User manual

Version 1.0

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Laboratory language and Cognition (LaCo)
Maison des Sciences de l'Homme and de la Société (MSHS) of Poitiers

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This manual is not a manual for the above-mentioned products.
Its content does not involve their respective manufacturers in any way.

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INTRODUCTION

Writing is a complex human activity. The writer has to compose a coherent message and formulate it in accordance with linguistic rules (grammar, spelling), all the while taking the characteristics of the potential reader into account. The ability to manage all these various mental activities, as well as their time course, can be regarded as an indicator of the writer's expertise (Alamargot & Chanquoy, 2001). For cognitive science researchers, identifying the rules that govern the engagement and course of these mental processes is an essential step towards a greater understanding of writing and processing (Levy & Ransdell, 1996). The Eye and Pen software was designed to help researchers attain this goal (Chesnet & Alamargot, 2005; Alamargot, Chesnet, Dansac & Ros, in press).

Eye and Pen can be mainly (but not exclusively) used in the context of handwriting studies, whatever the graphic format (from text to drawing).

The 'Eye and Pen' software was designed to allow the synchronous recording of handwriting (by means of a digitizing tablet: coordinates and state of the pen) and eye movements (via an optical eye-tracking system: eye coordinates in the task environment). The conjunction of these two signals allows us to study the synchronization between eye and pen movements during pausing and writing periods. For instance, it makes it possible to study not only the visual control of graphomotor execution, but also the reading of the text in order to revise it and the consultation of documentary sources with a view to summarizing them. Eye and Pen allows users to conduct these investigations in a continuous way, without interrupting the activity underway or increasing cognitive load.

In short, this software makes it possible to establish a link between the visual input of writing (gazes on documentary sources and/or text produced so far) and its graphomotor output (pausing and writing phases, drawing). This link can be studied in various situations and media (paper, computer screen, screen tablet, etc.)

The Eye and Pen software can be regarded as a type of digital video recorder, which allows users to watch and play-replay the process of graphic generation and associated eye movements as often as they wish. A semi-automated coding system enables users to characterize and classify ocular and graphomotor events.

Eye and Pen has two different modes of operation:

- the acquisition mode, allowing the recording of tablet and eye-tracker data
- the analysis mode, allowing the selection (with various filters) and editing (in text format) of data.

CHAPTER 1

Installation and configuration

I. HARDWARE

I.1. Requirements

Component	Requirement
System	Windows 98, Windows 2000, Windows XP. Some functions are not supported by Windows 95 and Windows NT. Under Windows 2000 and XP, you will have to have a user account with administrative rights to be able to install and use Eye and Pen.
Processor	PII 900 MHz or better.
RAM	Min. 256 MB RAM (min. 512 MB with Windows XP).
Free disk space	50MB for a complete installation (with samples), plus space needed for recordings and analyses.
Video adapter	Min. 16 MB of video memory. Min. resolution 800x600. For greater comfort, we recommend 32MB and a resolution of 1024x768.
Tablet	A Wintab32-compatible driver (see Appendix II for a list of manufacturers). This driver will normally have been supplied with your tablet.
Others	A free USB slot is required for the SafeNet Sentinel dongle (security lock key). Eye tracker (optional): “Eye & Pen” supports the following eye trackers: • Applied Science Laboratories ASL504 (serial) ; • Alphabio EyePuter ; • S. R. Research Eyelink I and Eyelink II.

I.2. Tablet installation

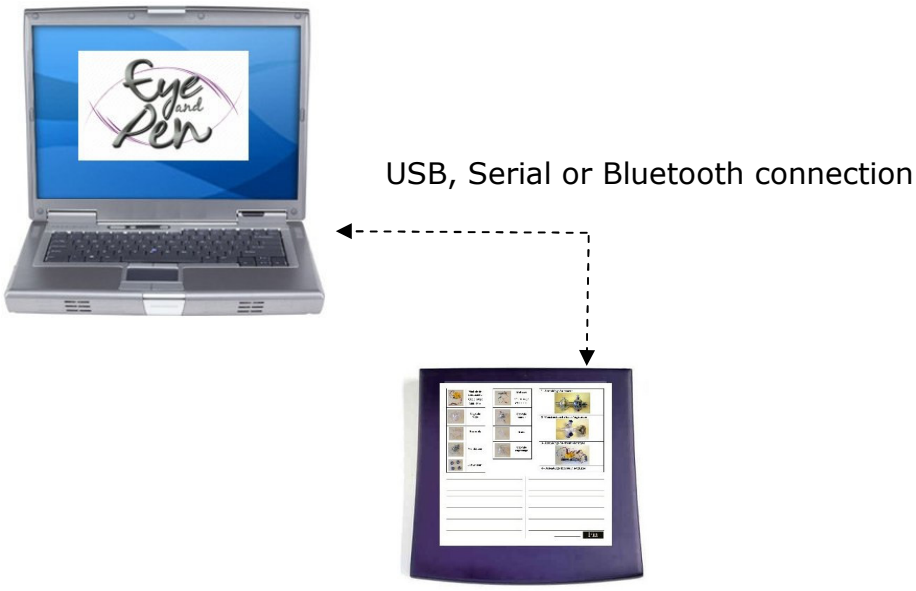


Figure 1: A tablet connected to a laptop.

STEP	DESCRIPTION
1	Switch your computer on.
2	Connect the tablet to your computer (follow its user manual instructions). **Important**: if it is to be taken into account in "Eye and Pen", the tablet must be **Wintab32-compatible.** (see appendix II)
3	**Install your tablet driver**. Set your tablet up following the instructions in the **user manual** supplied with your tablet**.**
4	Set the tablet **in absolute mode.** The tablet will then return the pen's "true" coordinates, rather than a relative position. The "absolute mode" option may vary from one tablet to another. For Wacom tablets, for instance, the name of the option is "stylus mode". Check your tablet user manual. To obtain the maximum sampling rate, select the "**recognition data**" option (no dual track). Here again, the name of this option may vary, so check your tablet user manual.

I.3. Eye tracker installation

Following the instructions in the eye tracker's manual, connect it (or its data transmission device) to the computer executing Eye and Pen.
For example, Eyelink will be linked to your computer through a network cable, whereas ASL504 will transmit its data via a serial cable connected to a free COM port on your PC.
Read the manufacturer's instructions carefully and use your eye tracker in accordance with its guidelines, including the safety instructions.

Note: to support Eyelink I, users must update the interface library (Eyelink Display Software) to version 2 (contact S.R. Research if in doubt).

Figure 2: The PC executing Eye and Pen "drives" the tablet and receives the eye-tracking data.

I.4. Eye & Pen installation

STEP	DESCRIPTION
1	Insert the CD labeled "Eye and Pen" into your CD device. The Eye and Pen setup should automatically begin. If nothing happens, launch Setup.exe (on the CD-ROM root directory) and follow the instructions.
2	Insert the USB dongle (key) supplied with "Eye & Pen" into a free USB port.
3	Install the dongle driver: launch Setup.exe, which you will find in the \SafeNetSentinel directory, on the CD root. **Important**: if the dongle is not plugged in, Eye and Pen will run in "Demo mode" and you will not be able to record data, save analyses or edit results.
4	Launch the software: Start menu/Programs/EyeAndPen/EP. If you see a warning message about the dongle (SafeNet Sentinel) : • check that the dongle driver has been installed (you may need to re-install it) ; • check that the dongle has been plugged in. If the problem persists, leave a message describing the problem (including the error code) on the forum (see error codes in Appendix XI.2.)

I.5. Starting Eye and Pen

Warning: Windows themes and special effects (blinks, sounds, etc.) may affect acquisition quality, as they create unforeseeable system response delays.

Switch to "classic mode" Windows (Windows 2000/XP) and/or turn off Windows themes.

There are four ways of launching Eye and Pen:

- click on the program icon on the Windows desktop;
- click on "Start", select "Programs", then "Eye and Pen". Click on "Eye and Pen" to start the program;
- go into the "Eye and Pen" software directory (default is c:\Program Files\ eyeandpen) and click on "EP.exe".
- on subsequent uses of Eye and Pen : double-click on a data file in Windows Explorer (filename has a extension TAB) or on an analysis file (filename has a TWK extension).

When launching it for the first time, the configuration panel will be displayed to let you select the language (drop-down list in the frame labeled "*language*")

Command line:

The program may also be launched through a command line (Start menu/Execute or in a "command prompt" window), with or without options.
Type in the following command:

<hard drive name> **:***<*software directory path*>**\ep.exe** *[option1] [option2]*

Options are:

[-*f <.tab ou .twk file name>]*
Directly opens a "file.tab" file (for a new analysis) or a "file.twk" file (to resume an ongoing analysis).

[*nosplash*]
Do not display Eye and Pen splash screen at start (launch is faster).

Example 1: to open the "subject1.tab" file without the Eye & Pen logo.

```
C:\ep1.0\ep.exe -f c:\mydata\subject1.tab nosplash
```

Example 2: to re-open "subject23.twk", the analysis of subject23 (Eye & Pen logo will be displayed).

```
C:\Program Files\eyeandpen\ep.exe -f c:\mydata\subject23.twk
```

The order of the options does not matter.

II. DEVICE CONFIGURATION

(*File/configuration/acquisition* menu)

The acquisition configuration panel has five tabs, allowing users to configure:

- the tablet being used;
- the connected eye tracker;
- the "Simple" acquisition paradigm ;
- script-based data acquisition;
- the display parameters.

To launch the acquisition configuration panel, click on the "*File*" menu, select "*Configuration"* and click on "*Acquisition*".

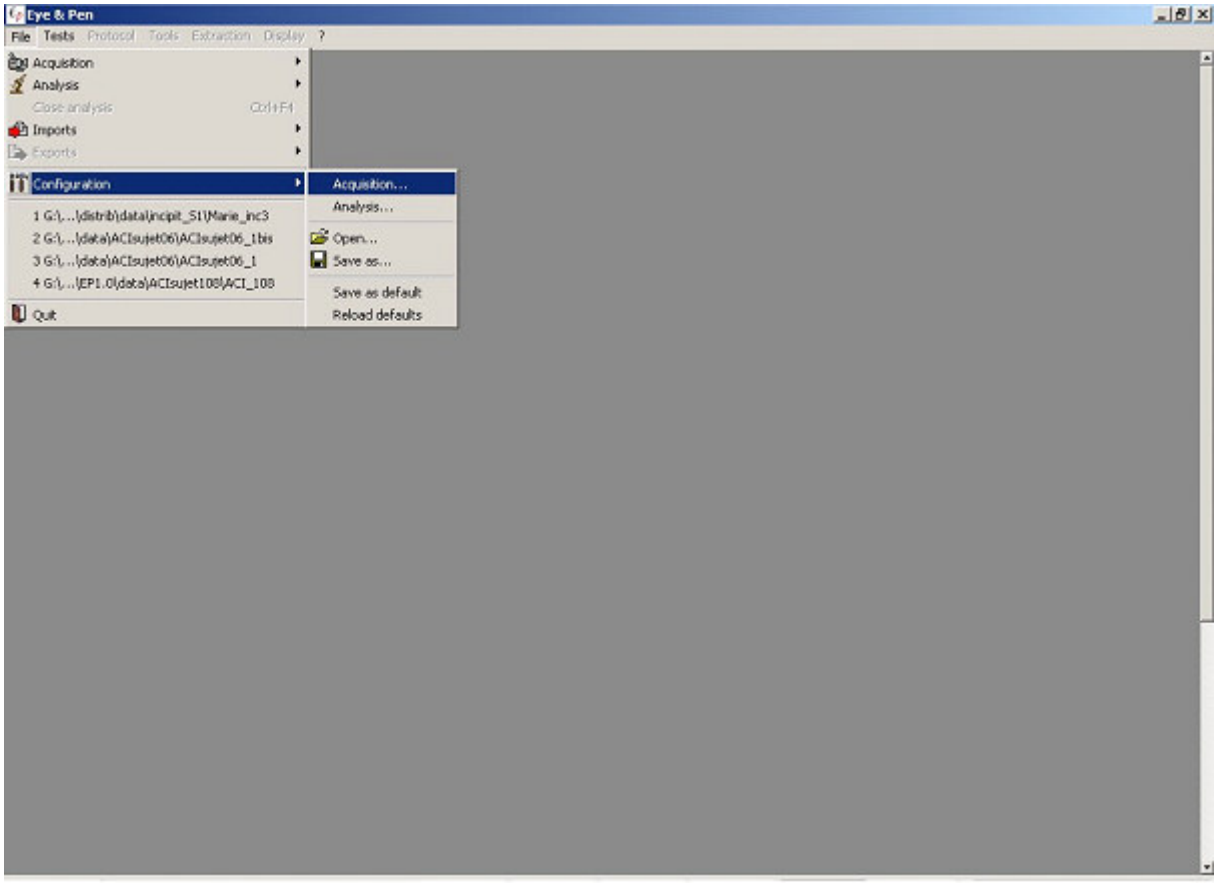


Figure 3: Launching the acquisition configuration panel.

Note: for the sake of data consistency, this panel cannot be launched when a protocol analysis is in progress.

II.1. Tablet configuration

(*File/configuration/acquisition* menu, "*Tablet*" tab)

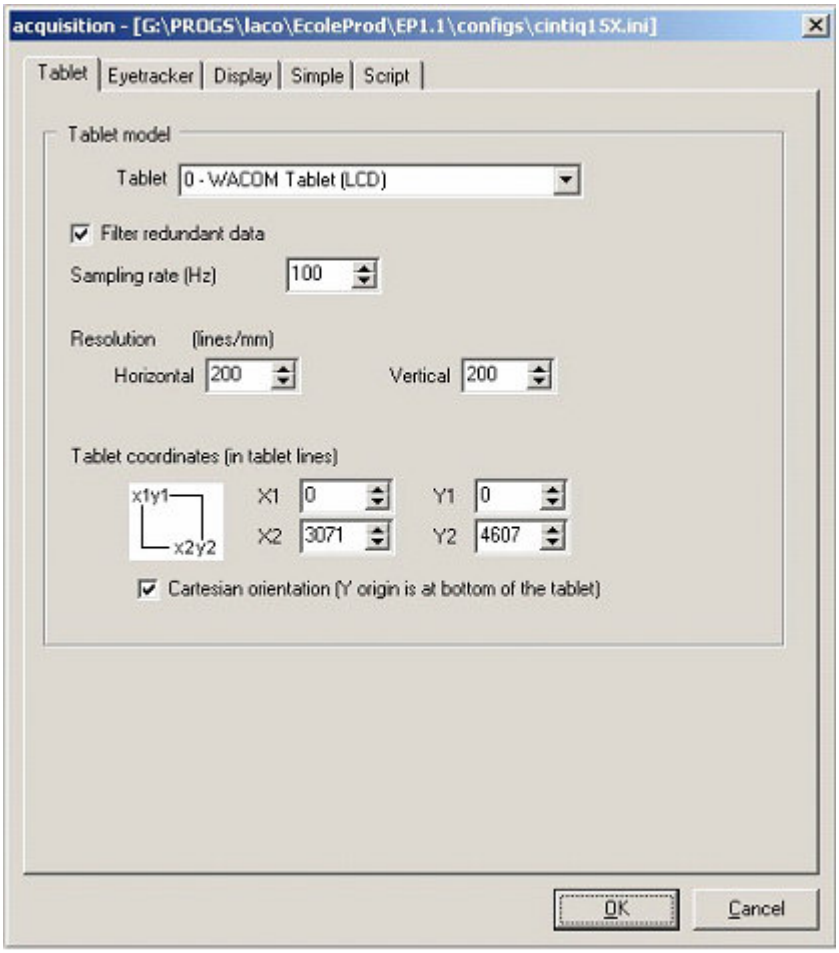
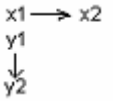


Figure 4: Acquisition configuration, "Tablet" tab.

LABEL	DESCRIPTION
Tablet	Allows you to choose your tablet from the ones recognized by the Wintab32 driver. Connected tablets are numbered from zero upwards. **<u>Important</u>**: when a tablet is selected, its frequency, resolution and active area coordinates fields are automatically filled in. You can manually modify these values.
Filter redundant data	If this option is ticked, the program will not record identical tablet data (successive samples with the pen at the same place with same pressure).

<table>
<tr><td>Sampling rate (HZ)</td><td>The tablet's sampling rate represents the number of times per second that pen data (coordinates and pressure) are sent by the tablet.</td></tr>
<tr><td>Resolution</td><td>These fields show the selected tablet’s horizontal and vertical resolutions. You can manually change the values.

These values are involved when converting calculation results into measurement units (mm, cm, inches, etc.).</td></tr>
<tr><td>Tablet Coordinates
(in tablet lines)

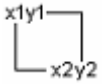
 

Tablet coordinates representation</td><td>This option shows the tablet's active area coordinates. You can manually change theses values.

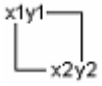
If you are using a double screen (LCD tablet plus a standard monitor), see Appendix VII.

<table>
<tr><th>LABEL</th><th>DESCRIPTION</th></tr>
<tr><td>X1</td><td>Coordinate of the left edge of the tablet's active area.

This point is the horizontal coordinates origin.</td></tr>
<tr><td>Y1</td><td>Coordinate of the upper edge of the tablet's active area.

This point is the vertical coordinates origin.</td></tr>
<tr><td> 
</td><td>X1 and Y1 coordinates correspond to the upper left-hand corner of the tablet's active area.</td></tr>
<tr><td>X2</td><td>Coordinate of the right edge of the tablet's active area

(equal to the width of the tablet's active area).</td></tr>
<tr><td>Y2</td><td>Coordinate of the bottom edge of the tablet's active area

(equal to the height of the tablet's active area).</td></tr>
<tr><td> 
</td><td>X2 and Y2 coordinates correspond to the lower right-hand corner of the tablet's active area.</td></tr>
</table>
</td></tr>
</table>

Cartesian orientation (Y origin is at bottom of the tablet)	This option allows you to choose the type of coordinate system used by the tablet (check your tablet's user manual). If your tablet uses a **Cartesian system of coordinates** (the origin of coordinates is located in the lower left-hand corner of the tablet), check this box. The program will then update the tablet data to align it on the screen coordinates system, which has its origin in the upper left-hand corner. If there is an error, the tablet data will be displayed "upside-down". **Standard tablets** (non-LCD) generally use a **Cartesian system, whereas LCD (Liquid Crystal Display) tablets** use a **screen coordinates** system (as they are also a screen)**.**

II.2. Eye-tracker configuration

(*File/configuration/acquisition* menu, "*Eyetracker*" tab)

Once the acquisition configuration panel has appeared, click on the "*Eyetracker*" tab.

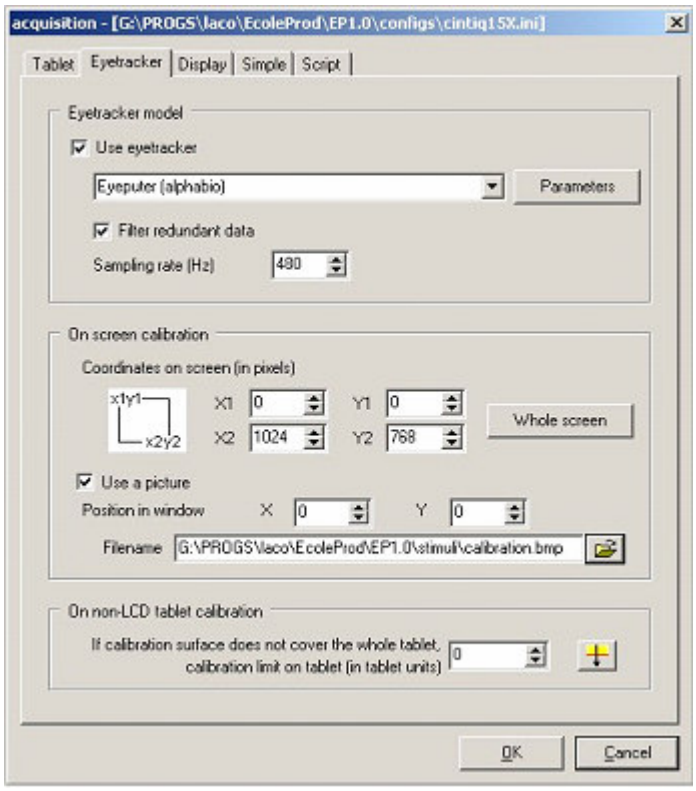


Figure 5: Acquisition configuration panel, "Acquisition" tab.

The "*Eyetracker*" tab shows three frames:

- "*Eyetracker model*": choose the eye tracker you are using from the list;
- "*On screen calibration*": for calibration on a PC screen or an LCD tablet;
- "*On non-LCD tablet calibration*": for calibration on a standard tablet.

II.2.1. Eye tracker model

LABEL	DESCRIPTION
Use eyetracker	This option allows to choose whether you want to use an eye tracker or not. If this option is selected (ticked), the "*Eyetracker model*" options become available. You can select the eye tracker model from the drop-down list below the option. Three models are available: **Eyelink I and II, ASL504, Eyeputer.** **Important:** if you wish to use an eye tracker that is not listed, leave a message on the Eye and Pen forum.
Parameters	This button allows you to set the eye-tracker parameters. If you are using: • Eyelink I and II: see page 18; • Eyeputer: see page 21; • ASL 504: see page 20
Filter redundant data	This option allows you to discard successive items of identical eye data (the eye is still watching the same location). With a very accurate and high-speed sampling eye tracker, this option is not particularly useful, as our eyes move slightly all the time. On the other hand, a less accurate eye tracker with a low sampling rate may return many identical eye positions when the eye is in a "stationary" state.
Sampling rate	Represents the number of times per second that the eye tracker samples the eye position. This value has to be set manually, as many eye trackers do not return this value, and some may have more than one sampling rate available.

II.2.2. Eye tracker configuration ("Parameters" button)

a°) Eyelink I and II (S.R. Research)

(*File/configuration/acquisition* menu, "*Eyetracker"* tab, "*Eyelink I and II*" model, then "*Parameters*" button)

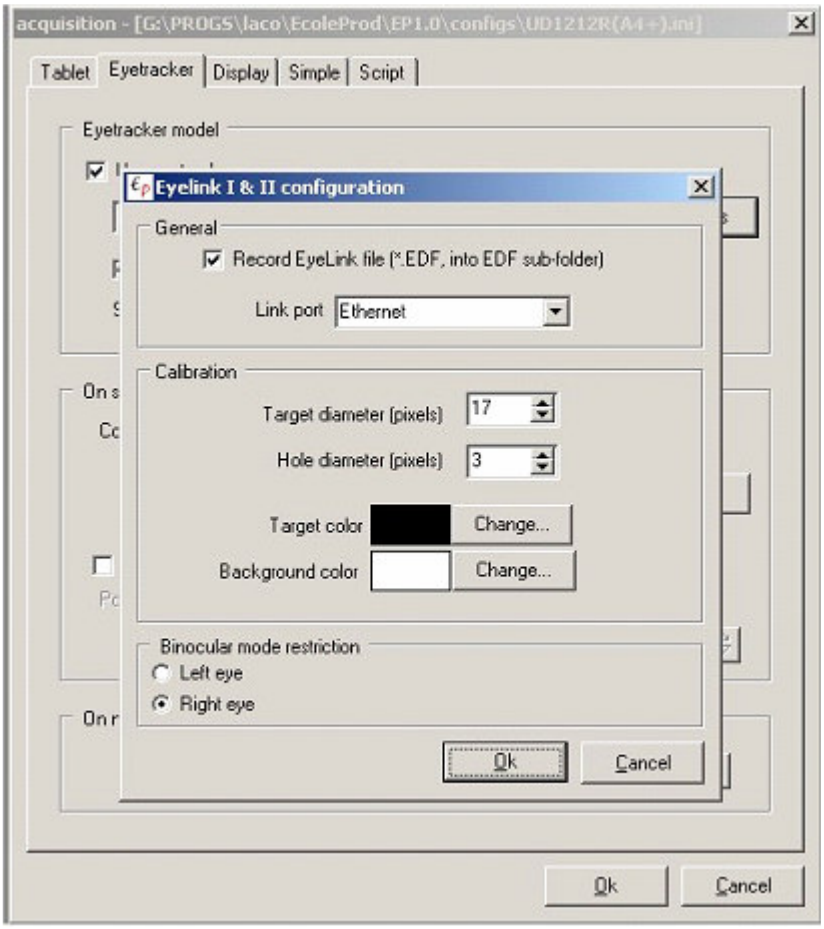


Figure 6: Acquisition configuration, Eyetracker tab ("parameters" button, Eyelink I and II)

The configuration panel for "Eyelink I and II" contains three frames, called:

- "*General*": overall parameters ;
- "*Calibration*": calibration parameters (driven by the Eyelink host PC);
- "*Binocular mode restriction*": choice of the recorded eye;

The "*General"* frame options are described in the following table:

LABEL	DESCRIPTION
Record Eyelink file (*.EDF, into EDF sub-folder)	If this option is ticked, data recorded in the "*Eyelink Data Viewer*" format (Eyelink host PC) will be transferred to the Eye and Pen PC.
Link port	For the time being, only the Ethernet link is supported.

The "*Calibration"* frame options are described in the following table:

LABEL	DESCRIPTION
Target diameter (pixels)	Calibration target diameter. Size of the "point" the subject has to look at for calibration.
Hole diameter (pixels)	Diameter of the "hole" in the middle of the calibration target.
Target color	Calibration target color.
Background color	Calibration window background color. This can be changed via the "*Change*" button. **Hint:** to enhance calibration, choose a background color similar to the one that will be used with the protocol displays.

The "*Binocular mode restriction"* frame option is described in the following table:

LABEL	DESCRIPTION
Binocular mode restriction	"Eye and Pen" only records data for one eye. This option allows you to choose which eye (left or right) will be recorded.

b°) ASL -504 (Applied Science Laboratory)

(*File/configuration/acquisition/Eyetracker* menu, "*ASL 504*" model, then "*Parameters*" button)

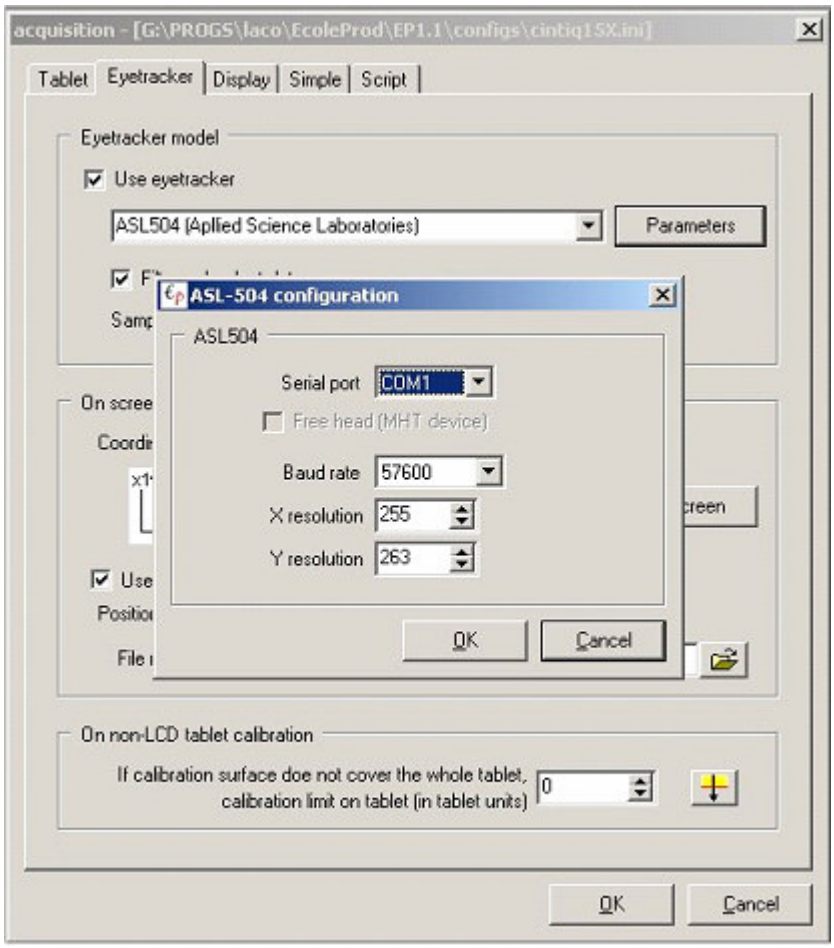


Figure 7: Acquisition configuration, "Eyetracker" tab ("Parameters" button, ASL-504).

LABEL	DESCRIPTION
Serial port	Select your port from 9 possible COM ports.
Free head (MHT device)	If you want to use a head movement compensation device (if the eye tracker has one), tick this option.
Baud rate	Select the serial transmission speed.
X resolution	Select horizontal eye tracker resolution (consult the manufacturer's technical specifications).
Y resolution	Select vertical eye tracker resolution.

c°) Eyeputer (Alphabio)

(*File/configuration/acquisition/Eyetracker* menu, "*EyePuter*" model, then "*Parameters"* button)

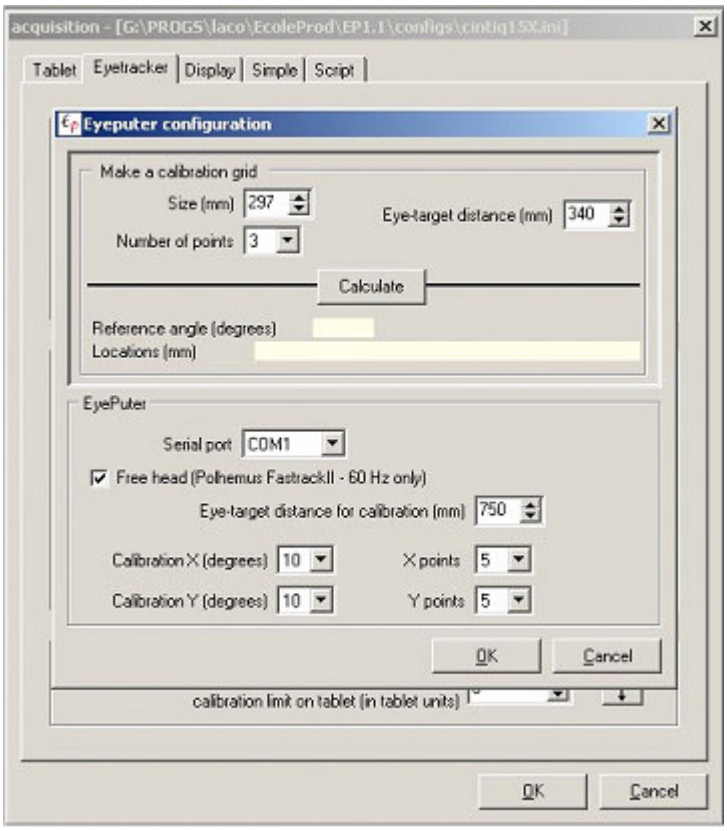


Figure 8: Acquisition configuration, "Eyetracker" tab("parameters" button, EyePuter).

The "Eyeputer" configuration panel contains two frames, called:

- "*Make a calibration grid*": a tool to calculate distances between two points on the calibration grid;
- "*Eyeputer"*: Eyeputer and calibration parameters.

"*EyePuter"* works in an angular system of coordinates. Accordingly, the "metric" distance between calibration points is not constant. Moreover, it does not have an on-screen calibration procedure.
To circumvent this problem, "Make a calibration grid" can help you to position calibration points on a sheet of paper that you can then place over the screen, etc., requiring calibration.

LABEL	DESCRIPTION
Size (mm)	Horizontal or vertical size of the calibration grid.
Number of points	Number of points used for calibration on the X or Y axis.
Eye-target distance (mm)	Distance between the subject's eye and the center of the calibration grid.
"Calculate" button	This button will calculate the angle between the calibration points and the metric distances between these points.

To create a calibration grid "by hand" on a sheet of paper, follow the steps below.

STEP	DESCRIPTION
1	Measure (with a ruler) the calibration grid length or width. Enter it (in millimeters) into the "*Size (mm)*" box.
2	Enter the distance between the subject's eye and the center of the calibration grid into the "Eye-target distance *(mm)*" box.
3	Select the number of calibration points you want for this dimension (horizontal or vertical) from the "*Number of points*" drop-down list.
4	Click on the "*Calculate"* button. The values in the "*Reference angle (degree)*" and "*Locations (mm)"* fields will be updated. "R*eference angle (degree)"* indicates the true angle between two points. The values in "Locations (mm)" are the distance between the first calibration point and the following ones.
5	Using the values in "*Locations (mm)*", plot the points on the sheet.

The parameters for the "*Eyeputer*" frame are described below.

LABEL	DESCRIPTION
Serial port	Select your serial (COM) port from the 4 possible ones.
Free head (Polhemus-FastrackII-60Hz only)	If you want to use a head movement compensation device (if your eye tracker is equipped with one), tick this box.
Eye-target distance for calibration (mm)	The distance between the eye and the calibration grid center. This option is only available if the "*Free head*" box is ticked.
Calibration X (degrees)	The theoretical angle between two calibration points on the horizontal axis.
Calibration Y (degrees)	The theoretical angle between two calibration points on the vertical axis.
X points	The number of calibration points on the horizontal axis.
Y points	The number of calibration points on the vertical axis.

II.2.3. Eye tracker calibration configuration

("*On screen calibration*" and "*On non-LCD tablet calibration"* frames)

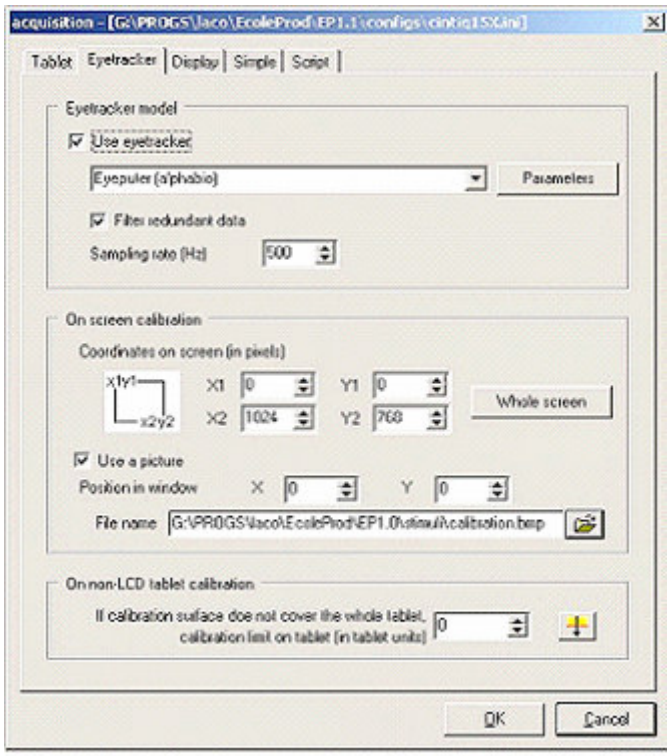


Figure 9: Acquisition configuration, "Eyetracker" tab.

a°) Calibration on screen

Details of the "*On screen calibration*" frame are given below:

LABEL	DESCRIPTION
Coordinates on screen (in pixels) x1 → x2 y1 ↓ y2 Coordinates representation	This option allows you to set the calibration grid coordinates. **LABEL** — **DESCRIPTION** **X1** — Horizontal coordinate of the left edge of the calibration grid. **Y1** — Vertical coordinate of the upper edge of the calibration grid. x1y1 └ x2y2 — X1 and Y1 coordinates correspond to the **upper left-hand corner** of the calibration grid. **X2** — Horizontal coordinate of the right edge of the calibration grid. **Y2** — Vertical coordinate of the bottom edge of the calibration grid. x1y1 └ x2y2 — X2 and Y2 correspond to the **lower right-hand corner** of the calibration grid.

Click on the "**Whole screen**" button to use the entire screen surface.

<table>
<tr>
<td>Use a picture</td>
<td>Displays a background picture when calibrating (on screen).
The following steps will help you to use this option.
<table>
<tr><th>STEP</th><th>DESCRIPTION</th></tr>
<tr><td>1</td><td>Tick the “Use a picture” option.</td></tr>
<tr><td>2</td><td>Select the picture you want to be displayed during calibration (click on the “folder” icon).
The path to this file is displayed to the right of the “Filename” label.

<u>Caution</u>: “Eye and Pen” only uses “.bmp” format pictures.[1]</td></tr>
<tr><td>3</td><td>Enter the picture’s upper left-hand corner horizontal coordinates (in pixels, relative to the display window) into the “X” box.</td></tr>
<tr><td>4</td><td>Enter the picture’s upper left-hand corner vertical coordinates (in pixels, relative to the display window) into the “Y” box.</td></tr>
</table>
The horizontal and vertical coordinates represent the location of the upper left-hand corner of the picture in the calibration window (see FAQ, p.142)</td>
</tr>
</table>

b°) Calibration on non-LCD tablet

When calibrating on a non-LCD tablet (i.e. a tablet with an opaque surface, such as the one you can lay down on a desk), ask the subject to look sequentially at points drawn on a sheet of paper (laid on top of the tablet).
To learn how to calibrate your eye tracker correctly on the tablet, get in touch with your eye tracker reseller helpdesk.
Next, select the calibration limit on the tablet (this limit is zero by default).

Only leave the calibration limit at zero if you are using a **conventional tablet** and your calibration covers the tablet's entire surface.

If you are using a **tablet and a PC screen and want to record eye movements on both surfaces**, read the following section to find out how to define a calibration limit.

[1] This format does not require calculation time to be uncompressed.

Why set a calibration limit?

Simply because using a non-LCD tablet and a computer screen involves several limitations.

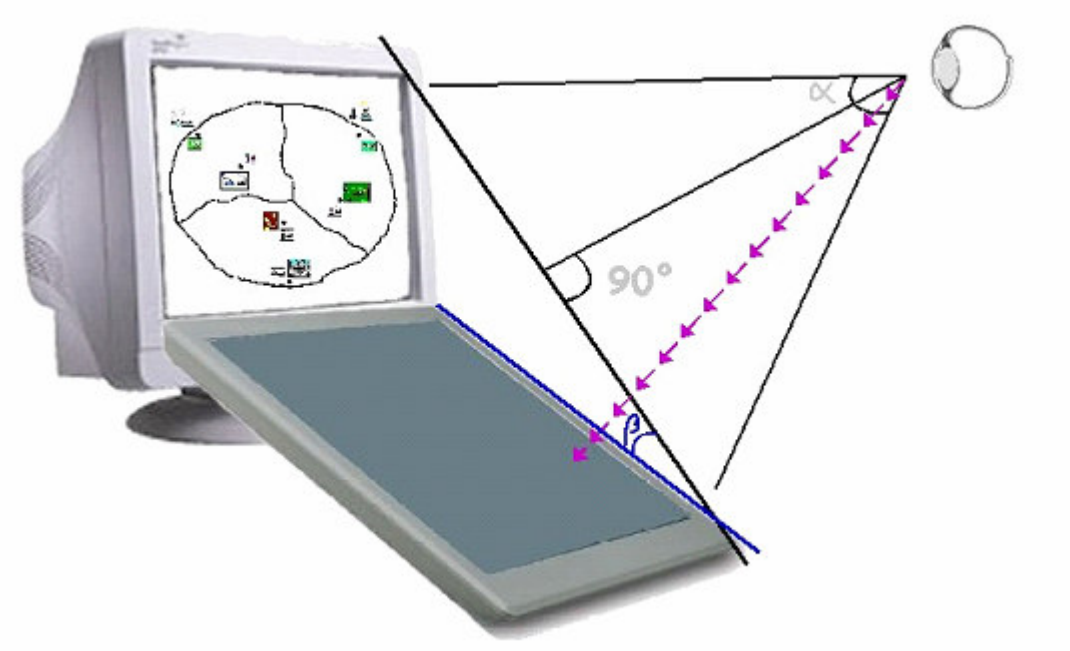


Figure 10: Calibration limit for a tablet-PC screen recording device.

On the one hand, the calibration area is restricted because most eye trackers are only able to make accurate recordings of eye positions within a 30° horizontal and 20° vertical range (angle "α" on Fig. 10). Indeed, depending on the size of the screen and tablet, the calibration area may be assigned to only part of the screen and/or tablet.

On the other hand, because the tablet and the screen are not aligned in the same plane, the distance (depth) between each hardware device and the eye will vary. This variation can entail a decrease in recording accuracy. This is because eye trackers measure eye movements as though the watched scene was flat and perpendicular to the line of sight. With a device like the one shown in Figure 10, the eye-fixated point will be miss-estimated because of the angle between the tablet and the "theoretical" plane of vision (angle "β" in Fig. 10). In order to minimize the error, angle "β" has to be reduced as much as possible, by aligning the tablet and screen surfaces.

When the distance between the eye and the device prevents the participant from seeing the entire surface of the screen and the tablet, the calibration has to be restricted to the visible area (depending on the participant's vision and/or eye tracker's range). In this case, part of the task environment must be ignored. The vertical limit of this ignored area is referred to as the "**calibration limit**".

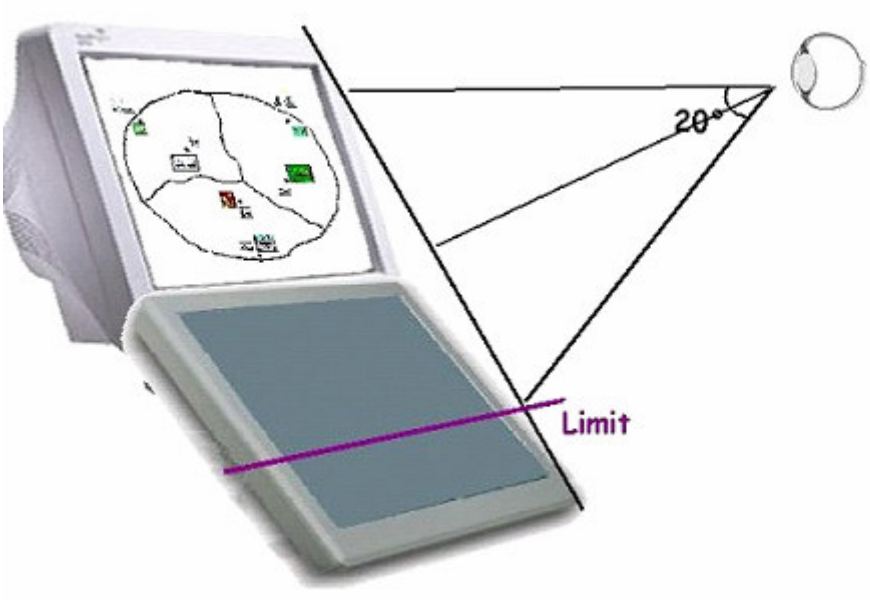


Figure 11: Calibration limit.

The steps to calculate the vertical calibration limit are described below.

STEP	DESCRIPTION
1	Click on the "  " icon to the right of the "*On non-LCD tablet calibration*" frame.
2	Touch the bottom of the calibration surface (calibration limit) with the pen (tablet stylus). The calibration limit value will be updated.
3	Click on the "*OK*" button. Mission accomplished.

III. DEVICE TESTS

Eye and Pen has functions that enable you to test the tablet and the eye tracker by two means:

- a visual test;
- a performance test.

III.1. Tablet tests

III.1.1. Visual tablet test

(*Tests/Tablet/Visual* menu)

This function allows you to check visually how the tablet is working within Eye and Pen.
A background picture or the background color is displayed (select from the *File/Configuration/Analysis* menu, "*Display*" tab).

Moving the pen across the tablet will leave a trace on the screen. Each pen position sampled by the tablet is plotted (no line between points), thereby giving a direct visual indication of data quality.
When moving the pen across the tablet, pen pressure and coordinates (horizontal=X, vertical=Y) are displayed at the top of the screen.

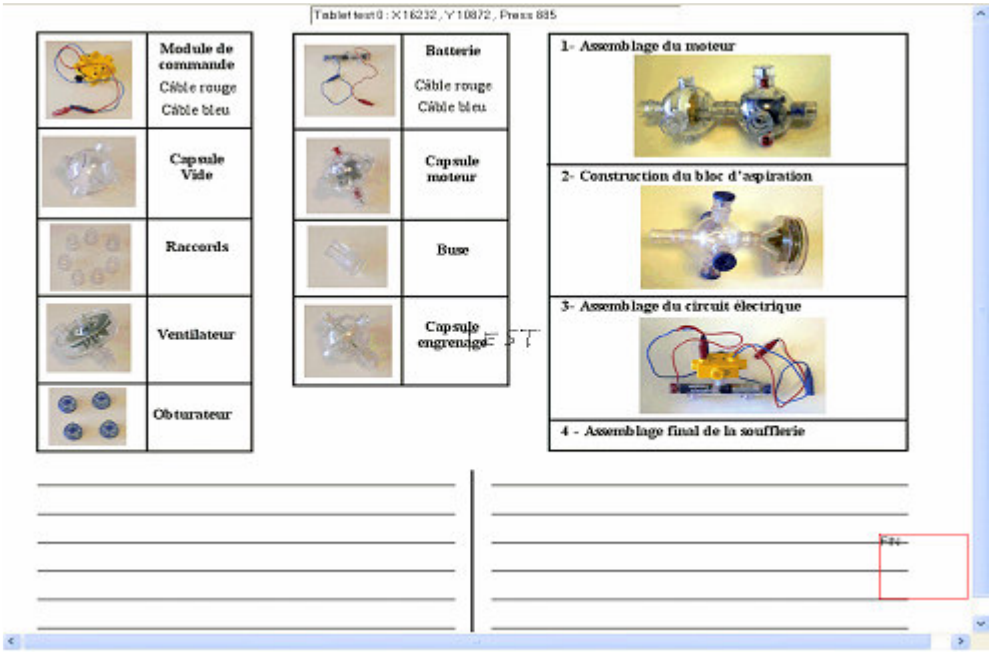


Figure12: Visual tablet test.

To leave or end this test, you can either:

- press the "Escape" key;
- press the pen in the rectangle labeled "End" (see option "Show trigger zones" in VI.3 Analysis configuration p.41).

III.1.2. Tablet performance test

(*Tests/Tablet/Performance* menu)

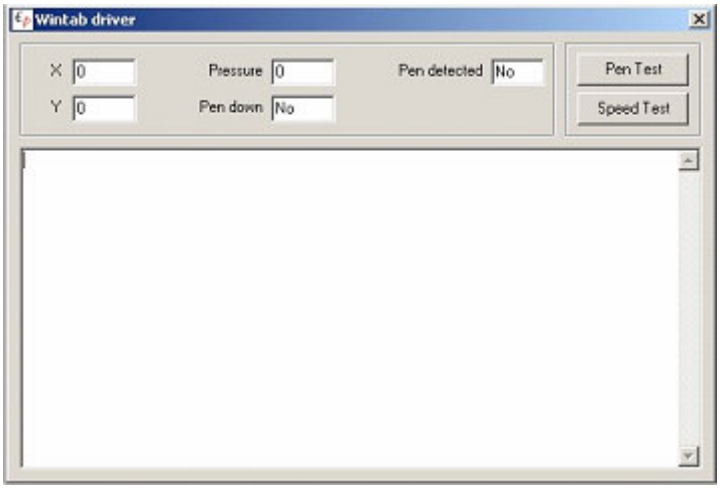


Figure 13: Tablet performance test.

LABEL	DESCRIPTION
X	Horizontal coordinate of the pen on the tablet.
Y	Vertical coordinate of the pen on the tablet.
Pressure	Indicates the pressure exerted by the pen tip on the tablet. **Important:** the pressure scale may differ, according to the tablet and pen model (usually 512 or 1024 levels).
Pen down	Indicates whether or not the pen tip is pressed on the tablet surface. It has two values: "*Yes*" and "*No*".
Pen detected	Most of the tablets can detect the presence of the pen above the surface, even when not being pressed down. It has two values: "*Yes*" and "*No*". **Hint:** You can use this feature to find out how many sheets of paper can be piled up on the tablet without loosing any pen data (e.g. to make a kind of notebook).
Pen test	Allows you to test some of the parameters of the pen on the tablet "for real" (X, Y, Pressure, Pen down, Pen detected). Once you have clicked on this button, it becomes a "*Stop test*" button to cancel the test.
Speed test	This button allows you to test the actual tablet sampling rate, with the data actually (not theoretically) available for the program. Click on the button and draw a continuous line across the tablet's surface. The program will then display: • the amount of data received; • drawing duration; • the calculated sampling rate.

III.2. Eye tracker tests

III.2.1. Eye tracker visual test

(*Tests/Eyetracker/Visual* menu)

This menu allows you to view the gaze position over the calibration grid (on screen). It helps you to check the calibration visually.

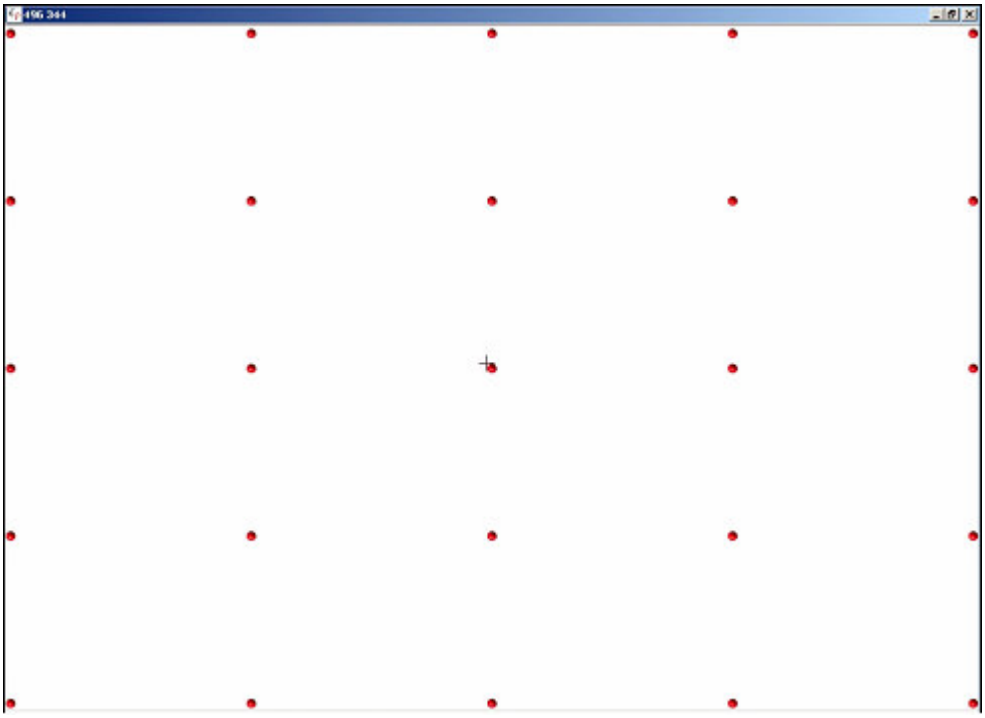


Figure 14: Visual eye tracker test.

Once you have calibrated your eye tracker, you should be able to see a cross (at the gaze position) "moving with your eyes" (center of Fig. 14), as it is measured by the eye tracker.

To cancel the test, press the “Escape” key.

III.2.2. Eye tracker performance test

(*Tests/Eyetracker/Performance* menu)

This menu allows you to estimate the data sampling rate as recorded by “Eye & Pen”. When you launch this function, a message will be displayed at the top of the screen, asking you to wait for 15 seconds.

A message box will then display:

- the amount of data received per millisecond;
- the eye tracker’s sampling rate.

Click on the “*OK*” button to end the test.

IV. DISPLAY CONFIGURATION PARAMETERS

(*File/Configuration/Acquisition* menu, "*Display"* tab)

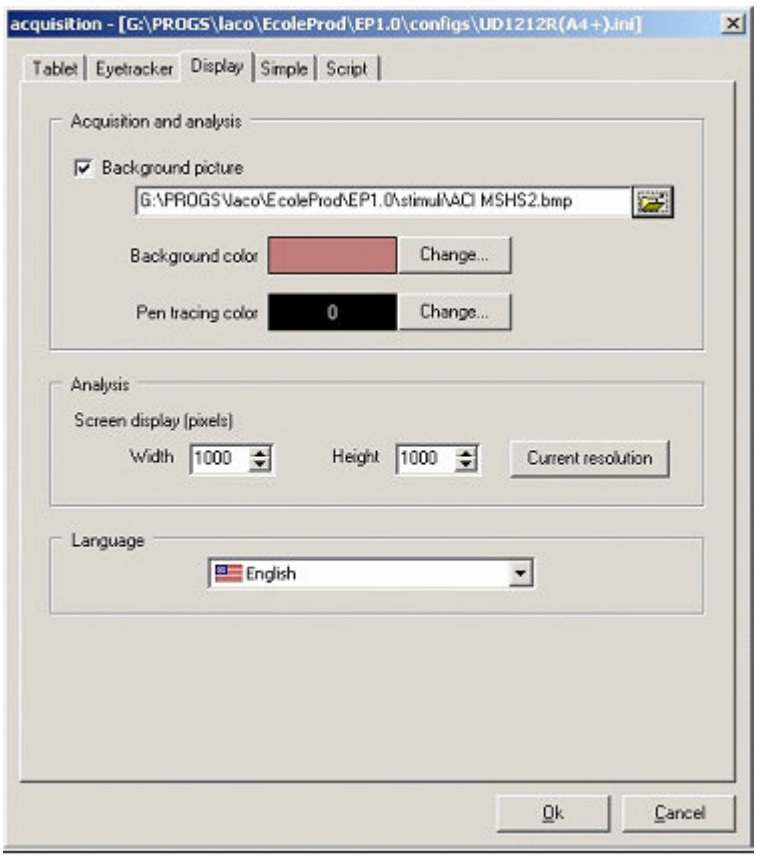


Figure 15: Acquisition configuration, "Display" tab.

The "*Display*" tab contains three frames:

- "*Acquisition and analysis*": displays parameters common to "Simple" mode of acquisition and analysis;
- "*Analysis*": displays parameters specific to the analysis;
- "*Language*": selects the language used in Eye and Pen.

"*Acquisition and analysis*" frame:

LABEL	DESCRIPTION
Background picture 	You can select a background picture by clicking on the folder icon. The path and name of this file will be displayed to the right of the label. "Eye and Pen" only accepts ".bmp"-format pictures.[2].
Background color	Select a background color for the display. **Note**: if you select a background picture that is as wide as the screen, the background color will not be visible.

[2] This format does not require calculation time to be uncompressed.

Pen tracing color	Select the color of the trace left by the pen on the screen. A sample of the current color is shown to the left of the "*Change*" button. Its color number is written over the sample (useful for indicating a color in a script). **Caution**: if the tracing color is the same as the background color, it will not be visible.

The "*Analysis*" frame allows you to configure display parameters that are only applicable for data analysis:

LABEL	DESCRIPTION
Width (pixel)	Width of the display window for later analysis.
Height (pixels)	Height of the display window for later analysis.
Current resolution	Directly fills "**Width**" and "**Height**" fields with the current screen display resolution (defined in the Windows display properties – see Windows Configuration Panel). **Caution**: the higher the resolution and color number, the longer it will take to "refresh" the display and the greater the video memory load will be.

The "*Language*" frame allows you to select the current software language (English or French).

V. ACQUISITION CONFIGURATION PARAMETERS

V.1. Simple acquisition

(*File/Configuration/Acquisition* menu, "*Simple*" tab)

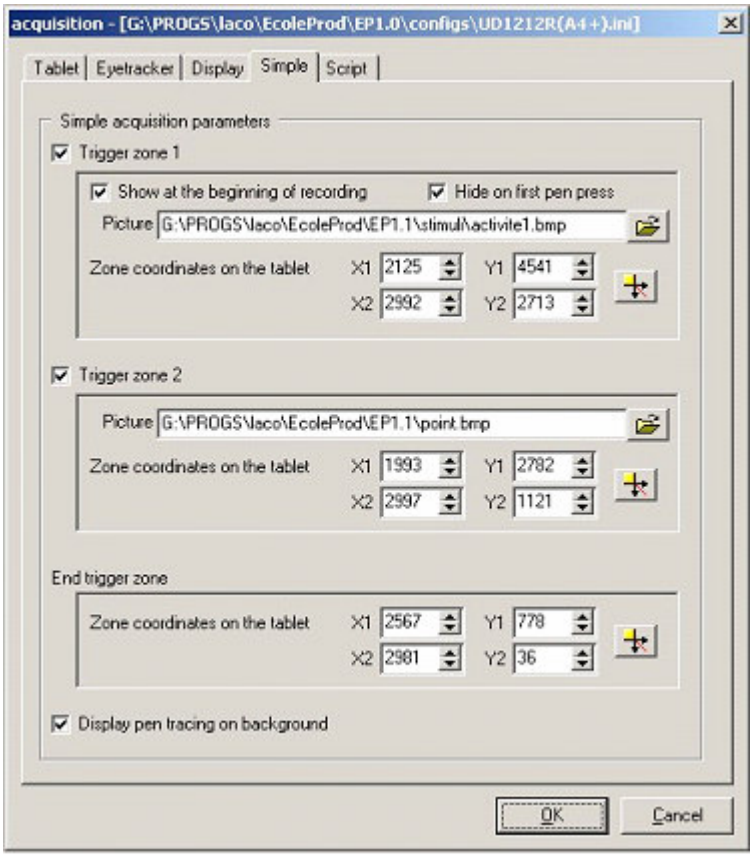
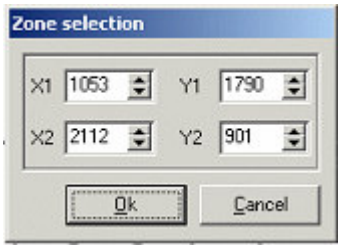


Figure 16: Acquisition configuration, "Simple" tab.

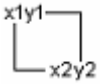
LABEL	DESCRIPTION
Trigger zone 1	This option creates a rectangular zone on the tablet, allowing you to display a picture on the screen. This will be referred to from now on as **Trigger zone 1.** In "simple acquisition" mode, if the subject presses the pen in a trigger zone, the selected picture is displayed on the screen. When the pen is released, the picture disappears. When it is ticked, this option allows you to select: • the trigger zone 1 coordinates on the tablet; • the associated picture; • the "*Show at the beginning of recording*" option; • the "*Hide on first pen press*" option.
Show at the beginning of recording	If this option is ticked, the picture "linked" to trigger zone 1 is displayed at the very start of data acquisition.

Hide on first pen press	This option is only available if the preceding option has been activated. If this option is ticked, the picture displayed at the start of recording is removed from screen when the pen is pressed on the tablet surface (i.e. typically when writing starts).
Picture (trigger zone 1) 	Allows you to select the picture "linked" to trigger zone 1 (click on the folder icon). The name and path of the selected picture are updated in the box labeled "*Picture*". The picture must be in ".bmp" image file format (this format does not require decompression calculations, thus resulting in faster loading). The picture is always displayed in the upper left-hand corner of the screen. According to its original size, the picture may cover only part of the screen (there is no resizing). **Important**: the bigger the picture, the higher its color number and the longer it will take to display it.
Trigger zone 2	Works in a similar way to trigger zone 1, except that it has no "Show at the beginning…" or "Hide on first…" options.
Picture (trigger zone 2) 	Works in a similar way to the picture for trigger zone 1
End trigger zone	Allows you to create a rectangular zone on the tablet. When the subject presses the pen on it, the recording stops.

Zone coordinates on the tablet (in tablet lines) 	Allows you to set tablet coordinates for trigger zones. Click on the  icon. A dialog box will be displayed, showing 4 boxes, one for each coordinate.  Press the pen on the upper left-hand corner of the zone (on the tablet). Keeping it pressed down, move the pen towards the lower right-hand corner of the zone, then lift it up. Coordinates are updates. Click on the OK button to validate them (for an explanation of coordinate representation, see below). **Hint :** to make it easier to define a zone on the tablet, you can either stick a "Post-it®" (or similar) on it or draw your zones in a picture. You can then either use this picture as a background picture, if you are using an LCD tablet (*Configuration/Acquisition/Display* menu, *"Background picture"* option), or print this picture and "stick" the paper on the tablet.
Display pen tracing on background	If this option is ticked, the subject's writing (or drawing) will be displayed on the screen.

Tablet coordinate representation

This representation is also applicable to "screen" coordinates and to the definition of rectangles.

LABEL	DESCRIPTION
	X1 and Y1 coordinates correspond to the **upper left-hand corner** of the tablet's active area. X2 and Y2 coordinates correspond to the **lower right-hand corner** of the tablet's active area.
X1	Coordinate of the left edge of the tablet's active area. This point is the horizontal **coordinates origin**.
Y1	Coordinate of the upper edge of the tablet's active area. This point is the vertical **coordinates origin**.
X2	Coordinate of the right edge of the tablet's active area (equal to the width of the tablet's active area).
Y2	Coordinate of the bottom edge of the tablet's active area (equal to the height of the tablet's active area).

V.2. Script-based acquisition configuration

(*File/Configuration/Acquisition* menu, "*Script*" tab)

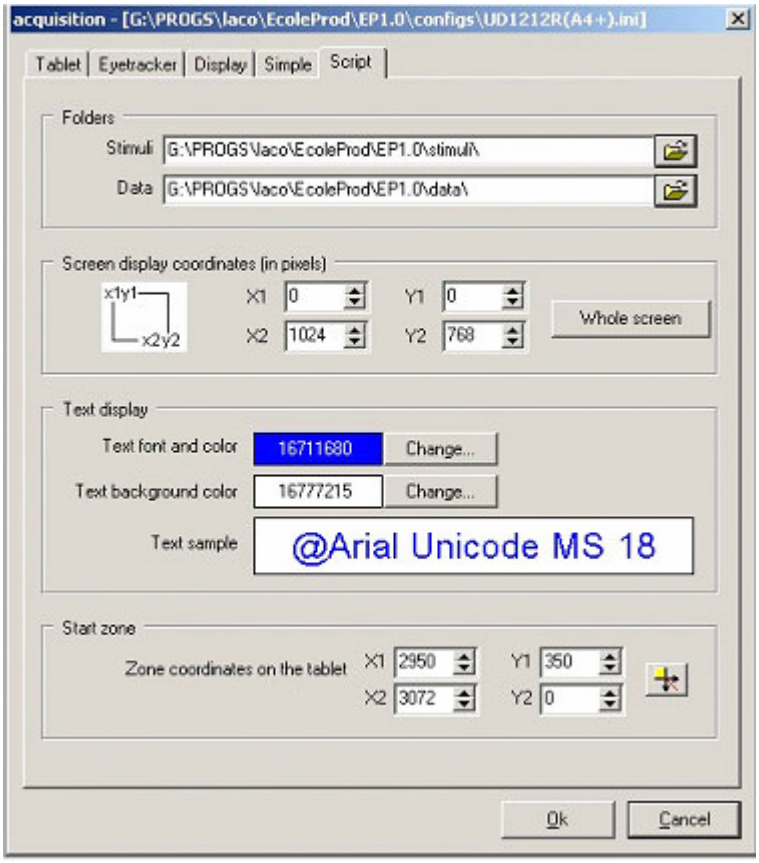


Figure 17: Acquisition configuration panel, "Script" tab.

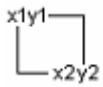
The "*Script*" tab contains four frames:

- "*Folders*": names of the directories of recorded data and the stimuli used;
- "*Screen display coordinates (in pixels)*": parameters of screen display coordinates;
- "*Text display*": text display parameters;
- "*Start zone*": start zone coordinates on the tablet.

The "*Folders*" frame contains all the parameters needed to define the names of the directories containing data recordings and the stimuli that have been used.

LABEL	DESCRIPTION
Stimuli 	Select the folder containing the stimuli used for script acquisition. Stimuli may be in the form of a ".bmp"-format image, ".avi"-format video, ".txt"-format text or ".wav"-format audio.
Data 	Select the folder in which the data will be recorded.

"*Screen display coordinates (in pixels)*" allows you to define which zone of the screen will be used to display stimuli, messages etc. To use the entire screen, set X1 and Y1 to zero, and set X2 and Y2 to the horizontal and vertical screen resolution values.
For example, with a 1024 x 768 resolution, set to 0, 0, 1024, 768 (see FAQ: "How can I find out the current screen resolution?" p.142), or click on the "Whole screen" button.

LABEL	DESCRIPTION
	X1 and Y1 coordinates correspond to the **upper left-hand corner** of the computer screen. X2 and Y2 coordinates correspond to the **lower right-hand corner** of the screen.
X1	Coordinate of the left edge of screen. This point is the horizontal **coordinate's origin**.
Y1	Coordinate of the upper edge of the screen. This point is the vertical **coordinate's origin**.
X2	Coordinate of the right edge of the screen (equal to the screen's width).
Y2	Coordinate of the bottom edge of the screen (equal to the screen's height).

The "*Text display*" frame contains the parameters needed to define how texts will be displayed with a script.

LABEL	DESCRIPTION
Text font and color	Allows you to select default parameters for **text** and **message displays.** You can set: • color; • font; • size; • underline or strikeout style. When selecting a color ("*Change*" button), the new color and its color number are displayed to the left of the button. The color number is used in some script commands.
Text background color	Allows you to select the default background color for text displays. When changing the color ("*Change*" button), the color and its number are updated to the left of the button. The color number is used in some script commands.

The "*Start zone*" frame allows you to define a default start zone on the tablet.
When calling up the corresponding command in a script, the script will remain "on hold" until the subject presses the pen in this zone (see p. 34, Coordinate representation).

VI. DATA ANALYSIS CONFIGURATION PARAMETERS

VI.1. Analysis configuration panel

(*File/Configuration/Analysis* menu)

Once the data acquisition is complete, the data analysis tools will help you to sort, code, discard, cluster, etc.
The options in this panel allow you to select default program behaviors. These can be modified at any time.

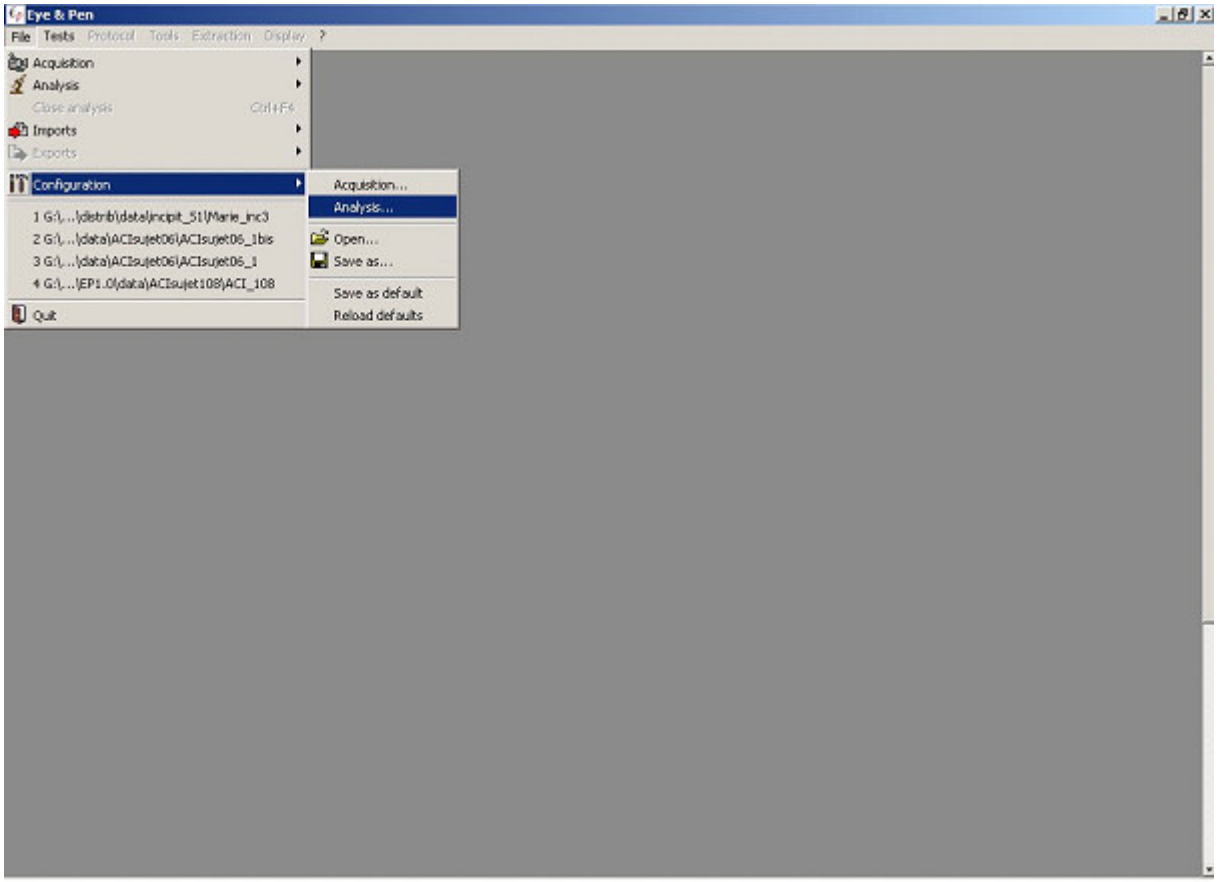


Figure 18: Launching the analysis configuration panel.

VI.2. New analysis configuration

(*File/Configuration/Analysis* menu, "*New Analysis"* tab*)*

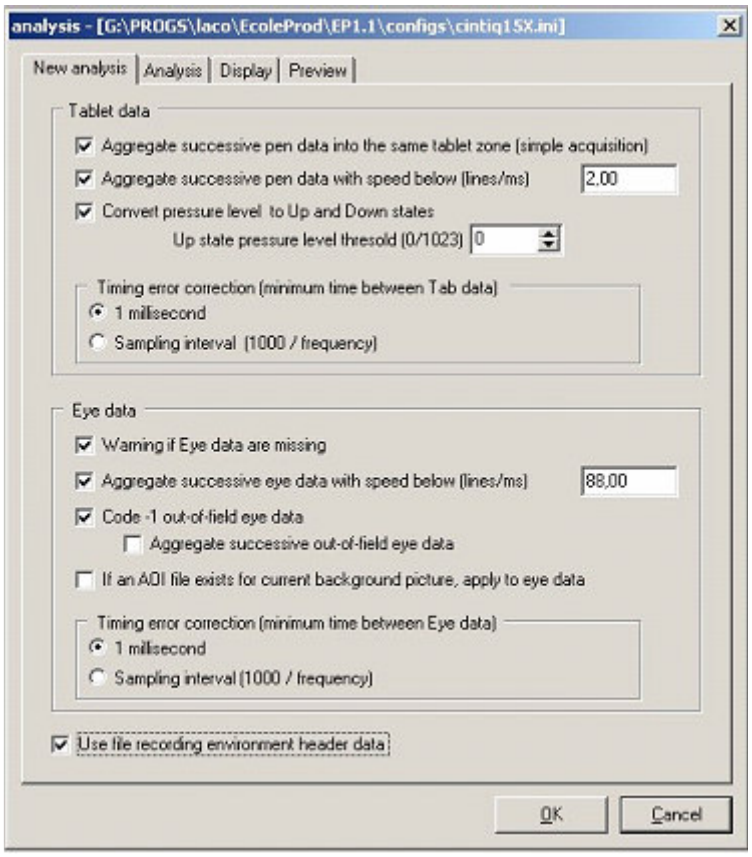


Figure 19: Analysis configuration panel, "New analysis" tab.

This tab shows the frames labeled:

- "*Tablet data*": parameters for tablet data treatment;
- "*Eye data*": parameters for eye-tracking data;

and an option labeled "*Use file recording environment header data"*.

Parameters for the "*Tablet data*" frame options are explained below:

LABEL	DESCRIPTION
Aggregate successive pen data in the same tablet zone (simple acquisition)	If this option is ticked, successive data items in the same trigger zone will be turned into a single data item. All the subject's moves in this zone will be clustered within a single point. This option is useful when, for example, a subject moves slightly when pressing the pen in a trigger zone. A series of moves then becomes a single press.

Aggregate successive pen data with speed below... (lines/ms)	Aggregates successive pen data (pen being pressed on the tablet moves slightly) relative to a speed threshold. This threshold must be empirically determined. It is expressed in lines (tablet counting unit) per millisecond. All successive moves (samples) with a speed below this threshold will be clustered into a single point.
Convert pressure level to Up and Down states	Transforms pressure exerted by the pen on the tablet into a bi-level state: the pen is either "up" or "down". By default, a pressure level of zero corresponds to a pen "up" state. Any other value corresponds to a pen "down" state and is then set to 1023 (maximum pressure). This can be compared to the process of converting a picture in a monochrome series of grays into a black-and-white picture. **Caution**: the pressure scale may vary from one tablet model to another.
Up state pressure level (0/1023)	Allows you to define the threshold pressure value for the "up" state of the pen. For example, if the pen does not leave a trace on the paper until the pressure exceeds a value of 3 or 4, you can set the threshold to this value. **Important:** This option is only available if the "*Convert pressure level...*" option has been ticked.
Timing error correction	This option allows you to select the minimum duration required between two pen samples. This value is used if a sampling or transmission mechanism error occurs and provides two samples at the same time. To correct these timing errors, you can specify whether the data should be at a millisecond interval or at the tablet sampling interval.

The parameters for the "*Eye data*" frame options are described below:

LABEL	DESCRIPTION
Warning if eye data are missing	This option is only useful only if you are using an eye tracker. Otherwise, do not tick it. If you have ticked it, a warning message will be displayed if the protocol's eye-tracking data are not found. **Important:** if you are not using an eye tracker, do not tick this box. This option may be useful for signaling a data management problem, for example when only a part of a subject's files has been moved to a new directory.
Aggregate successive eye data with speed below (lines/ms)	Aggregates successive eye data below a certain speed threshold. This threshold must be empirically determined. It is expressed in lines (tablet counting unit) per millisecond. All successive moves (samples) with a speed below this threshold will be clustered into a single point.
Code -1 out-of-field eye data	Data with coordinates beyond the calibrated area are automatically coded as -1.
Aggregate successive out-of-field eye data	This option is only available if the above option has been ticked. This option allows you to aggregate (cluster) successive data beyond the calibrated area. These items will not be taken into account in the analysis, but will enhance the initial data duration with the sum of all subsequent discarded data. It is useful to reduce the amount of data when, for example, the subject is thinking with his/her eyes "gazing skywards".
If an AOI file exists for current background picture, apply to eye data	If an AOI[3] file exists with the same name and in the same directory as the background picture (e.g. "backgnd.bmp" and "backgnd.aoi"), this option allows you to automatically load and apply AOI zone coding to the eye data.

[3] An AOI is a visual Area Of Interest (see p.97)

Timing error correction	This option allows you to select the minimum duration required between two eye-tracker samples. This value is used if a sampling or transmission mechanism error occurs and provides two samples at the same time. To correct these timing errors, you can specify whether the data should be at a millisecond interval or at the eye-tracker sampling interval.

The "*Use file recording environment header data*" option allows you to use the configuration parameters that were in use when the protocol was recorded.
Unticking this option will allow you to use current Eye and Pen settings instead of the original protocol's settings (see header details in Appendix XII).

As a rule, it is advisable to keep this option ticked.

VI.3. Analysis configuration

(*File/Configuration/Analysis* menu, "*Analysis*" tab*)*

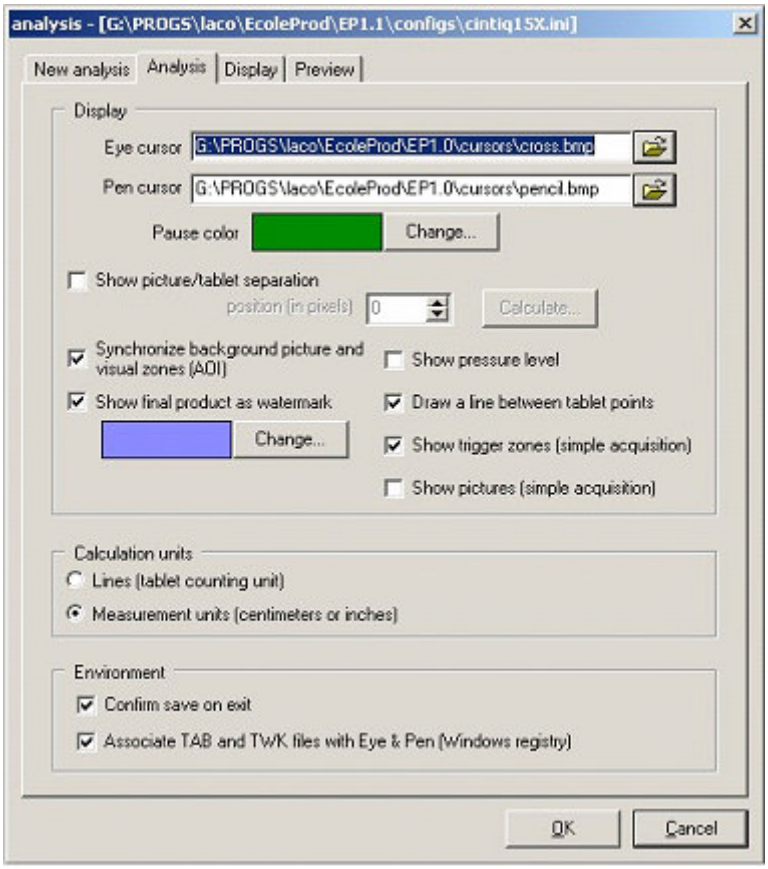
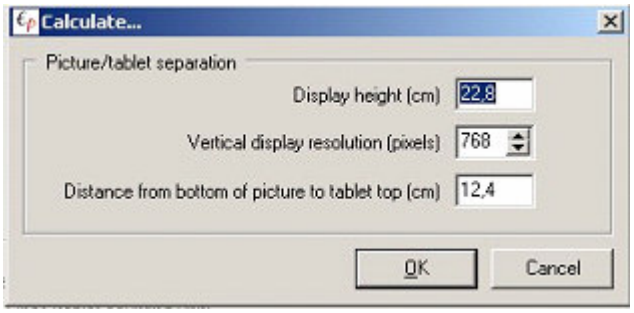


Figure 20: Analysis configuration panel, "Analysis" tab.

This tab shows three frames, labeled:

- "*Display*": parameters for data display options;
- "*Calculation units*": units of measurement for the calculation results;
- "*Environment*": miscellaneous options.

The "*Display*" frame options are described below.

LABEL	DESCRIPTION
Eye cursor	Choose the icon that will materialize (show) gaze position on the screen. A cursor is a ".BMP" picture file, with a maximum of 256 colors. The first point (pixel) in the lower left-hand corner of the picture defines the color that will be replaced by transparency. For example, you can create a cursor with a circle shape corresponding to the subject's central vision, or fovea (consult fovea.bmp in the \cursors subdirectory to gain a better idea of what is "centrally" viewed.
Pen cursor	Choose the icon representing the pen's position on the screen. See above description of "Eye cursor".
Pause color	Allows you to change the color used to represent pauses on the screen (see p.81). Click on the "*Change*" button, select a color and the color will be updated.
Show picture/tablet separation	Check this option if you are using a non-LCD tablet and a screen (the tablet is located below the screen) and you are calibrating your eye tracker on the whole device (cf. diagram, p.25) Eye and Pen will display a separation line between screen and tablet in the analysis window.
Position (in pixels)	Determine the position of the separation line, taking into account the physical position of the two devices. Click on the "*Calculate*" button, fill-in the fields of the dialog box and click on "*OK*".  *Figure 21: Physical limit between screen and tablet dialog box.*

Synchronize background picture and visual zones (AOI)	Visual Areas Of Interest (AOI) are commonly defined with respect to the background picture. If the background picture is moved (cf. Shift layers, p.94), the AOI will no longer be in the right place. This option allows you to "link" the AOIs to the background picture. That way, if the background is moved, the AOI will move with it.
Show final product as watermark	This option allows you to display the final state of the subject's production in the screen background, as a watermark. You can select the watermark color by clicking on the "*Change*" button. The selected color will be displayed to the left of this button.
Show pressure level	Change the color of the pen trace according to the amount of pressure exerted on the tablet (shades of gray). The greater the pressure, the darker the shade (0=white, 1023=black).
Draw a line between tablet points	This option allows you to draw a line joining up successive points. It makes the subject's writing easier to read. Unticking this option makes it easier to assess data quality in an initial analysis (number of points, etc.). The distance between the points will be related to the subjects' writing (drawing) speed.
Show trigger zones (simple acquisition)	If this option is ticked, trigger zones will be displayed in the background during analysis. In general, it is advisable to keep this option ticked.
Show pictures (simple acquisition)	If this option is ticked, the picture linked to a trigger zone will be displayed when the pen data "enters" into this zone. It mimics the subject's behavior.

The "*Calculation units*" frame allows you to select the unit of measurement for the calculation outputs. There are two possible values:

- in lines, the tablet's "natural" unit of measurement;
- in centimeters or inches, depending on the tablet's resolution and the driver's measurement system.

The "*Environment*" frame allows you to set specific behaviors:

Confirm save on exit	If this option is not ticked, the analysis will automatically be saved, without any prompt. Otherwise, you will be asked to decide whether you want the analysis to be saved or not.
Associate TAB and TWK files with "Eye and Pen" (Windows registry)	Allows you to directly launch "Eye and Pen" when you click on a ".TAB" data file or a ".twk" analysis file (details in Appendix XIII).

VI.4. Analysis display configuration

(*File/Configuration/Analysis* menu, "*Display*" tab)

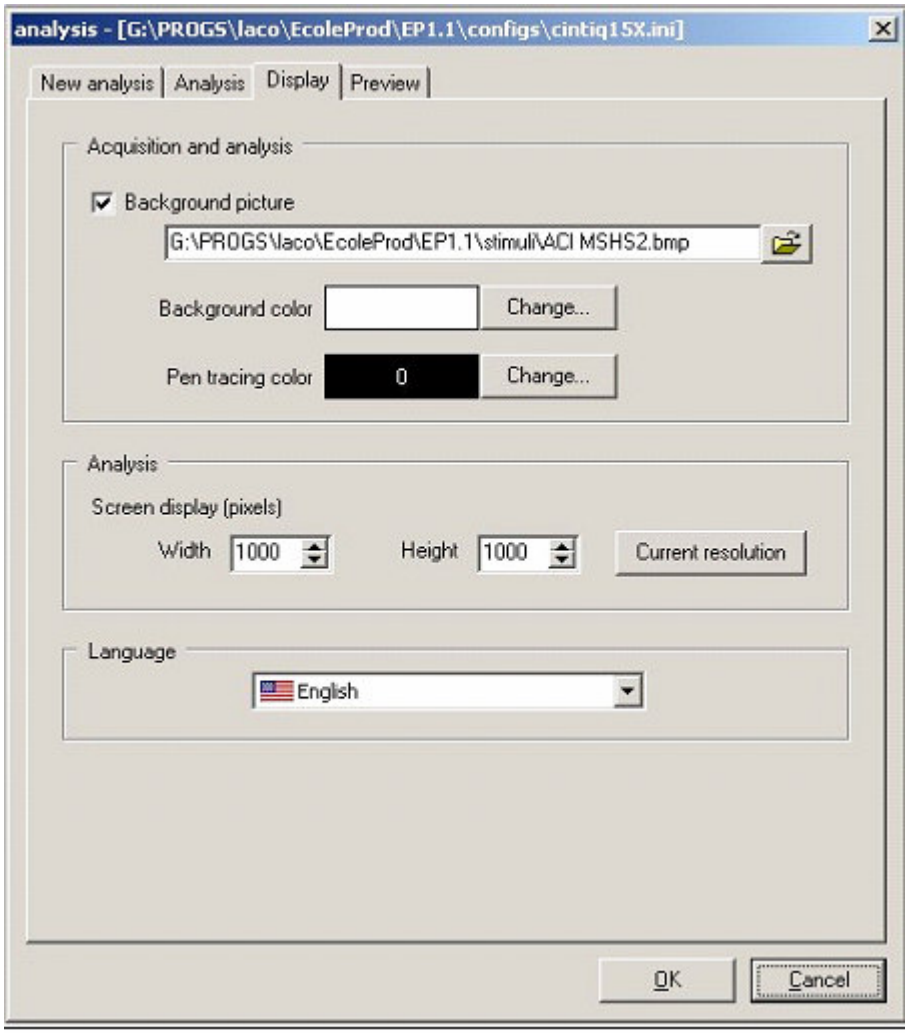


Figure 22: Analysis configuration panel, "Display" tab.

This tab is the same as the one in the acquisition configuration panel (File/Configuration/Acquisition/Display menu, p.30)

VII. PREVIEW CONFIGURATION

(*File/Configuration/Analysis* menu, "*Preview*" tab)

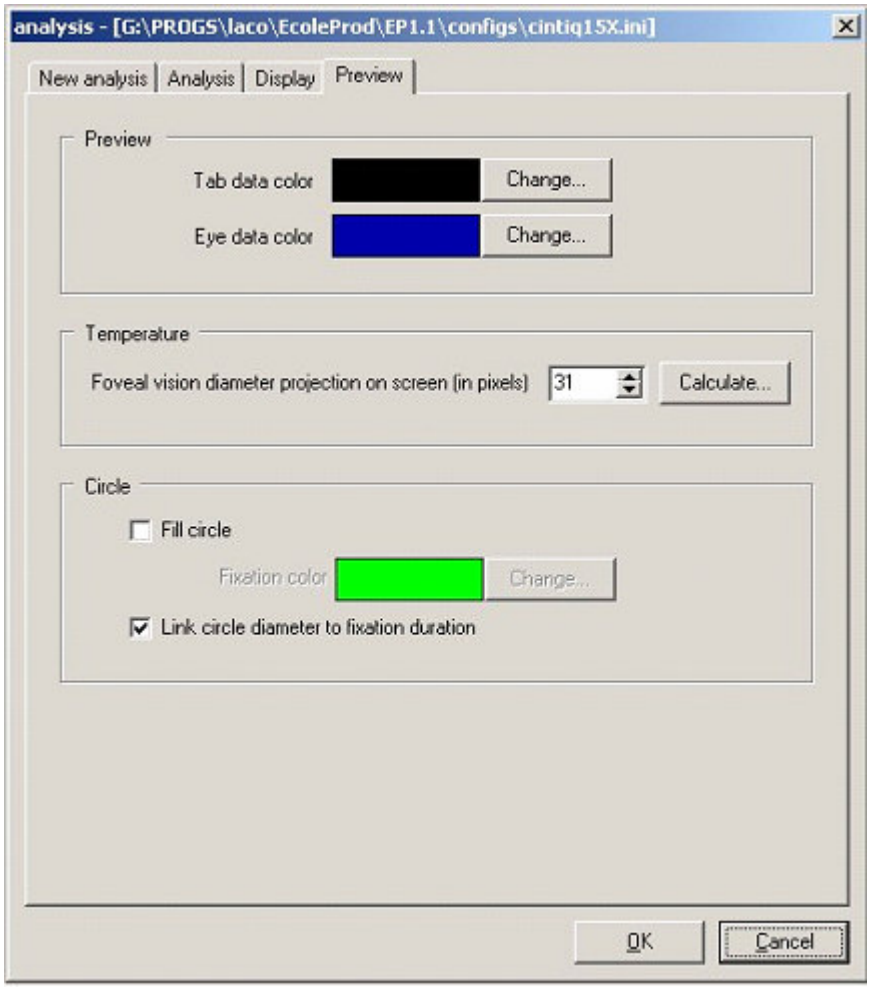


Figure 23: Analysis configuration panel, "Preview" tab.

The "*Preview*" tab shows three frames, labeled:

- "*Preview*": set colors to represent data projection on screen;
- "*Temperature*": parameters specific to this preview mode;
- "*Circle*": parameters specific to this preview mode.

The "*Preview*" frame allows you to set:

Tab data color	Select a color to represent tablet data (click on "*Change*" button). A sample of this color will be shown to the left of the button
Eye data color	Select a color to represent eye data (click on "*Change*" button). A sample of this color will be shown to the left of the button.

The "*Temperature*" frame allows you to specify **the foveal vision diameter projection on screen** (in pixels). To set this value, click on the "*Calculate*" button. The following dialog box will then be displayed:

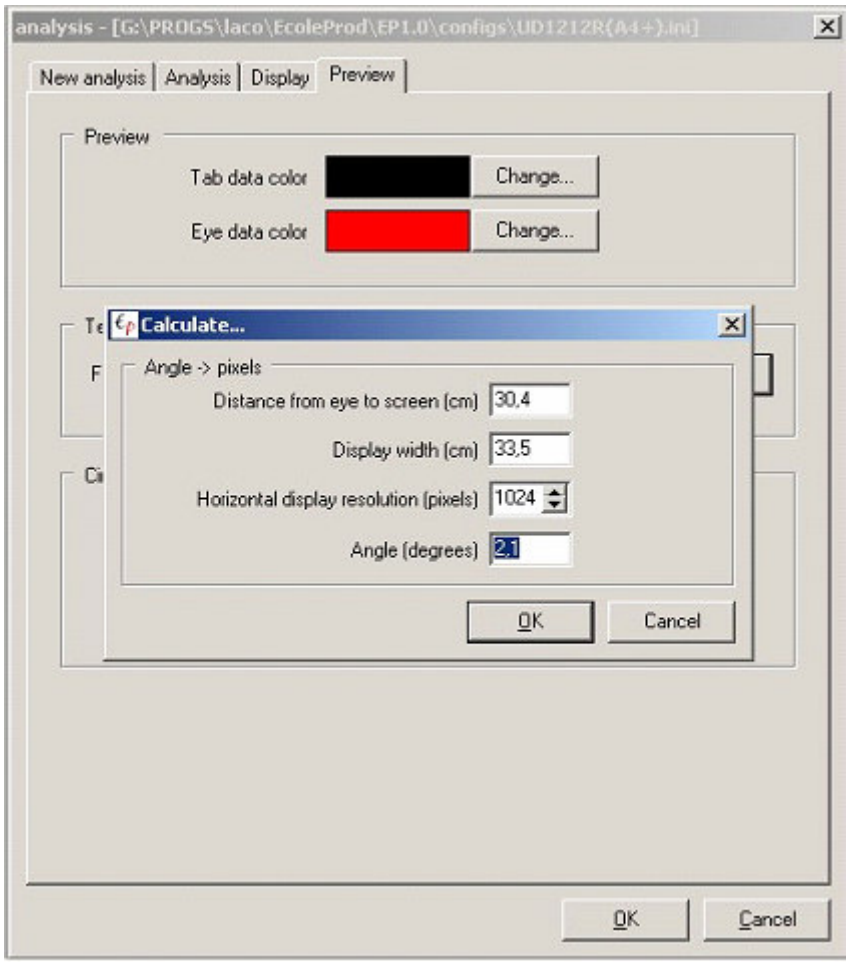


Figure 24: Calculation of foveal vision diameter on screen.

Fill the boxes with the requested values and click on the "*OK*" button.

The projection of the foveal vision will then be calculated and displayed to the left of the "*Calculate"* button.

The "*Circle*" frame options are described below:

Fill circle	Should the circles representing fixations be filled with color? If the answer is "yes", tick this box. Then, click on "*Change*" to select the color. The current color is shown to the left of the button.
Link circle diameter to fixation duration	If this option is ticked, the diameter of the circle representing a fixation will grow according to fixation duration. The longer the fixation, the greater the diameter. [diameter = (Log_2(Duration) * log_{10}(Duration)-1) / 2].

VIII. SAVE / LOAD CONFIGURATION PARAMETERS

When you use “Eye and Pen”, the last parameters to have been used are reloaded by default.

If you wish to use more than one configuration, you can **save** current parameters under a new name before modifying them. You will then be able to reload them later.

To do this, click on the “*File*” menu, select “*Configuration*” and click on “*Save as…*”. The following dialog box will then be displayed*:*

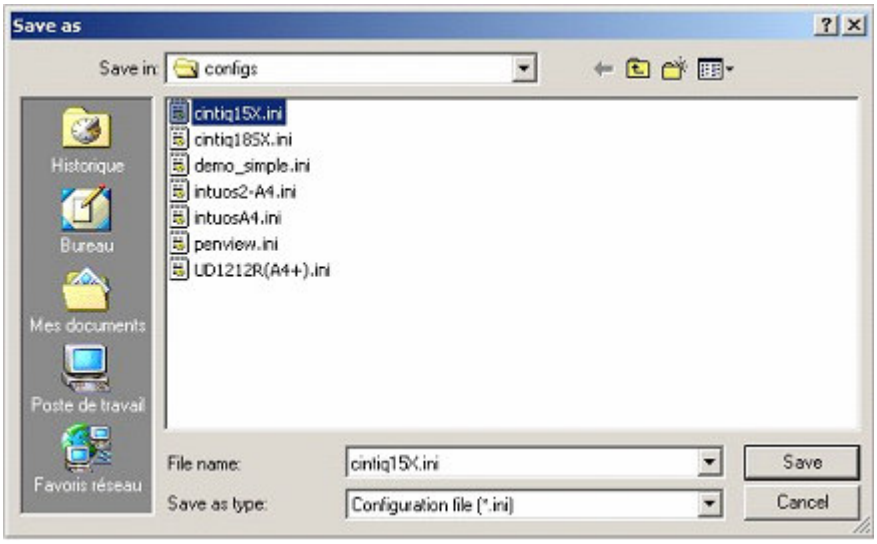


Figure 25: Saving the configuration parameters.

Choose a filename and a directory and save your configuration parameters (".ini" file type) clicking on the “*Save*” button.
The file has now been saved.

To **open** a parameters file, click on “*File”,* select “*Configuration*” and click on “*Open*”. The following dialog box will then be displayed:

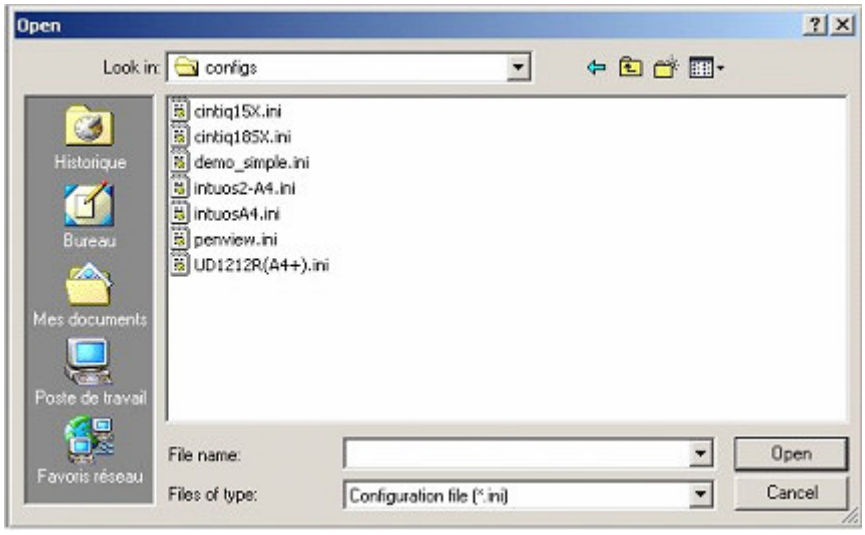


Figure 26: Loading the configuration parameters.

Select an ".ini" configuration file and click on "*Open*".

The configuration parameters contained in this file will immediately be activated.

Default configuration

If necessary (e.g. you misconfigured some parameters), you can **reload** the Eye and Pen **default parameters**.
To do so, click on "*File",* select "*Configuration*" and click on "*Reload defaults*".
Default configuration parameters will now be activated.

To save **current parameters as new default parameters** for Eye and Pen, click on "*File",* select "*Configuration*" and click on "*Save as default*".

Note:

You cannot load a configuration file or the default parameters once an analysis is underway. Otherwise, the parameters of the tablet, eye tracker and display, together with other parameters involved in the analysis might be modified and your analysis would be greatly compromised.
For this reason, if you wish to change the configuration file, close your analysis first.

CHAPTER 2

Data acquisition

I. INTRODUCTION

Data acquisition can be managed in two modes:

- a so-called “Simple” acquisition mode, which is totally defined in the Eye & Pen configuration panel;
- an acquisition mode driven by a “Script”, i.e. where all events are described through a pseudo command language. Certain basic parameters are set in the Eye & Pen configuration panel, but all the parameters may be redefined via the script.

During a recording session, the main events of interactivity with the subject (displays, recordings, answers etc.) are recorded in a “.log” text file, together with the time that has elapsed (time in milliseconds) since the beginning of the recording session.

Tablet and eye-tracking data are recorded with a common time base, i.e. the time at which the PC executing “Eye and Pen” started receiving the incoming data.

Note:

Although this system is not ideal (timing may be less reliable than that of the acquisition device because the data have to "travel through" the Windows system, resulting in additional and unpredictable delays), this mode had been chosen to circumvent problems encountered with some tablet drivers. Moreover, not all eye trackers time-stamp their data.

The tablet and eye tracker that you have selected and configured are activated as soon as data acquisition begins.

If the eye-tracking system is capable of doing so, its calibration procedure is automatically and immediately launched at the start of data recording, without any request on your part.

For EyePuter and ASL504 (serial mode), you will have to carry out an independent calibration prior to acquisition.

The acquisition is monocular (right eye or left eye alone, cf. Eyelink configuration panel, p.18).

II. "SIMPLE" ACQUISITION

(*File/Acquisition/Simple* menu)

The "Simple" mode of acquisition allows you to record tablet and eye data (if you are actually using an eye tracker, of course) using the simple acquisition parameters defined in the acquisition configuration panel.

Steps to launch the Simple acquisition mode are described below.

A dialog box will appear, asking for the name of the file in which to save the recorded data.

STEP	DESCRIPTION
1	Select the directory in which you want the data to be recorded.
2	Give the file a name, such as the subject's name (example: subject 1).
3	Click on the "*Save*" button. The "*Go*" button will then become available.
4	Click on the "*Go*" button to start your protocol and data recording.

To end the session using the simple acquisition mode, you have two solutions:

- press the pen in the "end" trigger zone on the tablet (normal exit);
- press the "*Escape*" key ("emergency" exit).

III. SCRIPT-BASED ACQUISITION

Acquisition based on script relies on a mini programming language.
This pseudo language is made up of a list of **commands** (for the complete list, see p.136**).**
These commands have to be written in a **text file ("*.txt**").
There must be only one command per line. No spaces (blanks) are allowed.
A set of commands in a text file is called a script.

In a script, a line may contain three sorts of items:

- a **command**
- a **comment**: defined by a semi-colon at the beginning of the line and followed by text (spaces allowed)
- a **label:** defined by "**:**" followed by a single word.

*Example**:***

```
Command1
; my comment is here      <-- A comment
command2
:Tag1                     <-- A label
Command3
```

III.1. Script-based acquisition dialog box

(*File/Acquisition/Script* menu)

When launching the script-based acquisition mode, a “start” dialog box is displayed on the screen.

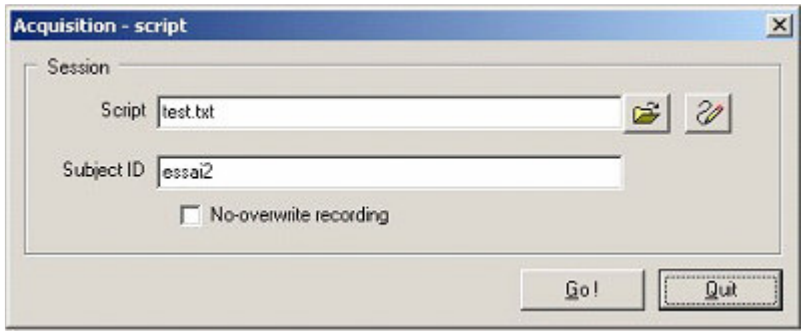


Figure 27: Script-based acquisition dialog box.

LABEL or ICON	DESCRIPTION
Script	Displays the name of the current script.
	Allows you to select the script you want to use. By default, the last used script is proposed.
	Modifies the current script in a Windows notepad. **Caution:** a script file must be saved in "text only" file format (“.txt”) if it is to be understood by Eye and Pen.
	Launches Windows Notepad to create a new script. Once the script is written, saves it and closes the notepad. To use this new script, click on the “folder” icon.
subject ID	Choose a name for the data file(s).
no-overwrite recording	This option allows you to avoid losing data from a previous recording if you mistakenly choose the same name. If this option is ticked and a data file with the same name already exists in the same directory, a warning will be displayed (recording is canceled).
Go !	Launches acquisition. First, the script is checked against major defects (syntax faults, missing files), then it is executed.
Quit	Closes the acquisition dialog box and returns to the main Eye and Pen screen.

III.2. Script commands.

Script uses two kinds of commands:

- commands comprising a single word.
  Example: `Command1`
- commands comprising a command word followed by parameters between brackets, separated by a comma.
  Example: `Command1(parameter1,parameter2)`

When using the second type of command, replace the parameter definitions (between brackets) with their values.

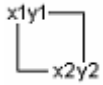
A few rules:

- never leave a blank (white space) in the text between brackets:
  - **Wrong:** `command(param1,  param2  ).`

    Mistake: spaces after the comma and before the last bracket;
  - **Right** : `command(param1,param2)`
- A single command, comment or label to a line
- the script analyzer does not like combinations of upper- and lower-case letters.

Reminder about coordinates:

X1 and Y1, X2 andY2 are the coordinates of the two opposite corners of a rectangular area (e.g. a screen, a picture, a zone on a tablet, etc.)

LABEL	DESCRIPTION
	X1 and Y1 coordinates correspond to the **upper left-hand corner** of the rectangle. X2 and Y2 coordinates correspond to the **lower right-hand corner** of the rectangle.
X1	Coordinate of the left edge of the rectangle.
Y1	Coordinate of the upper edge of the rectangle.
X2	Coordinate of the right edge of the rectangle
Y2	Coordinate of the bottom edge of the rectangle.

To find out the number of a color, there is a simple method. Follow the steps below:

STEP	DESCRIPTION
1	Open the acquisition configuration panel. Click on the "*File*" menu, select "*Configuration*" and click on "*Acquisition"*.
3	Select the tab labeled "*Display*".
4	Click on the "*Change*" button, next to "*Pen tracing color"*.
5	Select the color you want and click on "*OK"*. The color number will be displayed in the sample color box to the left of the "*Change*" button.
6	Write this number down on a piece of paper (or in a notepad) and click on "*Cancel*".

The script commands are presented and explained below, divided into different function categories.

Files and directories

Can a subject's existing data file be overwritten?

SetSafeRec(DontErase)

This command redefines the "*Safe recording (no subject overwrite)*" option in the dialog box.

Replace "*DontErase*" by:

- TRUE: no recording allowed if a file already exists.
- FALSE: allow data overwrite if one already exists.

Example
If you insert the command `SetSafeRec(False)` into a script, after this command, there will be no further overwrite checks.
If, a few lines further, you insert the command `SetSafeRec(True)`, **from that line onwards**, data will not be erased and it will be impossible to record them with the same name.

Hint: deactivate this checking for the training trials (to limit the number of useless files) and reactivate it for the following experimental trials.

Opens tablet and/or eye-tracking data recording file.

OpenRec(AddToSubjectName)

This command opens one/two file(s) to record the subject's data: one for the tablet data and one for the eye-tracker data, if an eye tracker is used.

The *"AddToSubjectName"* parameter allows you to define a suffix that will be added to the data filename (defined in the acquisition start dialog box).

Caution: each file opened with "*OpenRec*" must be closed with "*CloseRec*" (see next command description). If not, you may lose data.

Hint:
To avoid overwriting files if you are using a loop (e.g. when the subject has to perform the same task repeatedly), add "`_%`" at the end of *"AddToSubjectName*". This special option will be replaced by the number of times the script has read the last label (for a definition, p. 62).

Example 1
For a subject called "Toto" (you have defined his name in the start dialog box), the command `OpenRec(_serie1)` will record tablet data in the filenamed "*toto_serie1.tab"*.

Example 2
You have used the command `OpenRec(_serie1_%)` . Subject Toto has passed the same label in the script twice. You' will therefore end up with two recording files: "*toto_serie1_1.tab*" and "*toto_serie1_2.tab*".

Closes the opened data recording file(s).

`CloseRec`

This command closes the current subject's recording data file(s) (tablet ".TAB" file and optional eye tracker ".EYE")

Redefines the stimuli default directory (pictures, texts, sounds, videos).

`SetPicsDirectory(DirectoryPath)`

This command redefines the directory of stimuli used in the scripts, initially defined in the "Script" tab of the acquisition configuration panel.

Replace "*DirectoryPath*" with the path to the directory containing your stimuli.

Example

`SetPicsDirectory(c:\mypictures\)` gives the "mypictures" directory on the "C" drive of the PC as the new default stimuli directory.

Redefines the default data files directory.

`SetDataDirectory(DirectoryPath)`

This command redefines the directory in which data files will be recorded (initially defined in the "Script" tab of the acquisition configuration panel).

Replace "*DirectoryPath*" with the path to the directory you want to use.

Example

The command `SetDataDirectory(c:\mydata\)` gives the "mydata" directory on the "C" drive of the PC as the new data recording directory.

Display

Redefines the coordinates of the display area on the screen.

`SetDisplayWindowCoord(X1,Y1,X2,Y2)`

This command redefines the coordinates of the display area on the screen (initially defined in the "Script" tab of the acquisition configuration panel).

Replace "*X1, Y1, X2 andY2*" with the coordinates (in pixels) of the new display area you want to use (to define coordinates, see p. 36).

Example

`SetDisplayWindowCoord(0,0,1024,768)` defines a display area on the screen of 1024 x 768 pixels, beginning in the upper left-hand corner.

Hint:

If you have two 1024 x 768 resolution screens, the command `SetdisplayWindowCoord(1024,0,2048,768)` will move the display area to the second monitor. For this to work properly, ensure that Windows desktop extends to both monitors (see Windows user manual). However, note

that this configuration can lead to problems with certain LCD tablet drivers (see Appendix VII).

Redefines the color of the trace left by the pen on the screen.

`SetPenColor(ColorValue)`

This command redefines the "ink" color of the pen when tracing is reproduced on the screen (initially defined in the “Script” tab of the acquisition configuration panel).

Replace the term “*ColorValue*” with the number of the color you want.
Color numbers range from **0** (**black**) to **16777215** (**white**).

To find the color that meets your needs, follow the steps described in the introduction (p. 54)

Example

After the command `SetPenColor(0)`, the pen will write in black.

Redefines the characteristics of messages or texts displayed on the screen.

`SetFont(FontName,FontSize,FontColor,BkgndColor)`

This command redefines the characteristics of the font and the background of the text displayed on screen (initially defined in the “Script” tab of the acquisition configuration panel).
Replace the parameters (described below) with the appropriate values.

LABEL	DESCRIPTION
FontName	Name of the font used. Respect upper/lowercase letters and spaces in the names (you will find the font names in a word processor).
FontSize	Font size (in points, same unit as in word processors).
FontColor	Font color (color number)
BkgndColor	Background color for text display (color number)

Example

After the command `SetFont(Comic sans MS,14,0,16777215)` has been read by the Eye and Pen script interpreter, the text will be displayed:

- in black (*BkgndColor* = “0”);
- in the Comic sans MS font (*FontName* = “Comic sans MS”);
- in 14 points (*Fontsize* = “14”);
- against a white background (*BkgndColor* = “*16777215*”).

Eye tracker

Redefines the calibration area coordinates on the screen.

`SetCalibrationCoord(X1,Y1,X2,Y2)`

This command redefines the calibration area coordinates on the screen (initially defined in the "Eyetracker" tab of the acquisition configuration panel).

Replace *"X1", "Y1", "X2" and "Y"* with the calibration area coordinates (in pixels) you have chosen (see p. 53).

Example

`SetCalibrationCoord(0,0,1024,768)` defines a calibration area that is 1024 pixels wide (horizontally) and 768 pixels high (vertically), beginning in the screen's upper left-hand corner.

Hint:

If you are using two 1024*768 resolution screens, the `SetCalibrationCoord(1024,0,2048,768)` command will locate the calibration area on the second (screen) monitor (see double screen configuration in Appendix VII, p.141).

Launches the calibration procedure.

`TestCalibration`

This command launches the calibration procedure for the selected eye tracker;

For Eyelink, the calibration procedure is supplied by the eye-tracker interface.
For Eyeputer, this command launches a specific ("home made") calibration dialog box (see p.119).

Tests calibration reliability.

`TestDrift`

This command launches a test to assess eye-tracker coordinates drift.

For Eyelink, the test is run with a single (central) point, whereas with EyePuter, the entire calibration procedure is repeated. For EyePuter, you can also choose to test just one point.

Stop and wait for a key press

Stops the script. It starts again when a keyboard key is pressed.

`WaitForKeyPress`

This command puts the script on hold. As soon as a key is pressed, the script execution resumes.

Displays a message on the screen and stops.
The script starts again when a keyboard key is pressed.

`WaitForKeyPressMsg(Message,X,Y)`

This command displays a message on the screen and stops the script. As soon as a key is pressed, the message disappears and the script resumes.

To set the message content, replace the term "*Message*" with the message content you want.

Caution: do not insert "**,**" in your message, as it is a parameter separator and the command may have unexpected consequences.

To set the message's position in the display windows, replace "*X*" with the horizontal coordinates (in pixels) of the message's first character and "*Y*" with its vertical coordinates.

To set the message's horizontal and vertical coordinates, you can:

- proceed by trial and error;
- use a relation including the screen's physical size and its resolution (see FAQ, p.142).

Hint: to center the message in one/both dimension (s), set the corresponding coordinate to "-1".

Example

The command `WaitForKeyPressMsg(Press a key to continue...,-1,600)` stops the script and displays the message "Press a key to continue..." on the screen. This message is horizontally centered (X=-1), near the bottom of the screen (its vertical coordinate Y is 600). As soon as a key is pressed, the script resumes.

Displays a text file on the screen and goes into pause.
The script starts again when a keyboard key is pressed.

`WaitForKeyPressText(TextFileName)`

This command displays the content of a text file on the screen (taken from the stimuli directory) and stops the script.

Recall: the stimuli directory is defined in the "*Script"* tab of the acquisition configuration panel, or redefined via the `SetPicsDirectory` command.

As soon as a key is pressed, the text disappears from the screen and the script resumes.

To be properly displayed, the text file must be in a "text file" format (".TXT" extension), or "text only" or "raw text", depending on the application.

Example

The command `WaitForKeyPressText(mytext.txt)` displays the text contained in the "mytext.txt" file and stops the script.

Displays a picture on the screen and stops.
The script starts again when a key is pressed.

`WaitForKeyPressPic(PictureFileName,X,Y)`

This command displays the picture (found in the stimuli directory) and stops the script.
A s soon as a key is pressed, the script resumes.

To set the picture that will be displayed, replace "*PictureFileName*" with the name of the file containing the picture. The picture must be in a bitmap format ".bmp".

To set the picture position in the display window (on the screen), replace "*X*" with the horizontal coordinates (in pixels) of the picture's upper left-hand corner, and "*Y*" with the vertical coordinates of the picture's upper left-hand corner.

To set the picture's horizontal and vertical coordinates, you can :

- proceed by trial and error;
- use a relation including the screen's physical size and resolution (see FAQ, p.142).

Hint : to center the picture in one/both dimension(s), set the corresponding coordinate to "-1".

Example

The command `WaitForKeyPressPic(icon.bmp,10,370)` displays the "icon.bmp" picture at the following coordinates: 10 (horizontal) and 370 (vertical).

Stops the script and waits for the subject to press the pen in a defined tablet area.

`WaitForTabZoneAt(x1,y1,x2,y2,CanDraw,HidePic, MustLeave)`

This command stops the script until the subject presses the pen in the tablet area defined in this command.

To define the tablet zone (area), replace *"X1", "Y1", "X2" and "Y2"* with the coordinates (in tablet units, i.e. lines) of the area you have chosen (see p. 34).

- With the 4 coordinates set to **0**, the pen may be pressed anywhere on the tablet to "re-start" the script.
- With the 4 coordinates set to **-1**, it is the **start zone** coordinates which are used (defined in the "Script" tab of the acquisition configuration panel)

The other parameters can be given two values :

- "TRUE": activates the parameter;
- "FALSE": deactivates the parameter.

The table below explains these parameters, assuming a "TRUE" value.

LABEL	DESCRIPTION
CanDraw	The subject's writing is reproduced on the screen, until the pen is pressed in the zone.
HidePic	When the subject presses the pen in the zone, the picture being displayed disappears.
MustLeave	The pen must leave the zone before the script can continue.

Example

```
WaitForTabZoneAt(17327,5015,19850,2415,FALSE,TRUE,FALSE)
```

stops the script. If the subject presses the pen in the defined tablet area (coordinates X1=*17327*, Y1=*5015*, X2=*19850*, Y2=*2415),* the script resumes.

As the "*HidePic*" parameter is "TRUE", the picture will be removed from the screen when the pen is pressed in the zone.

Jumps in the script

The mechanism of **jumping into/through the script** allows you to eliminate the sequential aspect of the script (one command after another, in the right order) and create loops or interactive sequences.
This enables a subject to repeat the same task many times (with a maximum number) or to carry out different tasks, depending on the zone in which the pen is pressed.

Define a label.

:label

A label is a particular location in the script (mark). Strictly speaking, this is not a command, but a mark in the script. For this reason, each label in the script must be different.
Different "jump" commands allow subjects to go straight to a particular label (see other commands in this section).
When "jumping", commands located between the jump command and the destination label are ignored.

Replace the term "*label*" with a word of your choice.
You can insert spaces in front of the labels or the commands (indentation) in order to make your script easier to read.

Example

```
Command1
Command2
      :label
       Command3
       Command4
 etc.....
```

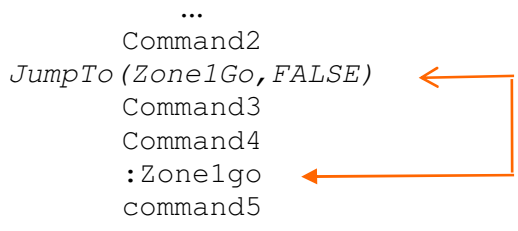
Jump to a label in the script.

JumpTo(Label,MustCloseRec)

This command "jumps" to the relevant label and, if specified in the parameters, closes the recording file.
All commands between this command and the relevant label will be ignored and the script will resume after the label.

Replace **"***label*" with the name of the label you want the script to jump to (without ":").
Replace **"***MustCloseRec*" with **"**TRUE", if you want to close an open data recording file, or "FALSE" if you do not need to.

Example



When the script interpreter reads the command `JumpTo(Zone1Go,FALSE)`, it will jump to "*Zone1go*".
Commands between `JumpTo(Zone1Go,FALSE)` and the destination label will not be executed (`command3` and `command4`). The script will continue and execute `command5`.
If the "MustCloseRec" parameter had been given the "TRUE" value, the subject's recording file would have been closed.

This command is mostly useful when used in conjunction with conditional jump commands (a jump is made if a condition is met, e.g. when the pen is pressed in a particular area of the tablet).

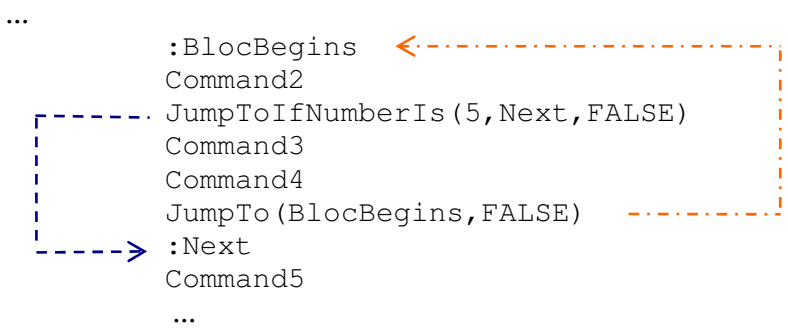
Jump to another label when the script has passed a label (preceding the command) a certain number of times.

JumpToIfNumberIs(Iterations,Label,MustCloseRec)

This command is only executed if the script has passed the label in front of (above) the command a certain number of times. If this is the case, the jump will be executed to the relevant label.
Replace "*Iterations*" with the maximum number of times the script can "see" the preceding label before executing the jump.
Each label has an internal iteration counter.
Replace "*Label*" with the name of the label to jump to (without "**:**").

Replace "*MustCloseRec*" (close an open recording data file or leave it open) with "TRUE" to activate this parameter or "FALSE" to ignore it.

Example



When the script reaches the `JumpTo(BlocBegins,FALSE)` command, it jumps to the "`:BlocBegins`" label.
The `JumpToIfNumberIs(5,Next,FALSE)` command is activated after its fifth "reading".
The command is then executed and the script jumps to the ":Next" label.
Commands 3, 4 and `JumpTo(BeginningOfBloc, FALSE)` are ignored and not executed.
The script resumes from the "`:Next`" label, reads command5 and executes it.

By the end, `Command2` will have been executed 5 times, whereas `Command3` and `Command4` will have been executed 4 times.

Examples of use

1 – Making a subject repeat a task several times.

2 – Used in conjunction with other commands, allowing a subject to repeat a task a maximum number of times, without any obligation to reach this maximum.

Jumps in the script triggered by tablet zones

Associate a label with a tablet zone.

`DefineTabZone(X1,Y1,X2,Y2,Label)`

This command allows you to "bind" the indicated label to a tablet area. When the subject presses the pen into the defined tablet are, the script jumps to the label location (in script).

To define the tablet zone, replace *"X1", "Y1", "X2" and "Y2"* with the area's coordinates on the tablet.

Replace "*label*" with a word of your choice.

Reminder: the coordinates are defined in tablet units (see p. 34).

Example

```
...
DefineTabZone(7327,5015,1850,2415,Zone1Go)
Command3
Command4
:Zone1Go
command5
....
```

`DefineTabZone(7327,5015,1850,2415,Zone1Go)` defines a tablet zone with coordinates *X1= 7327*, *Y1= 5015*, *X2=1850* and *Y2=2415*, bound to the "`:Zone1Go`" label.

You can use this command several times to create several zones that will be used at the same time.
This way, you create a "multiple choice" situation (cf. exercises in Appendix III).

Zones will be checked in their order of creation. This means that you can create one zone inside another, by creating the smaller zone first, then creating a larger one to encompass it. When the pen is pressed in the smaller zone, it will be recognized as an activation of the smaller zone, not the larger one.

You can create multiple zones aiming towards the same label.

Jump to a label depending on the selected tablet zone.

`WaitForTabZones(CanDraw,HidePic,MustLeave,MustCloseRec)`

This command stops the script until the subject has pressed the pen in one of the zones previously defined using the `DefineTabZone(X1,Y1,X2,Y2,Label)` command (see previous command description).

The **parameters** can be given two values :

- "TRUE": activates the parameter;
- "FALSE": deactivates the parameter.

The table below explains these parameters, assuming a "TRUE" value.

LABEL	DESCRIPTION
CanDraw	The subject's writing (drawing) is reproduced on the screen until the pen is pressed in one of the zones the script is waiting for.
HidePic	When the subject selects one of these zones, the picture being displayed disappears from the screen.
MustLeave	The pen must "quit" the zone before the script can continue.
MustCloseRec	Closes the current data recording file.

Example

```
...
Command2
DefineTabZone(7327,5015,1850,2415,Zone1Go)
Command3
WaitForTabZones(TRUE,FALSE,TRUE,FALSE)
Command4
:Zone1go
command5
...
```

The ":`Zone1Go`" label *is bound* to a tablet zone by the command `DefineTabZone(7327,5015,1850,2415,Zone1Go).`

The script executes Command3 and goes on hold, with the command `WaitForTabZones(TRUE,FALSE,TRUE,FALSE).`

As the "Candraw" parameter is "TRUE", the subject's writing is shown on the screen until the command comes to an end, i.e. when the subject presses the pen in the defined tablet zone.

As the "*MustLeave*" parameter is "TRUE", the command will only come to an end when the pen leaves the tablet zone.

The script will then "jump" to the "`:zone1Go`" label.

The script will continue and execute `Command5`.

In this example, you can see that `command4` will never be executed.

Clears previously defined tablet zones (defined by "*DefineTabZones*")

`ClearZones`

This command erases all tablet zones previously defined using the "`DefineTabZone`" command.

Stimuli

Displays a message for a certain length of time.

`DisplayMsg(Message,Duration,X,Y)`

This command is used to display a message for a user-defined duration, at the indicated screen coordinates. The script remains "on hold" until the display time has elapsed. The message disappears when the command comes to an end.

To set the content of the message, replace "***Message***" with the text you want to display.

Caution : do not include "**,**" in your message, as it is a parameter separator.

To set the message display duration, replace "***Duration***" with the desired amount of time, expressed in **milliseconds.**

To set the message's position in the display windows, replace "*X*" with the horizontal coordinate (in pixels) of the message's first character and "*Y*" with its vertical coordinate.

To set the message's horizontal and vertical coordinates, you can:

- proceed by trial and error;
- use a relation including the screen's physical size and resolution (see FAQ, p.142).

Hint :

- to center the message in one/both dimension(s), set the corresponding coordinate to "-1";
- to leave the message on the screen "forever", set duration to "-1". The script will resume immediately, without erasing the message.

Example

With the command `DisplayMsg(Hello world,500,120,600),` the message "Hello world" will be displayed for 500 milliseconds.

Erases the message left on the screen.

`HideMessage`

This command removes the message previously displayed with DisplayMsg (see above).

Displays a text file for a certain length of time.

`DisplayText(TextFileName,Duration)`

This command is used to display the content of a text file for a certain length of time. The script remains until the display time has elapsed. The text disappears when the command comes to an end.

Replace "***TextFileName***" with the name of the **text file** you placed in the stimuli directory.
Caution : do not forget to add the ".txt" extension to the filename.

Replace "**Duration"** with the **duration** (in milliseconds) of the text display.

Hint: if you want the text to remain "forever" on the screen, set the duration to "-1". The script will immediately resume, without erasing the text.

Example

With the `DisplayText(mytext.txt,500)` command, the text contained in the text filenamed "*mytext.txt*" (found in the stimuli directory) will be displayed for 500 milliseconds.

Erases the text on screen

`HideText`

This command removes the text displayed on the screen as a result of the "`DisplayText`" command.

Displays a picture for a certain length of time.

`DisplayPic(PictureFileName,Duration,X,Y)`

This command is used to display a picture (found in the stimuli directory) for a certain length of time. The script stays on the screen until the display time has elapsed. The picture disappears when the command comes to an end.

Replace "***PictureFileName***" with the name of the **picture** (do not forget the ".bmp" format extension).

Replace "**Duration**" with **the length of time** (in milliseconds) you want.

To set the picture's position in the display windows, replace "*X*" with the horizontal coordinate (in pixels) and "*Y*" with the vertical ccordinate of the picture's upper left-hand corner.

To set the picture's horizontal and vertical coordinates, you can:

- proceed by trial and error;
- use a relation including the screen's physical size and resolution (see FAQ, p.142).

Hint:

- to center the picture in one/both dimension(s), set the corresponding coordinate to "-1".
- to make the picture remain on the screen "forever", set the duration to "-1". The script will resume immediately, without removing the picture.

Example

With the `DisplayPic(icon.bmp,500,120,120)` command, the picture "*icon.bmp*" will be displayed for 500 milliseconds at the coordinates *X=120*, *Y=120*.

Erases the picture on the screen.

`HidePicture`

This command removes the picture from the screen (previously displayed using the DisplayPic or DisplayImageList command).

Displays a video file.

`DisplayAVI(VideoFileName,X,Y,Wait)`

This command displays a video (found in the stimuli directory) at specified coordinates (relative to the display window). The video disappears when it is finished.

Replace "***VideoFileName***" with the video file's full name (including its ".AVI" extension).
Caution : Eye and Pen can only read ".avi" video format, preferably with MS-RLE compression. To check whether the video file complies:

- In Windows, select the video file and, with a right mouse button click, select the Summary tab in Properties;
- Look in "*Video*" for the "*Compression*" label to check the video's compression mode. It should be either "none" or "MS-RLE".

To set the video's position in the display windows, replace "*X*" with the horizontal coordinate (in pixels) of the video's upper left-hand corner and "*Y*" with its vertical coordinate.

To set the video's horizontal and vertical coordinates, you can:

- proceed by trial and error;
- use a relation including the screen's physical size and resolution (see FAQ, p.142).

Hint: to center the video in one/both dimension(s), set the corresponding coordinate to "-1".

The "Wait" parameter determines whether the script should wait for the video to finish before continuing or not. This parameter can be given two values:

- "FALSE": the video starts to play and the script immediately resumes;
- "*TRUE*": the film starts and the script goes on hold. No script commands are executed while the video is being played.

Example

With the command `DisplayAVI(MyVideo.avi,-1-1,TRUE,)` the "*Myvideo.avi*" video is played in the center of the display window, because "*X*" and "*Y*" both have a "-1" value. The script resumes as soon as the video is finished.

Stops the video playing.

`StopAVI`

This command stops the AVI video currently being played

Displays a series of pictures one after another.

DisplayImageList(ListFileName,X,Y,
DurationPerPicture,HideLastPic)

This command displays pictures one after another (at the specified coordinates) for a specified length of time.

Replace "***ListFileName***" with a text filename (TXT format) containing the picture list (.bmp format) to be displayed (one picture name per line). Save this file and the pictures in the stimuli directory.

Example:
The file `MyList.txt` contains:
Eye.bmp
And.bmp
Pen.bmp

> **Caution** : all pictures must be the same size. The first picture to be displayed will define the size of all the others.

To set the picture's position in the display windows, replace "*X*" with the horizontal coordinate (in pixels) of the picture's upper left-hand corner and "*Y*" with its vertical coordinate.

To set the picture's horizontal and vertical coordinates, you can:

- proceed by trial and error;
- use a relation including the screen's physical size and resolution (see FAQ, p.142).

Hint: to center the picture in one/both dimension(s), set the corresponding coordinate to "-1".

Replace "***DurationPerPicture***" with the amount of time (in milliseconds) you want each picture to displayed for.

Replace "***HideLastPic***" with TRUE to remove the last picture from the screen or FALSE to leave it.

Hint : if you use the same background color for all the pictures, you will reduce the visual transition effect between the pictures.

Example
With the `DisplayImageList(Mylist.txt,120,120,250,FALSE)` command, the pictures listed in the "*mylist.txt*" file will be displayed one after the other. Each picture will be displayed at the coordinates X=120 and Y=120 for 250 milliseconds and the final picture will remain on the screen.

Plays an audio file.

PlaySound(WaveFileName,Wait)

This command plays an audio file (found in the stimuli directory) in ".wav" format.
Replace "*WaveFileName*" with the filename (do not forget to add ".wav" to the name).
The "Wait" parameter determines whether the sound is to be played as a background task or not.
This parameter can be given two values:

- "FALSE": playing begins and the script resumes immediately;
- "*TRUE*": playing begins and the script goes on hold. No other script command is executed until the audio sequence has finished.

Caution:
If you use this command twice (with no other command between the two), a "system" malfunction may occur.
This is because "Eye and Pen" uses a media player which takes some time to close, before being able to reopen with another file.
It is therefore advisable to create a single sound file containing several sound sequences (e.g. as a series of numbers).

Example
The command `PlaySound(ding.wav,FALSE)` plays the "*ding.wav*" sound file and the script continues (the "*Wait*" parameter is "*FALSE*"). The script's next command is immediately executed.

Example of use : a dictation.

Stops the audio play.

StopSound

This command stops the audio file currently being played.

Changes the sound output level.

SetVolume(value)

This command allows you to change the sound level for the audio output.

Replace "value" with a number between 0 (mute) and 65535 (maximum) to set the sound level.

Using the "Simple" acquisition mode

The commands described below are intended to give you the ability to use the "Simple" acquisition mode ("Simple" tab of acquisition configuration panel), allowing you to change some or all of its parameters.
You will then be able to record more than one task using this paradigm, for instance, with different pictures each time. Then again, you could use this task without any modification, but in the middle of a set of other tasks.

Launches the Simple acquisition paradigm.

`RecStandard(AddToSubjectName)`

The `RecStandard` command allows you to activate the simple acquisition paradigm, with the parameters defined in the acquisition configuration panel (Simple tab) of Eye and Pen. Replace *"AddToSubjectName*" with a suffix that will be added to the recording file's name.

> **Caution**: this command manages the opening and closing of the recording data files. This means that you do not have to use `OpenRec` and `CloseRec`.

Example

For the subject "Toto", the command `RecStandard(_standard)` launches the Simple acquisition (as if you had launched it yourself, using the File/Acquisition/Simple menu of Eye and Pen). The tablet data will be saved in "*toto_standard.tab"* and the eye-tracking data in "*toto_standard.eye*".

Launches the Simple acquisition, changing background picture and trigger zone use

`RecNewUsages(AddToSubjectName,UseBack,UseZone1,`
`ShowOnStart,HideOnPress,UseZone2)`

This command allows you to launch the Simple acquisition, redefining the activation of the background picture and trigger zones 1 and 2. These uses were initially defined in the acquisition configuration panel (Simple tab).

> **Caution**: this command manages the opening and closing of the recording data files. This means that you do not have to use `OpenRec` and `CloseRec`.

Replace *"AddToSubjectName"* with a suffix that will be added to the recording file's name.

Parameters can be given two values:

- "TRUE": activates the parameter;
- "FALSE": deactivates the parameter.

The following table describes the parameters, assuming a "TRUE" value.

PARAMETER	DESCRIPTION
UseBack	Use a background picture.
UseZone1	Use trigger zone 1.
ShowOnStart	Show the picture associated with trigger zone 1 as soon as recording starts.
HideOnPress	Hide the picture associated with trigger zone 1 as soon as the subject presses the pen on the tablet. **Caution**: this parameter will only be taken into account if "*ShowOnStart*" is activated.
UseZone2	Use trigger zone 2.

Example

With the subject "*Toto*", the command `RecNewUsages(_P3,FALSE,TRUE,FALSE,FALSE,FALSE)`:

- saves data under the name "*toto_P3*";
- there will not be any background picture ("*UseBack*" is "*FALSE*");
- trigger zone 1 will be used *("UseZone1"*= "TRUE");
- the associated picture will not be displayed *("ShowOnStart*" is "FALSE" and so "*HideOnPress*" will be ignored);
- trigger zone 2 will not be used *("UseZone2*" is "*FALSE*").

Launches the Simple acquisition, changing pictures

`RecNewPics(AddToSubjectName,BackPic,Pic1,Pic2)`

This command allows you to launch the Simple acquisition and to change the background picture and pictures associated with trigger zones 1 and 2 (initially defined in the Simple tab of the acquisition configuration panel).

> **Caution**: this command manages the opening and closing of the recording data files. This means that you will not have to use `OpenRec` and `CloseRec`.

Replace *"AddToSubjectName"* with a suffix that will be added to the recording file's name.

The following table describes the parameters.

PARAMETER	DESCRIPTION
BackPic	Background picture filename
Pic1	Picture filename associated with trigger zone 1
Pic2	Picture filename associated with trigger zone 2

Reminder**:** do not forget to add ".bmp" to the picture names.

Example:
For the subject "*Toto*", the command
`RecNewPics(_P2,YellowBack.bmp,Capsela.bmp,car.bmp):`

- saves the data under the name "*toto_P2*";
- the background picture is "YellowBack.bmp" ("*BackPic*" is "*YellowBack.bmp*");
- the picture associated with trigger zone 1 is "*Capsela.bmp*";
- the picture associated with trigger zone 2 is "*car.bmp.*

Launches the Simple acquisition, changing picture names and uses.

`RecNewPics&Usages(AddToSubjectName,BackPic,UseBack,`
`Pic1,UseZone1,ShowOnStart,HideOnPress,`
`Pic2,UseZone2)`

This command is a "compilation" of RecNewPics and RecNewUsages (see above). It launches the Simple acquisition, allowing you to change the pictures and their activation for background and trigger zones at the same time.

> **Caution**: this command manages the opening and closing of the recording data files. This means that you do not have to use `OpenRec` and `CloseRec`.

Replace *"AddToSubjectName"* with a suffix that will be added to the recording file's name.

Parameters for use can be given two values:

- "TRUE": activates the parameter;
- "FALSE": deactivates the parameter.

The following table describes the parameters (assuming a "TRUE" value for use parameters):

PARAMETER	DESCRIPTION
BackPic	Name of the background picture file.
UseBack	Use the background picture
Picture1	Name of the picture file associated with trigger zone 1.
UseZone1	Use trigger zone 1
ShowOnStart	Display the picture associated with trigger zone 1 as soon as the protocol recording begins
HideOnPress	Hide the picture associated with trigger zone 1 as soon as the subject presses the pen on the tablet. **Caution**: this parameter will only be taken into account if "*ShowOnStart*" is activated.
UseZone2	Use trigger zone 2
Picture2	Name of the picture file associated with trigger zone 2.

Example
For the subject "*Toto*", the command
`RecNewPics&Usages(_P4,YellowBkgnd.bmp,TRUE,Capsela.bmp,TRUE,TRUE,TRUE,car.bmp,FALSE):`

- the recorded data will be saved under the name "*toto_P4*";
- the background picture is "*YellowBkgnd.bmp*";
- the background picture will be displayed (*UseBack = TRUE)*;
- the picture file named "*Capsela.bmp*" is associated with trigger zone 1;
- trigger zone 1 will be used (*UseZone1 = TRUE*);
- the picture associated with trigger zone 1 will be displayed when the command starts (*ShowOnStart = TRUE*);
- the picture associated with trigger zone 1 will be removed as soon as the subject presses the pen on the tablet to write or draw (*HideOnPress=TRUE*);
- the picture "*car.bmp*" is associated with trigger zone 2;
- trigger zone 2 will not be used (*UseZone2 = FALSE*).

Sets new coordinates for trigger zones 1 and 2.

`SetPicsZones(x1Zone1,y1Zone1,x2Zone1,y2Zone1, x1Zone2,y1Zone2,x2Zone2,y2Zone2)`

This command redefines the coordinates of trigger zones 1 and 2 on the tablet. These coordinates will replace the coordinates defined in the acquisition configuration panel of Eye and Pen (Simple tab). These new values will remain until the original values are restored by the "RestoreOriginalPicsZones"command (see below).

Replace "*X1Zone1*", "Y*1Zone1*", "X*2Zone1*", "*Y2Zone1*" with the new coordinates you want to use for **trigger zone 1**.

Replace "*X1Zone2*", "Y*1Zone2*", "X*2Zone2*", "*Y2Zone2*" with the new coordinates you want to use for **trigger zone 2**.

Reminder: coordinates are defined in tablet units (see p. 34).

Example

The command
`SetPicsZones(27094,23480,30480,18203,27094,14626,30480,9434)` defines:

- the coordinates for trigger zone 1 :
  X1=*27094,* Y1=*23480,* X2=*30480,* Y2=*18203 ;*
- the coordinates for trigger zone 2 :
  X1=*27094,* Y1=*14626,* X2=*30480,* Y2=*9434.*

Restores original coordinates for trigger zones 1 and 2.

`RestoreOriginalPicsZones`

This command restores the coordinates for trigger zones 1 and 2 that were originally defined in the acquisition configuration panel (Simple tab), before being redefined via the `SetPicsZones` command (see above).

Launches the Simple acquisition mode, redefining all parameters.

RecNewAll(AddToSjName,BkPic,UseBack,
Picture1,x1Zone1,y1Zone1,x2Zone1,y2Zone1,
UseZone1,ShowOnStart,HideOnPress,
Picture2,x1Zone2,y1Zone2,x2Zone2,y2Zone2,
UseZone2,X1ZoneEnd,Y1ZoneEnd,X2ZoneEnd,Y2ZoneEnd)

This command launches the Simple acquisition paradigm, redefining all the parameters of the acquisition configuration panel (Simple tab).

> **Caution**: this command manages the opening and closing of the recording data files. This means that you do not have to use OpenRec and CloseRec.

Replace *"AddToSubjectName"* with a suffix that will be added to the recording file's name.

Replace *"x1Zone1"*, "*y1Zone1*", "*x2Zone1*", "*y2Zone1*" with new coordinates for trigger zone 1 (in tablet units, see p.34).

Replace "x1zZne2", "*y1Zone2*", "*x2Zone2"*, "*y2Zone2*" with new coordinates for trigger zone 2 (in tablet units).

Replace "x1ZoneEnd", "*y1ZoneEnd*", "*x2ZoneEnd"*, "*y2ZoneEnd* with new coordinates for the "end" zone (in tablet units)

The other parameters can be given two values:

- "TRUE": activates the parameter;
- "FALSE": deactivates the parameter.

The following table describes the other parameters (assuming a "TRUE" value for use parameters):

PARAMETER	DESCRIPTION
UseBack	Use background picture.
BackPic	Name of the background picture file.
Picture1	Name of the piture file (.bmp format) associated with trigger zone 1.
UseZone1	Use trigger zone 1.
ShowOnStart	Display the picture associated with trigger zone 1 as soon as the protocol recording begins.
HideOnPress	Hide the picture associated with trigger zone 1 as soon as the subject presses the pen on the tablet. **Caution**: this parameter will only be taken into account if "*ShowOnStart*" is activated.
UseZone2	Use trigger zone 2.
Picture2	Name of the picture file associated with trigger zone 2.

Example

For the subject "*Toto*", the command

```
RecNewAll(_P5,YellowBkgnd.bmp,TRUE,Capsela.bmp,27094,23480,30480,
18203,TRUE, TRUE,TRUE,car.bmp,27094,14626,30480,9434,FALSE,
12456,1845,14170,1235)
```

defines :

- the data that will be saved under the name "*toto_P5*" ("toto_P5.tab" and "toto_P5.eye" if an eye tracker is used)
- the background picture is "*YellowBkgnd.bmp*";
- the background picture will be displayed (*UseBack = TRUE)*;
- the picture file named "*Capsela.bmp*" is associated with trigger zone 1;
- the coordinates of trigger zone 1 on the tablet are :
  X1=27094, Y1=23480, X2=30480, Y2=1820
- trigger zone 1 will be used (*UseZone1 = TRUE*)*;*
- "*Capsela.bmp*" will be displayed when the command starts (*ShowOnStart = TRUE*);
- the picture associated with trigger zone 1 will be removed as soon as the subject presses the pen on the tablet to write or draw (*HideOnPress=TRUE*);
- the picture "*car.bmp*" is associated with trigger zone 2
- the coordinates of trigger zone 2 on the tablet are:
  X1=27094, Y1=14626, X2=30480, Y2=9434;
- trigger zone 2 will not be used (*UseZone2 = FALSE*)*;*
- the coordinates of the "end" zone on the tablet are:
  X1=12456, Y1=1845, X2=14170, Y2=1235.

CHAPTER 3

Data analysis

I. INTRODUCTION

Data analysis allows you to sort, code and export recorded data (into text files).

In Eye and Pen, data analysis is based on the principle of the VCR: things are viewed as though the subject were being “filmed” during production. You can then watch the resulting movie in a variety of ways. To do this, different tools allow you to “navigate” through the data, moving forward or backwards with self-defined filtering parameters.

As soon as you launch the Simple or scripted acquisition mode, tablet and eye-tracking data are recorded and “stamped” with a common time baseline (in milliseconds).

To make data geometrically compatible, the coordinates of the eye-tracking data are converted into the same coordinates system as the tablet data. The tablet is used as a reference.

Example
If the tablet coordinates are in a (0,0,30240,30240) frame and the "eye" coordinates are in a (0,0,1024,768) frame, the "eye" coordinates are scaled to the (0,0,30240,30240) frame so that both sets of information can be stacked on the same surface.

Important :
If the sheet of paper slips on the tablet, or the eye-tracker helmet moves on the subject's head, eye-tracking and tablet data will not be spatially accurate. Thus, **some eye-tracking data may be outside the calibrated area instead of inside, where it should be**. To help solve this kind of problem, “Eye and Pen” has a tool that can “shift” an entire set of data (see page 94).

Hint :
To avoid pointless extra work, we recommend that you initially apply every **overall filter** in order to reduce the total amount of data (shift layers, fixation building, out-of-field data cleaning etc.). Next, apply the **automatic coding filters** (Areas Of Interest, etc.) and only then begin the **qualitative and manual analyses** (codings, etc.).
Here is an example of what should be avoided: you have coded some pauses "by hand" and you then apply an automatic coding. The codes of these pauses may change, even if you do not want this to happen.
It is important to carry out these operations in the right order.

The analysis may be closed at any time, by clicking on the “*File”* menu, then selecting “*Close analysis”*.

II. DATA ANALYSIS CONFIGURATION

To configure the data analysis, see “Data analysis configuration” in chapter 1.

III. START AN ANALYSIS

To start a data analysis, you can:

- **start a new analysis:** click on the “*File”* menu, then select “*Analysis*” and finally “*New*”. A dialog box will be displayed so that you can select the tablet data file (file with a “.tab” extension) you want to analyze. Click on the ”*Open*” button;
- **reload a previous analysis:** click on the “*File”* menu, then select “*Analysis*” and “*Open*”. A dialog box will let you select the analysis data file (file with a “.twk” extension) you want to work on again. Click on the “*Open*” button;
- **import tablet data from G-studio files** (written production recording software for the MS-DOS system, also based on digitizing tablets). Click on the “*File*” menu, select “*Imports*” and “*G-studio*”. A dialog box will be displayed to allow you to select the file you want to import into Eye & Pen (file with a “._” extension). Click on the “*Open*” button to start the analysis.

IV. INFORMATION AVAILABLE AT ANY TIME

In “analysis” mode, the screen is composed of a number of elements:

- 7 navigation tools:
  - from event to event (Evt) ;
  - from pause to pause (Pause) ;
  - from fixation to fixation (Fixation) ;
  - by tablet data code (TCode) ;
  - by eye data code (ECode) ;
  - with the distance between pen ("tablet") and gaze ("eye") locations (“d(TE)”) ;
  - a stopwatch (clock);
- a zoom;
- a tool for creating sequences in the protocol;
- a tool for coding data;
- an information bar (status bar).

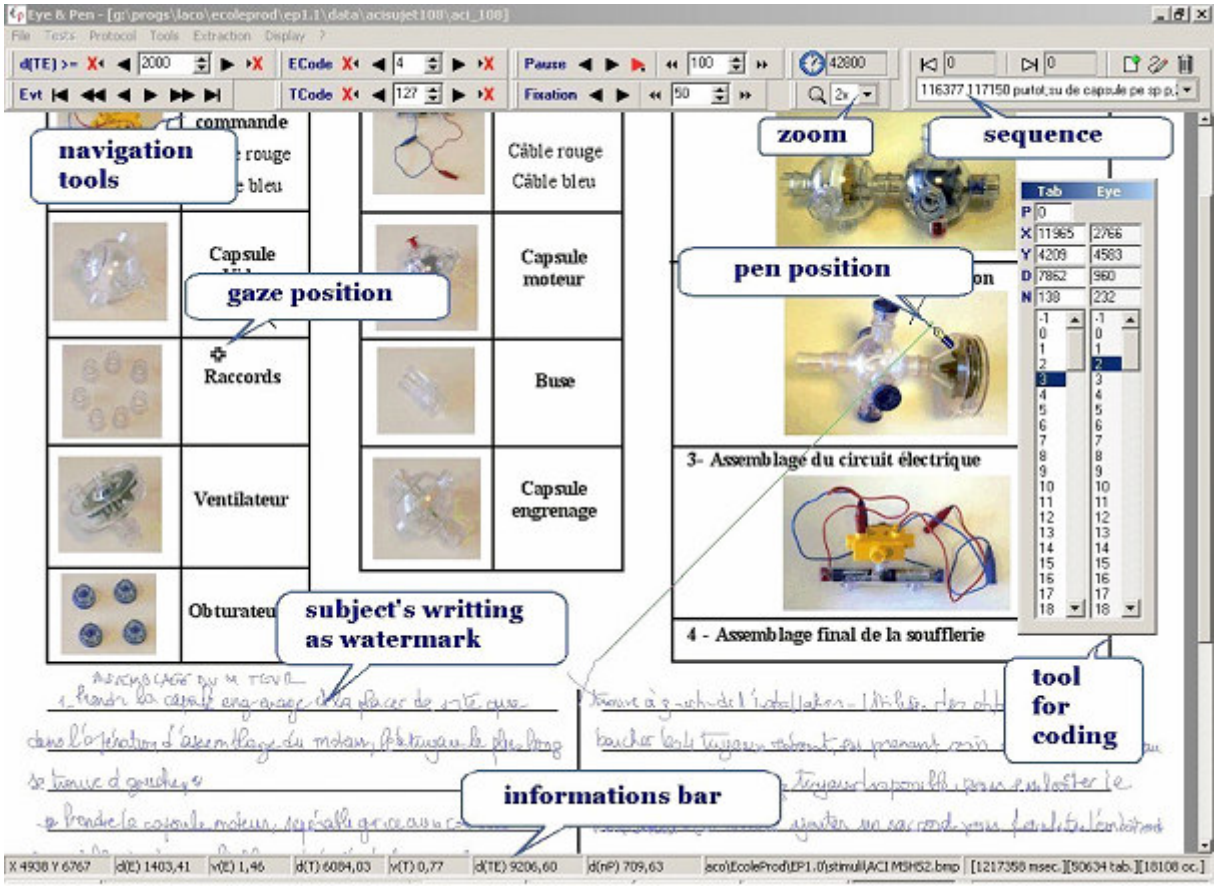
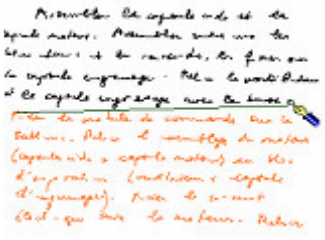


Figure 28: Data analysis screen.



When the pen is "Up" (pausing), a circle indicates the point where the pen left the tablet and a line connects this circle to the place where the pen subsequently "lands" (see *File/Configuration/Analysis* menu, “*Analysis”* tab to select “pause color”)

Figure 29: Representation of a pause.

IV.1. A tool for coding

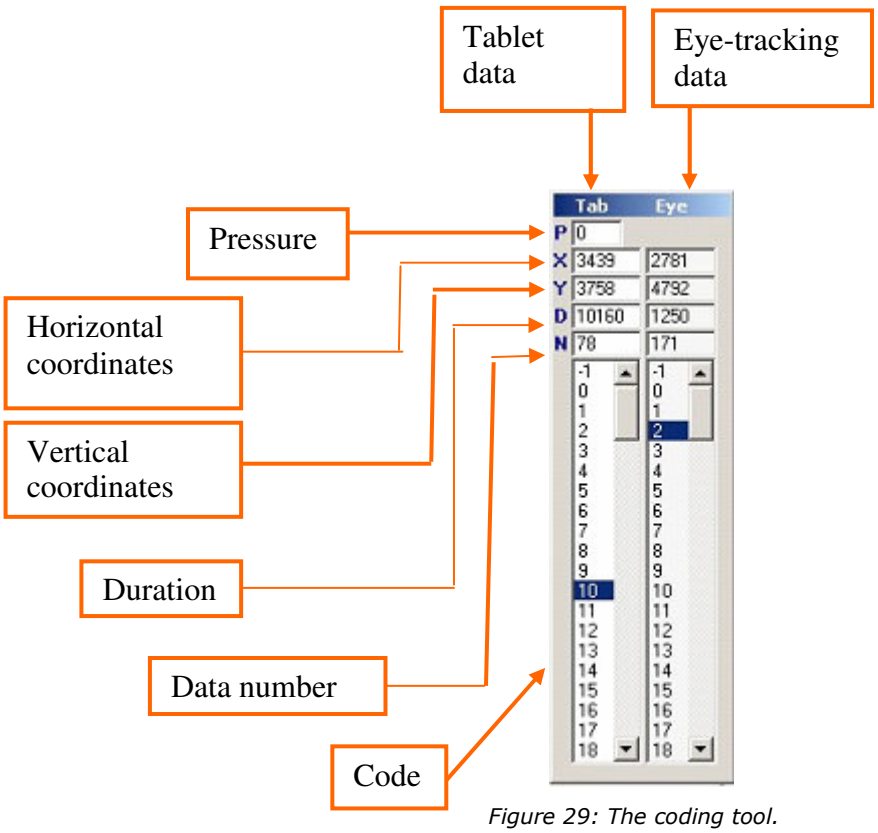


Figure 29: The coding tool.

While navigating through the protocol, the coding tool will show details of the current tablet and eye-tracking data. The code is a digit value (it is up to you to give it meaning).

LABEL	DESCRIPTION
P	Pressure exerted with the pen on the tablet.
	When the gaze position is beyond the calibrated area, a warning signal is displayed to the right of the pen pressure field, in the "Eye" data column.
X	Coordinate of the data (tablet or eye) on the horizontal axis.
Y	Coordinate of the data (tablet or eye) on the vertical axis.
D	Duration (in milliseconds) of the event, defined as the time that elapses between the current data and the following data of the same type (tablet or eye).
N	Data number (numbering from zero upwards). Each type of data is numbered separately.

You can reduce or enlarge the tool by double-clicking on its title bar. You can also move it.

IV.2. Information bar (status bar)

(*Display/Information* menu to show/hide this tool)

This tool provides additional information about the current data.

Figure 30:The information bar.

This information is described from left to right.

LABEL	DESCRIPTION
X **Y**	Mouse cursor's horizontal and vertical coordinates, expressed in tablet units. It may help you to check for the coordinates of a particular place in the protocol.
d(E)	Euclidian distance between current eye data (E stands for Eye) and the position of following eye data (in tablet units).
v(E)	Speed of movement between current eye data position and following eye position (in tablet units per millisecond).
d(T)	Euclidian distance between current eye data (T stands for Tablet) and the position of the following eye data (in tablet units).
v(T)	Speed of movement between current pen (Tab) data position and following pen position (in tablet units per millisecond)
d(TE)	Euclidian distance between current tablet data position and current eye data position (in tablet units).
d(nP)	Tracing distance (pen movements) between the end of the last "up" pause and the following "up" pause (in tablet units). This information can help you anticipate the next pause.
	Path and name of the background picture. Click on it to select a new one.
[]	**[** Total duration of protocol (in milliseconds) **]** **[** Total amount of tablet data ("tab.") **]** **[** Total amount of eye-tracking data ("oc.") **]**

IV.3. History

(*Protocol/History* menu)

This menu displays the list of processes that have been applied to the protocol in order to reduce the total amount of data, such as building fixations and the aggregation of successive data with the same code.

You can print this list and use the mouse right click to select, cut, paste or delete, as appropriate.

V. NAVIGATION

V.1. Introduction

You can navigate through the data in two ways:

- "spatially", by clicking with the right mouse button first on the place in the protocol that you would like to jump to (subject's writing on the tablet), then on the "*Jump here*" contextual menu that appears (see below).

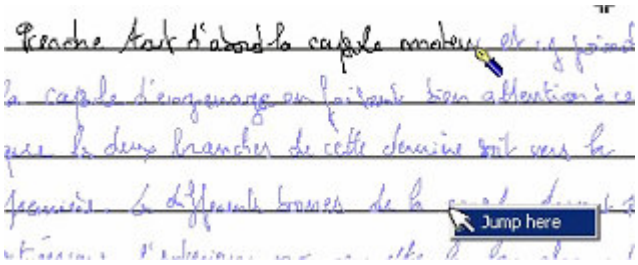


Figure 31: "Spatial" navigation.

Eye and Pen searches for the nearest item of data in a 5-pixel square around the mouse cursor. When it has been found, the protocol is "played" until it reaches this item.

- searching for a particular category of event:
  - from one item of data to the next;
  - from one pause to the next;
  - from one fixation to the next;
  - searching for the next item of "eye" or "pen" data with a particular code value;
  - searching for the next point where the distance between "eye" and "pen" data meets a given criterion.

The "***Display***" **menu** allows you to show or hide the **navigation toolbars** located under the menu bar.
These tools can be moved using "*drag'n'drop*":

STEP	DESCRIPTION
1	Click with the left mouse button on the vertical "line" left of the toolbar (to the left of its label)
2	Keep the left mouse button pressed down
3	Move the toolbar to the desired location.
4	Release the mouse button.

Important:

- the "**`shift + T`**" shortcut re-centers the protocol to make the pen cursor visible, i.e. on the screen ;
- the "**`shift + E`**" shortcut recenters the protocol to make the eye cursor visible, i.e. on the screen.

V.2. Navigating from one event to another

(*Display/Events navigation* menu allows you to show/hide this tool)

This tool allows you to navigate within the protocol, from one event to another, through the whole set of data (tablet and eye-tracking). An event is either a movement or an immobilization of the pen or eye. An item of data is understood to be the content of an event: its coordinates, its timestamp, etc.

Figure 31: The button bar for navigating from one event to another.

ICON	DESCRIPTION
	Jump to the beginning of the protocol.
	Move continuously back through the events (keep the mouse button pressed down).
	Previous event.
	Next event.
	Move continuously forward through the events.
	Jump to the end of the protocol.

V.3. Navigating from one pause to another

(*Display/Pauses navigation* menu to show/hide this tool)

This tool helps you navigate from one pause to another, for a greater duration than the defined threshold (see VI. Thresholds).

Figure 32: The button bar for navigating through pauses.

ICON	DESCRIPTION
	Previous pause (up or down).
	Next pause (up or down).
	Go to the end of the current pause.
	Step back by "***n***" pauses (up or down).
9	Number of pauses for the "backward / forward by ***n*** pauses" functions.
	Step forward by "***n***" pauses (up or down).

V.4. Navigating from one fixation to another

(*Display/Fixations navigation* menu to show/hide this tool)

This tool helps you navigate from one fixation to another, with a greater duration than the defined threshold (see VI. Thresholds).

Figure 33: The button bar for nagivating through fixations.

ICON	DESCRIPTION
◀	Previous fixation.
▶	Next fixation.
◀◀	Move "***n***" fixations backwards.
12	Number of fixations for the "backward/forward by ***n*** fixations" functions.
▶▶	Move "***n***" fixations forwards.

V.5. Navigating through "Eye" data filtered by code

(*Display/Eye codes Navigation* menu to show/hide this tool)

This tool helps you navigate through the eye-tracking data ("Eye"), filtered by a code you have selected (see X. Data coding). This enables you to jump from one item of Eye data with the required code to another.

Figure 34: The button bar for navigating with Eye data codes.

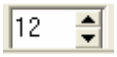
ICON	DESCRIPTION
X◀	Go back to the previous "Eye" data item without the required code value.
◀	Go to the previous Tab data item with the required code.
2	Code value.
▶	Go to the next "Eye" data item with the required code.
▶X	Go to the next "Eye" data item without the required code value.

V.6. Navigating through “Tab” data filtered by code

(*Display/Tab codes navigation* menu to show/hide this tool)

This tool helps you navigate through the tablet data (“Tab”), filtered by a code you have selected (see X. Data coding). This means you can jump from one item of tablet data showing the required code to another.

Figure 35: The button bar for navigating with tablet data codes.

ICON	DESCRIPTION
	Go back to the previous “Tab” data item without the required code value.
	Go to the previous “Tab” data item with the required code.
	Code value.
	Go to the next “Tab” data item with the required code.
	Go to the next “Tab” data item without the required code value.

V.7. Navigating through data filtered by gaze-pen distance

(*Display/Eye-Tab distance navigation* menu to show/hide this tool)

This tool allows you to navigate through the data on the basis of the (Euclidian) distance between the simultaneous gaze and pen positions (in tablet units).

Figure 36: The button bar for navigating according to the distance between gaze and pen positions.

ICON	DESCRIPTION
	Jump back to the previous point where the distance was below the criterion.
	Go back to the previous point (time) where the distance was equal to or above the criterion.
	Distance criterion (in tablet units).
	Go to the next point where the distance was equal to or above the criterion.
	Jump to the next point where the distance was below the criterion.

V.8. Navigating through time with the “clock”

(*Display/Clock* menu to show/hide this tool)

As soon as data recording starts, each item of data is "time-stamped" with a millisecond timing. Time “0” (zero) is the point where the recording started.
This tool allows you to navigate through the data, according to the time.

Figure 37: The clock.

The time (in milliseconds) that has elapsed since the beginning of the recording is displayed to the right of the "clock" icon.
When you click on the icon, the dialog box below appears:

Figure 38: Dialog box for selecting a particular “time” in the protocol.

There are two ways of reaching a particular point in the data:

- key in (or select with the up/down arrow) the desired timing in the box;
- slide the cursor to select the time you want.

VI. THRESHOLDS

(*Protocol/Thresholds* menu)

Thresholds are used as filters. They are involved in navigation and calculations, including data outputs and previews.

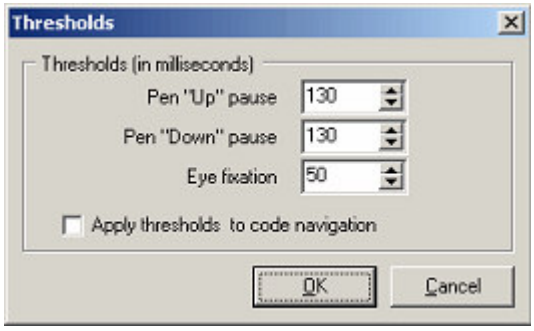


Figure 39: Threshold dialog box.

LABEL	DESCRIPTION
Pen "Up" pause	A pen event lasting longer than this value (with zero pressure) is considered to be a pause.
Pen "Down" pause	A pen event lasting longer than this value (with a pressure above zero) is considered to be a pause.
Eye fixation	An eye event lasting longer than this value is considered to be a fixation.

"*Apply thresholds to code navigation*" option:

If this option is ticked, the above thresholds will be applied as a secondary filter when using the "*By Tab code*" and "*By Eye code*" navigation tools (see page 86), i.e. an item of data must meet a double criterion (code + duration) if it is to be selected.

Minimum threshold values

As the "loss" of one or two consecutive data samples may occur during the acquisition or transmission of the data to the program, Eye and Pen imposes a minimum value equal to the duration of 3 samples.

Expressed in milliseconds, the minimum value for thresholds is determined by the formula 3*(1000/Sampling rate). For example, with a 200Hz sampling tablet, i.e. sampling 200 pen positions per second (=1,000 milliseconds), the minimum threshold will be: 3*(1000/200)= 15 milliseconds.

Hint: to view/edit all pauses (or fixations), set the minimum corresponding threshold.

VII. BUILDING FIXATIONS

(*Tools/Build fixations* menu)

Eye fixations are a construction and do not "naturally" exist. Building a fixation basically consists in grouping data as though they represented the same event (the eye remaining at a given location for a certain amount of time). Many methods exist to determine fixations, each one has its drawbacks and arouses controversy (cf. Bibliography).

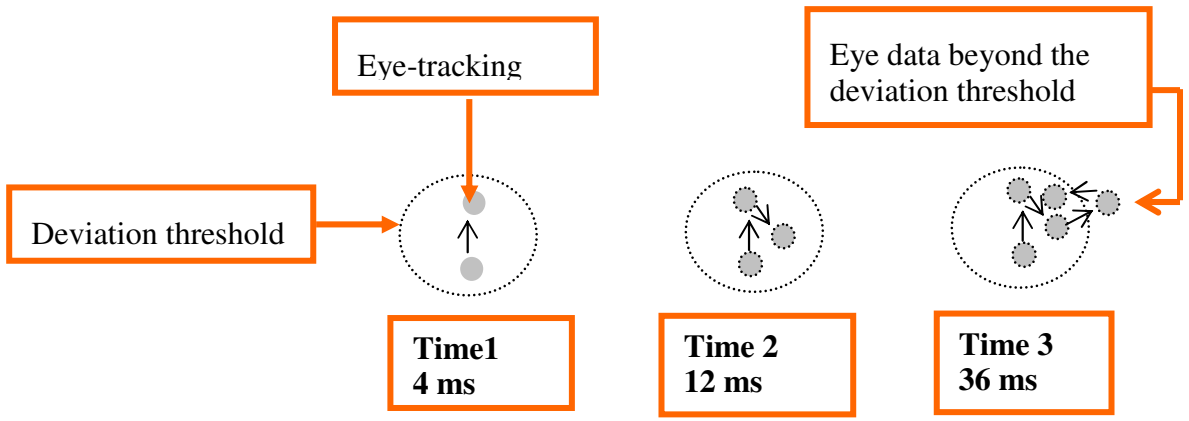
Method used :

An initial item of data is regarded as a cluster beginning and center. Each subsequent sample is compared with this cluster and integrated (cluster centroid value is updated) if its distance from the cluster center is below a defined threshold (known as the deviation threshold).

Note : the greater the amount of data included in the cluster, the "heavier" it becomes and the less likely its centroid is to "move" with the addition of new samples.

If the cluster represents a duration greater than the "minimum duration to start a fixation", it is deemed to represent the start of a fixation.
A tolerance criterion allows you to accept samples above the deviation threshold, providing the following samples are below it (external samples are then integrated into the cluster).

Example:



With a deviation threshold of 250 (tablet units), a minimum duration of 8 milliseconds and a noise tolerance of 4 milliseconds, we can state that:

- at Time 1, no fixation exists: data duration in the "diameter" threshold duration is below 8 milliseconds;
- at Time 2, with new data, the start of a fixation is "detected";
- at Time 3: the fixation "grows" with the addition of two more items of data, including one external item because the following item is located within the "packet" in less than 4 milliseconds.

To build fixations, click on the "Tools" menu and select "***Build fixations (barycenter method) ...***".
The following dialog box will then be displayed.

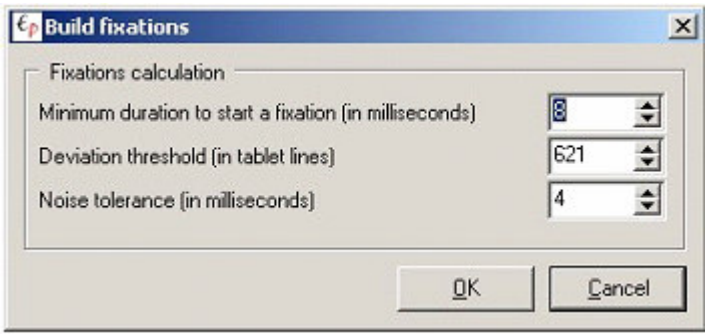


Figure 40: Building fixations using the "barycentric" method.

Fixation building is modulated by three parameters:

- minimum duration for starting a new fixation (in milliseconds);
- deviation threshold (in tablet units) : radius around the center of the fixation;
- Noise tolerance: number of samples "above" the deviation threshold that can be admitted as "members" of the current fixation if subsequent samples fit inside the cluster.

Caution: take care not to build more than one fixation at a time in the same protocol, as this method is data destructive. Once a fixation is determined, all the samples within it are replaced by the fixation centroid. A "second go" may have the effect of clustering fixations whose centers have moved closer to each other. When in doubt, consult the history (*Protocol/History* menu)

Note: fixation thresholds (see VI. Thresholds) allow you to filter fixations according to their duration. Fixations below this threshold will not be taken into account for navigating or editing.

VIII. PREVIEW

VIII.1. Introduction

The Eye and Pen preview functions allow you to represent data in a static and visual way, in two modes:

- as a temperature "map" showing the importance of events in relation to the total length of the protocol. The darker the color, the shorter the duration, the redder the color, the longer the duration.
- as circle projections: fixations are represented as circles with a diameter reflecting the duration (optional). Eye movements can be traced from one fixation to another.

Note: the Preview mode can be used in conjunction with the "*Shift layers*" tool (see p.94)
The screen display is composed of the background picture (or background color) and the subject's final product.

To make this easier to grasp, all the following illustrations are taken from the same protocol.

VIII.2. Preview configuration

See chapter 1 p.45.

VIII.3. Preview in "Circle" mode

(*Protocol/Preview/Circle* menu)

You can launch this preview to show:

- pauses;
- fixations only: click on "*Fixations*";
- fixations and saccades: click on "*Fixations & saccades*" (saccades between fixations are represented by a line joining up the fixations)

The following example shows "fixations only" circles.

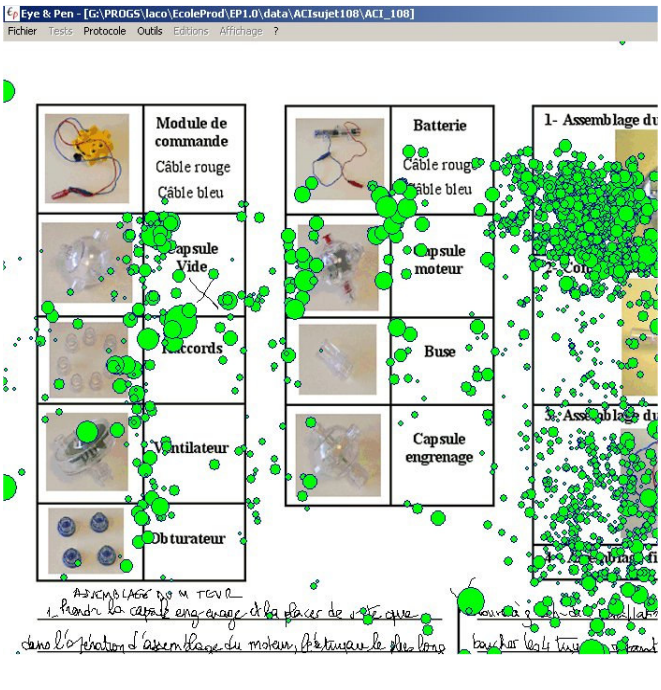


Figure 41: Preview configured with filled circles.

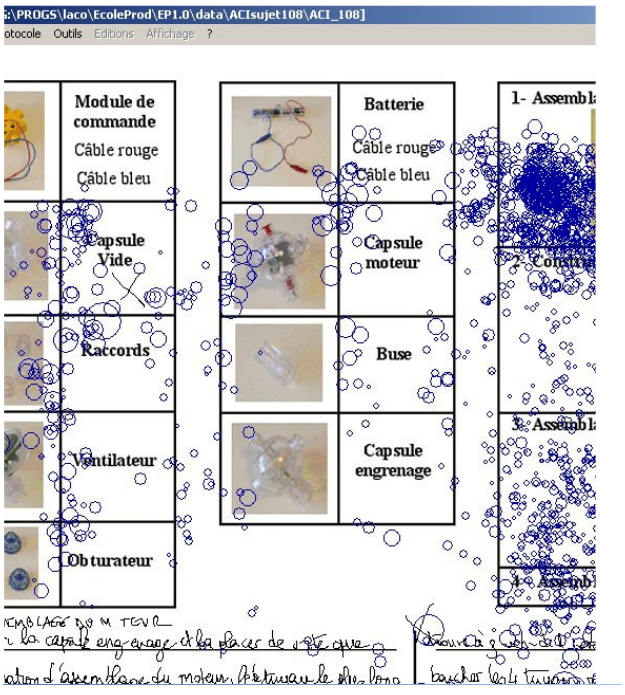


Figure 42: Preview configured with empty circles.

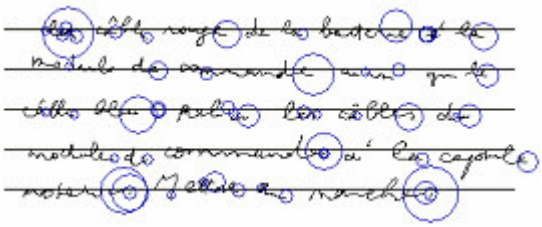


Figure 43: Pause preview with empty circles.

To close a preview, select "*Protocol*" and click on "*Close Preview*".

If you select “fixations and saccades” you may get something like this:

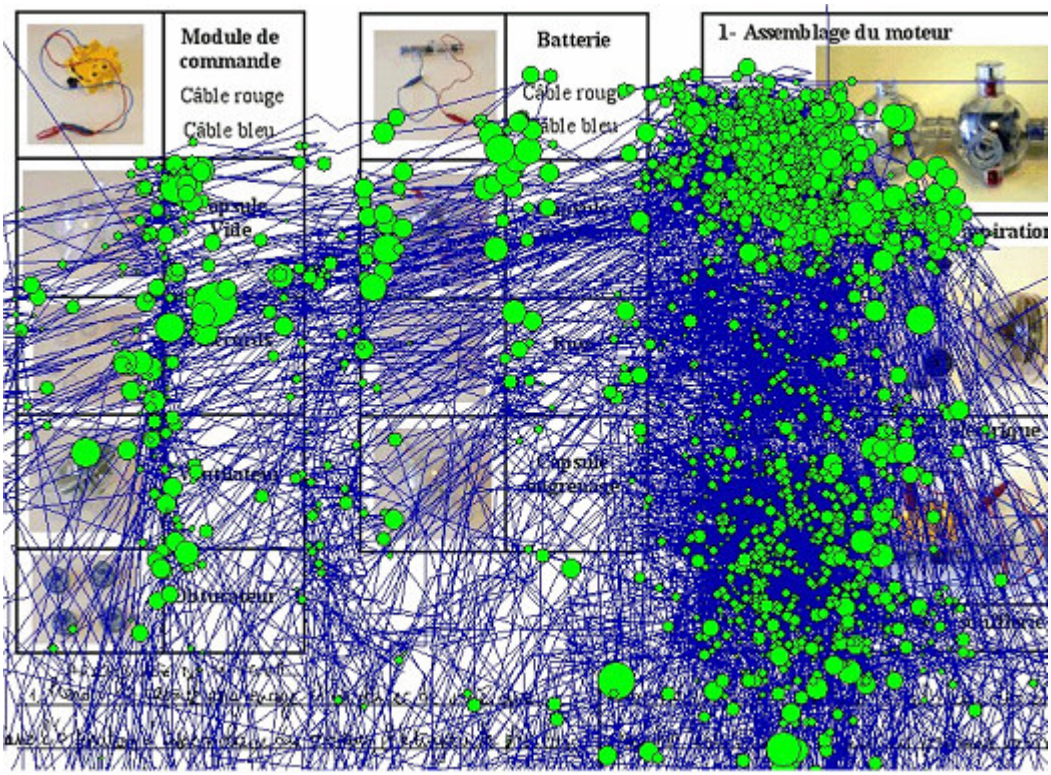


Figure 44: Pauses and saccades preview.

VIII.4. Preview in “Temperature” mode

(*Protocol/Preview/Temperature* menu)

In this preview mode, durations are represented by colors, as a "thermograph".
You can launch the "Temperature" preview showing:

- Pauses
- Pauses classified according to duration
- Fixations (takes the foveal vision size into account)
- Fixations and saccades (takes the foveal vision size into account)

VIII.4.1. Pauses

(*Protocol/Preview/Temperature/Pauses* menu)

Color represents pause duration in relation to the whole set of pauses.
Pauses are represented by a rectangle at the place where the pen left the tablet or became immobilized.

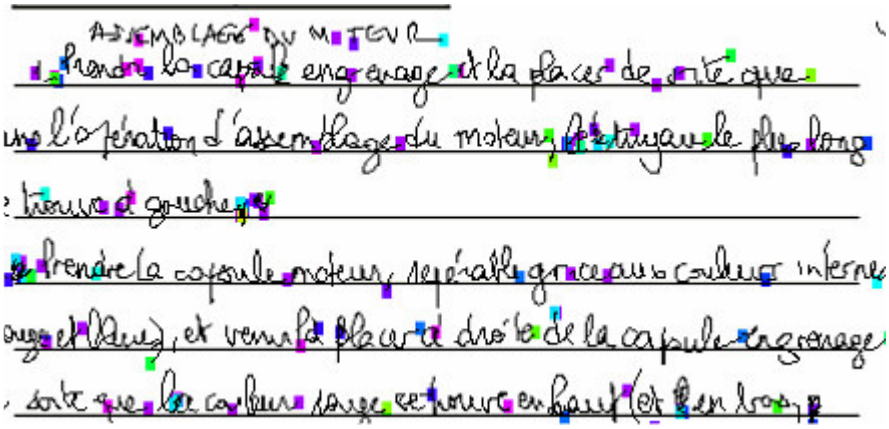
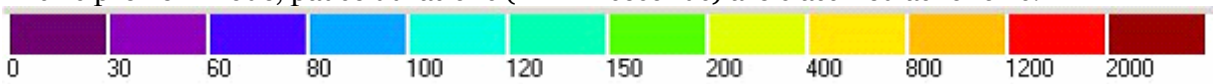


Figure 45: Pauses preview.

VIII.4.2. Pause duration categories

(*Protocol/Preview/Temperature/Pauses by duration categories* menu)

In this preview mode, pause durations (in milliseconds) are classified as follows:



The right section of the scale shows the color for pauses lasting 2,000 milliseconds or more. Below is an example of how they are represented:

Figure 46: Preview of pauses, color-coded according to duration.

VIII.4.3. Fixations

(*Protocol/Preview/Temperature/Fixations* menu*)*

This preview mode only shows the fixation durations on the protocol.
Below is an example of a protocol preview in this mode (foveal vision diameter is 30 pixels; see Preview configuration, p.45).

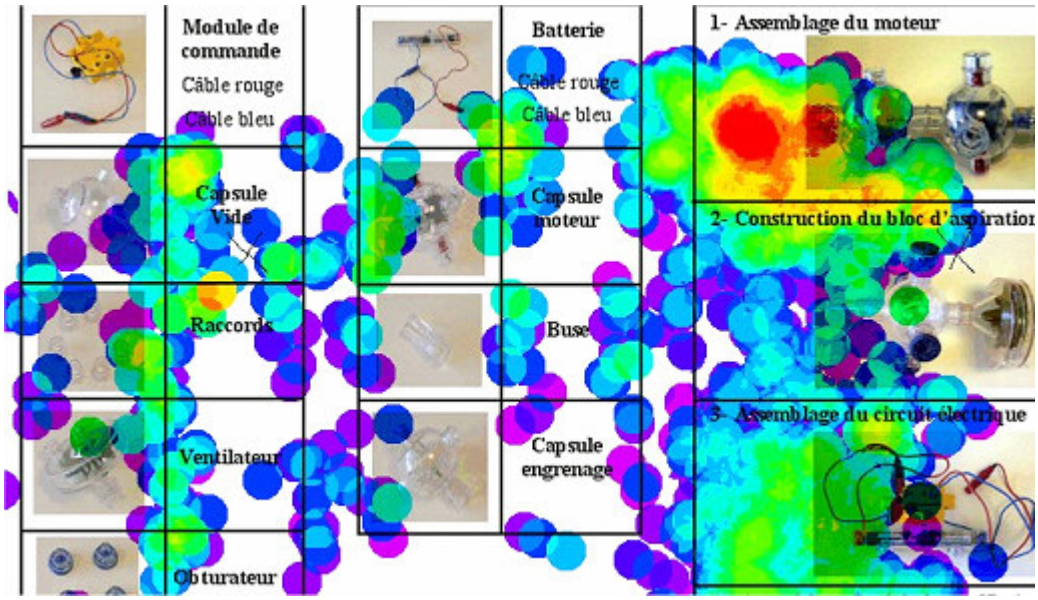


Figure 47: Fixations preview in "temperature" mode.

"Hotspots" represent the areas of greatest fixation duration.

VIII.4.4. Fixations and saccades

(*Protocol/Preview/Temperature/Fixations & saccades* menu)

This preview mode represents fixations and gaze movements on the protocol.
See example in figure below (with the same parameters as in Fig. 47):

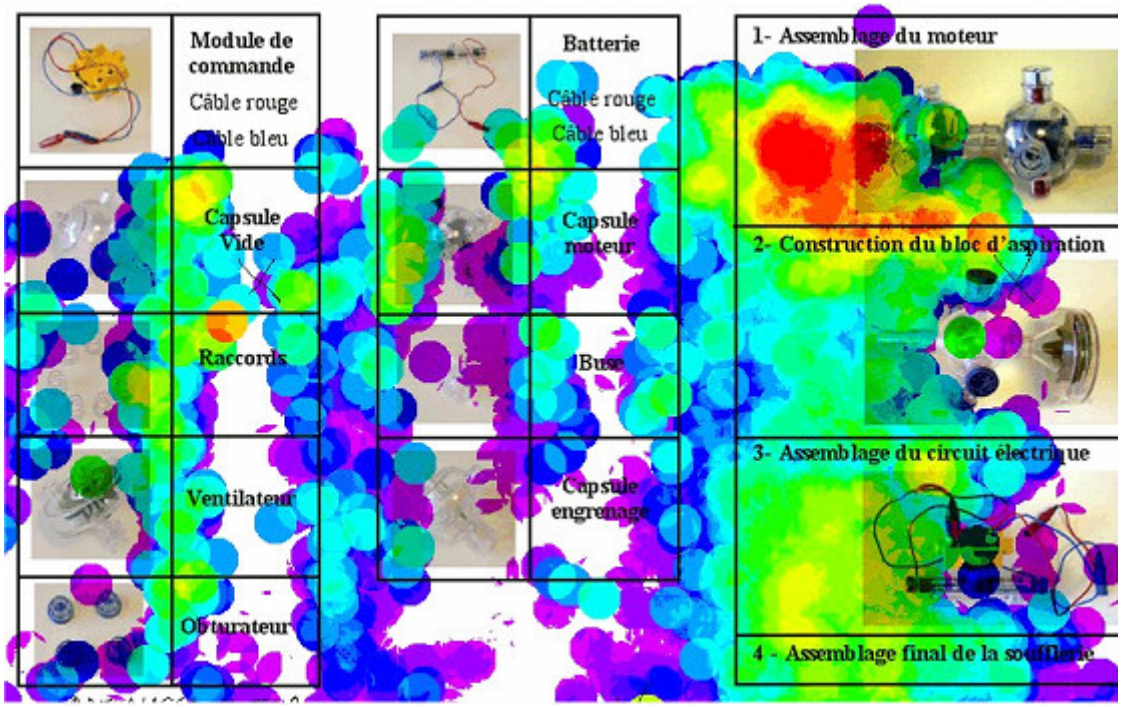


Figure 48: Fixations and saccades shown as "temperatures".

IX. SHIFT LAYERS

(*Tools/Shift layers* menu)

During data acquisition, the data may not necessarily be where they should be (they have "slipped") because:

- the sheet of paper on the tablet has moved (or been moved);
- even if the subject's head has been immobilized, s/he has nevertheless succeeded in moving slightly;
- etc.

Eye-tracking data therefore move in relation to the tablet data and background picture.
If the subject was writing on a sheet of lined paper and we use an image of this sheet as a background for analysis (see configuration), we can see that the writing is not where it should be.

To make it easier to track down these "displacements", apply the following tip prior to data acquisition:
Put (draw) a cross in the middle (or a more convenient place) of the production medium – sheet of paper, background picture, etc. - and ask the subject to fixate this mark for approximately 20 seconds. Next, ask the subject to draw over this cross with the pen. You can now start your experimental recording.
The subject's first fixation will therefore be on the cross. If a shift of data does occur, this first fixation will be a good way of spotting the problem and helping to align the data. The principle is the same for both writing and drawing: the subject's cross must be on top of your cross!

After the experimental recording, ask the subject to draw the cross again and to fixate it. This will be a way of checking that the data are still "well in place".
To limit this risk, you can try "fixing" the paper, e.g. using plastic corners on the tablet into which you can slide the sheets.

In the analysis stage, a "Temperature" preview (see page 92) may help you detect this kind of flaw and correct it by shifting the layers.

Recall : to have all the data in the same coordinates system, eye-tracking data must be converted into the tablet coordinates system.

We regard the protocol as being made up of 3 superimposed layers: the screen background (color or background picture) represents the bottom layer, the tablet data are "sandwiched" in the middle layer, and the eye-tracking data make up the top layer (third level). The reference level is the tablet data layer.

To re-adjust these layers, click on the "*Tools*" menu, then select "*Shift layers*".
The following dialog box will be displayed.

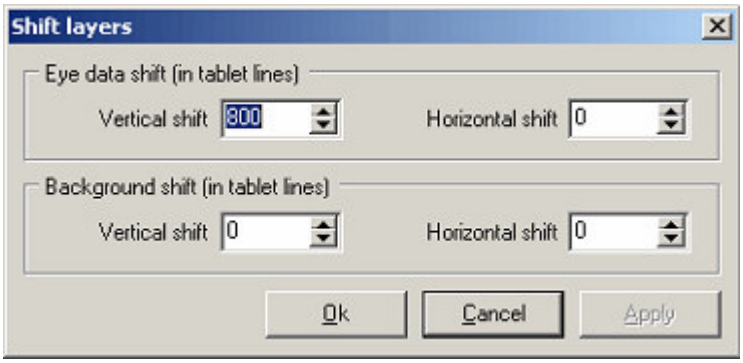


Figure 49: Dialog box for adjusting the position of the layers.

This box has two frames (parts), labeled:

- Eye data shift (in tablet lines): horizontal and vertical movement applied to all eye samples.
- Background shift (in tablet lines): horizontal and vertical movement applied to the background picture.

As the tablet data layer is the reference, it is never "moved".

There are two ways of shifting the eye data or the background layer: using the computer mouse or using numerical values.

Numerical shift of the layers

Set the number of tablet units you want the layers to be moved by, in the "horizontal shift" and/or "vertical shift" boxes.
Click on the "*Apply*" button to... apply the desired shift to layer(s).
Caution : the "*Apply*" button will validate your entries, but there is then is no way back except by setting new values.
If the applied shift has the desired effect, click on the "*OK*" button to close the dialog box.
If not, modify the values again or click on "*Cancel*" to close the dialog box.

Visual (and convenient) layer shift

Click with the right mouse button on the "start location" of the shift.
Then, keeping the button pressed down, move the mouse to the place where you want that point to be located. A dotted line will connect the starting point to the mouse cursor.

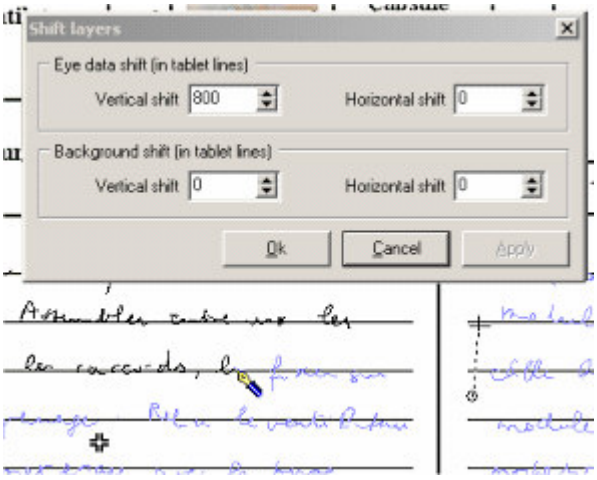


Figure 50: Setting a layer shift using right mouse button selection.

Release the mouse button and go the contextual menu (pops up to the right of the mouse cursor) if you want to shift the eye-tracking data layer or the background picture.

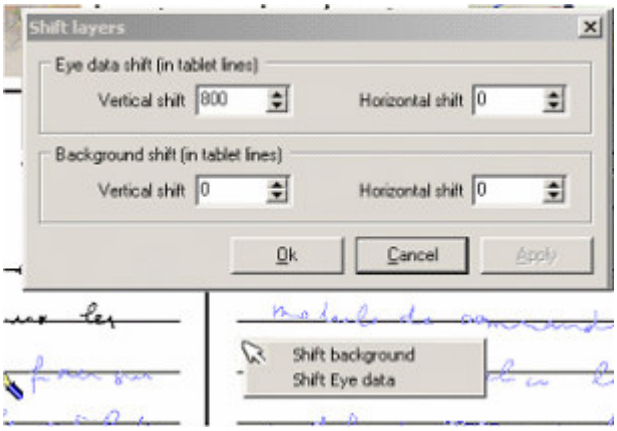


Figure 51: Selecting the layer you want to move using a contextual menu.

Values in the "*Shift layers*" dialog box are automatically updated and applied.

X. DATA CODING

X.1. Manually-coded data

The coding tool provides information on the event currently being observed in the protocol, but also allows you to attach a code to the data**.**
Below the "*D*" box of each data type (Tab or Eye), you will find a column with a list of numbers (from -1 to 127).
This column is used to assign codes to the data.

Each data item can be given a code from -1 to 127.

By default, each data item is coded "0" (neutral code).

Every data item coded -1 will be excluded from calculations and editing.

To code a data, simply click on a number in the column corresponding to its type (Tab or Eye).

Each item can only have one code.

X.2. Coding an item of tablet data when in trigger zone 1 or 2

(*Tools/Tablet zone auto-coding* menu)

The “Eye and Pen” program has tools which automatically code the tablet data "passing into" trigger zones 1 or 2 (defined in the acquisition configuration panel, “Simple” tab).

Click on the “*Tools*” menu, then select *“Tablet zones auto-coding…”*.
The following dialog box will be displayed.

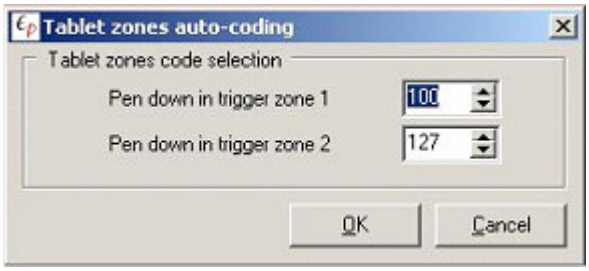


Figure 52: Automatic coding of data in trigger zones.

Enter a code number (between 1 and 127) in the “*Pen down in trigger zone 1*” box.
Enter a code number (between 1 and 127) in the “*Pen down in trigger zone 2*” box.

Click on the “*OK*” button to automatically attach these codes to the tablet data "located" in these zones.

X.3. Assigning the –1 code to “Eye” data beyond the calibrated area

(*Tools/Code -1 “out-of-field” Eye data* menu)

If you want to automatically assign the code **-1** to eye-tracking data located beyond the calibrated area (i.e. generally speaking, outside the analysis screen), there are two solutions:

- tick the “*Code -1 out-of-field data”* box in the “*New Analysis”* tab of the analysis configuration panel (optionally tick “*aggregate successive out-of-field data*”);
- click on the “*Tools*” menu, then on “*Code -1 out-of-field Eye data*”.

The disadvantage of using the “*New Analysis*” configuration for automatic coding is that you have to be sure that the data are properly "set up" (see “Shift layers”, p.94), otherwise you risk tagging valid data as invalid.

Please note that the “-1” code can be assigned to any type of data.

X.4. Coding “Eye” data in the Visual Zones (AOI)

(*Tools/Visual zones (AOI)* menu)

A Visual Zone (“*Area of Interest*” in the literature, or AOI) is a rectangular area of a protocol in which we consider the eye movements and fixations to be of particular interest.

To automatically code Eye data in a particular zone of the protocol, you must first define this Area Of Interest with the help of a specific tool. All data in this zone will then be coded with the associated code.

Important:

AOI-based processing is managed according to the order of AOIs in the list. When two zones share a common area(s), the last AOI in the list will "have the last word" when it comes to coding.

e.g. if, after a first zone has been defined, a second zone is defined, partially overlapping zone 1, data in this "dual zone" area will be given zone 2 coding.

To define an AOI, click on "*Tools*" and select "*Visual Zones (AOI)*".
The following dialog box will be displayed.

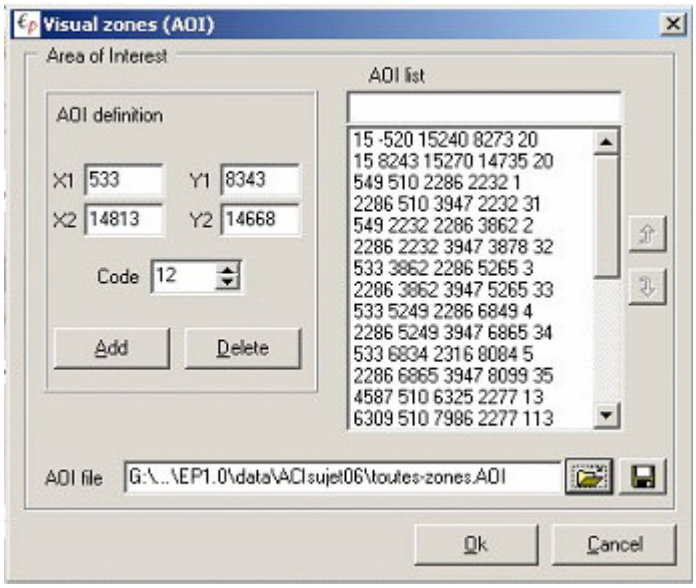


Figure 53: AOI definition/selection panel.

To define an AOI, follow the steps below.

STEP	DESCRIPTION
1	Click with the left mouse button on the place where you want the AOI to begin (its upper left-hand corner) in the protocol.
2	Keeping the button pressed down, move the mouse toward the right, then down. You have now created a rectangle which you can adjust by moving the mouse.
3	When you are satisfied with the result, release the mouse button. The coordinates of the selected zone will be updated in the boxes labeled "*X1*", "*Y1*", "*X2*" and "*Y2*".
4	Type the code value you want to be associated with this zone in the "*Code*" box.
5	Click on the "*Add*" button to add this new AOI to the list of AOIs (in the frame labeled "*AOI list*"). Each line of this list contains "*X1*", "*X2*", "*Y1*", "*Y2*" and "*Code*".

You can save or load your AOI lists in order to use them again another time.

To save an AOI list, click on the “floppy” icon in the lower right-hand corner of the dialog box. A “*Save as*” dialog box will be displayed. Choose a name for the file and click on “*Save*”. The full path and filename of this file will be updated to the right of the “*AOI file*” label.

To load an AOI list you created earlier, click on the “opened folder” icon. A dialog box will be displayed where you can select an “AOI” list file.
Click on the “OK” button to load and open this list. The “*AOI list*” will be updated.

To select an AOI, click on the corresponding AOI line in the “*AOI list*”. This AOI will be displayed on the protocol as a "darkened" rectangle.
The Up and Down arrow to the right of the list allows you to move up or down the items in the list. This means you can modify the order of items in the list.

To delete an AOI, select it in the “*AOI list*”, then click on the “*Delete*” button in the “*AOI definition*” frame.
The selected AOI will be erased from the list.

Note :

When defining AOIs, make sure you take into account the subject’s foveal vision radius. An over-restrictive definition may lead to under-estimated gaze durations in these zones.

For example, I want to study gaze durations for a photo of a desk. I am particularly interested in an object lying on the desk. I therefore define an AOI around this object. When the subject's gaze approaches the "boundary" of this object, the coordinates of the gaze may be a few pixels outside the AOI, even though the subject is actually looking at this object. The amount of data “involved” will therefore be under-estimated. The reason for this is that the subject not only sees what is at the exact center of his/her line of sight, but also what is within a certain perimeter, i.e. foveal vision.

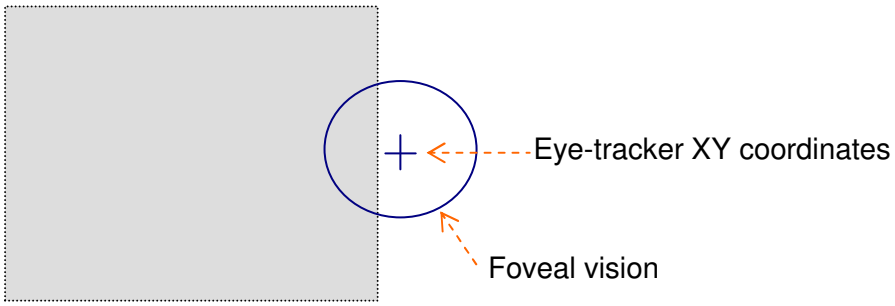


Figure 54:Foveal vision at the edge of a visual zone (AOI).

You may therefore need to define an AOI that is larger than the item you wish to study.

AOI and background picture:

if you save an AOI list in the directory where the background picture is, using the same name, you can use the option *“If an AOI file exists for the current background picture, apply to data”* (*configuration/Analysis/New analysis*, see page 38).

X.5. Erasing all the codes

(Tools/Erase codes menu*)*

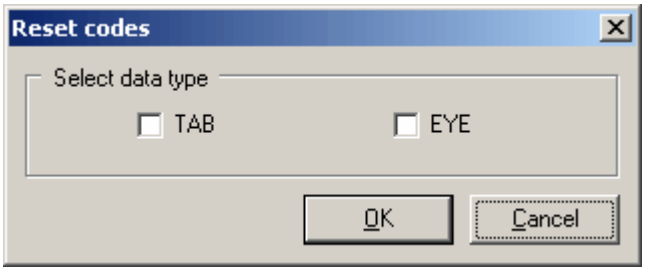


Figure 55: Selecting the type of data for resetting the codes.

Tick the data category (Tab and/or Eye) where you want the data codes to be **reset to zero**.

Simply click on the "OK" button: now, none of the data in the selected data type has a significant code.

X.6. Replacing one code with another

(Tools/Replace codes menu*)*

You want to substitute one code for another for a particular type of data (Tab and/or Eye). The following dialog box will be displayed.

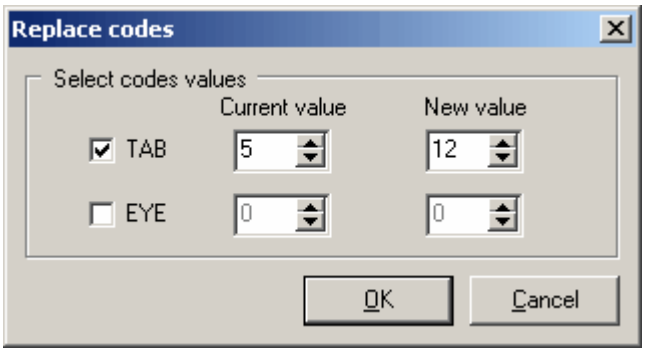


Figure 56: Replacing the codes given to the data types.

To change a code, follow the steps below.

STEP	DESCRIPTION
1	Choose the data type you want the modification to apply to, by ticking the "*Eye*" and/or "*Tab*" boxes.
2	In the "*Current value*" column, enter the code value(s) you want to be replaced.
3	In the "*New value*" column, enter the new code value(s).
4	Click on the "*OK*" button to apply the modification to your data.

XI. STATISTICAL PROTOCOL DESCRIPTION

(Protocol/Description menu*)*

In order to help you analyze tablet and eye-tracking data, Eye and Pen can provide statistical descriptions of the data.

Note: events coded -1 (Tab and Eye) are excluded from descriptions.

The following description panel will be displayed.

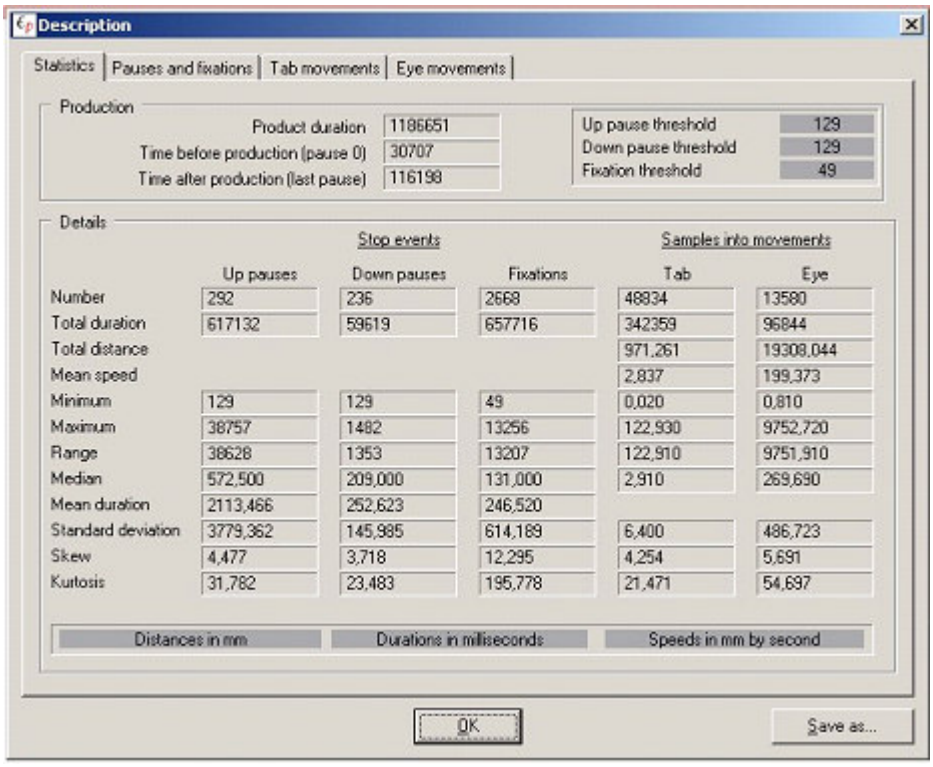


Figure 57: Statistical description.

The first tab (Statistics) shows quantitative data in two frames:

- "*Production*": general information about the entire protocol;
- *"Details"*: statistical description of the tablet and eye-tracking data;

The "*Production*" frame contains three types of information:

- total production duration;
- pre-writing pause duration (time elapsed before the subject presses the pen on the tablet);
- last pause duration (pause before the pen is pressed in the "end" zone). This pause may not exist if the recording was stopped by an "Escape" keypress or if the subject slipped the pen into the "end" zone (the value will then be zero).

Hint: place a thick border (e.g. made of plastic) around the "end" zone to force the subject to raise the pen in order to press it in this "box".

The "*Details*" frame gives statistical parameters for different categories of information:

- the "stop" events during the written production (Up or Down pauses) and ocular activity (fixations). These parameters are filtered by (see VI. Thresholds);
- the movements of the "eye" or pen.

For each of these categories, the following information is given:

- Number: number of events in the category;
- Total duration;
- Total distance (for “movements”);
- Mean speed (for “movements”);
- Minimum/maximum range;
- Median (duration: median value for “stops”; speed: median value for “movements”);
- Mean duration (for “stops”);
- Standard deviation;
- Skew: distribution asymmetry indication. A positive value shows an asymmetry with a "swelling" on the left side. The distribution is skewed to the right;
- Kurtosis: indicates the flatness or otherwise of the distribution shape. A high positive value indicates a "pointed" shape with long "tails", whereas a negative value indicates a "square" shape;

Three different tabs can be used to generate a graphic representation of these distributions:

- “Pauses and Fixations”: distribution of pause and fixation durations.

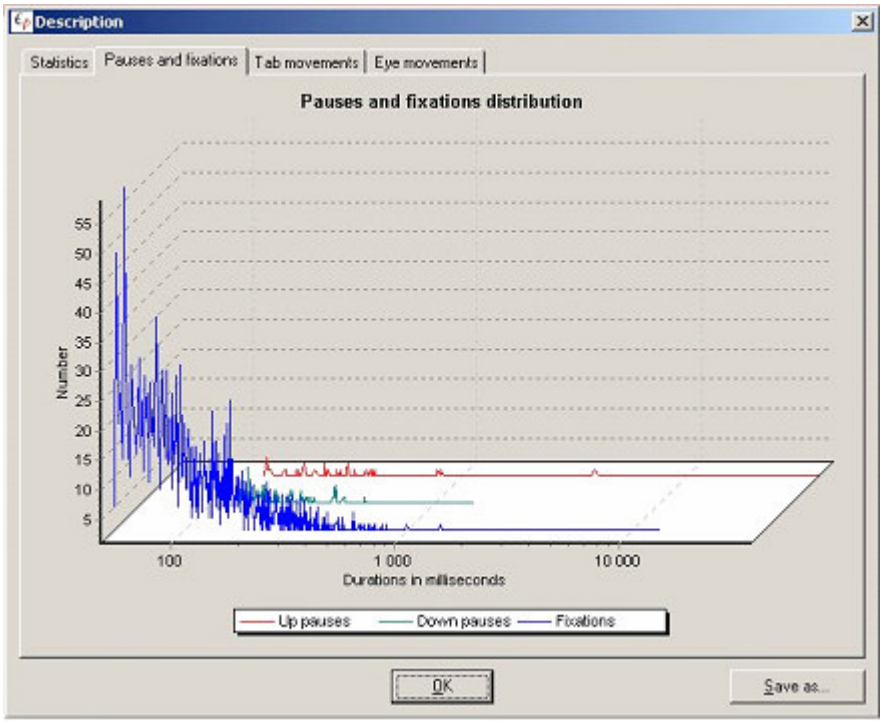
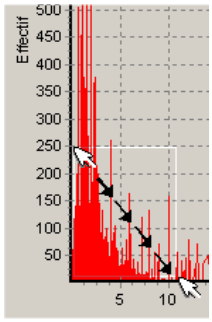
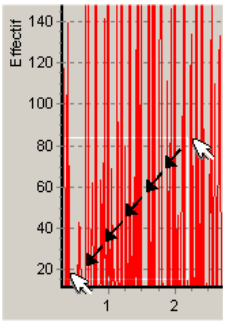


Figure 58: Graph showing pauses and fixations distribution (logarithmic scale).

To **zoom** in on the data: using the left mouse button, select the part of the graph you wish to enlarge, moving from its upper left-hand corner to its lower right-hand corner.



To **cancel**, select part of the enlarged area (its size does not matter) moving from the upper right-hand corner to the lower left-hand corner.



You can move the whole graph with a right mouse click (drag the graph).

- “Tab Movements”: pen movement speed distribution.

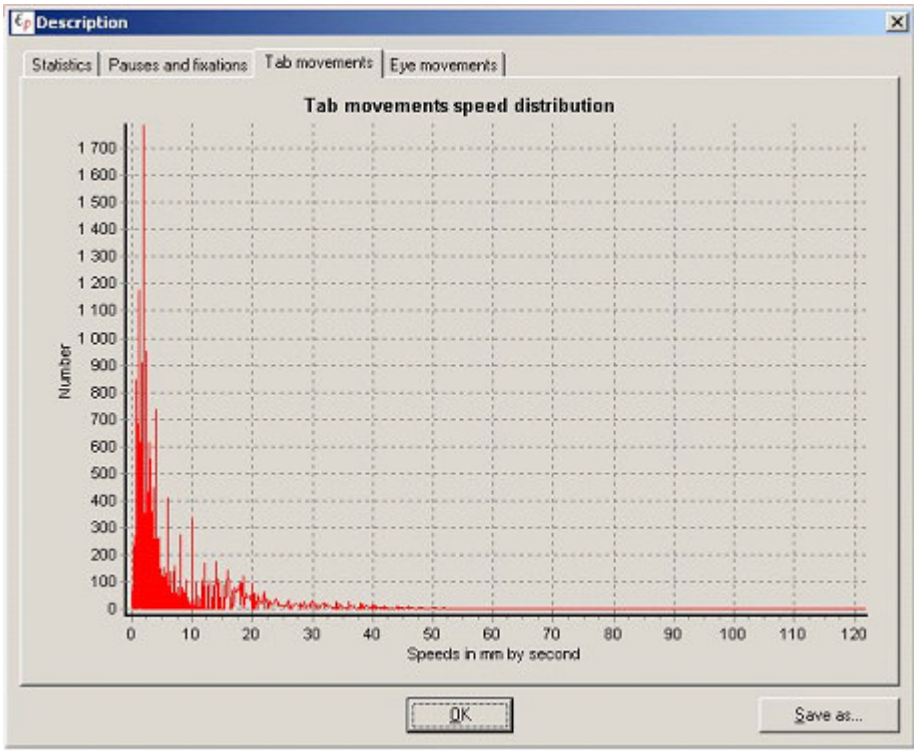


Figure 59: Pen movement speed distribution.

- “Eye Movements”: eye movement speed distribution.

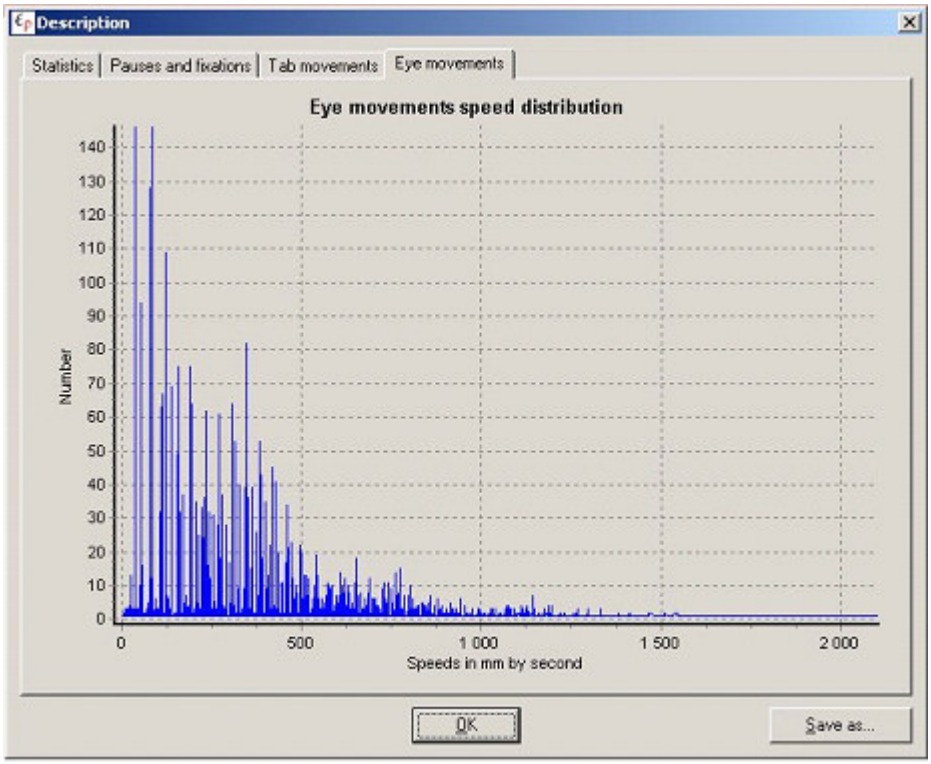


Figure 60: Gaze movement speed distribution.

XII. USEFUL TOOLS AND FUNCTIONS

XII.1. Sequences

(*Display/Sequences* menu to show/hide the tool)

Defining sequences is a way of "breaking the protocol down", i.e. creating subsections.

A sequence contains a set of data (Tab and Eye) defined by a beginning time, an ending time and a name (label).

The "*Sequences*" tool allows you to:

- define a sequence;
- directly "jump" to the beginning of a sequence.

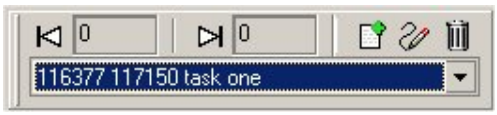
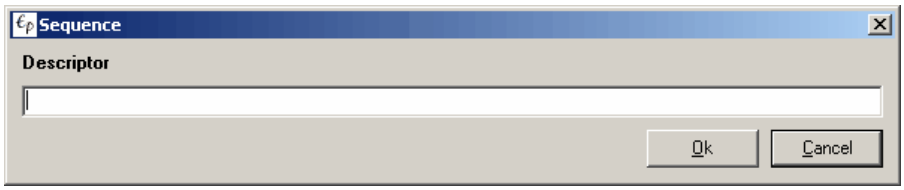
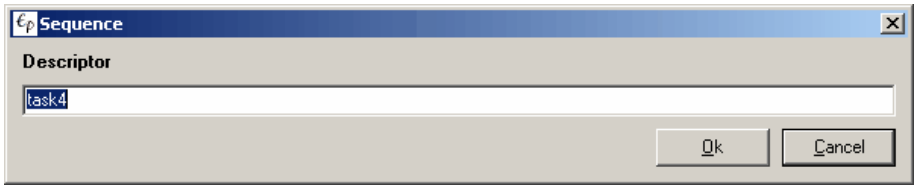


Figure 61: The tool for defining sequences.

ICON	DESCRIPTION
	Set the current time (time elapsed since the start of the data recording, displayed in the "*clock*" tool) in the protocol as the sequence beginning.
	Time at which the sequence begins.
	Set the current time (time elapsed since the start of the data recording, displayed in the "*clock*" tool) in the protocol as the sequence ending.
	Time at which the sequence ends.
	**Create a sequence.** Once the times of the beginning and ending of the sequence have been defined, you can create a new sequence and give it a name. When you click on the icon, the dialog box below will be displayed:  *Figure 62: Describing a sequence.* Type the label for the sequence in the "***Descriptor***" box, then click on the "*OK*" button. The new sequence, with its start and end times and its label, will be added to the drop-down list, to the left of the  button

	**Edit the selected sequence label.** To change the name/label of a sequence, select this sequence from the list ( button to view the list) then click on the  button**.** The "descriptor" dialog box will be displayed:  *Figure 63: Editing a sequence label.* Edit the label for the sequence (the dialog box is horizontally resizable). Click on the "*OK*" button to validate.
	**Delete a sequence.** Select a sequence from the list ( button to view the list). Once selected, click on the trash  button.
	**Scroll down the sequence list**. When you click on this icon, the sequences you have defined will be displayed in the form of a drop-down list. Important : sequences are sorted according to their date of creation (the most recent one will be at the bottom of the list). Click on a sequence. The protocol will immediately jump to the start time of this sequence.

To edit the list of sequences, click on the "*Tools*" menu, then select "*Edit sequences list…*"

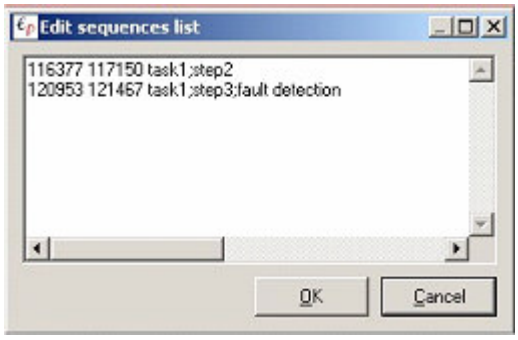


Figure 64: Editing the entire sequence list.

When you have finished selecting, cutting, pasting, etc., click on the "*OK*" button to validate the changes.

XII.2. Successive data with the same code aggregation

(*Tools/Aggregate redundant codes* menu)

This function can be used for deleting successive Eye data with the code -1 (mainly "out-of-field data").
A dialog box allows you to choose the data type it will apply to: Tab and/or Eye.
The aggregation adds the duration of the erased data to that of the first item of data. The data are thus aggregated "to" the first item of data.
This function must be used with care, as it applies to all codes (except 0).

XII.3. Zoom

(*Display/Zoom* menu to show/hide this tool)

This tool allows you to zoom in on a particular area of the screen.

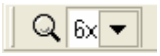


Figure 65: "Zoom" tool.

To select the zoom factor, click on the icon, then select a zoom factor from the 6 zoom levels (2x, 4x, 6x, 8x 10x, 12x).

Next, click on the magnifying glass to activate the tool (click again to de-activate).

Figure 66: Zoom "at work".

Your mouse cursor will indicate the center of the area to be magnified in the Zoom window.

This window is resizable and movable.

There are two ways of closing it:

- click on the cross in the upper right-hand corner of the window;
- click on the magnifying glass icon again.

XII.4. Capture a picture of the analysis

(*Protocol/Capture to picture* menu)

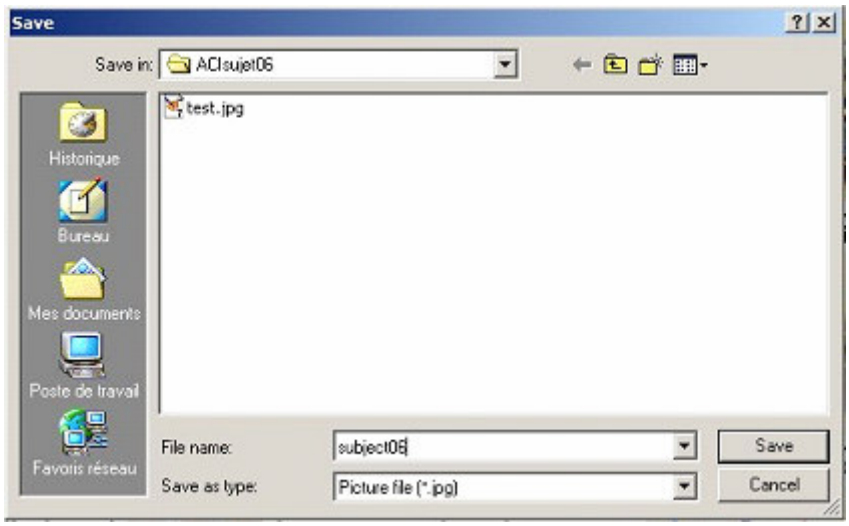


Figure 67: Taking a "snapshot" of the analysis.

A dialog box allows you to name the capture. Next, click on the "*save*" button to generate a JPEG picture (".jpg" extension) showing the current state of the analysis, without menus or boxes.

XIII. SAVE ANALYSIS

XIII.1. Creating a sub-analysis

(*Protocol/Sub-analysis* menu)

If only a portion of the protocol interests you, you can create a sub-analysis, in a separate file.

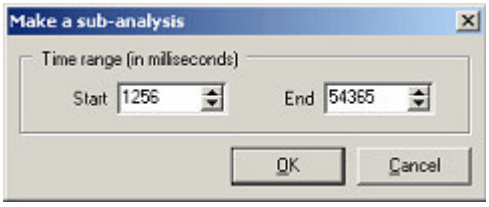


Figure 68: Defining timing boundaries.

A sub-analysis is part of the overall analysis defined by a beginning and an end time (in milliseconds). Select (type in) a time for the beginning and a time for the end, then click on the "*OK*" button. A dialog box will allow you to supply a path (directory) and a name for this new file ("*.twk*")

XIII.2. Saving an analysis

There are two ways of saving the data during an analysis:

- Click on the "*Protocol*" menu, then click on "*Save*" to save the protocol under its current name;
- Click on the "*Protocol*" menu, then click on "*Save as*".

The following dialog box will then be displayed.

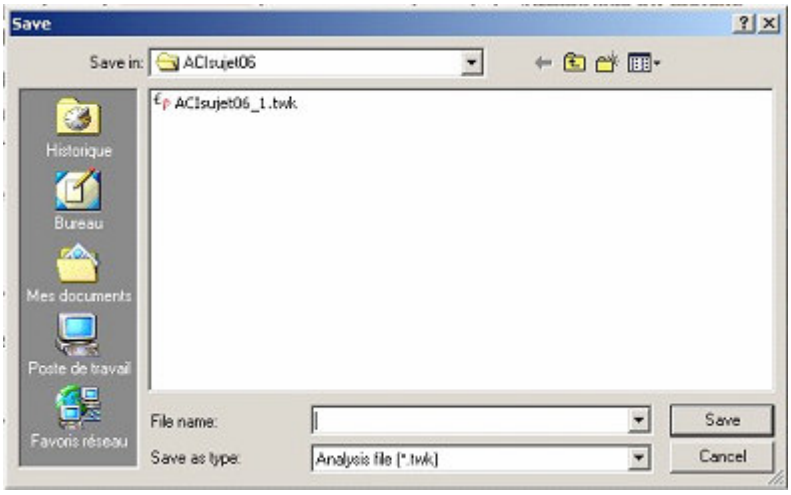


Figure 69: Saving an analysis under a new name.

Give a new name to the file (".twk") and click on the "*Save*" button. A copy of the current protocol will be created with another name.

XIV. DATA EXTRACTION

XIV.1. Selection by type of event

Data are "published" in tabulation-separated ASCII files (can be imported into most statistics software, spreadsheets and word processors).

Select the information you want, then choose the parameters you want to extract (coordinates, timestamps etc.):

TYPE of EVENT	ACTION
All data (events)	*Extractions/Events/All events* menu. Follow the instructions, page 110.
Data during pauses and fixations	*Extractions/Events/During pauses & fixations…* menu. Follow the instructions, page 110.
Pauses	*Extractions/Pauses…* menu. Follow the instructions, page 110 (the "Eye" column of the information extraction panel is not displayed).
Eye (gaze) activity during pauses	*Extractions/During pauses/Eye Activity…* menu. Follow the instructions, page 110.
Fixations during pauses	*Extractions/During pauses/Fixations…* menu. Follow the instructions, page 110.

Eye activity in AOI, during pauses	*Extractions/During pauses/Eye Activity in AOI*... menu. Follow the instructions, page 110.
Fixations in AOI, during pauses	*Extractions/During pauses/Fixations in AOI*... menu. Follow the instructions, page 110.
Summary of all eye movements in AOI, during pauses	*Extractions/During pauses/Eye Activity in AOI summary*... menu. Follow the instructions, page 113.
Summary of all fixations in AOI during pauses	*Extractions/During pauses/Fixations in AOI summary*... menu. Follow the instructions, page 113.
Fixations	*Extractions/Fixations*... menu. Follow the instructions, page 110 (the "Tab" column of the information extraction panel is not displayed).
Eye activity in AOI	*Extractions/Visual zones (AOI)/Eye activity*... menu. Follow the instructions, page 110 (the "Tab" column of the information extraction panel is not displayed).
Fixations in AOI	*Extractions / Visual zones (AOI) / Fixations*... menu. Follow the instructions, page 110 (the "Tab" column of the information extraction panel is not displayed).
Eye activity (movements) in AOI summary	*Extractions/Visual zones (AOI)/ Eye activity summary*... menu. Follow the instructions, page 113.
Fixations in AOI summary	*Extractions/Visual zones (AOI)/fixation summary*...menu. Follow the instructions, page 113.
Tracing dynamics (pen movement data)	*Extractions/Tracing dynamics*... menu. Follow the instructions, page 115.

XIV.2. Information selection

Except for:

- eye activity in AOI, summary
- fixations in AOI, summary
- tracing dynamics

When you have selected the type of event you want to extract, the following dialog box will be displayed.

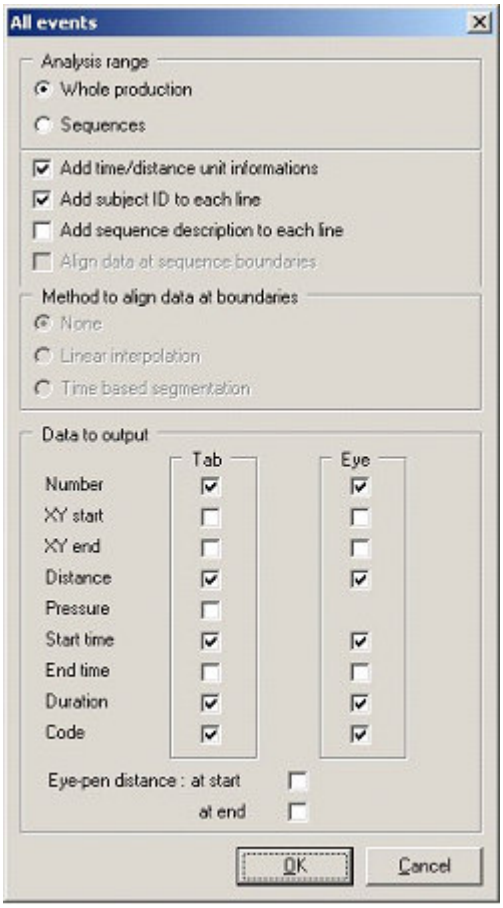


Figure 70: Selecting information.

This dialog box contains four frames :

- "*Analysis range*": extracts data either for the whole protocol or for defined sequences ;
- a zone with 4 checkboxes;
- "*Method to align data at boundaries*": choice between two methods (or nothing) to determine what to do with data which crosses sequence boundaries (limits)
- "*Data to output*": selection of the items of information to be extracted (coordinates, etc.)

The "***Analysis range***" frame allows you to:

- extract data from the whole protocol;
- restrict extraction to (previously defined) sequences.

Below this frame, you will find 4 options.

LABEL	DESCRIPTION
Add time/distance unit information	Add time unit and distance unit information at the beginning of the extraction ? (subject's ID is always added)
Add subject ID to each line	Add subject's name to each data line in the output file ?
Add sequence description to each line	Add the sequence description to each data line ? This description is composed of a sequence number (according to date of creation), beginning timestamp, ending timestamp and label.
Align data at sequence boundaries	Should I do anything with data beginning before and ending after a sequence? This option can only be activated if "*Sequences*" ("*Analysis range*") is selected.

The options of the "***Method to align data at boundaries***" frame are activated when the "*Align data at sequence boundaries"* option is ticked.

LABEL	DESCRIPTION
None	No events that are "truncated" by a sequence limit will be taken into account.
Linear interpolation	An event that is "truncated" by a sequence boundary will be included in the sequence. A linear interpolation calculation will determine the coordinates corresponding to the "cut-off-" point.
Time-based segmentation	An event that is "truncated" by a sequence limit will be partially included in the sequence. A time-based segmentation will adjust the event time to the sequence start and/or finish.

The "***Data to output***" frame allows you to fine-tune the details of the information you wish to extract

LABEL	DESCRIPTION
Number	Event number in its category (Tab or Eye data) since the beginning of the protocol. The first event is numbered zero.
XY start	Coordinates when the event began.
XY end	Coordinates when the event ended.
Distance	Euclidian distance between start and finish of the event.
Pressure	Pressure of the pen on the tablet.
Start time	Time when the event began.
End time	Time when the event ended.

Duration	Event duration.
Code	Event-associated code.
Eye - pen distance	Euclidian distance between the position of the pen and the position of the "gaze": • when the event started • when the event ended The choice of measurement unit (tablet or metric/imperial unit) is made in the analysis configuration panel, "*Analysis*" Tab.

Once you have selected the information you want, click on the "OK" button to validate it.
The program will display a second dialog box, where you can refine the extraction, e.g. the code an item of data must have if it is to be extracted.

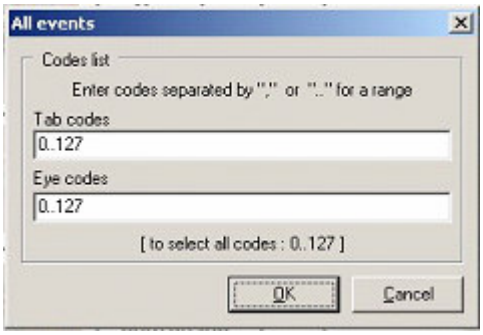


Figure 71: Defining codes for filtering data.

To restrict the data extraction to one or more code(s), type the code number you want in the "*Tab code"* box for the tablet data and in the *"Eye codes*" box for the eye-tracking data.

Separate isolated codes with a comma "**,**" or with two periods "**..**" if you want to select a range of codes.

Then click on the "*OK*" button to validate it.

Lastly, a third dialog box allows you to give a name (and optionally a new path) for the text file that will contain the data.

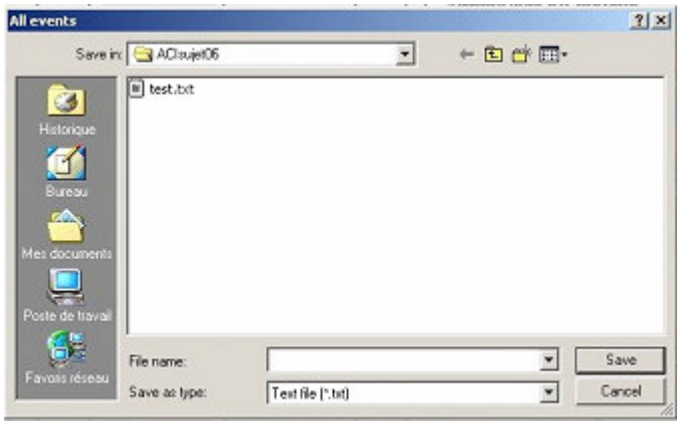


Figure 72: Naming the output file.

Click on the "*Save"* button to complete the process.

XIV.3. Data in AOI summary ("Eye activity" and "Fixations")

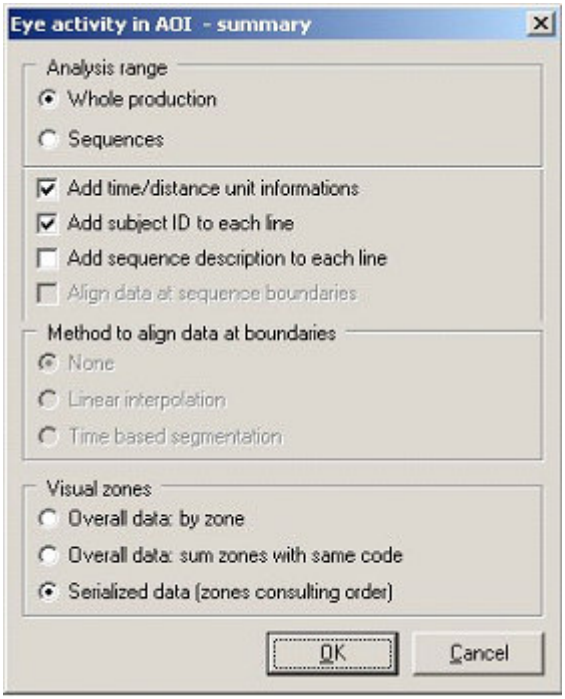


Figure 73: Selecting the summary mode.

The "***Analysis range***" frame allows you to choose whether you want to:

- extract data for the whole analysis ("*Whole protocol*");
- restrict the data extraction to the existing sequences ("*Sequences*").

LABEL	DESCRIPTION
Add time/distance unit information	Add time unit and distance unit information at the beginning of the extraction ? (subject's ID is always added).
Add subject ID to each line	Add subject's name to each data line in the output file ?
Add sequence description to each line	Add the sequence description to each data line ? This description is composed of a sequence number (in order of creation), beginning timestamp, end timestamp and its label.
Align data at sequence boundaries	Should I do something special with data beginning before and ending after a sequence limit? This option can only be activated if "*Sequences*" ("*Analysis range*") is selected.

The options in the "***Method to align data at boundaries***" frame are activated when the "*Align data at sequence boundaries*" option is ticked.

LABEL	DESCRIPTION
None	An event that is "truncated" by a sequence limit will not be taken into account.
Linear interpolation	An event that is "truncated" by a sequence boundary will be integrated into the sequences. A linear interpolation calculation will determine the coordinates corresponding to moment of "truncation".
Time-based segmentation	An event that is "truncated" by a sequence limit will be partially integrated into the sequence. A time-based segmentation will adjust the event time to the sequence start and/or finish.

The following table describes the parameters for the "***Visual Zones***" frame :

LABEL	DESCRIPTION
Overall data: by zone	Each line contains a summary of all the data for an AOI, in the AOI list order (by AOI number).
Overall data: add together zones with same code	Same as the above option, but if two (or more) zones have the same code for data, their data will be added together and they will be regarded as a unique zone. Each line in the file will show the summary for a particular data code belonging to one or more zones.
Serialized data (zone consultation order)	Each line of the output file shows a data summary for an AOI. The order is that of AOI consultations. Each AOI may therefore appear several times. By following the lines of the summary, you can follow the subject's "route" across the AOIs

Once all the parameters have been selected, click on the "*OK*" button to validate. If no AOI list has been loaded, a dialog box will ask you to select an AOI list file.
Next, a "*Save*" dialog box will let you give a name (and optionally a new path) to the output text file.

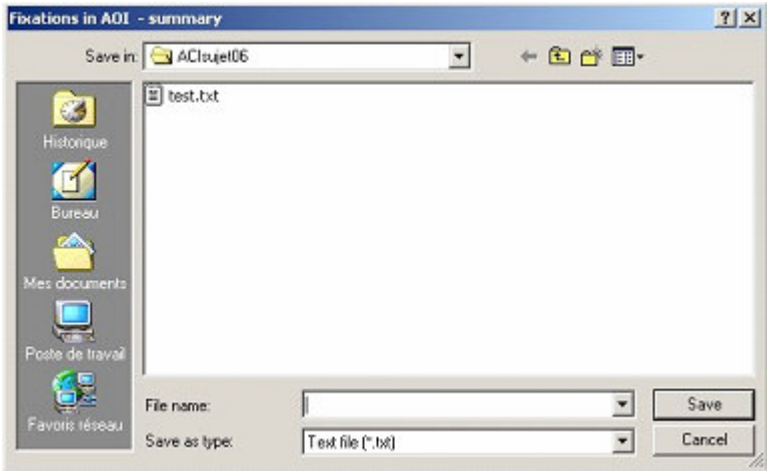


Figure 74: Naming the output file.

Click on the "*Save*" button to complete the process.

XIV.4. Information selection: tracing dynamics

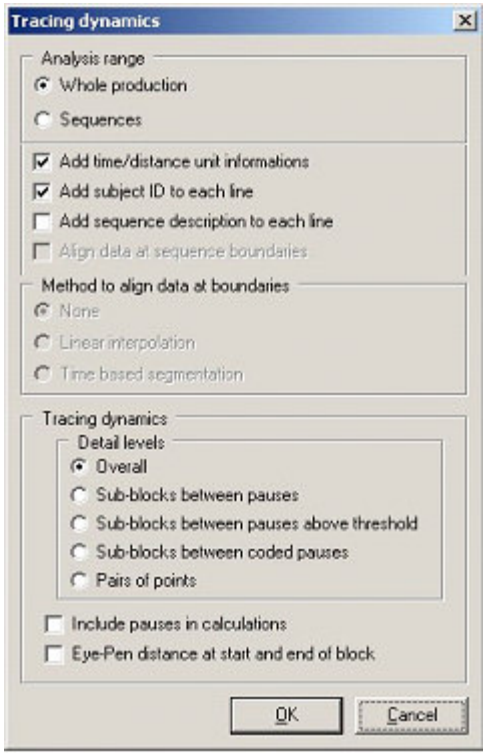


Figure 75: Extraction mode selection.

The "***Analysis range***" frame allows you to choose whether you want to:

- extract data for the entire analysis ("*Whole protocol*");
- restrict data extraction to the existing sequences ("*Sequences*"). Sequences are processed in order of creation.

Below this frame, you will find 4 options, explained in the following table:

LABEL	DESCRIPTION
Add time/distance unit information	Add time unit and distance unit information at the start of extraction ? (subject's ID is always added).
Add subject ID to each line	Add subject's name to each data line in the output file ?
Add sequence description to each line	Add the sequence description to each data line ? This description is composed of a sequence number (according to date of creation), beginning timestamp, end timestamp and label.
Align data at sequence boundaries	Should I do something special with data beginning before and ending after a sequence limit? This option can only be activated if "*Sequences*" ("*Analysis range*") is selected.

The options in the "***Method to align data at boundaries***" frame are activated when the "*Align data at sequence boundaries*" option is ticked.

LABEL	DESCRIPTION
None	An event that is "truncated" by a sequence boundary will not be taken into account.
Linear interpolation	An event that is "truncated" by a sequence boundary will be integrated into the sequences. A linear interpolation calculation will determine the coordinates corresponding to the point of "truncation".
Time-based segmentation	An event that is "truncated" by a sequence boundary will be partially integrated into the sequence. A time-based segmentation will adjust the event time to the sequence start and/or end.

The parameters in the "***Detail levels***" frame are described below.

LABEL	DESCRIPTION
Overall	Gives an overall description of the pen tracing dynamics (average speed, etc.)
Sub-blocks between pauses	Pen tracing is broken up into segments, delimited by "up pauses".
Sub-blocks between pauses (above threshold)	Pen tracing is broken up into segments, delimited by "up pauses" with a duration longer than the pause threshold.
Sub-blocks between coded pauses	Pen tracing is broken up into segments, delimited by "up pauses" with a significant code (>0).
Pairs of points	Calculations are made for each pair of successive points.

Below this frame (and inside the "*Tracing dynamics*" frame) you will find two options:

- "**Include pauses in calculations**". If this option is not ticked, calculations of tracing dynamics will not include pause values. They will be based on "pure" movements.
- "**Eye-pen distance at start and end of block".**

Click on the "OK" button to validate the parameters.
A "*Save*" dialog box will then allow you to supply a name (and optionally a new path) for the output text file.

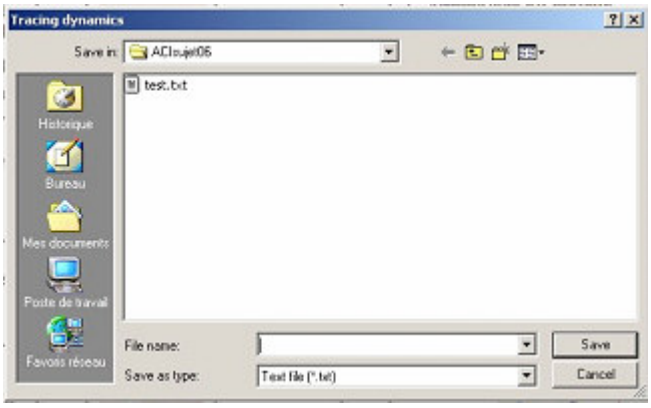


Figure 76: Naming the output file.

Click on the "*Save*" button to complete the process.

XV. DATA EXPORTS

XV.1. Exporting data as a text file

(*File/Exports/Text file*...menu)

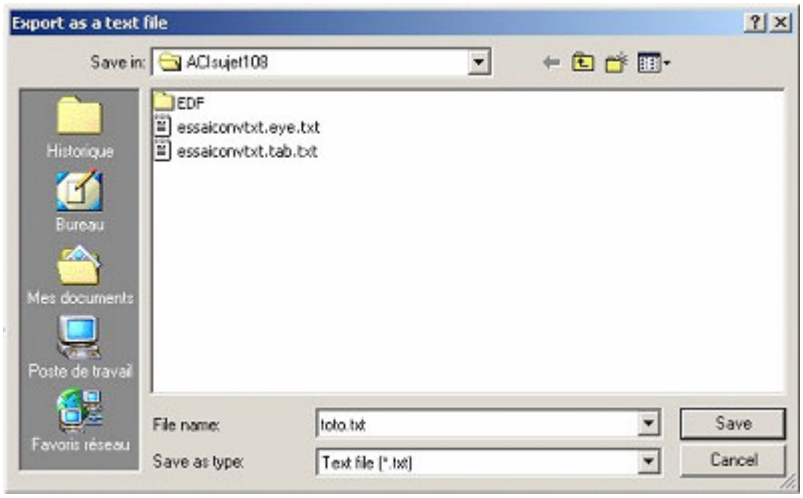


Figure 77: Naming the text file.

Select a directory, choose a name for the file, and click on the "*Save*" button.

Let us suppose that you gave *MyFile* as the filename. In this case, tablet data will be exported to *MyFile.tab.txt* and eye-tracking data to *MyFile.eye.txt*.

Tablet data includes time (in milliseconds), X and Y coordinates, and pen pressure.

Eye data includes time (in milliseconds) and X and Y coordinates.

XIV.2. Exporting data as a G-Studio file

(*File/Exports/G-Studio*... menu)

Select a directory, choose a name for the file, then click on the "*Save*" button.

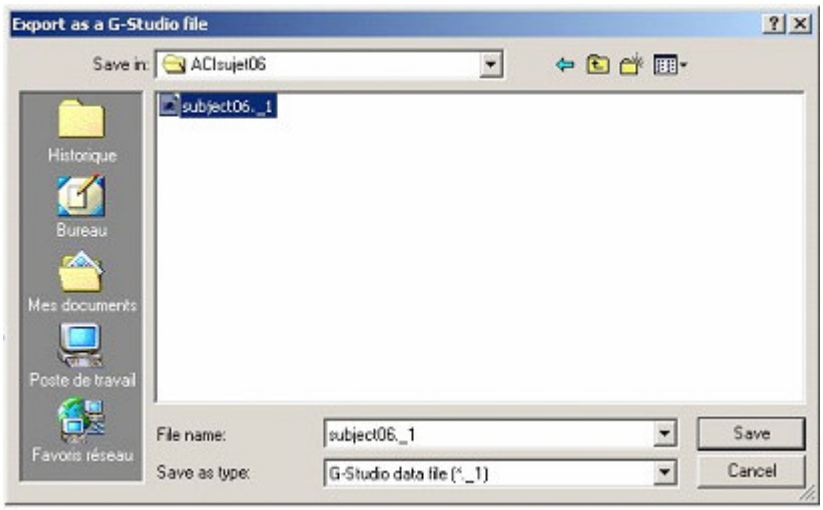


Figure 78: Naming the G-Studio file.

Let us suppose you gave *MyFile* as the filename. Tablet data will therefore be exported to the file named *MyFile._1*.

CHAPTER 4

Useful tools and functions

I. CALIBRATION TEST FOR EYEPUTER

As Eyeputer does not have an interface for a calibration or drift test procedure, a specific calibration test panel has been developed.
To launch this panel, use the "TestCalibration" or "TestDrift" command in a script (for information about using commands, see Part III. Script-based acquisition).
Once a script-based acquisition has been launched and one of these two commands sent, you will see the following panel:

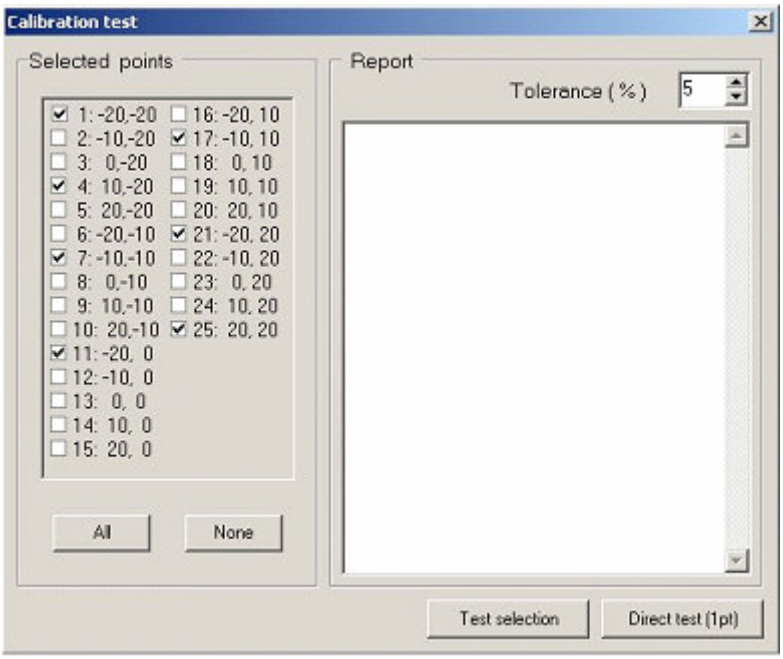


Figure 79: Calibration test panel.

The calibration test panel for Eyeputer shows two frames, labeled:

- "Selected points": select the points that will be used in the test (tick the boxes);
- "Report": shows the coordinates returned by EyePuter, indicating the deviation relative to the theoretical coordinates, and an indication if the deviation exceeds the tolerance limit.

To fine-tune this threshold (percentage), change the value of the parameter located to the right of the "*Tolerance (%)*" label.
The reference for maximum deviation is the distance between the first point of the first line and the second point of the second line of the calibration grid (no.1 and no.7).

The "*Test selection*" button located at the bottom of this frame allows you to test the whole set of selected points.

The "*Direct test*" button allows you to continuously test the first selected point (coordinates returned by the EyePuter are displayed one after the other until you cancel the test).

Press on the keyboard space bar to validate the moment where the subject is looking at the point.

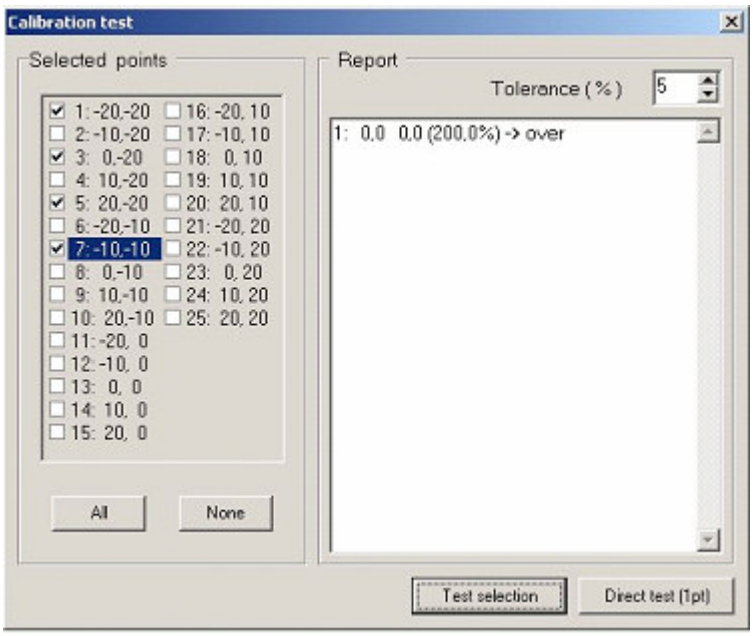


Figure 80: Calibration test report.

In the above example, the points 1, 4, 7 and 11 have been tested and, each time, the returned coordinates were 0 on X and 0 on Y (eye tracker is stopped). Eye & Pen indicates (between brackets) the percentage of deviation between the "theoretical" coordinates and those that were actually received. If this distance is above the tolerance threshold, "-> over" is added.

II. TABLET UNITS – DISTANCE CONVERSION

(*?/Conversions* menu)

The "Eye and Pen" software has a tool to help you *convert* tablet units (lines) into distance measurement units (centimeters or inches, according to the tablet version).
The following dialog box is displayed.

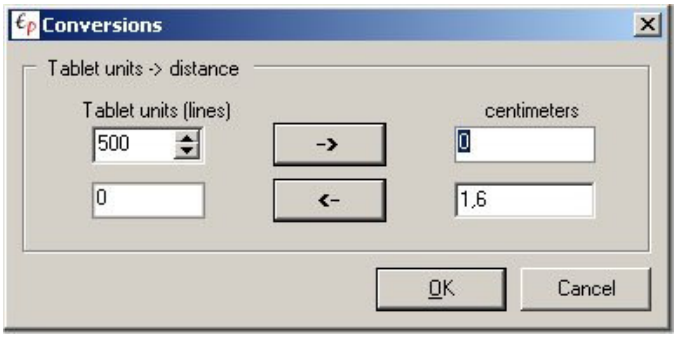


Figure 81: Tool to convert units.

To convert to distance units (e.g. into millimeters), type your value in the "*Tablet units*" box, then click on the right arrow "[->]" button.

The value in measurement units is updated in the box to the right (in this case, the "*centimeters*" box).

To convert to lines, type the value in the box on the right of the dialog box (bottom line), then click on the left arrow "[<-]" button.

The value will be updated in the box on the left.

III. SYSTEM INFORMATION

III.1. Configuration and resources

(*?/System information* menu)

The following panel will be displayed.

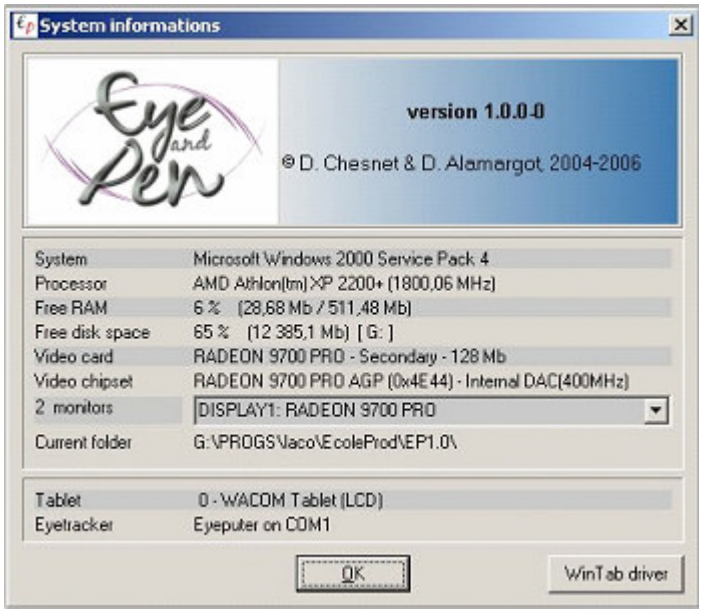


Figure 82: System information dialog box.

To obtain further details about the tablet driver, click on the "*Wintab driver*" button.

III.2. Tablet driver information

(*?/System information* menu, *Wintab driver* button)

The following information is not needed for everyday use. However, it may help you understand how the tablet driver works and how it interacts with the Windows system. It may also prove useful during maintenance operations.

The dialog box contains a set of 10 buttons for displaying specific driver parameters.

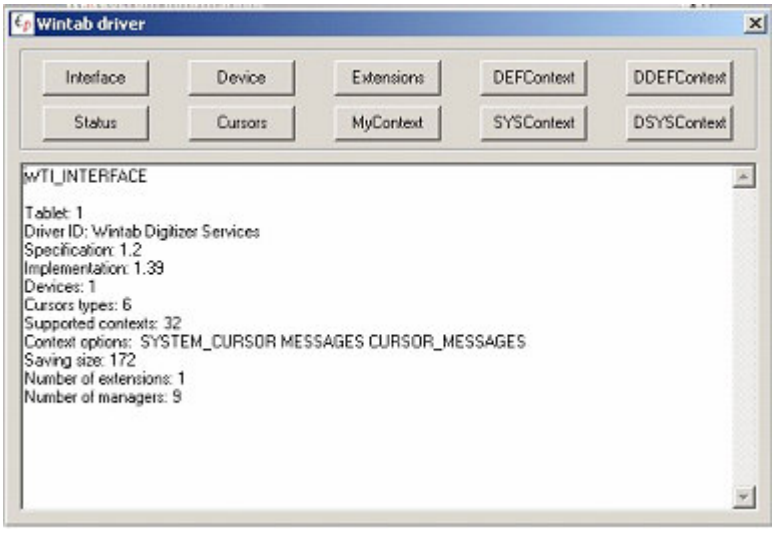


Figure 83: Information panel for the tablet driver.

III.2.1. Interface

Click on the "*Interface*" button to obtain information about how the tablet driver communicates with the Windows interface.

LABEL	DESCRIPTION
Tablet	Number of the tablet detected by the driver.
Driver ID	Name of the tablet driver.
Specification	Version of the formal description of the driver (standard specification supported).
Implementation	Driver version.
Devices	Number of devices.
Cursor types	Number of cursor types supported (e.g. stylus, puck, etc.).
Supported contexts	Maximum number of simultaneous contexts.
Context options	Driver options, as requested by "Eye and Pen".
Saving size	Buffer size for saving information.
Number of extensions	Driver's maximum number of extensions.
Number of managers	Maximum number of management structures for contexts.

III.2.2. Device

The "*Device*" button provides information about the connected tablet.

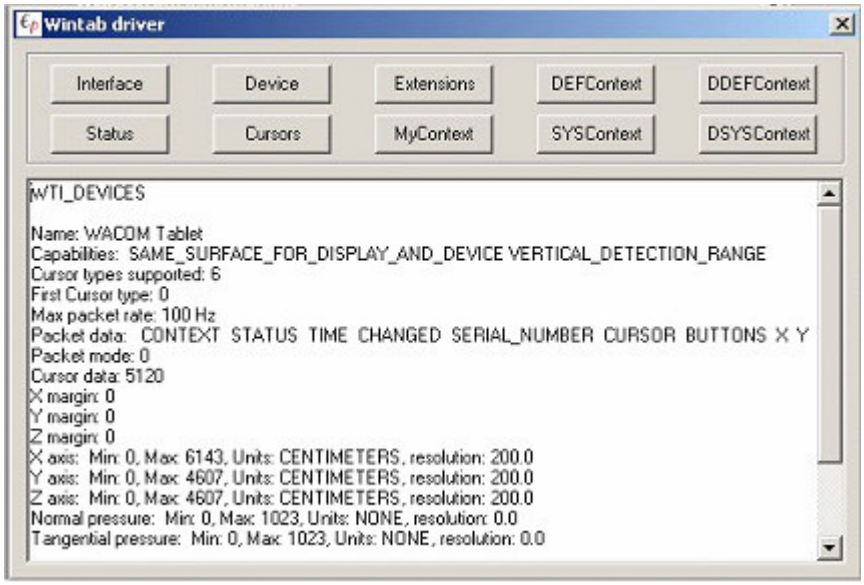


Figure 84: Tablet device parameters.

LABEL	DESCRIPTION
Name	Tablet name.
Capabilities	Specific capabilities of the tablet model For example : - the same surface is used for display and pen detection (specific characteristic of an LCD tablet) - the vertical detection range
Cursor types supported	Number of cursor models supported.
First cursor type	Number of the first cursor type.
Max. packet rate	Maximum sampling rate for this device.
Packet data	Description of the data included in a packet (ex. X and Y coordinates, button states, etc.)
Packet mode	How the data packets are transmitted (messages, requests,etc.).
Cursor data	Numeric value for the binary mask describing the cursor shape.
X margin	Horizontal axis offset.
Y margin	Vertical axis offset.
Z margin	“Depth” axis offset.
X axis	Horizontal axis: minimum and maximum coordinates, unit type, resolution.
Y axis	Vertical axis: minimum and maximum coordinates, unit type, resolution.
Z axis	“Depth” axis: minimum and maximum coordinates, unit type, resolution.
Normal pressure	Information about pen pressure (minimum and maximum pressure values, unit type and resolution).
Tangential pressure	Information about tangential pen pressure (minimum and maximum values, unit type and resolution).
Orientation	Slope of the pen: minimum and maximum coordinates, unit and resolution on each axis (X, Y and Z).
Rotation	Rotation of the pen: minimum and maximum coordinates, unit and resolution on each axis (X, Y and Z).
Plug and Play ID	Device’s Plug and Play identifier.

III.2.3. Extensions

The “Extensions” button provides information about the tablet driver's installed extensions.

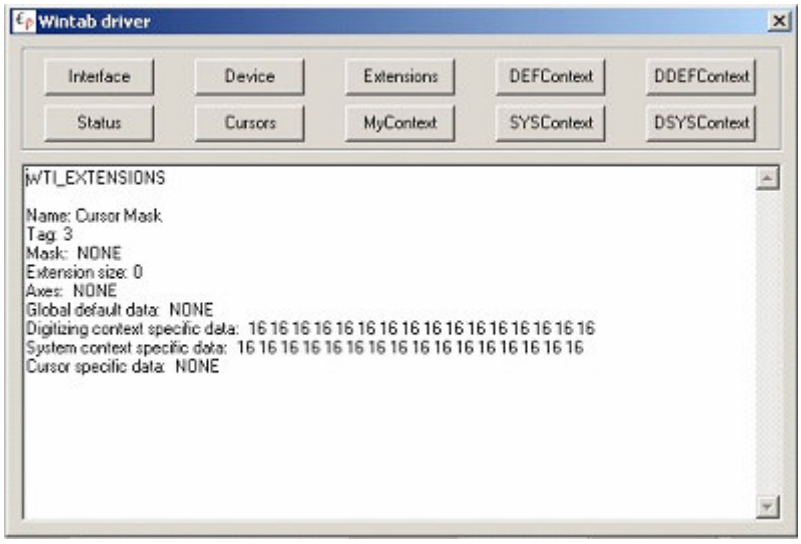


Figure 85: Driver’s active extensions.

LABEL	DESCRIPTION
Name	Extension name.
Tag	Value.
Mask	Mask value for events.
Extension size	In absolute and relative mode.
Axes	Axes involved in the extension functions.
Global default data	Self-explanatory
Digitizing context specific data	Self-explanatory
System context specific data	Self-explanatory
Cursor specific data	Self-explanatory

III.2.4. System and logical contexts

The *DEFContext, DDEFContext, SYSContext* and *DSYSContext* give the same types of information.

- *DEFContext*: digitization default logical context.
- *DDEFContext:* digitization default logical context for the corresponding device.
- *SYSContext*: system digitization default logical context for the system.
- *DSYSContext:* system digitization default logical context for the corresponding device.

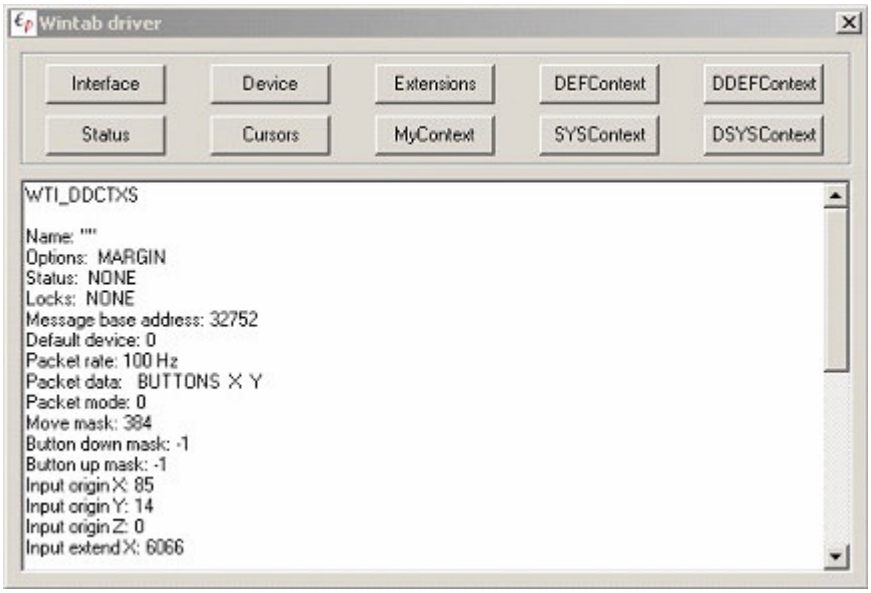


Figure 86: Default context.

LABEL	DESCRIPTION
Name	Context name.
Options	Options specific to this context.
Status	Context status in relation to other contexts.
Locks	Locked functions and values.
Message base address	Memory address for the messages in the system message queue.
Default device	Default device number.
Packet rate	Packet transmission rate (approx. sampling rate).
Packet data	Packet content (e.g. X and Y coordinates, button states, etc.).
Packet mode	Data transmission mode.
Move mask	Logical mask for movements.
Button down	Logical mask to assign a button down event.

mask	
Button up mask	Ditto for a button up event.
Input origin X	X coordinates origin (in tablet units). This may not be zero, e.g. due to the calibration of an LCD tablet (matching between screen output and tablet input).
Input origin Y	Y coordinates origin (input = digitizer origin).
Input origin Z	Z coordinates origin.
Input extend X	Extension of the coordinates on the X axis (in tablet units).
Input extend Y	Extension of the coordinates on the Y axis (in tablet units).
Input extend Z	Extension of the coordinates on the Z axis (in tablet units).
Output origin X	Origin value for the digitized position on the X axis.
Output origin Y	Origin value for the digitized position on the Y axis.
Output origin Z	Origin value for the digitized position on the Z axis.
Output extend X	Extension of the digitizing coordinates on the X axis (in tablet units).
Output extend Y	Extension of the digitizing coordinates on the Y axis (in tablet units).
Output extend Z	Extension of the digitizing coordinates on the Z axis (in tablet units).
Sensitivity X	Sensitivity to position variation between one point and the next on the X axis.
Sensitivity Y	Sensitivity to position variation on the Y axis.
Sensitivity Z	Sensitivity to position variation on the Z axis.
Tracking mode	The way the tablet "pointer" is treated: absolute mode (pen) or relative mode (mouse).
Display origin X	Origin of physical display coordinates on the X axis (pixels).
Display origin Y	Origin of physical display coordinates on the Y axis (pixels).
Display extend X	Extension of the display coordinates on the X axis (in pixels).
Display extend Y	Extension of the display coordinates on the Y axis (in pixels).
System cursor sensitivity X	Sensitivity of the system cursor on the X axis (can be zero).
System cursor sensitivity Y	Sensitivity of the system cursor on the Y axis (can be zero).

III.2.5. Status

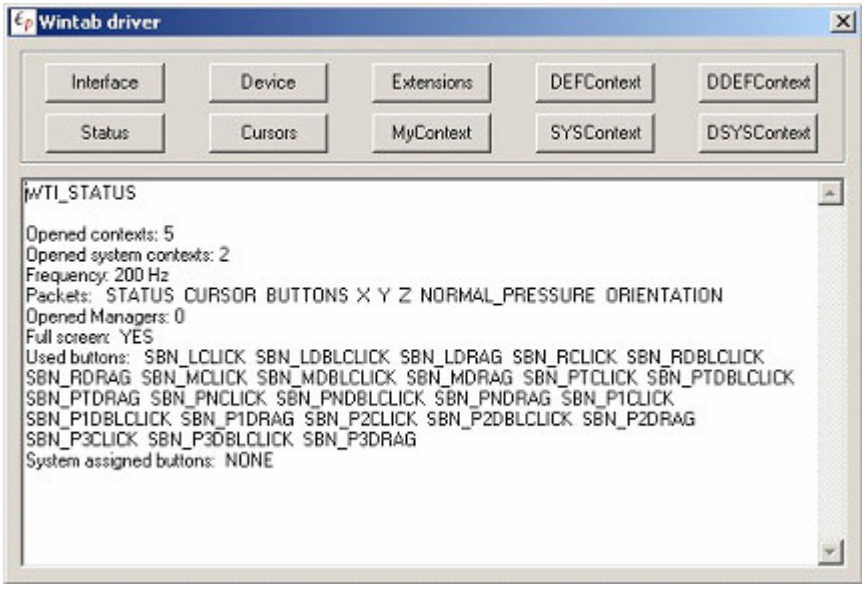


Figure 87: Driver status.

LABEL	DESCRIPTION
Opened contexts	Number of logical contexts currently in use.
Opened system contexts	Number of system contexts currently in use.
Frequency	Maximum transmission rate.
Packets	Data included in a packet (Button states, X and Y coordinates, etc.).
Opened managers	Number of context managers up and running.
Full screen	Does the tablet surface match the entire screen ?
Use buttons	Events the device's buttons can respond to.
System assigned buttons	System events a button will be able to respond to.

III.2.6. Cursors (tablet tools)

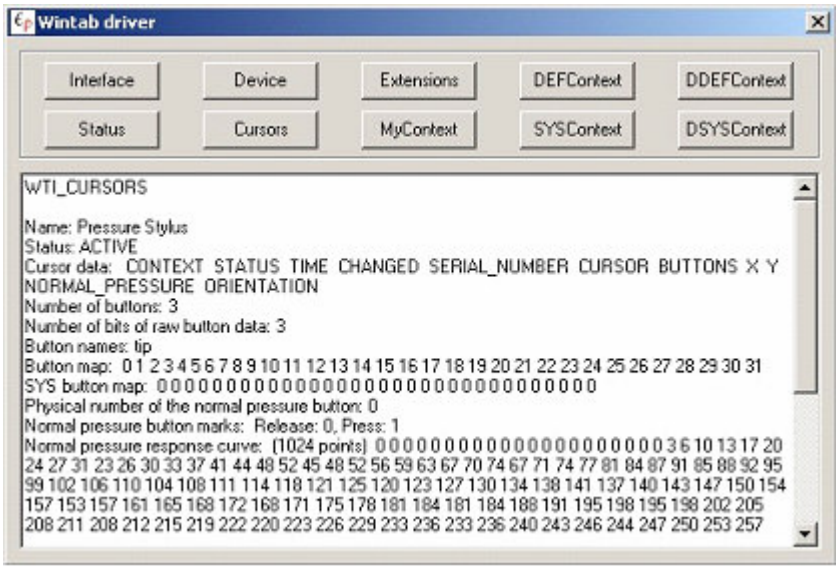


Figure 88: Cursor parameters.

LABEL	DESCRIPTION
Name	Cursor (tool) name.
Status	Active / inactive.
Cursor data	Information returned by the driver with this cursor.
Number of buttons	Number of buttons for the tool.
Number of bits of raw button data	Number of bits in data indicating button states.
Button names	Names of the cursor's buttons.
Button maps	Value indicating which button is supported.
SYS Button maps	Value indicating which button can act on the system.
Physical number of the normal pressure button	Number of the button returning the pressure value.
Normal pressure button marks	Pressure values marking press/release state (e.g. press = 23, release = 20).
Normal pressure response curve	Values returned in response to each pressure level.
Physical number of the tangential pressure button	Number of the button used to return the tangential pressure value.

Tangential pressure button marks	Pressure values marking press/release state (e.g. press = 23, release = 20).
Tangential pressure response curve	Values in response to each pressure level.
Manufacturer cursor physical ID	"Hardware" identifier provided by the cursor manufacturer.
Cursor capabilities	How the cursor is able to return information (multimode, etc.).

III.2.7. MyContext

Provides information about Eye and Pen's current defined logical context. This is the context used if you launch an acquisition.
Field names and values have the same meaning as for other context types.

Please note in the following screenshot that a special warning is displayed when in double screen configuration with an LCD tablet (see appendix VII, p141).

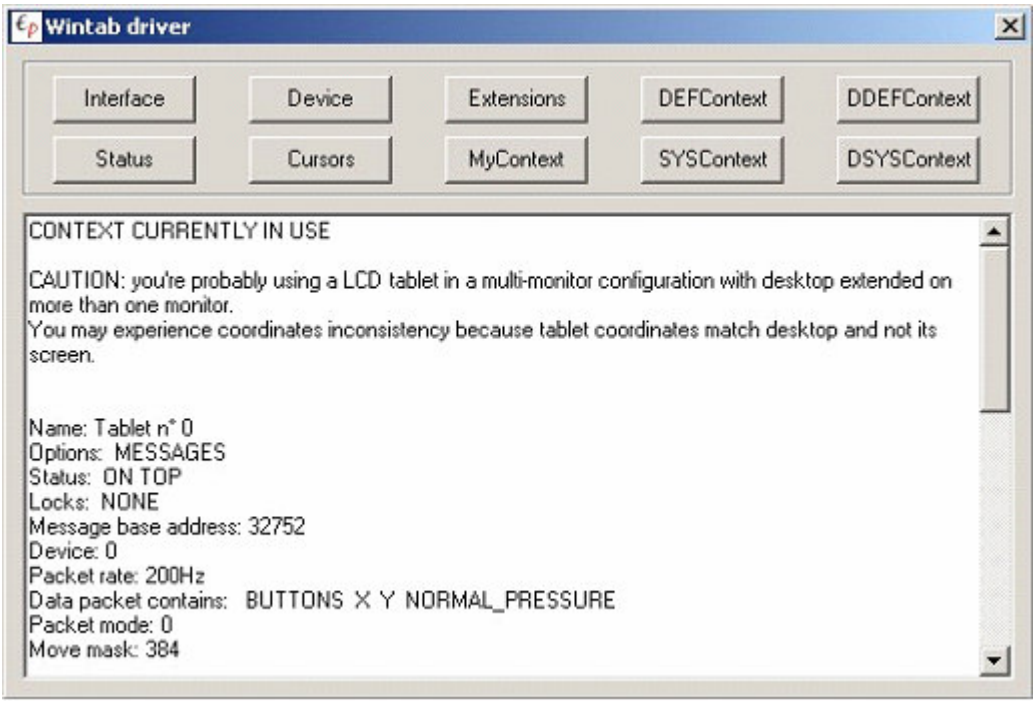


Figure 89: Logical context defined by Eye and Pen.

LABEL	DESCRIPTION
Name	Name of the current "Eye and Pen" context (tablet number)
Options	Options specific to this context.
Status	Context status, relative to all contexts.
Locks	Locked functions and values.

Message base address	Memory address for the messages in the system message queue.
Default device	Default device number.
Packet rate	Maximum packet transmission rate.
Packet data	Content of a packet (e.g. X and Y coordinates, button states, etc.).
Packet mode	Data transmission mode.
Move mask	Logical mask for movements.
Button down mask	Logical mask to assign a button down event.
Button up mask	Ditto for a button up event.
Input origin X	X coordinates origin (in tablet units). This may not be zero, e.g. due to the calibration of an LCD tablet (matching between screen output and tablet input).
Input origin Y	Y coordinates origin (input = digitizer origin).
Input origin Z	Z coordinates origin.
Input extend X	Extension of the coordinates on the X axis (in tablet units).
Input extend Y	Extension of the coordinates on the Y axis (in tablet units).
Input extend Z	Extension of the coordinates on the Z axis (in tablet units).
Output origin X	Origin value for the digitized position on the X axis.
Output origin Y	Origin value for the digitized position on the Y axis.
Output origin Z	Origin value for the digitized position on the Z axis.
Output extend X	Extension of the digitizing coordinates on the X axis (in tablet units).
Output extend Y	Extension of the digitizing coordinates on the Y axis (in tablet units).
Output extend Z	Extension of the digitizing coordinates on the Z axis (in tablet units).
Sensitivity X	Sensitivity to position variation between one point and the next on the X axis.
Sensitivity Y	Sensitivity to position variation on the Y axis.
Sensitivity Z	Sensitivity to position variation on the Z axis.
Tracking mode	Way the tablet "pointer" is treated: absolute mode (pen) or relative mode (mouse).
Display origin X	Origin of physical display coordinates on the X axis (pixels).
Display origin Y	Origin of physical display coordinates on the Y axis (pixels).

Display extend X	Extension of the display coordinates on the X axis (in pixels).
Display extend Y	Extension of the display coordinates on the Y axis (in pixels).
System cursor sensitivity X	Sensitivity of the system cursor on the X axis (can be zero).
System cursor sensitivity Y	Sensitivity of the system cursor on the Y axis (can be zero).

IV. LEGAL INFORMATION AND ACKNOWLEDGEMENTS

(*?/About* menu)

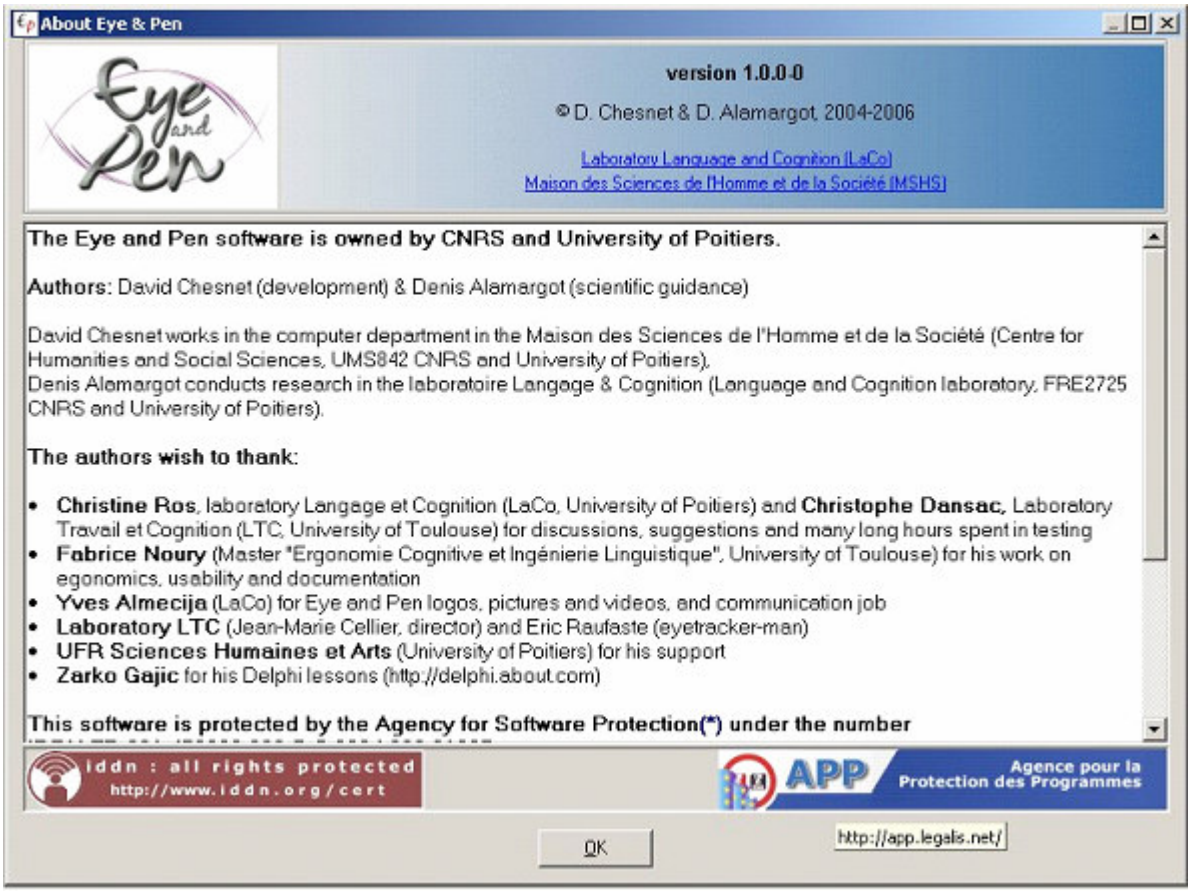


Figure 90: Information and acknowledgements dialog box

Chapter 5

Appendices

I. KEYBOARD SHORTCUTS

KEY(S)	DESCRIPTION
CTRL + **N**	New analysis
CTRL + **O**	Open an existing analysis
CTRL + **S**	Save the current analysis
CTRL + **F4**	Close the analysis
ALT + **F4**	Quit Eye and Pen
SHIFT + **E**	Recenter the analysis “window” to make the eye cursor visible
SHIFT + **T**	Recenter the analysis “window” to make the pen cursor visible
HOME	Jumps to start of protocol
END	Jumps to end of protocol
Up arrow	Previous pause
Down arrow	Next pause
Left arrow	Previous data (event)
Right arrow	Next data (event)

II. WINTAB32-COMPLIANT HARDWARE MANUFACTURERS

Wintab32is an industrial standard intended to ensure straightforward communication between computers and digitizing tools, such as tablets.
This list is not exhaustive. Some manufacturers of compliant hardware may be missing.

COMPANY	WEBSITE
ACECAD Enterprise Co. Ltd.	http://www.acecad.com.tw
Aiptek Inc.	http://www.aiptek.com.tw
ALTEK Corp	http://www.altek.com
Aristo Graphic Systeme GmbH & Co. KG	http://www.aristo.de
Communications Intelligence Corp.	http://www.cic.com/
Graphtec Corp.	http://www.graphteccorp.com
GTCO Calcomp Corp.	http://www.gtcocalcomp.com
IQ Automation	http://www.iq-automation.de/
Hitachi Digital Graphics	http://www.hitachi-soft.com/icg/products
KYE Systems Corp.	http://www.genius-kye.com
Mutoh America, Inc.	http://www.mutoh.be/
NEC Corp.	http://www.nec.com/
Numonics Corp.,	http://www.numonics.com
Oce Graphics SA.	http://www.oce.com
Pinnacle Technologies	http://www.pinnacle.com.ph/
Seiko Instruments Inc.,	http://www.sii.co.jp/corp/eg/index_1.html
Sony Corp.	http://www.sony.net/
Topaz Systems Inc.	http://www.topazsystems.com/
Twinhead Corp.	http://www.twinhead.com/
WACOM Corp.	http://www.wacom.com

III SCRIPT TRAINING

This section of the manual is intended to help you to practice script writing.

III.1. Exercises

III.1.1. Exercise 1

Build a script allowing the subject to start (or restart) Task 1 a maximum of 4 times and Task 2 a maximum of 2 times. Each task is triggered by a zone on the tablet.
We want you to record what the subject does each time (different recording file for each time).
When the maximum is reached, event if the subject presses the pen in one of the zones, nothing will happen, the session is over. When the pen is pressed in the "Stop" zone, the script continues, jumping to a "Next" label.

III.2. Solutions

III.2.1. Exercise 1

```
DefineTabZone(x1,y1,x2,y2,Task1)
DefineTabZone(x1,y1,x2,y2,Task2)
DefineTabZone(x1,y1,x2,y2,Stop)

JumpTo(Go)

:Task1
JumpToIfNumberIs(5,Go,FALSE)
OpenRec(_task1_%)
```

do something

```
JumpTo(Go,TRUE)

:Task2
JumpToIfNumberIs(3,Go,FALSE)
OpenRec(_task2_%)
```

do something

```
JumpTo(Go,TRUE)

:Stop
JumpTo(Next)

:Go
WaitForTabZones


:Next
```

script continues here

IV. SCRIPT COMMANDS SUMMARY

Files and directories

SetSafeRec(DontErase)

SetSafeRec(TRUE)

OpenRec(AddToSubjectName)

OpenRec(_partie1)

CloseRec

CloseRec

SetPicsDirectory(DirectoryPath)

SetPicsDirectory(C:\MesImages\)

SetDataDirectory(DirectoryPath)

SetDataDirectory(C:\DataManip1\)

Display

SetDisplayWindowCoord(X1,Y1,X2,Y2)

SetDisplayWindowCoord(0,0,1024,768)

SetPenColor(ColorValue)

SetPenColor(0)

SetFont(FontName,FontSize,FontColor,BkgndColor)

SetFont(Arial,14,0,16444)

Eye tracker

SetCalibrationCoord(X1,Y1,X2,Y2)

SetCalibrationCoord(0,0,1024,768)

TestCalibration

TestCalibration

TestDrift

TestDrift

Stop the script and wait for a key press

WaitForKeyPress

WaitForKeyPress

WaitForKeyPressMsg(Message,X,Y)

WaitForKeyPressMsg(Press a key to continue…,-1,600)

WaitForKeyPressText(TextFileName)

WaitForKeyPressText(introduction.txt)

WaitForKeyPressPic(PictureFileName,X,Y)

WaitForKeyPressPic(probe.bmp,0,0)

Tablet zone

WaitForTabZoneAt(x1,y1,x2,y2,CanDraw,HidePic,MustLeave)

WaitForTabZoneAt(2483,0,5624,378,TRUE,TRUE,TRUE)

Jumps in the script

:label

:Label1

JumpTo(Label,MustCloseRec)

JumpTo(Label1,FALSE)

JumpToIfNumberIs(Iterations,Label,MustCloseRec)

JumpToIfNumberIs(5,Label1,TRUE)

Jumps in the script triggered by the tablet

DefineTabZone(X1,Y1,X2,Y2,Label)

DefineTabZone(2483,0,5624,378,Label1)

WaitForTabZones(CanDraw,HidePic,MustLeave,MustCloseRec)

WaitForTabZones(TRUE,TRUE,TRUE,FALSE)

ClearZones

ClearZones

Stimulus

DisplayMsg(Message,Duration,X,Y)

DisplayMsg(Welcome to the lab,2500,-1,-1)

HideMessage

HideMessage

DisplayText(TextFileName,Duration)

DisplayText(Textfile1.txt,-1)

HideText

HideText

DisplayPic(PictureFileName,Duration,X,Y)

DisplayPic(stimulus1.bmp,1200,0,0)

HidePicture

HidePicture

DisplayAVI(VideoFileName,X,Y,Wait)

DisplayAVI(film.avi,100,150,TRUE)

StopAVI

StopAVI

DisplayImageList(ListFileName,X,Y,DurationPerPicture, HideLastPic)

DisplayImageList(diaporama.txt,-1,-1,1850,TRUE)

PlaySound(WaveFileName,Wait)

```
PlaySound(noise.wav,FALSE)
```

StopSound

```
StopSound
```

SetVolume(value)

```
SetVolume(35000)
```

Using the "Simple" acquisition mode

RecStandard(AddToSubjectName)

```
RecStandard(_Item1)
```

**RecNewUsages(AddToSubjectName,UseBack,UseZone1,
ShowOnStart,HideOnPress,UseZone2)**

```
RecNewUsages(_1,FALSE,TRUE,TRUE,TRUE,FALSE)
```

RecNewPics(AddToSubjectName,BackPic,Pic1,Pic2)

```
RecNewPics(_Serie2,YellowBack,car.bmp,road.bmp)
```

**RecNewPics&Usages(AddToSubjectName,BackPic,UseBack,
Pic1,UseZone1,ShowOnStart,HideOnPress,Pic2,UseZone2)**

```
RecNewPics&Usages(_2,Fond.bmp,TRUE,Im1.bmp,TRUE,FALSE,FALSE,Im2.b
mp,TRUE)
```

**SetPicsZones(x1Zone1,y1Zone1,x2Zone1,y2Zone1,
x1Zone2,y1Zone2,x2Zone2,y2Zone2)**

```
SetPicsZones(27094,23480,30480,18203,27094,14626,30480,9434)
```

RestoreOriginalPicsZones

```
RestoreOriginalPicsZones
```

**RecNewAll(AddToSjName,BkPic,UseBack,
Picture1,x1Zone1,y1Zone1,x2Zone1,y2Zone1,
UseZone1,ShowOnStart,HideOnPress,
Picture2,x1Zone2,y1Zone2,x2Zone2,y2Zone2,UseZone2,
X1ZoneEnd,Y1ZoneEnd,X2ZoneEnd,Y2ZoneEnd)**

```
RecNewAll(_4,back.bmp,TRUE,Im1.bmp,27094,23480,30480,18203,
TRUE,FALSE,FALSE,Im2.bmp,27094,14626,30480,9434,TRUE,12456,
1845,14170,1235)
```

V. ACQUISITION SESSION LOG FILE (SCRIPT)

A file is generated for each acquisition session (<Data Directory><SubjectID>**.**LOG). This contains a trace of the main events of interaction with the subject (displays, recordings, subject's answers, etc.), with the corresponding time (in milliseconds) of the event. The start of timing (the zero hour) coincides with the beginning of the acquisition session (when the "Go" button is pressed).

The parameters between **<>** are replaced in the file with their value (cf. table of script commands on p. 136 for name and parameter values).

<*Time*> WaitForTabZoneAt <*X1*> <*Y1*> <*X2*> <*Y2*> <*CanDraw*> <*HidePic*> <*MustLeave*>

<*Time*> WaitForTabZones <*CanDraw*> <*HidePic*> <*MustLeave*>

<*Time*> ZoneSelected <*label of the selected zone*>

<*Time*> RecStandard < *subject filename* > <*UseBack*> <*PictureFileName*> <*UseIm1*> <*PictureFileName*> <*zone1 X1*> <*Y1*> <*X2*> <*Y2*> <*ShowOnStart*> <*HideOnPress*> <*UseIm2*> <*PictureFileName*> <*zone2 X1*> <*Y1*> <*X2*> <*Y2*> <*zone Fin X1*> <*Y1*> <*X2*> <*Y2*>

<*Time*> OpenRec <*subject filename*>

<*Time*> CloseRec

<*Time*> DisplayMsg <*Message*> <*X*> <*Y*>

<*Time*> MessageHidden

<*Time*> DisplayText <*TextFileName*>

<*Time*> TextHidden

<*Time*> DisplayPic <*PictureFileName*> <*X*> <*Y*>

<*Time*> PictureHidden

<*Time*> DisplayImageList <*ListFileName*> <*X*> <*Y*> <*DurationPerPicture*>

<*Time*> DisplayAVI <*VideoFileName*> <*X*> <*Y*>

<*Time*> AVIEnd

<*Time*> WaitForKeyPress

<*Time*> KeyPressed <*key pressed*>

<*Time*> WaitFor <*Duration*>

<*Time*> PlaySound <*WavFfileName*> <*Wait*>

<*Time*> SoundEnd

VI. FILENAME EXTENSIONS

This table explains the file extensions recognized or generated by Eye and Pen.

Extension	Usage
TAB	“Tablet” acquisition data
EYE	“Eye-tracker” acquisition data
TWK	Analysis file, tablet data
EWK	Analysis file, eye (gaze) data
INI	Eye and Pen configuration file
HST	History file for a protocol (record of data reduction, etc.)
AOI	Visual Area Of Interest file
SEQ	Protocol sequence file
LOG	Record of main interactive events during an acquisition session (Script)
_1	“Magneto” file (import / export)
TXT	Text file (export)
TAB.TXT	“Raw” tablet data export file (text-only file)
EYE.TXT	“Raw” eye data export file (text-only file)
BMP	Bitmap picture (import)
JPG	Jpeg picture(import / export)

VII. CONFIGURING THE TABLET WITH A DOUBLE SCREEN

A double screen configuration is a display configuration (defined in Windows) where you work with a computer monitor and an LCD tablet.

With this kind of configuration, the Windows operating system will consider that the tablet screen and the computer screen are merged into single desktop.

The *?/System information* menu, *Wintab driver* button, then *MyContext* button will tell you whether you are in a configuration that may lead to problems.

Let us suppose that each monitor is configured with a 1024 x 768 pixels resolution. Windows desktop will then be 2048 x 768 pixels wide.
In this example, the LCD tablet connected to my computer has a 6000-line resolution for digitization (returned coordinates range from 0 to 6000).

In theory	In practice
Report The system of coordinates is the same as the computer screen. The tablet assigns its system of coordinates to half the Windows desktop: its 6000 points are linked to 1024 pixels on the desktop.	**Report** The LCD tablet re-assigns the computer screen coordinates to its own system. It assigns its digitalizing coordinates to the whole Windows desktop: its 6000 points are linked to the 2048 pixels of the desktop.
Consequences If the LCD tablet is located : • **to the left** of the computer screen, its display coordinates will range from 0 to 1024 pixels. When digitizing data, its coordinates will range from 0 to 6000 lines. • **to the right** of the computer screen, its display coordinates will range from 1025 to 2048 pixels. When digitizing data, its coordinates will range from 0 to 6000 lines.	**Consequences** If the LCD tablet is located : • **to the left** of the computer screen, its display coordinates will range from 0 to 1024 pixels. When digitizing data, its coordinates will range from 0 to 3000 lines. • **to the right** of the computer screen, its display coordinates will range from 1025 to 2048 pixels. When digitizing data, its coordinates will range from 3000 to 6000 lines.

Solution

When you want to work in this configuration, make sure you define the tablet with half its horizontal (X) coordinates.
To do this, launch the acquisition configuration panel, select the "Tablet" tab and set "*X2*" to half your tablet's horizontal resolution.

VIII. FREQUENTLY ASKED QUESTIONS (FAQ)

1- How can I find out my screen resolution?

In Windows, go to the Start/Parameters/Configuration panel menu. Choose Display. Click on the Parameters tab. The “Screen resolution” frame will tell you everything you need to know.

2- I want to display a picture in the calibration window, but I don't know how to calculate its position in pixels.

If your picture is to be displayed in the upper left-hand corner of the screen, it is simplicity itself, as the coordinates are 0 and 0.
However, I actually want to place the picture 10 cm away from the left edge of the window. My screen has a 1024x768 pixels resolution. I measure (with a ruler) the horizontal width of the display surface (the display area of the screen, not the plastic frame, etc.). On my 15" LCD, this comes to 30.4 cm. As my horizontal resolution is 1024, 10 cm represents (1024 / 30.4) x 10 = 336.84, i.e. approx. 337 pixels.

3- I want to display a video file, but it is not in a supported AVI format.

Use video conversion software (encoding software) to convert your video into AVI with MS-RLE compression (you can find reliable software for free on the Web).

4- I want to play an audio file, but it is not in a supported WAV format.

Try using audio encoder/decoder software to convert your file into wave file format (you can find reliable software for free on the Web).

5- I have an annoying item of data in my protocol, how can I get rid of it ?

You can manually assign the “-1” code to an item of data. That way, it will not be taken into account when editing, etc. This is a simple way of discarding "poor" or "unwanted" data.

6- I can't remember all the transformations I've carried out on my protocol...

Consult the history (Protocol/History menu) to find out if you have already built fixations, shifted layers, aggregated data, etc.

7- When does the recording timer start?

The recording timer starts immediately (or is reset to zero) when the command `OpenRec` is activated or when recording commands driving the “simple” protocol (`RecStandard`, etc.) is executed. Therefore, each new data file starts at zero time. To gain an overview of the session, check the session log file (<*subjectname*>.LOG) which contain the time when each event occurs. The session has its own timer, where "zero time" corresponds to the click on the “Go” button.

8- In the case of “All events/Pauses and fixations” extractions, some data are mentioned more than once. Is this normal?

As you may have guessed, it is. This edition shows the state of concomitant events. Accordingly, if several fixations take place during a single pause, this pause will be mentioned several times, once for each fixation.

IX. TROUBLESHOOTING

1- Since I plugged a second tablet in, everything has gone wrong.

WACOM tablet drivers prior to version 4.78.6 may cause problems if too many tablets are connected. De-install the current driver (in Windows, Configuration panel, Add/Remove programs), then install the latest version.

2- Eye and Pen tells me "Wintab32.dll not found", but my tablet still seems to work in Windows.

Wintab32.dll is an interface library that is needed for Eye and Pen to communicate with your tablet's driver. Usually, this file is installed when you install the tablet's software provided by its manufacturer. When in doubt, reinstall the driver.

3- I move the pen on the tablet (Tablet/Test menus), but nothing happens...

Check if the pen you are using is compatible with the tablet. For example, Wacom Intuos2 pencils are not compatible with other tablets from the same manufacturer. Also check if the tablet's driver is correctly installed and configured. Check if you have selected the tablet you actually want to use (*File/Configuration/Acquisition/Tablet* menu)

4- When I click on the *?/Manual* menu nothing is displayed

Either the EPManuel_EN.pdf file is not in the *documents* subdirectory of Eye and Pen, or you do not own the software required to read this document (Adobe Reader®), which you can download for free from the Website http://www.adobe.fr/products/acrobat/)

X. BIBLIOGRAPHY

Eye and Pen: methods and early results

Alamargot, D., Chesnet, D., Dansac, C., & Ros, C. (in press). Eye and Pen: a new device to study reading during writing. *Behavior Research Methods, Instruments and Computers*.

Alamargot, D., Dansac, C., & Chesnet, D. (in press). Parallel processing before and after pauses: A combined analysis of graphomotor and eye movements during procedural text production. In M. Torrance, D. Galbraith & L. v. Waes (Eds.), *Cognitive Factors in Writing*. Dordrecht-Boston-London: Elsevier Sciences Publishers.

Alamargot, D., Dansac, C., Ros, C., & Chuy, M. (2005). Rédiger un texte procédural à partir de sources: relations entre l'empan de mémoire de travail and l'activité oculaire du scripteur. In D. Alamargot, P. Terrier & J. M. Cellier (Eds.), *Production, compréhension and usages des écrits techniques au travail* (pp. 51-68). Toulouse: Octarès.

Caporossi, G., Alamargot, D., & Chesnet, D. (2004). Using the computer to study the dynamics of handwriting processes. *Lecture Notes in Computer Science, 3245*, 242-254.

Chesnet, D., & Alamargot, D. (2005). Analyses en temps réel des activités oculaires and graphomotrices du scripteur: intérêt du dispositif 'Eye and Pen'. *L'Année Psychologique, 105*(3), 477-520.

Some publications on eye movements

Inhoff, A. W., & Gordon, A. M. (1998). Eye movements and eye-hand coordination during typing. *Current Directions in Psychological Science, 6*(6), 153-157.

Inhoff, A. W., & Radach, R. (1998). Definition and computation of oculomotor measures in the study of cognitive processes. In G. Underwood (Ed.), *Eye Guidance in Reading and Scene Perception*. North Holland: Elsevier Sciences Publishers.

Inhoff, A. W., Topolski, R., & Wang, J. (1992). Saccade programming during short duration fixations: An examination of copytyping, letter detection, and reading. *Acta Psychologica, 81*(1), 1-21.

Kennedy, A., Radach, R., Heller, D., & Pynte, J. (Eds.). (2000). *Reading as a Perceptual Process*: North Holland - Elsevier Science Publishers.

Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin, 124*(3), 372-422.

Reichle, E. D., Rayner, K., & Pollatsek, A. (2003). The E-Z reader model of eye-movement control in reading: comparisons to other models. *Behavioral and Brain Sciences, 26*, 445-526.

Salvucci, D. D., & Anderson, J. R. (2001). Automated eye-movement protocol analysis. *Human Computer Interaction, 16*(1), 39-86.

Salvucci, D. D. & Goldberg, J. H. (2000). Identifying fixations and saccades in eye-tracking protocols. In *Proceedings of the Eye Tracking Research and Applications Symposium* (pp. 71-78). New York: ACM Press.

Some publications on written production and pauses

Alamargot, D., & Chanquoy, L. (2001). *Through the Models of Writing*. Dordrecht-Boston-London: Kluwer Academic Publishers

Chanquoy, L., Foulin, J.-N., & Fayol, M. (1990). Temporal management of short text writing by children and adults. *Cahiers de Psychologie Cognitive, 10*(5), 513-540.

Chesnet, D., Guillabert, F., & Espéret, E. (1994). G-Studio: un logiciel pour l'étude en temps réel des parameters temporels de la production écrite. *L'Année Psychologique, 94*, 115-125.

Foulin, J.-N. (1995). Pauses et débits: les indicateurs temporels de la production écrite. *L'Année Psychologique, 95*(3), 483-504.

Foulin, J.-N. (1998). To what extent does pause location predict pause duration in adults' and children's writing. *Cahiers de Psychologie Cognitive, 17*(3), 601-620.

Levy, C. M., & Ransdell, S. (Eds.). (1996). *The Science of Writing : Theories, Methods, Individual Differences, and Applications*. Mahwah: Laurence Erlbaum Associates

Matsuhashi, A. (1981). Pausing and planning: The tempo of written discourse production. *Research in the Teaching of English, 15*(2), 113-134.

Schilperoord, J. (1996a). The distribution of pause time in written text production. In G. Rijlaarsdam, H. van den Bergh & M. Couzijn (Eds.), *Theories, Models and Methodology in Writing Research* (pp. 21-35). Amsterdam: Amsterdam University Press.

Schilperoord, J. (1996b). *It's About Time. Temporal Aspects of Cognitive Processes in Text Production*. Amsterdam - Atlanta, Ga.: Rodopi.

Schilperoord, J., & Sanders, T. (1999). How hierarchical text structure affects retrieval processes: Implications of pause and text analysis. In M. Torrance & D. Galbraith (Eds.), *Knowing What to Write: Conceptual Processes in Text Production* (pp. 13-30). Amsterdam: Amsterdam University Press.

XI. ERROR MESSAGES

XI.1. Eye and Pen

General

<*file name*>: analysis data not found
Does the analysis file still exist in the same directory?

Save failed for <*file name*>
Is there enough memory left? Does the same filename exist in this directory with a "read-only" attribute?

<*file name*>: data not found
One of the two analysis files is missing (TWK or EWK).

not enough video memory
The video card does not have enough video memory capacity to handle the display with the width and height you asked for.

configuration

Recording devices already in use
You are attempting to use the tablet when it is already being used.

Save failed for <*file name*>
Either the file is in "read-only" format or your disk is full.

Incorrect numeric value! (e.g. 4,7)
You typed something that is not a valid numerical value.

Incorrect values in <*configuration file name*>
Some mandatory parameters of the configuration file either do not exist or their value is not a number.

Script

Cannot load <*picture file name*>
A picture could not be loaded. Either the name is incorrect (the file cannot be found where it is supposed to be) or there is not enough video memory available for a picture of this size.

Error line <*number*> in script <*script file name*>
The script contains a mistake. The line number given does not include empty or comment lines.

Duplicate Label: "<*label*>"
You have created the same label twice, which is not allowed in a script.

Unknown command: "<*command*>"
This command is not known to Eye and Pen. See the command list on p. 136 (maybe a misspelling?).

Error in file list <*list name*>
A picture mentioned in the picture list cannot be found.

No Wintab32 tablet driver available. Abort recording.
Eye and Pen could not find the tablet driver (see IX. Troubleshooting).

No tablet connected. Abort recording.
A tablet is required...

Label not found: "<*label*>"
A command refers to a label which does not exist in the script.

Cannot find <*directory or file*>
The script mentions a directory or a file that Eye and Pen cannot find. Typo?

No audio device detected
Is your PC equipped with a sound card or onboard sound chip? Is it properly installed and configured in Windows?

Failed to handle audio mixer
Eye and Pen cannot communicate with the audio device management system.

Audio mixer open failed
Ditto.

No MCI device opened
Probably two successive `PlaySound` commands. The system needs a little time to close the audio device before being able to re-open it with another file. Instead of several successive audio files, it is advisable to create a single file containing all these successive samples (e.g. create a dictated number series).

Eyelink

Eyelink connection lost
A communication breakdown has occurred. Check the Ethernet link.

Can't unload Eyelink library
When closing communication with the eye tracker, Eye and Pen unloads a specific Eyelink library. To avoid problems, it is best to restart your computer.

Failed to close EyeLink connection
Eye and Pen could not politely close its conversation with the eye tracker.

ERROR: Start recording failed!

Eyelink failed to start the data recording and data transmission to Eye and Pen.

ERROR: Eyelink is not connected!
Check connections and the eye tracker network configuration in Windows.

ERROR: No link data samples received!
A communication problem with the eye tracker. Check the configuration on the Eyelink host. Has the recording mode been engaged?

EYELINK_EXPTKIT20.DLL not loaded
The interface library for the eye tracker could not be loaded.

EYELINK_EXPTKIT20.DLL: function "<*something*>" not supported
Eye and Pen requested a function that is not supported by the eye-tracker interface library. Have you installed the latest Eyelink library version?

FATAL: Eyelink "open connection" failed.
Eye and Pen cannot start to "speak" with the eye tracker. Possibly a library version problem.

Cannot get window to calibrate
Probably a system overload problem. It is safe to restart your computer.

Cannot know which eye is used
Eyelink has returned an incorrect item of information.

EyePuter & ASL 504

Failed to get state: <*COM port*>
Eye and Pen cannot check the state of the <*COM port*> serial port through which it is supposed to communicate with the eye tracker. It is safe to restart your computer.

Failed to get timeouts for <*COM port*>
Eye and Pen could not read the timeouts values for the serial port. It is safe to restart your computer.

Failed to set <*COM port*>
Eye and Pen could not set the parameters for the <COMport> serial port. It is safe to restart your computer.

Failed to set timeouts for <*COM port*>
Eye and Pen could not set the timeouts values for the serial port.

Failed to get sampling rate
Eye and Pen should read the Eyeputer sampling rate (60, 240 or 480 Hz) before launching the acquisition, because the data format is different for each value.

Opening port failed: <*COM port*>

Eye and Pen could not open the serial port to communicate with the eye tracker. It is safe to restart your computer.

Failed to close <*COM port*>
Eye and Pen couldn't close the serial port communication channel. If you need to re-launch an acquisition, restart the computer beforehand.

No data on <*COM port*>
Eye and Pen doesn't receive data from the eye tracker through the serial port. Check the serial connection and the eye tracker configuration on its host PC. If everything is in order, restart your computer.

Edition

Only numbers allowed (range separator ".." or ",")
You typed a forbidden character in the list of codes.

Dongle (Complete code list in Appendix XI.2. SafeNet Sentinel).

Interface not found (UX32W.DLL)
The dongle interface library (UX32W.DLLl) file is missing. It must be located in the Eye and Pen program directory.

Initialize failed
The activation of the dongle management system failed.

Release License failed
A problem occurred when "closing" the dongle.

SetContactServer failed
A major problem with the dongle management system initialization.

XI.2. "SafeNet Sentinel"

CODE	MESSAGE
1	INVALID FUNCTION CODE
2	INVALID PACKET
3	UNIT NOT FOUND
4	ACCESS DENIED
5	INVALID MEMORY ADDRESS
6	INVALID ACCESS CODE
7	PORT IS BUSY
8	WRITE NOT READY
9	NO PORT FOUND
10	ALREADY ZERO
11	DRIVER OPEN ERROR
12	DRIVER NOT INSTALLED
13	IO COMMUNICATIONS ERROR
15	PACKET TOO SMALL
16	INVALID PARAMETER
17	MEM ACCESS ERROR
18	VERSION NOT SUPPORTED
19	OS NOT SUPPORTED
20	QUERY TOO LONG
21	INVALID COMMAND
29	MEM ALIGNMENT ERROR
30	DRIVER IS BUSY
31	PORT ALLOCATION FAILURE
32	PORT RELEASE FAILURE
39	ACQUIRE PORT TIMEOUT
42	SIGNAL NOT SUPPORTED
44	UNKNOWN MACHINE
45	SYS API ERROR
46	UNIT IS BUSY
47	INVALID PORT TYPE
48	INVALID MACH TYPE
49	INVALID IRQ MASK
50	INVALID CONT METHOD

51	INVALID PORT FLAGS
52	INVALID LOG PORT CFG
53	INVALID OS TYPE
54	INVALID LOG PORT NUM
56	INVALID ROUTER FLGS
57	INIT NOT CALLED
58	DRVR TYPE NOT SUPPORTED
59	FAIL ON DRIVER COMM
60	SERVER PROBABLY NOT UP
61	UNKNOWN HOST
62	SENDTO FAILED
63	SOCKET CREATION FAILED
64	NORESOURCES
65	BROADCAST NOT SUPPORTED
66	BAD SERVER MESSAGE
67	NO SERVER RUNNING
68	NO NETWORK
69	NO SERVER RESPONSE
70	NO LICENSE AVAILABLE
71	INVALID LICENSE
72	INVALID OPERATION
73	BUFFER TOO SMALL
74	INTERNAL ERROR
75	PACKET ALREADY INITIALIZED
76	PROTOCOL NOT INSTALLED
101	NO LEASE FEATURE
102	LEASE EXPIRED
103	COUNTER LIMIT REACHED
104	NO DIGITAL SIGNATURE
105	SYS FILE CORRUPTED
106	STRING BUFFER TOO LONG

XII. STRUCTURE OF "EYE AND PEN" FILES

Every file fulfilling these prescriptions can be opened with Eye and Pen.
The prototypes are given in Pascal 32 bits (Delphi 7). "Word" represents a 16-bit unsigned numeric type, Integer represents a 32-bit signed numeric type.

TAB FILE HEADER: (128 bytes)

Field	Type	Description
Id	Word = 137	TAB file identifier
Version	Word = 111	Current version
HeaderSize	Word	Header size (in bytes)
Dx, Dy	Word	Display X and Y sizes (e.g. 1024*768)
X1, Y1, X2, Y2	Word	Definition of the tablet coordinates
LgmmX, LgmmY	Word	X and Y tablet resolution (e.g. 200 lines /mm)
SamplingRate	Word	Acquisition frequency (e.g. 200 Hz).
CartesianOrigin	Word	(0/1). Is the coordinates system following a Cartesian orientation? (1=yes)
Reserved	Array[0..50] of Word	Reserved for future use

TAB DATA

Pressure	Word	Pen pressure (0 to 1023)
X, Y	Word	Pen X and Y coordinates
Time	Integer	Time in milliseconds

EYE FILE HEADER (128 bytes)

Id	Word = 149	EYE file identifier
Version	Word = 111	Current version
HeaderSize	Word	Header size (in bytes)
OcModel	Word	Eye tracker model number
EyeDegX, eyeDegY	Word	For angular data, number of degrees between two calibration points, on X and Y axes
nPtX, nPtY	Word	For angular data, number of X and Y calibration points
X1,Y1,X2,Y2	Word	Calibration coordinate system for non-angular data (e.g. 0,0,1024,768)
SamplingRate	Word	Acquisition frequency (e.g. 500 Hz)
CartesianOrigin	Word	(0/1). Is the coordinate system following a Cartesian orientation? (1=yes). Always set to 1, yes
Reserved	Array[0..49] of Word	Reserved for future use

EYE DATA

X, Y	Integer	X and Y coordinates
Time	Integer	Time in milliseconds

Eye tracker model number:

```
0: EyePuter
1: EyeLink
2: ASL504
```

XIII. REGISTRY KEYS (WINDOWS)

When you tick the option “associate Eye & Pen with .TAB and .TWK files”, registry keys are added to the Windows registry. These are removed when you untick the option.

Key	Value
HKEY_CLASSES_ROOT\.tab	(Reg_SZ) Ep.Data
HKEY_CLASSES_ROOT\.twk	(Reg_SZ) Ep.Analysis
HKEY_CLASSES_ROOT\EP.Data	(Reg_SZ) EP File
HKEY_CLASSES_ROOT\EP.FileType\DefaultIcon	(Reg_SZ) c:\ep1.0\EP.exe,0
HKEY_CLASSES_ROOT\EP.FileType\Shell\open\command	(Reg_SZ) "c:\ep1.0\EP.exe" "F:%1"
HKEY_CLASSES_ROOT\EP.Analysis	(Reg_SZ) EP File
HKEY_CLASSES_ROOT\EP.FileType\DefaultIcon	(Reg_SZ) c:\ep1.0\EP.exe,0
HKEY_CLASSES_ROOT\EP.FileType\Shell\open\command	(Reg_SZ) "c:\ep1.0\EP.exe" "F:%1"