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## Product Overview

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### **Version information**

This document describes the ClearView gaze analysis software, release 2.7, July 2006.

The ClearView software is continuously developed and refined. Please visit [www.tobii.com](http://www.tobii.com) for the most recent specifications.

### **Product philosophy**

ClearView, by Tobii Technology, is a software for analyzing eye gaze data thus facilitating the interpretation of human behavior, consumer responses and physiology. Some of the benefits of the software are;

- Ease of use
- Time- and cost effectiveness in both small and large studies
- In-depth quantitative analysis
- High-level analysis with striking visualizations
- Support for a broad range of studies, including web, videos and physical objects
- Flexibility in system configurations and integrations

Tobii eye tracking hardware provides high-quality, automatic eye tracking. Together with the easy to use and powerful analysis tools in ClearView this provides a comprehensive system to effectively record and analyze gaze data.

ClearView provides a number of tools for specific applications while being flexible enough for more unique analysis and interpretation. The focus of the software is on collecting and analyzing eye gaze data, but also combines this with a range of other synchronized data streams.

### **Applications**

#### **Usability testing**

ClearView is well suited for usability testing on:

- web pages (using built-in web recording tools)
- software (using screen recording options)
- interactive TV
- handheld devices and physical products

The workflow of ClearView also supports the use of industry standard think-aloud protocols. In addition to gaze data, ClearView records stimulus, mouse clicks, key strokes, user camera and user audio.

Using Gaze Replays or Gaze Plots one gains an in-depth understanding of individual user behavior. With Hot Spots and Area Of Interest statistics it is possible to aggregate data from multiple users and compare quantitative data and use this to illustrate conclusions to clients and colleagues.

ClearView also integrates with leading usability software such as INTERACT from Mangold or The Observer from Noldus for behavioral logging, further video analysis and integration with additional data streams.

**Advertising testing**

ClearView is ideal for advertising design testing on a variety of media:

- print advertising (digitally scanned and presented on a monitor)
- print advertising (using the actual physical print)
- TV commercials
- product placement (with projection screen shopping shelves)
- web advertising

The ease of use and effectiveness of both ClearView and the Tobii eye tracking systems, make it possible to gather data with large number of participants cost effectively. Using the analysis tools, in particular the Area Of Interest statistics and Hot Spot visualizations, such data is easily and quickly taken to a high level for meaningful comparison, interpretation and presentation.

**Psychology research**

ClearView is suitable for a wide range of psychology and physiological experiments, such as:

- Studies of autism, ADHD, schizophrenia
- General psychological response studies, including use of scan-paths, gaze distribution, gaze response times, manual response times and more
- Infant research
- Reading studies
- Studies of ocular-motor behavior and vision deficiencies

The ease of use of the software enables researchers and students to work with the system without need for extensive training.

Using ClearView, you quickly create Slideshows, Moving bitmap scripts or AVI movies as stimuli. ClearView collects responses from your subjects, such as keystrokes, and also handles all data synchronization.

The flexibility of ClearView also allows the use of other software programs for stimulus presentation, and optionally also for data collection. Of particular interest for psychology researchers is the deep integration between the Tobii eye tracking system and E-Prime by Psychology Software Tools, a leading software today for psychology experimental design.

Extensive resources have been put into facilitating psychological eye tracking experiments on infants and other low attention subjects. For instance, the software is highly suitable to use eye tracking to replace manual “preferential looking” methods.

In addition to easily creating suitable stimulus for infant experiments (Slide Shows and AVI movies), ClearView also features specifically customized “infant calibration routines”, which makes it much easier to obtain robust calibrations on individuals with low attention.

<b>ClearView feature chart</b>	ClearView (basic)	AVI Recording AddOn	Moving Bitmap AddOn	Video Capture AddOn	Screen Recording AddOn	Web Recording AddOn	Live Viewer	Software Development kit	E-Prime extens. for Tobii
<p>The columns to the right indicate different "AddOns", which are purchased separately, and required to obtain the listed functionality.</p>									
<b>Stimulus presentation features</b>									
Still images	√								
Slide shows	√								
AVI movies		√							
Scripts of moving bitmap images			√						
Video from external source				√					
Scene camera				√					
Screen contents					√				
Web browser contents						√			
Empty (stimulus from other application)	√								
<b>Recording features</b>									
Eye tracking data (binocular) - Gaze points - Gaze data timestamps - Eye positions - Pupil sizes - Data validity	√								
Stimulus timing - Image presentation timing - Movie start timing - Html page shown timing - Moving bitmap positions	√								
Video from external source - RGB - S-video - Web camera				√					
Scene camera - S-video or Web camera video - Perspective compensation				√					
Screen recording (at full screen resolution)					√				
Web recording - Page transitions - Bitmap image of each full html frame - Individual html frame positions - Browser window position - Scrolling - Multiple browser windows (pop-ups)						√			
Subject responses - Mouse clicks - Key strokes	√								
Event signals sent from other applications - Event signal time stamp - Event code - Event text	√								
User camera							√		
User audio							√		
<b>Calibration features</b>									
Standard, fully automatic	√								
Low vision, semi-manual calibration	√								
Low attention, (infant) calibration	√								
Calibration plot	√								
Automatic calibration improvement suggestions	√								

<b>ClearView feature chart</b> ... continued	ClearView (basic)	AVI Recording AddOn	Moving Bitmap AddOn	Video Capture AddOn	Screen Recording AddOn	Web Recording AddOn	Live Viewer	Software Development kit	E-Prime extens. for Tobii
<b>Analysis features</b>									
Gaze Replay - Any stimulus with gaze superimposed - Picture-in-picture of track status - Picture-in-picture of user camera	√								
Gaze Plot visualization - Time segment option	√								
Hot Spot visualization - Multiple subject response based on fixation count, fixation length or subject percentage - Time segment option	√								
Area of interest definition tool - Rectangular and polygon shapes - AOI categorization	√								
Scene segmentation tool - Define discrete scenes in movies - AOI, hotspot and gazeplot per scene	√								
Statistics - Including fixation count, gaze time, time to first fixation and fixation order	√								
Data filters - Raw data option - Left/Eye and Validity filters - Adjustable fixation filter	√								
<b>Integration features</b>									
Text Export - Raw data - Eye filtered data - Fixation filtered data - Event data - AOI data - AOI list - Combined data	√								
AVI Export - Stimulus video with gaze overlay and picture in picture mixing - Only gaze overlay - Only stimulus video	√								
Direct Excel Export	√								
INTERACT Integration - Export of video and data to INTERACT - Triggering of recordings from INTERACT	√								
The Observer Integration - Export of video, fixation data, event data and AOI data to The Observer - Triggering of recordings from The Observer	√								
E-Prime Integration - Triggering of ClearView from E-Prime - Full recording integration into E-Prime									√
Trigger API - APIs using DLL calls and ActiveX - Sample code and documentation								√	
<b>System configuration features</b>									
Single / double computer setup options	√								
Double monitor setup option - For separated subject and test leader views	√								
Screen copy, live observation - Real-time view on second screen - stimulus with gaze data superimposed							√		
Track status during recording	√								

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**ClearView features and benefits**

Feature	Description	Benefit
Many types of stimuli	<ul style="list-style-type: none"> <li>• Still images</li> <li>• Slide shows</li> <li>• Movies</li> <li>• Screen recordings</li> <li>• Web pages</li> <li>• Scripts of moving bitmaps</li> <li>• External video source</li> <li>• Physical objects and scenes using a scene camera</li> </ul>	<p>Setup your study very quickly.</p> <p>Easily present the appropriate stimulus.</p> <p>Facilitates powerful studies in a large variety of research fields</p>
Records more than gaze data	<p>Record and synchronize the following data:</p> <ul style="list-style-type: none"> <li>• Gaze data</li> <li>• Stimulus timing</li> <li>• Key strokes and mouse clicks</li> <li>• Moving bitmap positions</li> <li>• Screen contents</li> <li>• Web page scrolling and page transitions</li> <li>• External video</li> <li>• External events and triggers</li> <li>• User camera and user audio</li> </ul>	<p>Gaze data is only one of many possible sources of information in a study. By recording many different sources and automatically synchronizing the resultant data, ClearView provides a complete picture without additional work or hassle.</p> <p>Built-in support for user camera and user audio facilitates talk-aloud protocol in behavioral testing.</p>
Multi-person studies	<p>A ClearView study can contain many recording sessions from many test subjects. Built-in analysis tools help you visualize and analyze the individual or aggregated data from these recordings.</p>	<p>For many types of studies, for example in advertising and psychology, the truly interesting conclusions can be drawn from analysis of the behavior of groups of subjects. With effective tools for multi-person analysis, such results are easily distilled from the data in a time and cost-effective way.</p>
Powerful visualization tools	<ul style="list-style-type: none"> <li>• Gaze Replay</li> <li>• Gaze Plot visualization</li> <li>• Hot Spot visualization</li> </ul>	<p>Eye gaze information is by nature very visual. Being able to visualize your data in a number of ways, with gaze superimposed on any kind of stimulus, enables you to make very fast and deep qualitative interpretations of your studies.</p> <p>Striking visualizations also help to convey your conclusions in papers or customer presentations.</p>

Feature	Description	Benefit
Statistics tool	Standard statistics and graphs such as fixation counts, gaze time distribution and time to first fixation.	Quickly and easily extracts meaningful statistics for quantitative analysis and comparison of your results, without need for you develop your own tools.
Integrated Area Of Interest tools	Define Areas Of Interest (AOI) on any of your stimuli. ClearView keeps track of your AOIs and correlates these with gaze data.	A great way to quantify gaze data. By relating eye gaze to objects on the screen, you can obtain meaningful statistics from one or multiple trials.
Powerful web analysis tools	Analyzing the way subjects view web pages when surfing the web has never been easier. ClearView automatically records a video of the web session, as well as all information about scrolling, page transitions etc. During analysis, you can define AOIs on each web page, and have these automatically compensated for scrolling, page transitions etc.	By using web tools that work in a real web environment, ClearView enables you to perform cost-effective and profitable studies of web usability and advertising responses with proven ROI.
Sophisticated filtering tools	Filter gaze data into fixations, or based on eye options and validity codes	Reduce data quantities for easier analysis.  Increase quality and reliability of data by filtering data points.
Live viewing capabilities	Watch live results on the test leader's screen: <ul style="list-style-type: none"> <li>• Eye gaze displayed on stimulus</li> <li>• User camera</li> <li>• Track Status</li> </ul>	Live information during testing enables assurance of recording quality, real-time monitoring and interpretation of results as well as client demonstrations.
Quick and automatic calibration procedure	Choose between different calibration routines, including a fully automatic process, a low-vision calibration and an infant subject calibration.  A calibration plot shows the quality of the completed calibration.	Makes it extremely fast and easy to set up each test session.  Proper tracking capability is easily verified.  Easy to obtain calibrations also on subjects with low attention.
Integration capabilities	Integrate ClearView with either your own software (using the ClearView API), other leading software (E-Prime, Noldus Observer, Mangold INTERACT) or text export of your results (eg to Excel, SPSS or Matlab)	You have full access to both raw and filtered data.  Gives unlimited flexibility for post-analysis using methods developed by yourself or those commonly available in other software.

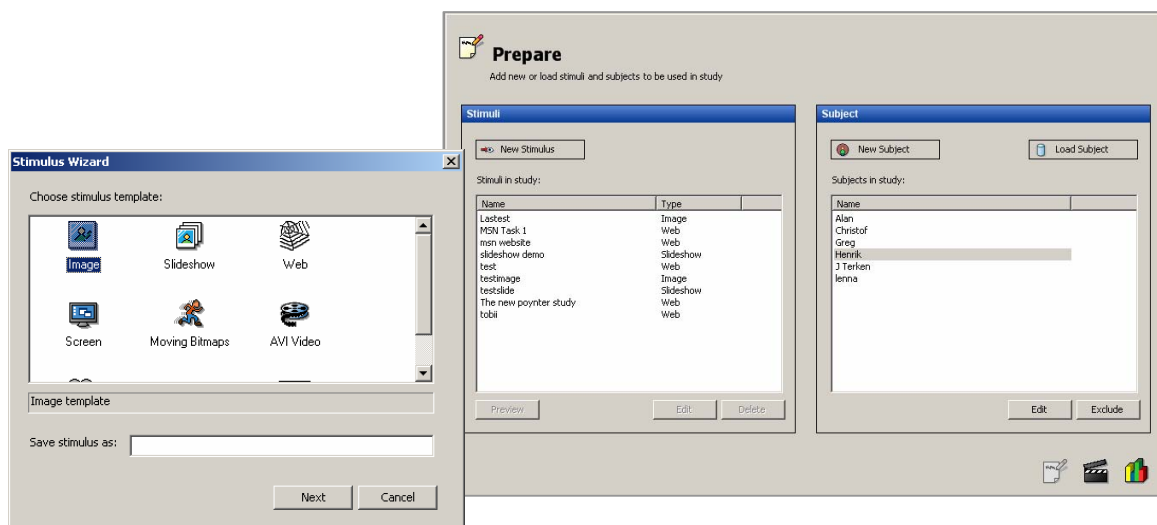
## Basic work-flow

Working with ClearView, you usually follow a basic workflow.

1. Prepare a study
2. Make recordings
3. Analyze data

### *Preparing a study*

The first step is to prepare what is called a “Study”. A Study can be a specific psychological experiment, or the study of a particular web site.



Each Study contains one or several stimuli. The stimulus is what the user sees during a gaze recording. In a usability study, each user task would be a separate stimulus. ClearView has support for a large number of different stimuli types that are described in detail in the following chapters.

In each study you can have one or several subjects. You can store information on the subject such as name, some personal data and an individual eye tracking calibration.

### *Making a recording*

Before you start your recording, you calibrate the subject by looking at a dot that moves across the screen for about 15 seconds.

To start a gaze recording, all you need to do is to select one of the stimuli and one of the subjects in your Study and hit “Record”. The eye tracker handles all recording automatically.

With a typical system setup, the test subject will view the stimulus on one monitor during the recording, and the test leader will control the experiment, watch track status, eye gaze and user camera in real-time on a second monitor. Data from keystrokes, mouse-clicks, screen contents, video, external events and more are recorded automatically for later analysis.

### *Analyzing data*

After your data has been collected, you can use the analysis tools to visualize and analyze the behavior of an individual or group of recordings.

Data is also easily exported for further analysis in applications such as Noldus Observer, Mangold INTERACT, Excel, SPSS or Matlab.

## Stimulus presentation

ClearView is capable of presenting many forms of stimuli to the subjects.

### Still image and slideshow stimulus

ClearView allows you to create stimulus from a still image or to compose slideshows made up from several images that are displayed in sequence for a certain time interval or until a subject response is received.

Still image stimuli are used for many basic gaze analysis applications, including psychological studies and advertising testing.

### Movie stimulus

Pre-defined movies in AVI format may be used as stimuli. The movies will be replayed in sequence, while gaze recording is taking place, and will be synchronized with the gaze data for analysis.

Movie stimuli are useful for studies of dynamic content, useful for instance for infant studies and TV commercial testing.

### Moving bitmap script stimulus

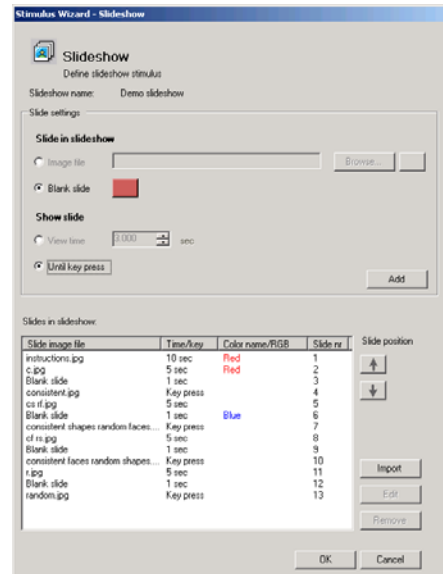
Stimulus from moving bitmap scripts can be created using the built-in script wizard. This allows you to load bitmap images and make them move across the screen in jumping, smooth or sinusoidal motions. An AVI movie is generated from any number of such scripts.

Moving bitmap stimuli are useful for physiological studies of eye movements, including response times, smooth pursuit studies and more.

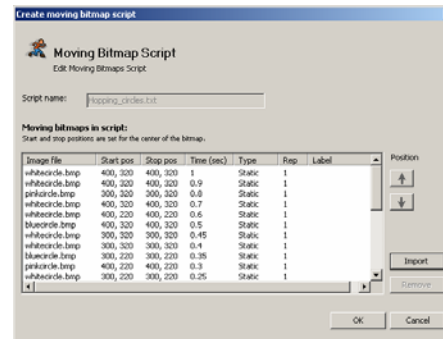
### Screen stimulus

Screen stimulus is not a pre-defined stimulus as such. Instead, it makes use of whatever is present on the subject's screen as stimulus. This is achieved by ClearView making a software-based video recording of the screen contents of the subject's screen. See the Recording chapter.

Screen stimulus is useful to study behavior in HCI studies in real computer environments, such as browsing the web or using a certain software application.



*Slide-show stimulus setup tool*

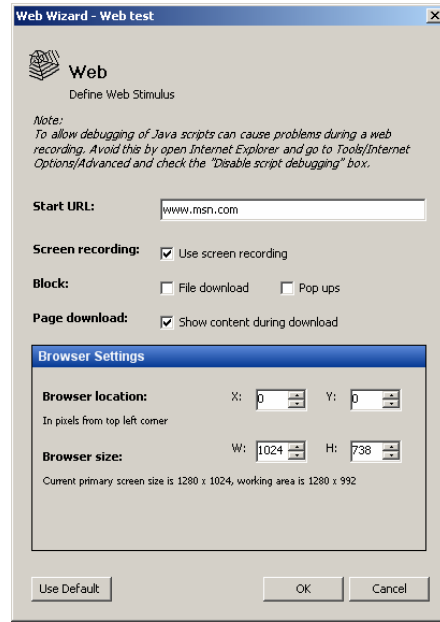


*Moving bitmap script definition tool*

### Web stimulus

The web stimulus allows the subject to browse a normal web site during the test session and use this as stimulus. ClearView records all the data from the session by recording the layout and events (such as scrolling and page transitions) from a web browser during the test. See the Recording chapter for more information.

When combined with screen recording, web page stimulus is very powerful for time and cost-efficient web usability and web advertising testing.

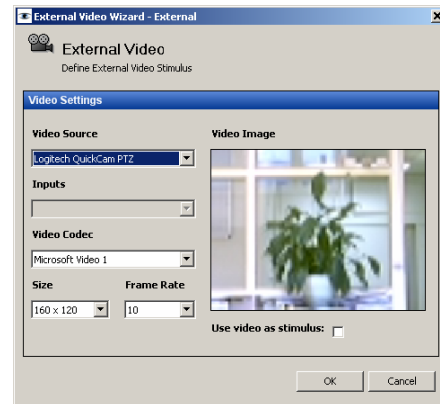


*Web stimulus setup tool*

### External video stimulus

External video sources may also be used as stimuli.

This allows you to plug in a video source, for example data presented on a separate computer or video input from a VCR, and use this as stimulus. See more information under the Recording chapter.

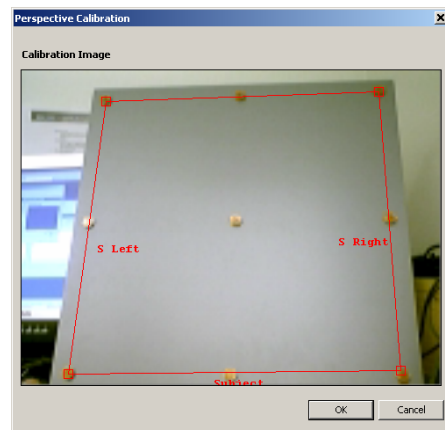


*External video setup tool*

### Scene camera stimulus

The scene camera stimulus enables the subject to look at a physical scene in the real world during the test session. An example might be objects moving around on a table.

A scene camera records an exact view of what the subject is looking at. During the stimulus setup, the perspective of the scene camera is calibrated relative to the perspective of the subject, so that gaze data can later be re-computed to accurately compensate for these perspective differences.



*Scene camera setup tool*

## Calibration

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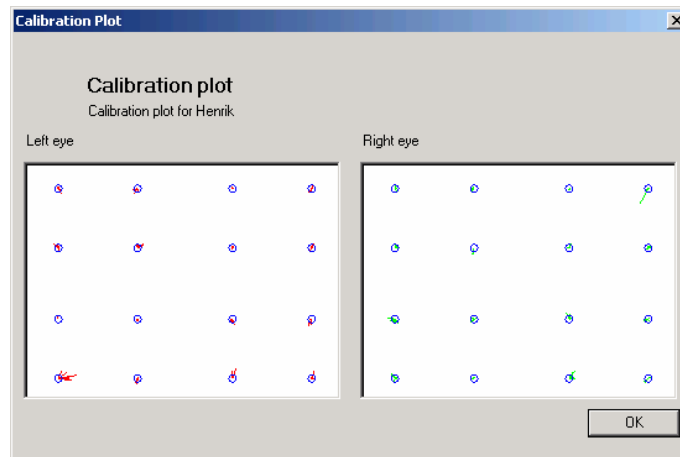
ClearView offers a number of options to easily, quickly and robustly create eye tracking calibrations. Since calibrations with the Tobii Eye Trackers are long-lasting, each calibration is saved as a part of the subject's personal profile and can be re-used in later sessions.

Three types of calibration procedure are available:

- **Auto calibration.** This is the standard option and provides easy to use and automatic calibration procedures displaying a series of shrinking dots across the screen. A normal calibration takes less than 10 seconds.
- **Low-vision calibration.** This option is intended to use with subjects with low vision, and displays an easy to see cross-hair and involves manual forwarding of the calibration process. This can also be used for scene camera setup calibrations.
- **Infant calibration.** This is intended for use with infants and other subjects with difficulties concentrating on a certain stimulus. The process involves playing AVI-movies with sound at different sections on the screen. It also includes a number of options for starting, pausing and aborting calibration points, as well as the ability to play an attention grabbing movie at any time during the process.

It is also possible to adjust the number of calibration points (2, 5 or 9), the brightness of the calibration screen and the color of the calibration point (in the automatic calibration routine).

A calibration plot makes it easy to verify the quality of a calibration. This software automatically makes recommendations if certain sections of the screen require re-calibration.



*Calibration plot to verify calibration quality*

## Recording

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Gaze data is a very powerful source of data for studies of behavior. By combining gaze data with other sources of data, a holistic view of user responses is achieved.

To enable a comprehensive analysis and interpretation, ClearView is capable of recording much more than just gaze data. It is also designed to provide an easy to use and effective recording workflow, which allows you quickly to collect data from large groups of subjects.

### **Gaze data**

Gaze data recording is the core of the ClearView analysis system. It uses the power of the Tobii Eye Trackers for fully automatic tracking. Hit “record” and the system takes care of the rest.

The following data is recorded for each eye separately:

- Eye gaze position
- Timestamp for each data point
- Eye position (X/Y)
- Distance from eye tracker to eye
- Pupil size
- Validity code

### **Stimulus and data timing**

ClearView records the timing properties of whatever stimulus you use to allow for accurate data synchronization. This includes:

- Timestamps of images being shown
- Timestamps of the start of movies
- Timestamps of html pages being shown
- Timestamps for mouse clicks and key strokes
- Timestamps for external triggers sent to ClearView

### **Key strokes and mouse clicks**

All key-strokes and mouse clicks are recorded, and synchronized with gaze data.

### **External events and triggers**

ClearView is capable of recording events sent via TCP/IP. Creating these events is extremely simple in the ClearView Trigger API. This enables an external application to:

- Start and stop recordings in ClearView
- Give a name to each recording
- Send event signals containing event codes and event strings

The external events and triggers allow other applications to present stimulus but still have ClearView manage the data recording and synchronization. It also allows for recording of additional data streams that are not natively supported by ClearView.

To write your own application to use these features the ClearView Trigger API is required, which is part of the Tobii Software Development Kit.

### **Screen recording**

ClearView is capable of making a video recording of the contents of the subject's screen. This is very useful as it allows at a later date to replay exactly what the user saw during their session on such stimulus as a web-page or in a piece of third party software. This allows you to get a strong feeling for exactly how the user was reacting to the stimulus.

The screen recording uses software based real-time compression to record a movie in AVI-format. Using software based recording has a number of advantages compared to say using a video-mixer to superimpose gaze data. First of all, it is very much easier to use; there is no trouble with video hardware, cables etc. Second, it provides flexibility in analysis as the screen information and the gaze data are saved as separate files. The test leader can choose to replay superimposed gaze data with or without filtering, change the color of the visual indicator etc. The screen is also recorded at full screen resolution, as opposed to most hardware based capture solutions that cause a massive degradation in the quality of the resultant video of the screen.

Movies created with screen recordings are not excessively large. For web browsing, typical file size is approximately 2 MB/minute at 10 fps at a screen resolution 1024x768 with a 16-bit color depth.

On ordinary computers, software based screen recording techniques are not practical with graphically resource-intensive applications such as 3D-games or full-size movies. For such purposes, it is recommended to use preloaded movies, or using video-capture for external video recording described below.

### **Web page images, scrolling and page transitions**

ClearView has very strong tools for supporting studies of web-based content, such as web usability and web advertising studies. ClearView uses a browser based on the Microsoft Internet Explorer to record:

- A screen recording movie.
- A bitmap image of each html page visited. This bitmap contains the full size of each page, not only what fits on the screen.
- Information about page transitions, including frame transitions of sites with html frames.
- Position of all browser windows.
- Scrolling information, including scrolling within individual html frames.
- Information about multiple browser windows, and correlating gaze data to correct window even for superimposed browser windows (pop-ups).

This allows for live web browsing, i.e. there is no need to first locally store all sites the user is expected to visit. During analysis, the gaze data is recomputed based on the web page and scrolling information, to accurately reflect where on each page the subject was looking.

Certain types of content on web pages are not accurately recorded by ClearView. This is particularly content of highly dynamic content, such as Flash and dynamic javascript. These limitations primarily affect the ability to make accurate AOI analysis and Gaze Plot and Hot Spot visualizations. The Gaze Replay tool works accurately for all types of web content, including highly dynamic content.

***Moving bitmap position***

ClearView allows you to create scripts of moving bitmaps as stimulus.

During recording with such stimuli, the screen positions of the moving bitmap images are continuously recorded. This simplifies later studies of for instance “gain” in a smooth pursuit motion, as the image positions can be directly compared with the gaze data.

***External video input***

ClearView is capable of recording video from an external source. This is accomplished through a hardware video capture device on the computer.

This can be used, for example, to capture a video of stimulus presented on a different device (a VCR or Macintosh computer) or from a scene camera.

The system generates an AVI movie of the captured video, which is synchronized and possible to play back with gaze data superimposed.

This is a powerful feature to do eye tracking on very graphically-intensive applications such as 3D games and full screen movies, while maintaining ease of use and flexibility in gaze analysis.

Video is recorded at up to a resolution of 640x480 and up to 30 fps. Capture can be done from most video sources that use a WDM driver, including:

- From a DV camera using S-Video via analogue video capture card
- From a web camera via USB
- From a computer via RGB video capture card

***User camera and user audio***

During recording, you may also record an additional video and audio stream. This is intended to be used in the Gaze Replay to provide a picture-in-picture view of the subject to give a synchronized view of user responses by observing posture, facial expressions and vocalizations.

The user camera and user audio are great tools to support talk aloud protocols for usability testing.

Video sources for the user camera can be either S-Video or web camera.

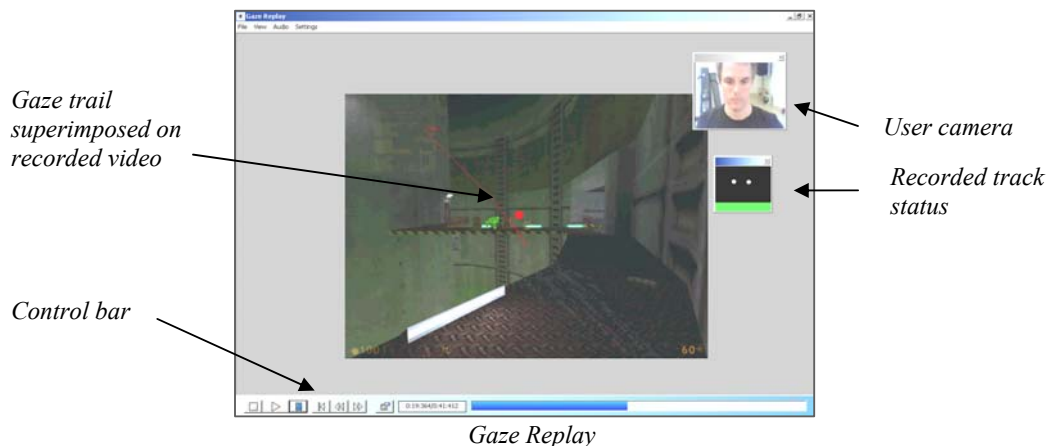
## Data analysis and visualization tools

ClearView provides a number of powerful tools for analysis of eye gaze. It provides unique features for gaze visualization, multi-person analysis as well as synchronization between gaze and other recorded information.

### Gaze Replay

Gaze Replay gives you a play-back of the test session. It replays a movie of the presented stimulus (for example a slide-show, an AVI movie or the screen contents), with the gaze point of the test subject superimposed. This gives a very easy to use yet powerful qualitative understanding of gaze behavior during the test, and is excellent as an analysis tool or a tool to verify that the test was conducted properly.

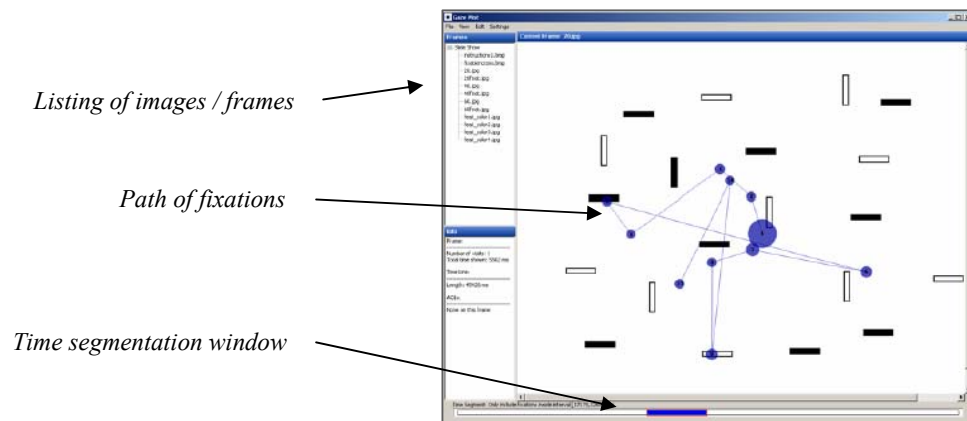
During Gaze Replay, picture-in-picture windows can show the track status obtained in the recording, as well as the user camera and user audio.



### Gaze Plot

Gaze Plot displays gaze points, fixations and scan paths superimposed over different images or web pages in your test.

The tool allows you to set a number of attributes of the scan path. You may also zoom in on time segments. The Gaze Plot tool automatically correlates the gaze data with the stimulus, for instance image transitions and scrolling.

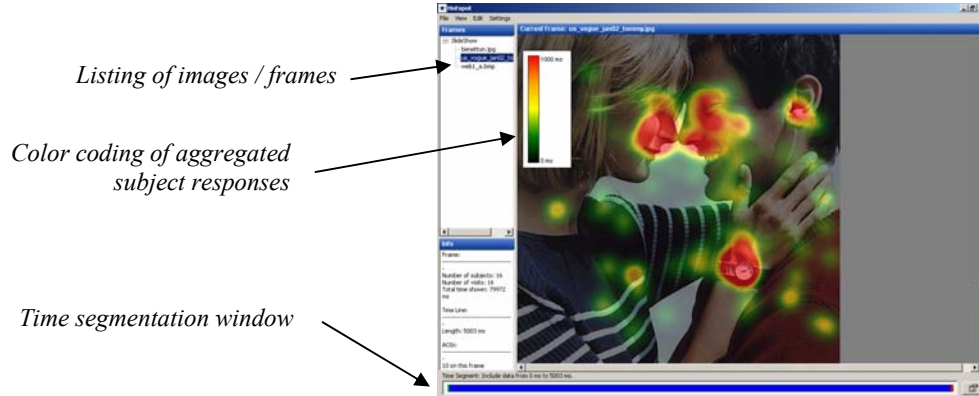


### Hot Spot

While the static Gaze Plot and the dynamic Gaze Replay are useful to understand the gaze behavior of a single person, the Hot Spot tool allows you to clearly visualize gaze from multiple test participants.

It summarizes the gaze from multiple recordings and creates a Hot Spot map based on this. This map is then superimposed on the stimuli used in the test. The Hot Spot map can be based on different data, including fixation counts, gaze time and percentage of subjects that viewed a particular area. The tool also provides time segmentation features.

The Hot Spot tool also works well for slide shows and web pages, and automatically keeps tracks of scrolling, page transitions etc and compensates for this.



Hot Spot visualization

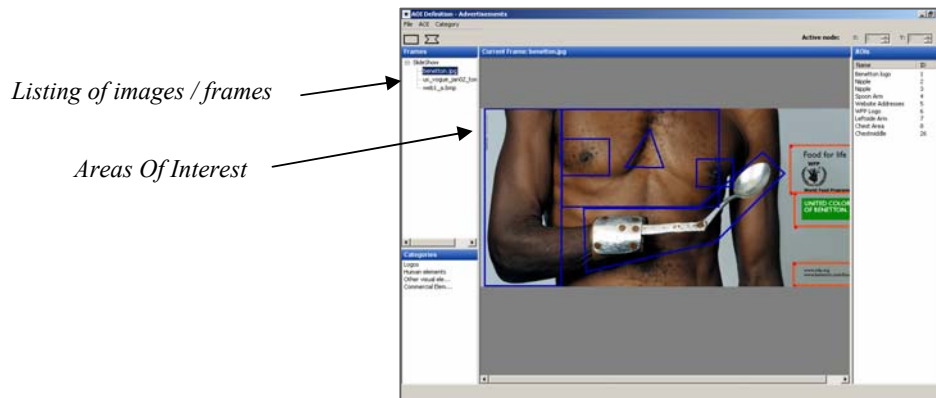
### Area Of Interest definition tool

The Area Of Interest (AOI) definition tool allows you to easily define areas of interest on your stimulus.

This is a powerful way to quantify gaze data – instead of knowing the coordinate on the screen where the test subjects were looking, you get information on which object (AOI) they were looking at. This enables you to analyze data on a higher level, and even combine quantitative data for multiple test sessions and multiple test subjects in a meaningful way.

You create AOIs by drawing rectangles or polygons over any type of stimuli used with ClearView and provide each AOI with a specific name.

If your stimulus contains several images, such as slide shows or web surfing sessions, the tool allows you to define AOIs for each individual page. The gaze data for each recording are automatically adjusted relative to the AOI positions to compensate for scrolling, moving windows and page transitions.

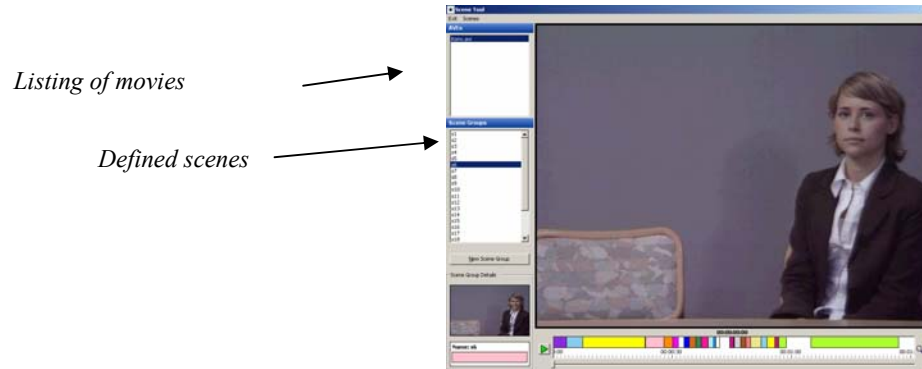


Area of interest definition tool

### Scene segmentation tool

The scene segmentation tool allows you to split up any movie-based recording into any number of “scenes”. Each scene is a segment in time from the movie. Thus, you can transform a movie into a kind of “slideshow”, which makes quantitative data analysis much easier and more meaningful.

For each scene, you are able to do gaze plot and hot spot visualizations, as well as define areas of interest and compute statistics.



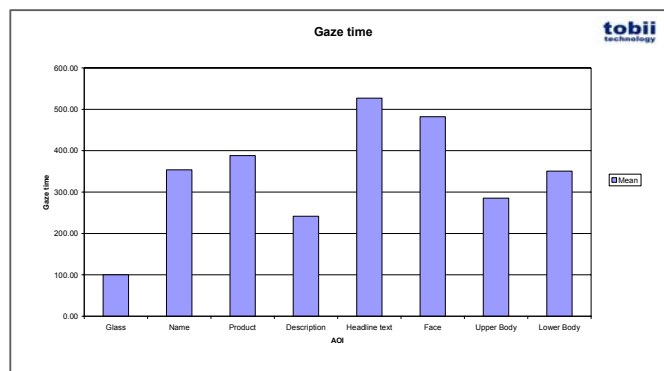
*Scene segmentation tool*

### Statistics

ClearView provides statistics tools to calculate standard eye tracking related metrics.

The tools allow you to calculate the following statistics based on AOI data:

- Fixation count (number of fixations on each AOI per recording)
- Gaze time (total time each AOI was viewed during each recording)
- Average gaze time (average time of fixation per AOI and recording)
- Time to first fixation (time from when each subject enter a certain web page or time stamp when a particular image is shown)
- Fixation order (order in which each AOI was fixated)
- Transition matrix (percentage of fixations going from each AOI to all other AOIs)



*Area of interest statistics*

### **Filters**

ClearView enables automatic filtering of gaze data in several ways. This is important to reduce the amount of data for processing, as well as to filter out less reliable data. All filtering options are available both for the data visualization done within ClearView, as well as for export functions.

- Fixation filters*      Fixation filtering is used to extract fixations from gaze data. ClearView has an adjustable fixation filtering algorithm.
- Validity filters*      The Tobii Eye Tracker provides a validity code for each data point. This indicates the certainty that the system has recorded the correct data. ClearView is capable of filtering data based on the validity code, to only providing data with a high degree of certainty.
- Eye filters*            The Tobii Eye Tracker does binocular recording when both eyes are available, and otherwise monocular recording. ClearView is capable of filtering the eyes, either using both eyes separately, either of the eyes or the average of the two eyes. The average of the two eyes is especially powerful to increase longevity of calibrations and get higher accuracy.

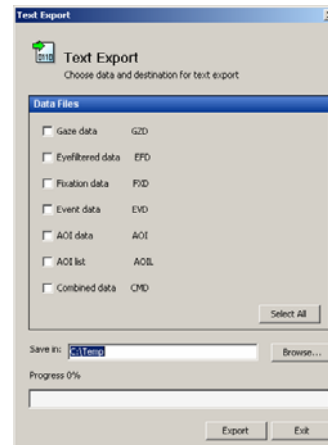
## Integration features

### Data export

To provide full flexibility in your own gaze analysis, ClearView makes it possible to export almost all recorded data to text file.

This enables the use other available software such as Matlab, SPSS or Excel to customize the data analysis you want to perform. Export is done as tab-delimited text files.

ClearView allows you to export data with a variety of data columns, including time stamps, gaze point on the screen, eye-position in space, pupil size, validity data etc. Export can be done with or without filtering - available filters are eye-filters, fixation filters and validity filters. Area-of-interest filtered data and event data can also be exported.



### Movie export

ClearView can export the visualization of gaze data as standard AVI movie. This enables you to share and distribute the qualitative view of your analysis with colleagues and customers. Also the User Video may be exported to either a separate file or merged together with the gaze replay file.

### DirectExcel Templates

ClearView provides a concept called “DirectExcel Templates” for numerical analysis and graphing of gaze data.

This tool exports all of your data into an Excel document of your choice. It can also activate a Visual Basic script in Excel, which allows you to automate some of your data post-processing.

### Integration with E-Prime from Psychology Software Tools

E-Prime is a leading software package for designing and conducting psychological experiments available from Psychology Software Tools.

There is an extensive package for integrating the E-Prime software with the Tobii eye tracking system. To obtain the full features of this, a separate module called “E-Prime extensions for Tobii” is required, as well as a copy of the standard E-Prime software. The Tobii extensions for E-Prime enables some features which are not possible by ClearView alone, for instance

- Use E-Prime and E-Basic to design your stimulus
- Create gaze-contingent experiments, i.e. stimulus which reacts when the user looks at a particular object.
- Create conditional stimulus, i.e. stimulus, instructions or questions which are presented differently depending on what has previously happened in that particular test session.
- Perform proper automated counterbalancing on your experiments.

The Tobii extensions for E-Prime offer a set of native E-Prime objects tailored for the Tobii eye tracking system. These offer functions on two different levels:

**TET level** In this mode, E-Prime controls the Tobii Eye Tracker Server directly, without the need for using ClearView at all. E-Prime performs calibrations, collects gaze data and saves this to file.

**ClearView level** In this mode, E-Prime remote controls ClearView. Timing is synchronized between E-Prime and ClearView, data is collected by both E-Prime and/or ClearView, and ClearView can also be used for data visualization and analysis.

For more information about E-Prime, please visit [www.pstnet.com](http://www.pstnet.com).

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### ***Integration with INTERACT from Mangold***

INTERACT is a software solution for analyzing behavior, for instance in sophisticated usability and psychology research.

ClearView is capable of exporting data to the INTERACT software, which can import this, for instance fixation data, event data, AOI data and video data including screen recording and gaze overlay video. The practically unlimited number of data sources and video files that can be visualized and analyzed synchronously within INTERACT allows for sophisticated presentation and post-analysis inside INTERACT.

For more information about INTERACT, please visit [www.behavioral-research.com](http://www.behavioral-research.com).

### ***Integration with The Observer from Noldus***

The Observer is a software solution for analyzing human behavior, for instance in sophisticated usability and psychology research.

Integration features between the ClearView and The Observer are built into the standard version of ClearView and The Observer. With this integration, the eye tracking recording and analysis features of ClearView are combined with the observational logging, additional data collection capabilities, video analysis, and quantitative analysis features of The Observer.

The integration provides the following features:

- Ability for The Observer to remote control ClearView to start, stop and name recordings in ClearView. This makes it convenient to run both software programs in parallel, and also ensures timing synchronization between them.
- Ability to export data from ClearView into the Noldus Observer for analysis. The following data is exported according to the Observer format:
  - Eye fixation data
  - Area Of Interest data
  - Event data, including stimulus timing and time for entering a certain web page
  - Video data, including screen recording and gaze overlay video

For more information about The Observer, please visit [www.noldus.com](http://www.noldus.com).

### ***Triggers and the ClearView API***

The Tobii Software Development Kit is a professional package which allows customers and partners to develop applications using Tobii eye tracking hardware. This development kit is purchased separately from ClearView.

The Tobii Software Development Kit contains (among other things) a ClearView level API which allows other applications to:

- Remotely start and stop ClearView recordings over TCP/IP
- Name recordings in ClearView
- Send event signals with synchronized time stamp, event code and text strings

The development kit contains:

- API as both DLL interfaces and ActiveX components.
- Comprehensive documentation
- Library of code samples

For more information, please refer to a separate documentation on the Tobii SDK.

## System configuration features

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By combining the ClearView software with Tobii eye tracking hardware and various other hardware and software components, you get a complete system for usability testing, advertising testing or psychology research.

Great care has been taken in the design of ClearView to obtain ease of use, effective workflows and flexible setups. Some key features in this are described below.

### **Dual monitor setup**

For most setups, we recommend using ClearView with a dual monitor setup. This allows the test subject to view the stimulus on one monitor, while the test leader can control and view the recording on a secondary screen.

The double monitor setup is realized by using double monitors connected to a single computer with a dual-head graphics card. It also works well on most laptops, using the built-in laptop screen as the test leader view.

### **Remote eye tracking computer**

ClearView may connect to a Tobii Eye Tracker server which runs on a separate computer. The communication is done over TCP/IP and is seamlessly supported by ClearView.

For most setups, this is not required. However, if you are running heavy studies on less powerful computers, this may help distribute processor load on the two computers.

### **Live Viewer**

The Live Viewer is a highly useful component that allows the test leader to view the eye tracking session in real-time. A test leader sees a real-time copy of whatever is presented on the subject's screen, with the eye tracking data superimposed. In addition to this, track status and user camera and user audio are presented as picture-in-picture to the test leader.

This functionality gives deep real-time insight into the subject's behavior, which for instance is useful for moderating usability tests, or for presenting the testing process to clients.

*Illustration of what test leader sees during recording*

*Real-time view of eye gaze*



*Eye tracking status*

*Picture in picture view of user camera*

### **Recommendations for system setups and accessories**

Since ClearView integrates with a Tobii eye tracker as well as a range of other hardware devices, it forms a complete system. It may also be configured in various ways, for instance as stationary or portable labs.

Examples, sketches and recommendations of typical lab setups, together with a complete listing of tested and recommended accessories are found in a separate document, "System Recommendations". For the latest version of that document, please contact your Tobii sales representative, or download it from [www.tobii.com](http://www.tobii.com).



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