User Guide: CANDO-CS

F. Hutchings, D. Firfilionis

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Initial Setup

Hardware:

- Connect a laptop with the user interface installed to the CANDOCS box using a USB cable.
- Connect the DC shift box to the mains and to the intan output (into input one of the DC shift box)
- Output 1 of the DC shift box then connects to the ADC
- DAC port (to the left of the ADC) goes to the LED

Software:

Figure 0.1: Hardware setup

- Double click on the CANDO user interface (UI) icon if you are using a compiled version
- If using the mlapp code, open a Matlab instance and then navigate to the folder containing the mlapp file. Double click on the file in the file explorer tab, or alternatively type 'CANDO_control_GUI' in the command window and press enter.
- Once the UI has loaded it should look like the image in figure 1.

User Interface Overview

Setting up an experiment using the Stimulation Box

Connect the CANDOCS box to a computer with the GUI installed using a USB cable.

Open the GUI on the host computer, and select the port which your serial device is connected to in the Port

Select dropdown menu. This menu will auto-populate with viable ports.

Test the connection: Press the Start Button on the GUI to initialise the connection. The button will change colour to red and change name to 'stop' when the connection is active. A pop-up window will appear asking the user to select a save directory. If the system is properly connected, then the user interface will start recording at this point without applying any stimulation. You should see a trace in the LFP graph. Pressing the start/stop button again will terminate the recording.

Press the configure button to trigger the experimental planner window. This will allow you to select an algorithm to apply, and set the parameters for it. The central frequency should match the frequency of ongoing activity that you are interested in modulating. Default parameters are already entered for each algorithm, and if the defaults are unchanged the selected algorithm will loop through different phases from 0:315 degrees in steps of 45 degrees. This can be useful for ascertaining which phase will suppress or enhance the oscillation of interest - in the case of *in vitro* experiments the distance of the electrode and stimulation source from the slice can impact the phase response. Make sure to enter an 'on time' as the default is zero, so the algorithm will not start until a greater than zero value is entered. This can be changed in the 'Quick Config Options' on the main GUI window if needed.

Once algorithm options have been selected, press the 'Finish and Configure' button to pass these parameters to the serial port device and return to the main GUI window. From here, once the 'Start' button is pressed the stimulation should start to be applied and the current values will be plotted on the lower graph. If the Start button is already active then the stimulation should begin as soon as the parameter update is processed by the microcontroller.

If you wish to change parameters, the 'Quick Config Options' will allow modifications. Once the recording is in progress the signal and stimulation values will be saved on the host machine in the user chosen save directory. When the stimulation run is completed the data will be saved as matlab readable files. See the section on Analysis for further information about how to process these results.

Setting up a custom algorithm through the UI

Loading pre-recorded data to test the algorithm output

Using a test signal from a local machine

Adding new algorithms to firmware

Additional Features

Analysing results

The results are saved as...

* Run 'runscript' in each folder * Collect results into structures * run Junbox$_s$*timcomparison*