PulsePalOutput update for Open Ephys GUI

Alessio Paolo Buccino[1]: alessiob@ifi.uio.no

December 5, 2017

[1] Center for Integrated Neuroplasticity (CINPLA), Department of Biosciences, University of Oslo, Oslo, Norway

New features

1. `PulsePalOutput` is updated to the new event channel structure.
2. `PulsePalOutput` allows the user to directly communicate with the Pulse Pal and update all parameters from the GUI.

1 Event channel information

The *Trigger* and *Gate* combo boxes now are updated with information about incoming TTL channels. Input TTL sources are stored in the `PulsePalOutput` processor and updated with the `updateSettings()` call. In Figure 1 is an example using multiple `Phase Detector` modules. When only one detector is applied the list of incoming inputs contains 8 TTL channels from `Phase Detector 1`. If a new detector module is added, 8 extra channels are added to the lists (`Phase Detector 2`). This feature eases and widens the choice of incoming TTL events to trigger/gate Pulse Pal channels.

Limitations and possible improvements If one wants to trigger a Pulse Pal channel in response to multiple TTL events, it is not possible with the current implementation (built upon previous implementation). A possible solution could be using list boxes (https://juce.com/doc/classListBox) instead of combo boxes.

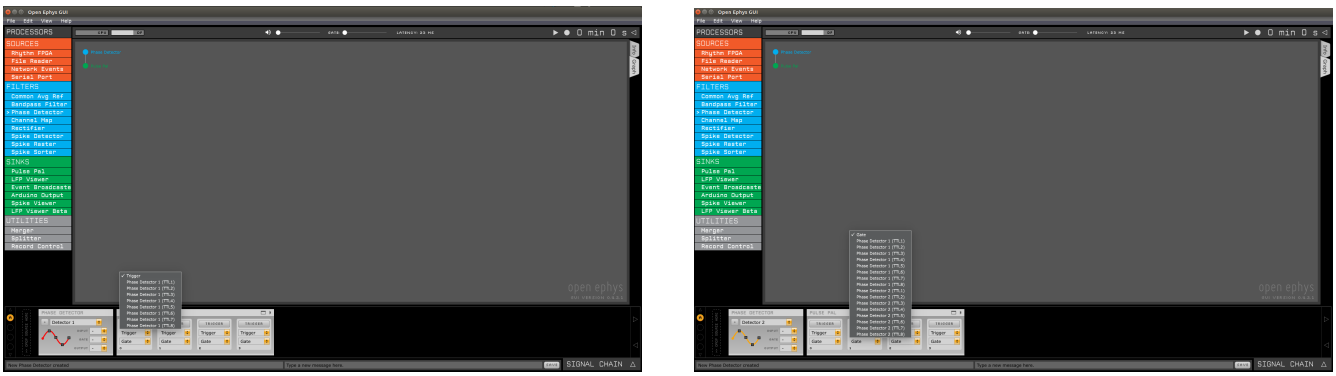

Figure 1: (left) When one detector module is instantiated 8 TTL channels from `Phase Detector 1` are in the combo box. (right) If we instantiate a second detector module, now 16 TTL channels are available, 8 from `Phase Detector 1` and 8 from `Phase Detector 2`.

2 Pulse Pal Parameters settings

The plugin is now a visualizer plugin and the user can set all Pulse Pal parameters from the visualizer (Figure 2).

For each of the 4 channels, one can set: *phase1 duration, phase1 voltage, phase2 duration, phase2 voltage, inter phase duration, resting voltage, inter pulse duration, burst duration, inter burst interval, train duration,* and *train delay* using editable labels.

burst duration, inter burst interval appear only when the `BURST` button is toggled and *phase2 duration, phase2 voltage, inter phase duration* only when the `BIPHASIC` button is toggled (e.g. Channel 2 in figure).

`LINK TRIG 1` and `LINK TRIG 2` toggle buttons link the corresponding channel to the digital input 1 and 2 of the Pulse Pal. The *trigger mode* combo box allows to select the channel trigger mode (0 = normal, 1 = toggle, 2 = pulse gated).

The `TTL` button sets the channel to TTL parameters (e.g. Channel 4 in figure).

`PulsePalOutput` checks the consistency of the parameters. Parameters are consistent if the following conditions hold:

- if burst is OFF: the single pulse duration (phase1 + phase2 + inter phase interval if biphasic is selected) + inter pulse interval < train duration
- If burst is ON: single pulse duration + inter pulse interval < burst duration AND burst duration + inter burst interval < train duration

If parameters are not consistent, they are adjusted in the following way:

- if burst is OFF: train duration = single pulse duration + inter pulse interval + 1
- if burst is ON: burst duration = single pulse duration + inter pulse interval + 1 AND train duration = burst duration + inter burst interval

Limitations and possible improvements Currently, the user can not set custom trains.

Figure 2: The `PulsePalEditor` visualizer allows to set all parameters of the Pulse Pal from the GUI.