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How-To Story
EEG + Behavior Observation

Challenge & Goal

This example describes the integration of EEG data and coding results from video based observations.

Using:

- BRAIN PRODUCTS Recorder and Analyzer

- **Mangold VideoSyncPro IP**

- **Mangold DataView**

- **Mangold INTERACT**

- With or without using a stimulus trigger

Mangold offers a great integration of BRAIN PRODUCTS EEG data in its long-standing successful chain of products, enabling you to make the most out of each system's strengths.

Study Idea

Get more information by combining behavioral observation + EEG, compared to the independent observation of behavior or the sole measurement of EEG signals.

(1) Record EEG, using a BRAIN PRODUCTS device.

(2) Record video of your subject from different angles, using Mangold's VideoSyncPro.

(3) Do post-analysis of your recorded videos and add additional information in form of video ratings or observational coding to your study, using Mangold INTERACT.

(4) Integrate the measured EEG data with the observed coding data.

(5) Finally draw conclusions out of this combination of measured data plus observed data.

Let's assume:

- You want to review the parts of your videos, which correspond to the presented stimuli in your EEG recording session.

- Those stimuli were presented in combination with a special stimulus trigger, connected to your BRAIN PRODUCTS Recorder.

- You want to transfer results of your video based observations from within Mangold INTERACT to the BRAIN PRODUCTS Analyzer, to make use of the high-end special EEG/ERP analysis routines available in this product.

The biggest challenges we face are:

- Synchronizing EEG data acquisition with video recording

- Transfer BRAIN PRODUCTS specific markers to INTERACT (This allows you to watch the corresponding video sequences in-sync with your EEG data and make use of INTERACTS ability to search for co-occurrences and enables you to identify contingencies between situations).

- Transfer behavioral observations as markers to the BRAIN PRODUCTS Analyzer in a way that they exactly match the measured EEG sequences.

That's how you can do it

Study Design

A BRAIN PRODUCTS Recorder setup, including several hardware boxes, is in place to record EEG and stimulus information. All material is recorded within a Mangold video lab setup, using Axis IP cameras and **VideoSyncPro IP** for the recording of al video material and sending a synchronization signal to your BRAIN PRODUCTS device the moment a video recording is started.

A stimulus trigger that presents stimuli and enters markers per stimulus can be connected to this setup as well.

The moment the video recording has started, a marker signal is send to the BRAIN PRODUCTS Recorder, which is written into the regular BRAIN PRODUCTS *Marker* file (*.amrk or *.vmrk).
Only AFTER the video recording has started, the stimulus presenter comes into action, also writing marker signals into this *Marker* file of your BRAIN PRODUCTS session.

Prepare Data Recording

Communication from third party systems with the BRAIN PRODUCTS Recorder is only possible through an LTP signal. Therefor we insert a PCI card with LTP socket and connect a corresponding cable between the VideoSyncPro IP recording station and the BRAIN PRODUCTS Recorder.

To setup the communication, all you need to do, is activate the LTP trigger signal in the **Mangold VideoSyncPro IP** settings dialog:
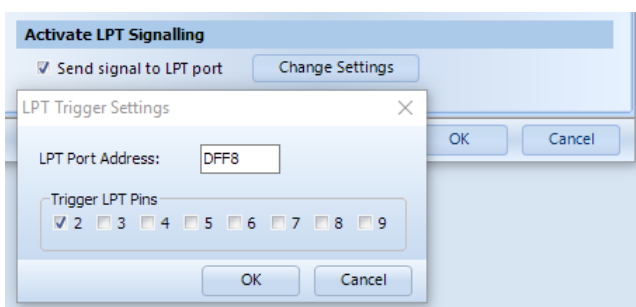
You can specify the pin(s) on which the signal is send. This signal is stored in the BRAIN PRODUCTS specific marker file.
This signal is supposed to be the very first marker entry in your marker file.

If all is setup correctly, it is important that you start the EEG recording session BEFORE your start the video recording in VideoSyncPro IP.

Should you make use of a stimulus presenter, the presentation should only start AFTER the video recording has started.

Review Recordings

After a session, the recorded videos can simply be opened in INTERACT as they are, so you can start logging independent observations right away. If you only want to closely observe the sequences around recorded markers from your session, you need to hookup your BRAIN PRODUCTS data first.

To hookup the BRAIN PRODUCTS results with INTERACT and your video(s), you first need to open your EEG session data in the BRAIN PRODUCTS Analyzer.
From within this Analyzer you need to export your data into an *.EDF file.
It is also important that you locate the *Marker* file created for your session, because it is needed for synchronization.

The *.EDF file now holds all the measured data; the *Marker* file holds whatever markers have been send to the EEG system. Make sure you can access those files on the computer you use for INTERACT and DataView.

To review any kind of sensor data in-sync with your video(s), we make use of the integration between **Mangold INTERACT** and **Mangold DataView**. As stated before, you need to export the session data to a EDF file from within the BRAIN PRODUCTS Analyzer, in order to be able to transfer the EEG data to **Mangold DataView**.

Once you have created you EDF file, you can open this data file in DataView and save it in the DataView file format (*.dtlx), to ensure that all further actions can be saved.

The resulting file looks something like this:

The first value in the EDF file is drawn from the middle of the chart for each channel. At this point in time, the video was not yet being recorded. Thus, to synchronize the measures with your video(s), you need to run a command that searches for the marker entered into the *Marker* file at the start of the video recording by **VideoSyncPro IP**.

Before you run the 'Synchronize to video-start in Marker file' command, you need to make sure you have the BRAIN PRODUCTS *Marker* file available on your **DataView** computer.

After selecting the correct *Marker* file from your EEG session, the time information of the first marker found within that marker file is entered as the offset time value in **DataView**, to synchronize the measures with the start of your video(s):
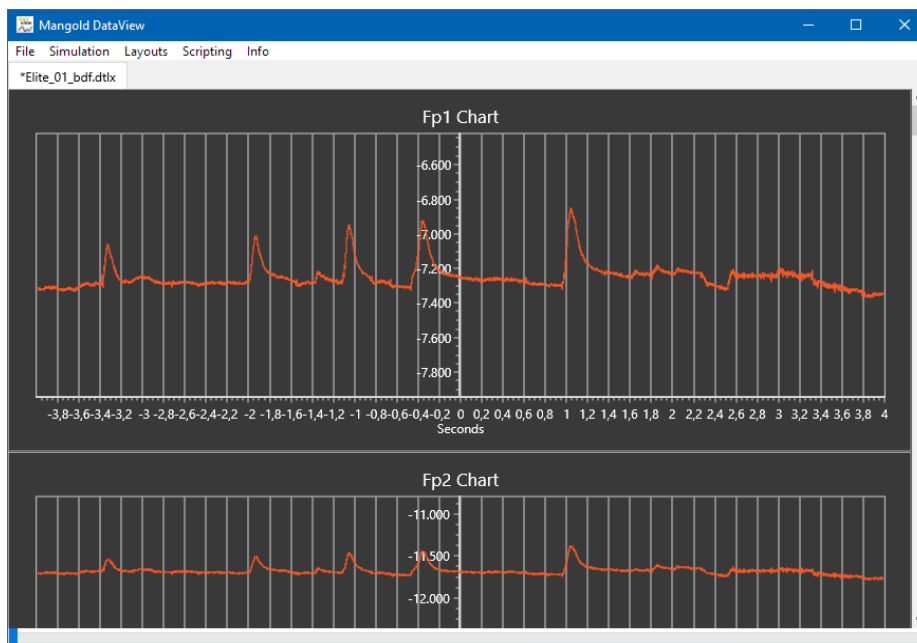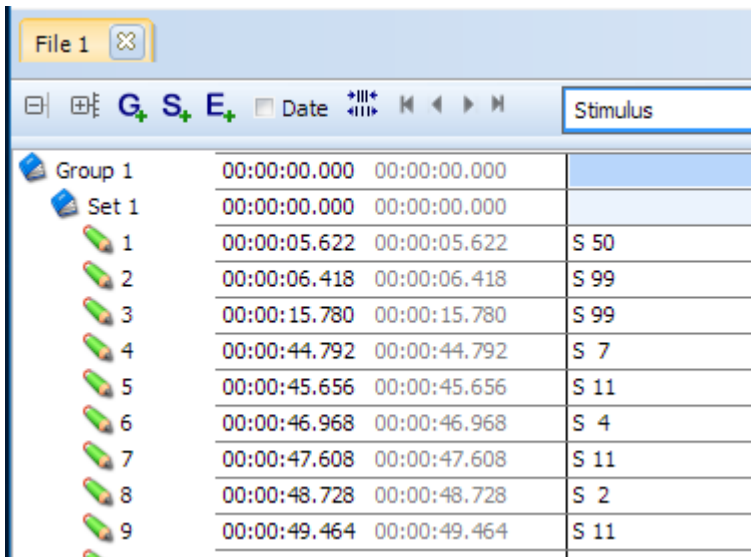
Now the data is in sync with your video(s). Playing the video in INTERACT will cause the EEG charts to move along from left to right.
The Y-ax represents the current video frame, 0 in this picture.

Observe Behavior per Stimulus

If you made use of the stimulus presenter (or any other device that enters marker information into the BRAIN PRODUCTS Marker file), the corresponding markers - with exact time information for each stimulus - are also available in the *Marker* file of your BRAIN PRODUCTS session. You can now convert those markers into INTERACT Events with a single command.

The 'BrainProducts' scripting command 'Import marker as INTERACT events' inserts Code entries into the raw data table of your **DataView** file and creates new INTERACT Events inside the current INTERACT data file:

Those Events can be used to jump to the corresponding sequences in your video(s)!

Of course, you can also add your observations during, before or after those automatically generated Events.
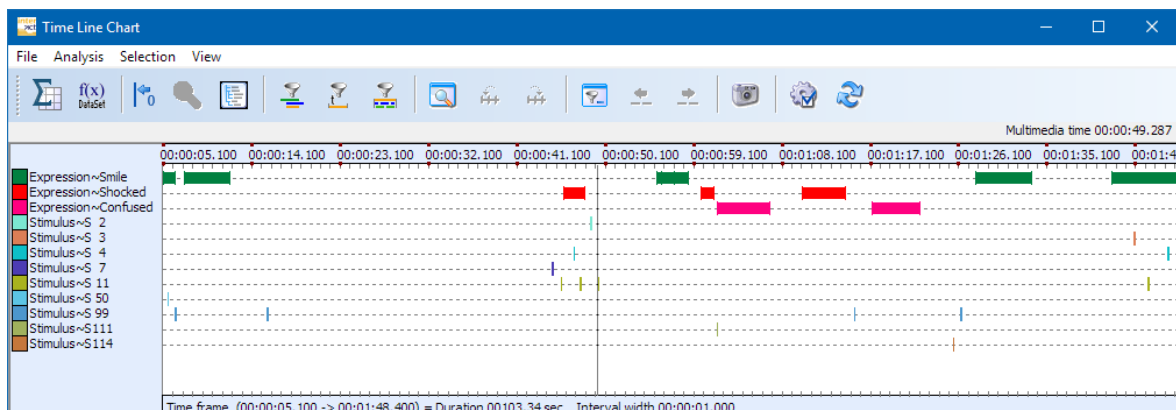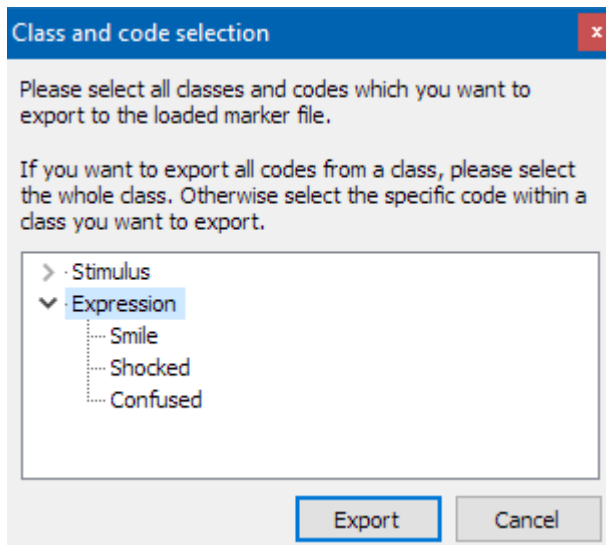
Analyze Behavioral Events in BRAIN PRODUCTS Analyzer

The moment you have logged video based observations in INTERACT, it is possible to transfer this information from INTERACT to DataView and from **Mangold DataView** into an existing BRAIN PRODUCTS *Marker* file.

This allows you to perform any of the specific BRAIN PRODUCTS Analyzer routines on your behavioral Events, as if they were stimuli or any other kind of marker information!

All you need to do is to select the Events (that hold the Codes you want to transfer) within your INTERACT document and select the command 'Copy Codes to DataView'.

A message informs you that information was added to your DataView data. This means that the Codes from the selected Events are added to the corresponding value lines, inside the raw data table of your DataView file.

The **DataView** command 'Export INTERACT Events as marker' enables you to pick a Class or a single Code to be added into your BRAIN PRODUCTS Marker file:

Select the whole class or the Code you want to transfer to your BRAIN PRODUCTS Marker file and confirm your selection by clicking Export.

Those behavioral Event Codes are now entered into your *Marker* file like this:

Those new markers can be handled and analyzed like any other BRAIN PRODUCTS based marker entry, using BRAIN PRODUCTS Analyzer.