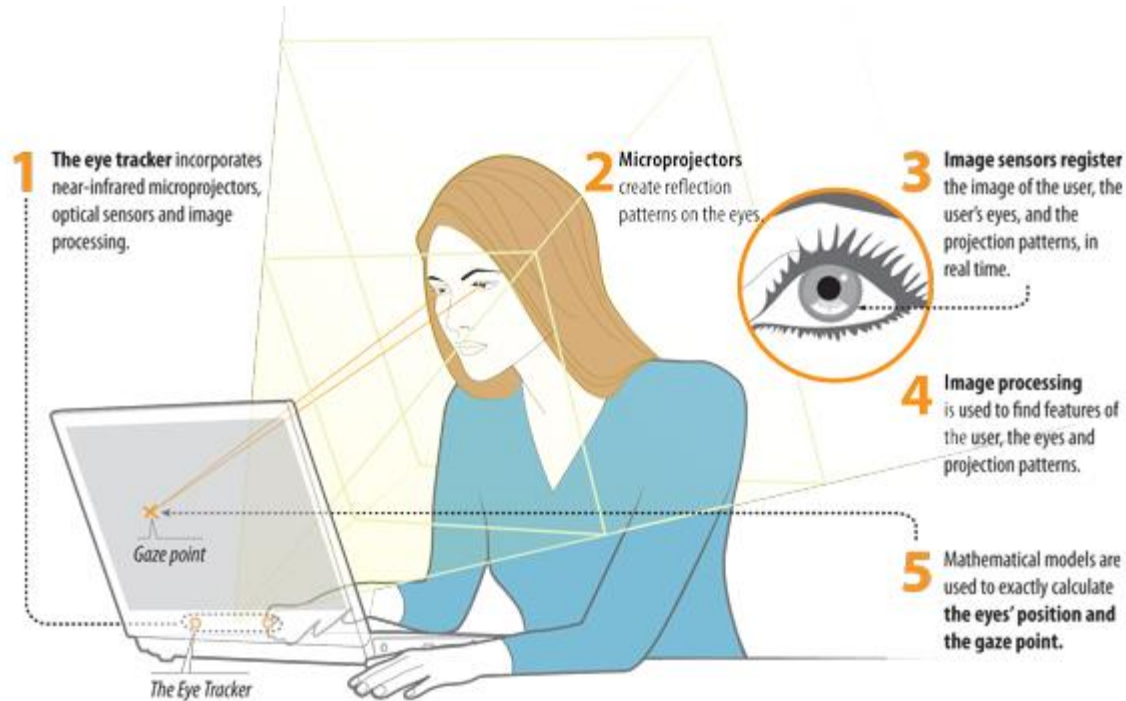


# Privacy user interfaces for eye-tracking

Sören Preibusch

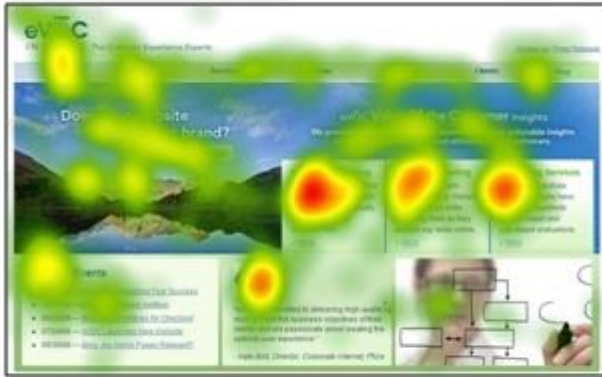
20 November 2014 @ W3C Workshop on Privacy and User-Centric Controls

# How eye-tracking works



# Time-stamped gaze data plus semantics

Aggregated Heat Map



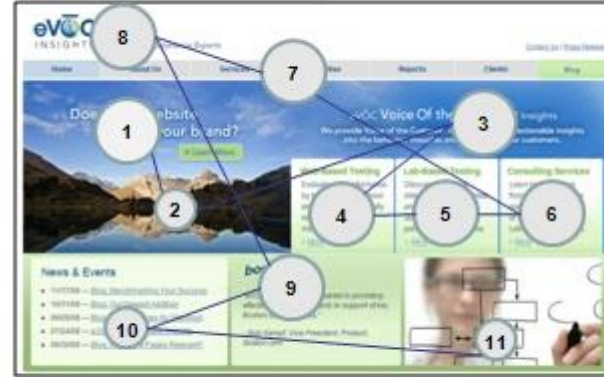
Intensity of Viewers



Low → High

Sample	12
Time of Snapshot	20 sec

Chronological Gaze Plot



# of Viewers Per Area



Low → High

Sample	12
Avg. Time on Page	20 sec

# Opportunities and applications

## One-off research tasks

- User interface testing (online, physical)
- Package design
- Store planning, shelf layout

## Niche applications

- Various medical diagnosis
- Sports performance support
- Security, law enforcement

## Mainstream, continuous

- Attention monitoring
- Relevance measurement
- Ad billing
- Drowsiness detection
- Input modality (for disabled, kiosks)

### GM to launch cars that can pick up on distracted driving

Preparing to launch the world's first mass-produced cars with eye- and head-tracking technology that can tell whether drivers are distracted

By Sally Davies, FT

Published: 17:00 September 1, 2014

GULF NEWS 

# Eye-tracking output data

## Gaze data

- Gaze direction and point
- Combined with object of interest

## Eye data

- Eye presence
- Eye position and movement
- Eyelid closure (blinks)
- Pupil size and dilation

## Biometrics

- User re-identification
- Inferred: age, medical condition

## Preferences and lifestyle

Eye movements to smoking-related pictures in smokers: relationship between attentional biases and implicit and explicit measures of stimulus valence  
[K Mogg, BP Bradley, M Field, J De Houwer - Addiction, 2003 - Wiley Online Library](#)  
... also operate in initial attentional shift mechanisms, as smokers preferentially directed their gaze towards smoking-related scenes, while non-smokers showed no bias; although this evidence is not conclusive as the groups did not differ significantly on this eye movement index. ...  
[Cited by 249](#) [Related articles](#) [All 10 versions](#) [Cite](#) [Save](#)

# Regions of interest



# Regions of interest: by gender

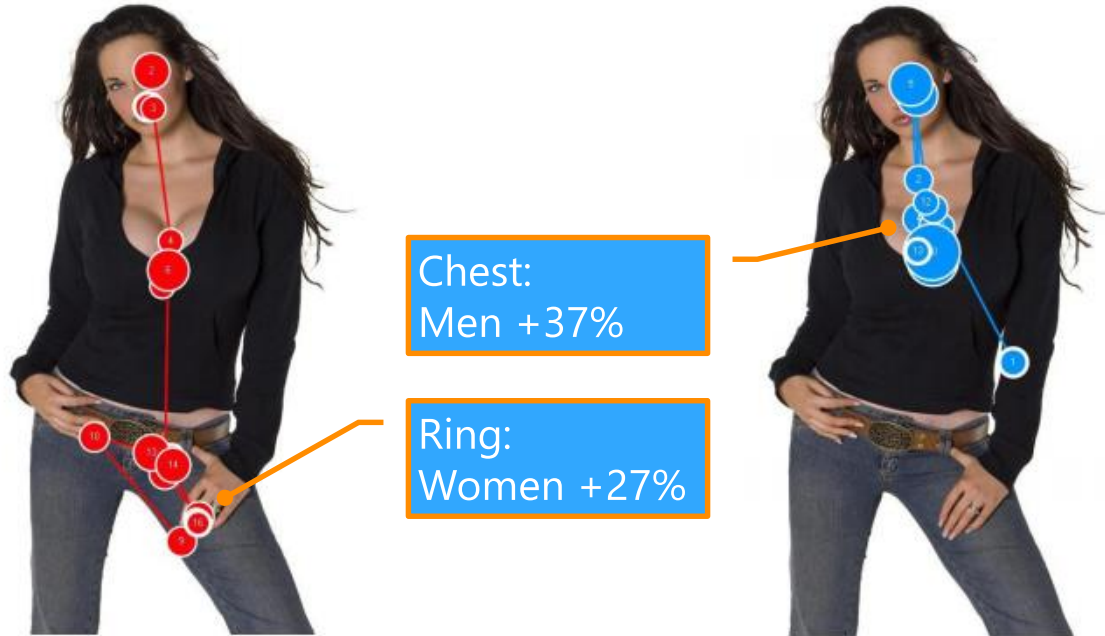


Figure 22: The gaze plot of a Brazilian woman after 5 seconds of viewing

Figure 23: The gaze plot of a Brazilian man after 5 seconds of viewing

# Potential remedies

- Obstruction and destruction
- Meaningful browser APIs
- Meaningful notice to users
- Meaningful choice and control
- Policy and regulation



## Semantic APIs

- Eye-triggered events: *ongazeenter*
- *:seen* pseudo-class, queryable
- Heatmaps: *getUserMedia*

## Notice and choice

- Privacy consequences: explain collected and inferred data
- Status indicators (LED, icons)
- Hardware and software switches



Thank you.