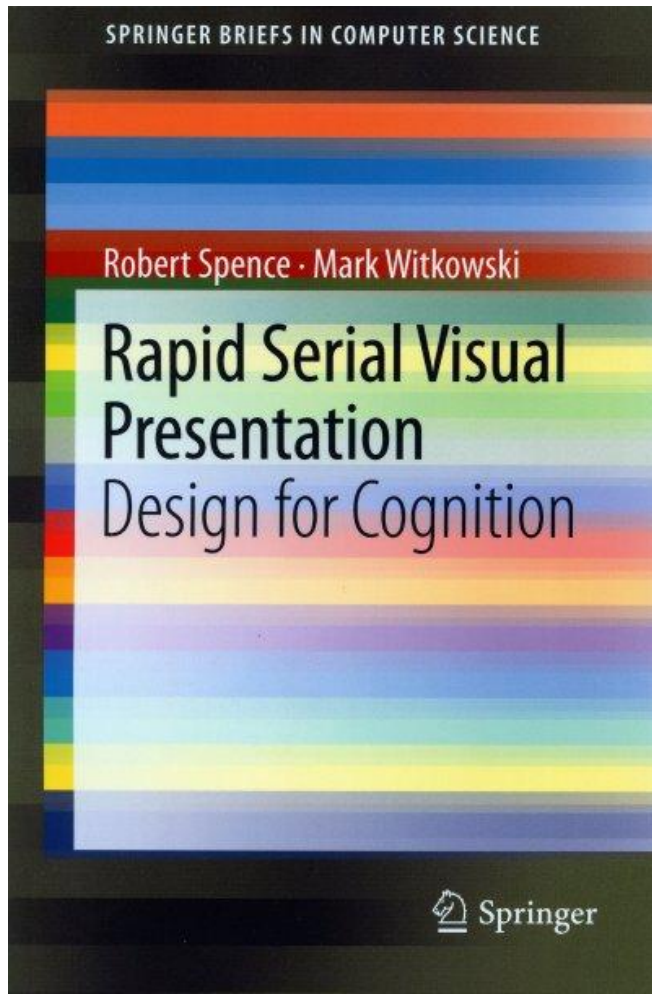
- Whether target was ever foveated/tracked
- If there is a locus of attention/stability
- Chaotic gaze patterns (stream mode)
- Completely irrelevant content (ring mode)
- Conflicts of search pattern (collage mode)
- Inefficient use of display (volcano mode)
- Gaze as a (mild) predictor of both effectiveness and attractiveness

RSVP and Mapping

- James Mardell (Imperial College London)
- Gaze behaviour during a challenging visual search task
- Tomorrow at 16:00



More Information



- Rapid Serial Visual Presentation: Design for Cognition

**Robert Spence and
Mark Witkowski**

- 1: What is RSVP? And Why do I Need it?**
 - 2: Experimental Evidence**
 - 3: RSVP Modes and Their Properties**
 - 4: Eye-gaze**
 - 5: Analysing Gaze for RSVP**
 - 6: Design**
- Bibliography**

<http://link.springer.com/book/10.1007/978-1-4471-5085-5/page/1>