Data integration & visualization

The Observer XT

INTEGRATING DIFFERENT TYPES OF DATA

The Observer XT uses robust standard technologies to interface with other systems.

To be able to study time relationships, data synchronization is vital in multi-modal research. The Observer XT® uses robust standard technologies to interface with other systems. You can import almost any time-based external data (from other data acquisition (DAQ) systems), for example heart rate data, eye fixations, screen captures, physiological signals, facial expressions, or location data.

After import into The Observer XT, you can synchronize your external data with your behavioral observations and visualize the combined data or export them.

The benefit of combining different types of data is that you get a more complete picture of the phenomena that you are studying. For instance, when you are setting up a study to test the usability of your company's web site, it may be worthwhile to consider using an eye tracker. Eye fixations can tell you what the focus is of your participants' attention. This is very useful information that is hard to obtain from behavioral observations. The combination with manually recorded tasks and observed participants' behavior makes these data even more meaningful.

Emotion theory suggest that physiological reactions underlie changes in overt emotional responses. Therefore, to get a more complete picture of the person's response it is useful to combine the measurement of behavioral and physiological data.

MIX & MATCH PRINCIPLE

The Observer XT enables you to integrate multiple data modalities, e.g.:

- behavioral events, logged by a human observer
- logged comments
- video streams, captured by digital cameras
- key presses, mouse clicks, and other events, captured for instance by uLog
- physiological signals, collected by data acquisition systems
- facial expressions, recorded by FaceReader
- data from eye trackers and other recording tools
- data from any other software

This paper will show how logged events can be combined and synchronized with external data by using The Observer XT (External Data Module required).

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LOGGING & IMPORTING OBSERVATIONAL DATA

Logging observational data is what many users do most with The Observer XT. You can use any of the following methods to acquire and manage data in your research:

- *Live observation* - If you do not want to limit your view to what is recorded on video.
- *Off-line video and external data analysis* - For maximum accuracy and synchronization with other types of data.
- *Observing live while recording video for off-line analysis* - Get the best of both worlds, and save time by doing part of the coding while recording.
- *Live observation with Pocket Observer* - Use a handheld computer for your observations. Afterwards you can synchronize your data with video or other data if desired.
- *Automatic data logging* - Integrate events logged by external devices such as other Noldus software (e.g. FaceReader), or third party products, such as data acquisition systems or an eye tracker.
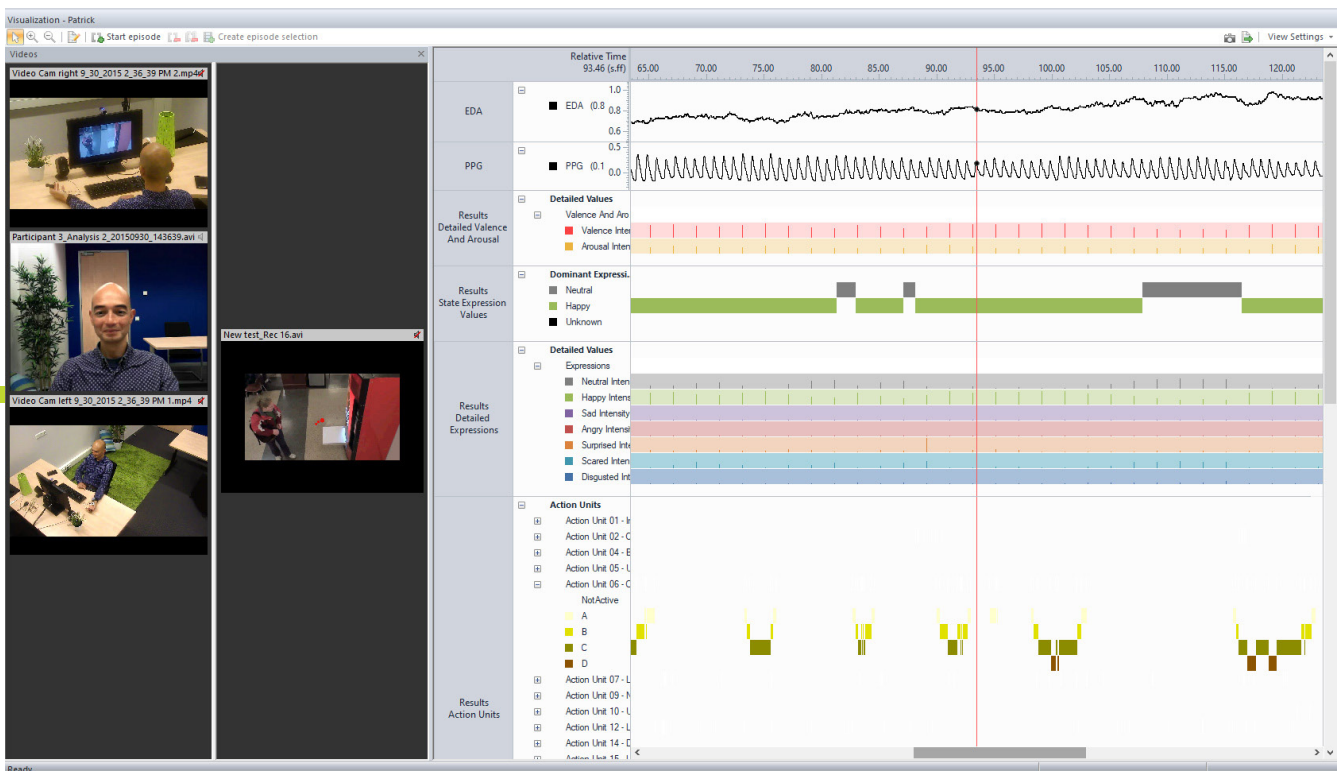
In The Observer XT you can visualize all your data streams in one clear overview.

It is possible to import event data into The Observer XT. This can be observational data from other programs than The Observer XT or data obtained with previous versions of The Observer XT.

Importing events is done by creating an import profile. The only 'must' is that the event data are in ASCII format and that the data file consists of a column with time stamps and one or more columns with values. The import of events is not restricted to observational data only, events can also be, for instance, R-tops in an ECG or blood pressure spikes.

It is easy to import and synchronize logged events from multiple sources. This makes it possible to combine automatic data logging with manual logging on a handheld computer, or have two observers watch the same scene from different viewpoints.

RECORDING AND PLAYING BACK VIDEO

The Observer XT works with a wide range of video equipment, both consumer range and professional systems. You can:

- Record streams from one or two USB cameras directly on the PC.
- Play multiple digital media files in sync.
- Integrate with standard video equipment, such as MPEG encoders, mixers, quad units, etc.
- Use a screen capture device to make computer screen recordings without installing any software on the test PC.

If you need more freedom of motion, you can record the video using a camcorder. Later, you can encode it as a digital media file, or score from digital tape directly.

IMPORTING EXTERNAL DATA

It is often the combination of overt behavior and physiological responses that is the most interesting.

The Observer XT makes it possible to combine them into one view. Physiological signals often measured in conjunction with behavior are body temperature, heart rate, pulse, skin conductance, respiration, and/or muscle tension. However, any other time-varying signal can be imported into The Observer XT, such as fNIR, facial expressions and eye tracking data.

SIMPLIFY YOUR START/STOP ACTIONS

Start and stop other recording devices from The Observer XT with only one click of the button. No more hassles since you do not need to turn on all different devices one by one. The Observer XT offers a built-in application launcher. It gives you the opportunity to trigger commands at the start and end of observations.

Examples include:

- Starting and stopping FaceReader or an eye tracker.
- Starting and stopping a bio physiological measurement system
- Starting and stopping an experiment control or stimulus delivery application.
- Automating tedious manual procedures, such as making a backup.
- Controlling video encoding devices.
- Starting other instances of The Observer XT on other computers.
- Starting and stopping software that you are testing.
- Controlling screen capture applications.
- Controlling hardware peripherals.

The mechanism for launching external applications and systems is generic and configurable and can be used for any application. Applications can be on the same PC or on your network. You can even control multiple applications.

With macros and batch files, you can automate multi-instrument and multi-application set-ups. Our consultants will be happy to assist you with this if needed.

Start and stop other recording devices from The Observer XT with only one click of the button.

SYNCHRONIZING MULTIPLE DATA STREAMS

The Observer XT works with a wide range of DAQ systems and even with multiple DAQ systems simultaneously.

Importing data is a first step, but is usually not the last. It is critical that you synchronize your data streams. The Observer XT offers several mechanisms to synchronize your observational data, video, and external data. For each data stream, including video, you can manually define its offset with an accuracy of one millisecond. For behavioral data and external data there are other options as well.

The easiest method to synchronize behavioral data and external data is to carry out a live observation while co-acquiring external data. The Observer XT can start/stop the DAQ and by using an NTP server the same time is used on both PCs thus the sync is taken care of. Alternatively The Observer XT can send out a synchronization signal to the external data acquisition system, which you can feed back into the system as if it is an extra sensor.

The time information in the synchronization signal is used during import to synchronize observational and external data. If your data acquisition device does not have a vacant sensor socket, you can send an on/off pulse from The Observer XT to your DAQ system, which switches on when the observation starts, and off when it stops. This will ensure accurate synchronization throughout the observation. It prevents errors due to, for instance, inaccuracies in the internal clock of your systems.

If there is no way to connect the DAQ system to the PC, it is still possible to synchronize automatically if there is a time reference in the export file. If neither possibility works, you can use the manual synchronization mechanism.

SYNCHRONIZE WITH ALL KIND OF DAQ SYSTEMS

Due to these generic synchronization mechanisms, The Observer XT works with a wide range of DAQ systems and even with multiple DAQ systems simultaneously. You can import almost all external data, acquired with a separate DAQ system, into The Observer XT as long as they are in ASCII format. The ASCII data files must have at least one column with time stamps and one with the values of the external variable.

The Observer XT allows you to import, synchronize, and analyze data from many different streams, such as facial expressions, physiology, and eye tracking.

Another prerequisite is that the data have been sampled with a constant sample rate. You can import external data into The Observer XT using an import profile. The Observer XT comes with predefined import profiles for a number of DAQ systems (BIOPAC, Data Sciences, Polar, and Tobii). If you want to use a system that does not have a predefined profile, you can create a new import profile. The Observer XT synchronizes both the beginning and the end of recordings, thus correcting for any offset and gain differences.

VISUALIZING, ANALYZING & EXPORTING DATA

The Observer XT allows you to visualize your data in a chart. If you like, you can make a selection of your behavioral data and associated external data before you make the chart. In the chart you will see the behaviors that you scored and the external data plotted against a time axis. If you have scored from a media file, you will also see a video window with the video. You can play back the data and all data files, including the video, are played synchronously.

The Observer XT offers extensive data analysis features. You can filter out exactly the data and time periods you want to analyze, based on the data you scored. This makes it possible to zoom into interesting periods and to isolate relevant data. On these data you can calculate a number of descriptive statistics, export filtered or unfiltered lists of events, or export external data highlights.

EXPORT OF DATA FOR FURTHER ANALYSIS

If you like, you can export your behavioral data and associated external data to ASCII files for further analysis in other programs, such as statistical packages, or specialized signal analysis programs. You do not have to spend time re-arranging tables in Excel. You simply adapt the layout of your output to the requirements of your statistical analysis.
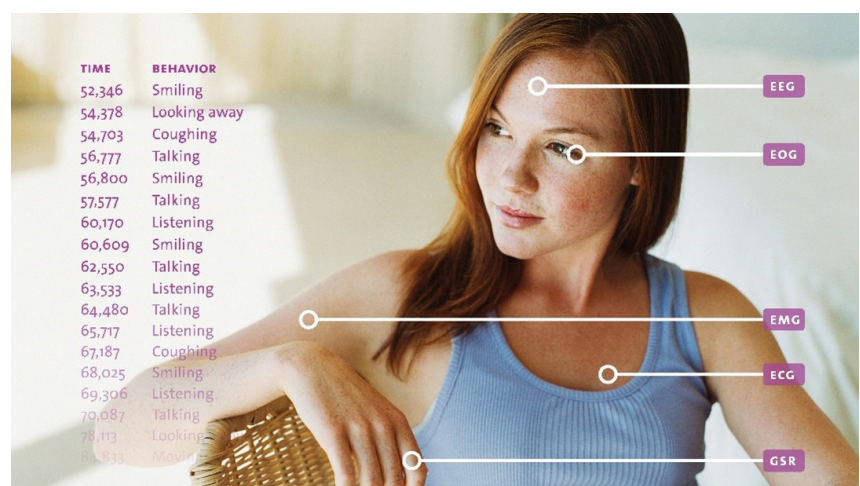
HOW TO BUILD AN OBSERVATION LAB

Our technical experts can also configure the software for you to optimize the integration, including writing of macros and batch files.

If you are building a new lab, we can help you find the optimal solution for your type of research and your budget. If you already own a lab, it is likely that The Observer XT fits with your hardware. Our sales engineers and consultants are ready to help you with choosing the right hardware and software components for your project. Our technical experts can also configure the software for you to optimize the integration, including writing of macros and batch files.

Download our white paper 'How to build an AV lab'

AN EXAMPLE OF A MULTIMODAL SET-UP

You can make your set-up as straightforward or complex as you like. Extending your observational data with data on a particular physiological parameter may already give you a wealth of additional information. However, some research questions are so complex that they demand a sophisticated solution.

When studying brain-behavior relationships in children with a psychological disorder, for instance, your set-up may include the following elements:

- *One or more data acquisition systems* - Measure psycho-physiological parameters, such as heart rate variability, EEG, or galvanic skin response.

- *A series of stimuli to present to the children* - There are several software programs available to create your own experiment. E-prime®, for instance, is a popular tool used in psychology research. It allows you to define a number of tasks for the children in your study. You can start, for instance,

by showing the children a picture of an ice cream and asking them what color the ice cream is. If they push the button with the correct color, they will see a picture of their mother, smiling. Choosing a wrong color will be followed by a picture of their mother looking angry. E-prime can put markers in your EEG data so you know the exact time stamp of the stimuli and you can easily see the children's response.

- *An eye-tracker to determine the location and duration of the children's eye fixation* - Measuring what the children look at and for how long gives you information about visual orientation and attention.

- *The Observer XT as the central software application* - Scoring the children's behavioral responses (live or from video), synchronizing all data acquisition equipment, and integrating the multimodal data streams for joint analysis.

THE OBSERVER XT BENEFITS

Easily integrate multiple data streams
Get complete insight in behavior and physiology and take advantage of fully integrated equipment.

Synchronization of data simplified
Perfect sync of all data streams is what you need and is what The Observer XT offers.

Simplify your start/stop actions
Start and stop other recording devices from The Observer XT with only one click of the button.

Clear visualization of all data streams
The Observer XT organizes all your data streams in one clear overview.

Raw data access & automated back-up
Your data is always safe because of the automated back-up function of The Observer XT.

The Observer XT is designed to reduce the amount of work and simplify data integation! Request the free trial to try it yourself. Or contact us for more detailed information.

www.noldus.com