Geovisualisation Conference

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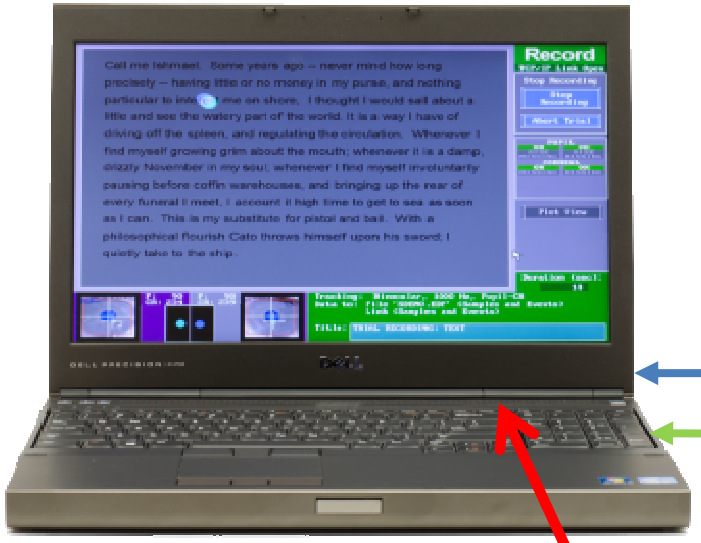
How the EyeLink 1000+ works



Display PC- runs experiment.
Can be Mac / PC / Linux.
Stimuli presented via:

- Experiment Builder
- E-Prime
- Matlab+PTB
- Presentation
- OpenSesame
- Python / C / C++
- LabView Etc.

Host PC – runs realtime OS

- Performs image processing and calculates gaze.
- Sends data to Display PC with <1.5ms latency allowing gaze contingent tasks.
- Can be laptop for portability.

EyeLink Camera:

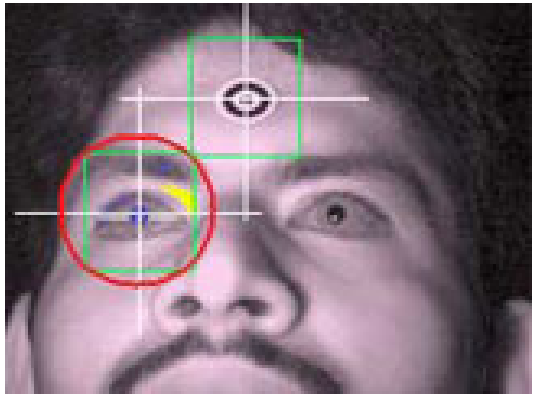
- High speed (2000fps).
- Exceptionally low noise
- High spatial accuracy
- Operates in head fixed and head free modes.

Head fixed vs Head free

Head fixed mode:

Head free mode:

Tower mount allows pointing / touch screen research



Collecting Data: Tracker specifications

What are the spatial and temporal resolutions of the recording?

(spatial resolution is NOT the same thing as accuracy…)

- Spatial: <0.01 degs (head fixed)
- Spatial: <0.05 degs (remote)
- Temporal: 2000Hz (typically 1000Hz)

Accuracy: Typically 0.2-0.5 degs in head fixed mode, <0.5 degs in head free mode.

Eye tracking accuracy reflects error in the oculomotor systems as well as noise in the eye tracker.

Collecting Data: Synchronisation

How can one co-register other motion sensing or physiological sensors (ie sync devices)?

- Markers sent from or to display PC (via parallel port or external USB device).
- Analogue output card for EEG / MEG etc
- Data can be sent directly to parallel port pins on host PC to be merged with eye movement data.
- Gaze overlay can be output in real time and merged with other data (beta)

Real time gaze output can be merged with other real time info (beta)

- http://www.youtube.com/watch?v=tgnlYjf5iUc

Collecting Data: Data

Can one access the raw data?

- Yes – in real time: Raw data consists of -
    1) Samples: timestamp, X, Y and pupil size
    2) Events: Saccade / Fixation / Blinks / Messages

In what kinds of formats can data be exported or accessed?

- Native binary / Ascii conversion tool

How can one move data between systems (ie merging data)?

- Convert to ascii / analogue out option for real time merging with EEG / EMG etc.

Analysing Data

What are the system's out of the box capabilities for analysing dynamic stimuli (e.g. changing screen displays during an interactive session)?

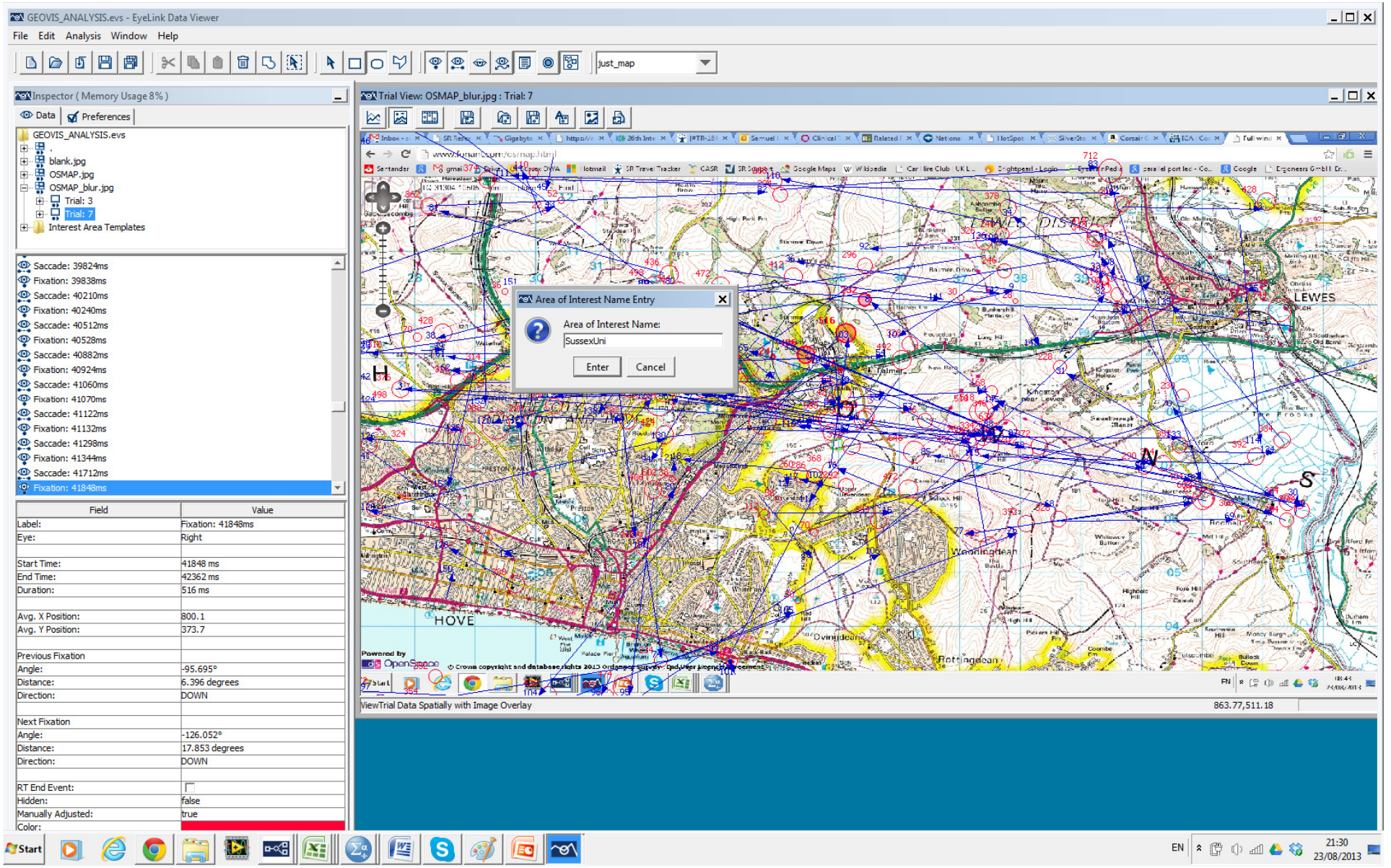
- DataViewer software does animated trial playback. Dynamic IAs are in beta testing.
- Popup calibration utility – records screengrab + gaze
- Hi-res gaze overlay currently beta

Analysing Data

What types of eye-tracking metrics are implemented in the analysis software?

DataViewer is very sophisticated analysis software:

- IA reports – one row per IA: Over 100 different metrics including dwell time / dwell time % / first fixation time / run count / IA contingency tables etc etc etc
- Fixation reports – one row per fixation: lots of metrics including duration; start,end,average x and y; min / max / mean pupil size etc etc etc
- Saccade reports – one row per saccade: lots of metrics – amplitude; direction; latency; start/end x/y; peak velocity etc etc
- Sample reports – one row per sample –lots of metrics including X,Y, IN_BLINK, IN_SACCADE, IA_LABEL etc etc


GEOVIS_ANALYSIS.evs - EyeLink Data Viewer
File Edit Analysis Window Help
just_map
Inspector (Memory Usage 8%)
Data
Preferences
GEOVIS_ANALYSIS.evs
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blank.jpg
OSMAP.jpg
OSMAP_blur.jpg
Trial: 3
Trial: 7
Interest Area Templates
Saccade: 39824ms
Fixation: 39838ms
Saccade: 40210ms
Fixation: 40240ms
Saccade: 40512ms
Fixation: 40528ms
Saccade: 40882ms
Fixation: 40924ms
Saccade: 41060ms
Fixation: 41070ms
Saccade: 41122ms
Fixation: 41132ms
Saccade: 41298ms
Fixation: 41344ms
Saccade: 41712ms
Fixation: 41848ms
Field
Value
Label: Fixation: 41848ms
Eye: Right
Start Time: 41848 ms
End Time: 42362 ms
Duration: 516 ms
Avg. X Position: 800.1
Avg. Y Position: 373.7
Previous Fixation
Angle: -95.695°
Distance: 6.396 degrees
Direction: DOWN
Next Fixation
Angle: -126.052°
Distance: 17.853 degrees
Direction: DOWN
RT End Event:
Hidden: false
Manually Adjusted: true
Color:
Trial View: OSMAP_blur.jpg : Trial: 7
Area of Interest Name Entry
Area of Interest Name:
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Enter
Cancel
LEWES
HOVE
ViewTrial Data Spatially with Image Overlay
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23/08/2013

General

What types of support materials and training are available from the vendor?

- SR Research support is legendary – a company run by eye tracking researchers for eye tracking researchers. All support staff have PhDs in psychology / psycholinguistics / psychophysics / vision science and extensive experience in eye tracking research.
- Over 100 peer reviewed publications by company staff. (over 2600 by our customers…)
- Support forums
- support@sr-research.com (answer within 2 hours)
- Support helpline (North American hours)
- Skype calls to UK office (European hours).

SR-Research staff publications

(staff are highlighted in red)

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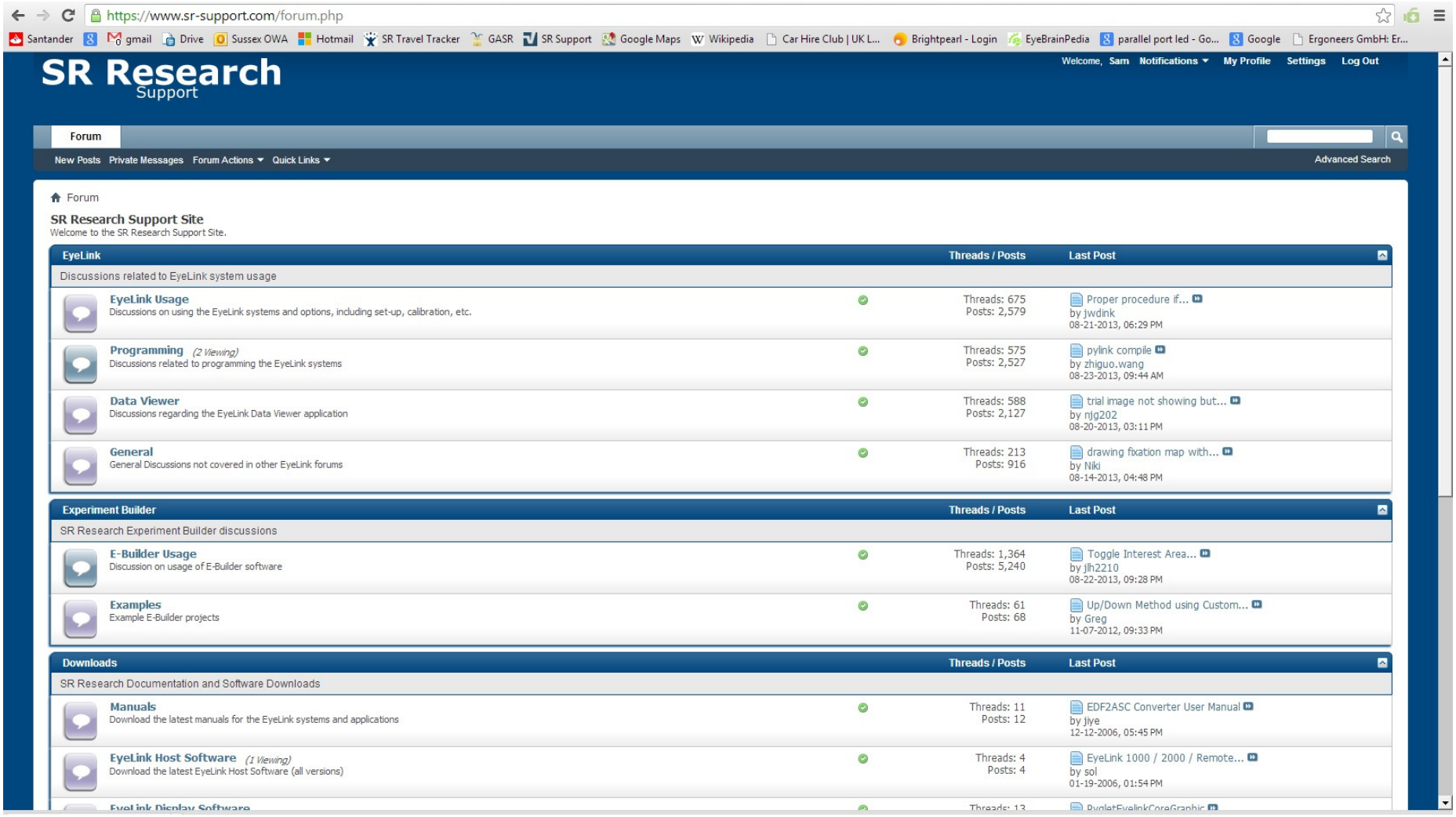
SR Research Support Forum



Analysing Data

How do you check the quality of the data & ensure their validity?

- We use artificial eyes (both static and dynamic)
- Peer reviewed comparisons between scleral search coil and EL1K show very close agreement.
- We work with users to perform any tests / checks they require

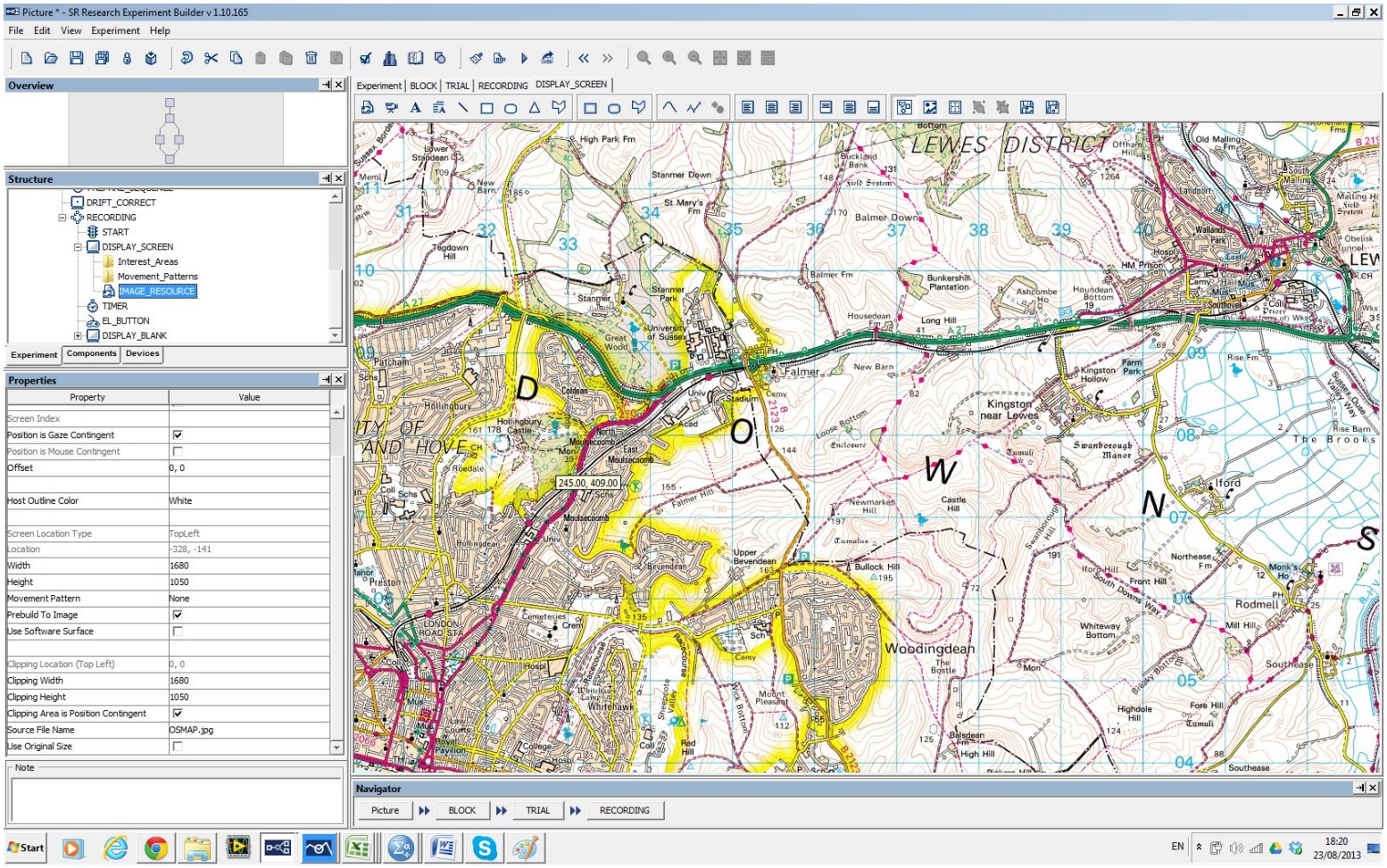
To what extent are the algorithms of the software exposed? Can one find out the details of what is under the hood?

- Filter (which can be turned off) is published.
- Saccade parser can be configured by user
- Raw data can be reparsed

Generating Data

How easy is it to create experiments and collect data?

- Very – Experiment Builder is intuitive and easy to use and allows complex (e.g. gaze contingent) tasks to be developed very quickly



General

What is on the horizon in terms of the product, with respect to Research & Development?

- Larger headbox in remote mode
- Further improvements to existing software (Host software, Experiment Builder and DataViewer)
- Replacement for old head mounted EL-II (e.g. mobile solution)…