

Quick guide to all the elements of SPIKY

Menu

Items of the menu allow you, among others, to control the input (spike train data) and output (results variables and figures) of SPIKY. They also allow to load and save standard parameter values and provide hints as well as general information on SPIKY.

Main menu item “File”

Menu Item “Reset”: This resets SPIKY to its initial state.

Menu Item “Reset with same data”: This resets SPIKY to the state where the data have been loaded but the dissimilarity measures have not yet been calculated.

Menu Item “Open Mat”: This opens a Load-dialogue in which you can choose a Matlab ‘mat-file’ with spike train data.

Menu Item “Open TXT”: This opens a Load-dialogue in which you can choose a ‘txt-file’ with spike train data.

Menu Item “Save Mat”: This opens a Save-dialogue which allows you to save the Matlab workspace which among others includes several structures with all the parameters and results.

Menu Item “Save Fig”: This opens a Save-dialogue which allows you to save the current state of the figure as a Matlab ‘fig’-file.

Menu Item “Save figure to postscript file”: This opens a Save-dialogue which allows you to save the current state of the figure as a Matlab ‘fig’-file.

Main menu item “Options”

Menu Item “Hints”: You can select whether you want to see short hints when you hover with the mouse cursor above the SPIKY-elements of interest. [This also shows a dialogue where you can load and save standard parameter values (currently disabled).]

Menu Item “Info”: This shows a window with the SPIKY logo, version info, references and a link to the SPIKY website where you can find more information.

Toolbar

The toolbar allows to control the input (spike train data) and output (results variables and figures) of SPIKY.

Icon “Reset”: This resets SPIKY to its initial state.

Menu Item “Reset with same data”: This resets SPIKY to the state where the data have been loaded but the dissimilarity measures have not yet been calculated.

Icon “Open mat-File”: This opens a Load-dialogue in which you can choose a Matlab ‘mat-file’ with spike train data.

Icon “Open txt-File”: This opens a Load-dialogue in which you can choose a ‘txt-file’ with spike train data.

Icon “Save Workspace as .mat”: This opens a Save-dialogue which allows you to save the Matlab workspace which among others includes several structures with all the parameters and results.

Icon “Save Figure as .fig”: This opens a Save-dialogue which allows you to save the current state of the figure as a Matlab ‘fig’-file.

Icon “Save figure to postscript file”: This opens a Save-dialogue which allows you to save the current state of the figure as a Matlab ‘fig’-file.

Panel “Selection: Data”

This panel covers the many different ways to select data. One additional way is to load a either a mat- or a txt-file via the Menu or via the Open-File Icons in the toolbar.

Listbox: Select one of the pre-defined examples. You can also add your own examples via the Matlab function “**SPIKY_f_user_interface**”.

Button “Select from list”: One way to select data. Loads the example selected in the listbox. Once the spike trains are created the ‘Parameters: Data’ panel is activated.

Button “Load from workspace”: Another way to select data: Loads Matlab variable from the workspace.

Button “Event detector”: Another way to select data: Opens new window in which it is possible to detect discrete events from continuous data.

Button “Spike train generator”: Another way to select data. Starts spike train generator in a new window. Once the spike trains are created the ‘Parameters: Data’ panel is activated.

Panel “Parameters: Data”

Subpanel “Time”

Edit “Start”: Beginning of the recording/simulation.

Edit “End”: Termination of the recording/simulation.

Edit “Data sampling”: Defines the temporal resolution (sampling interval, not sampling rate) of the recording/simulation.

Edit “Thick time markers”: Defines individual moments in time which will be marked by another kind of (typically thick) line. Use Matlab syntax, e.g. ‘10 100’ or ‘10:10:100’ (without the apostrophes).

Edit “Thin time markers”: Defines individual moments in time which will be marked by one kind of (typically thin) line. Use Matlab syntax, e.g. ‘10 100’ or ‘10:10:100’ (without the apostrophes).

Button “Select”: This opens a graphical input form which lets you select either via keyboard or via mouse the time instants for the thick and the thin markers.

Subpanel “Spike trains”

Popupmenu “Spike train selection”: This allows you to select a subset of spike trains or spike train groups for which the spike train distances will be calculated. Since the computational cost scales with the squared number of spike trains (N^2), excluding spike trains that are not really needed from the calculation can save a considerable amount of computation time.

Edit “Trains”: If ‘Select trains’ is selected, you can either identify the spike trains directly using Matlab notation or use the bottom below and select them from a list. Use Matlab syntax, e.g. ‘2 10’ or ‘2:2:10’ (without the apostrophes).

Button “Select trains”: This allows you to select the spike trains for which you would like to calculate the spike train distances from a list.

Edit “Groups”: If ‘Select groups’ is selected, you can either identify the spike train groups directly using Matlab notation or use the bottom below and select them from a list. Use Matlab syntax, e.g. ‘2 10’ or ‘2:2:10’ (without the apostrophes).

Button “Select groups”: This allows you to select the spike train groups you would like to calculate the spike train distances from a list.

Edit “Thick separators”: Defines lines between spike trains which will be marked by another kind of (typically thick) line. Use Matlab syntax, e.g. ‘2 10’ or ‘2:2:10’ (without the apostrophes).

Edit “Thin separators”: Defines lines between spike trains which will be marked by another kind of (typically thin) line. Use Matlab syntax, e.g. ‘2 10’ or ‘2:2:10’ (without the apostrophes).

Button “Select”: This opens a graphical input form which lets you select either via keyboard or via mouse the separators between spike train groups.

Edit “Group names”: Before you can select spike train groups you should define them here. Identify their names each separated by ‘;’ and a space as well as ending with a ‘;’, e.g. ‘G1; G2; G3; G4;’ (without the apostrophes).

Edit “Group sizes”: Then identify their sizes using Matlab notation, e.g. ‘10 10 10 10’ (without the apostrophes). Numbers should add up to the total number of spike trains.

Button “Select”: This opens a graphical input form which lets you select either via keyboard or via mouse the separators between spike train groups (which define the sizes of these groups). Subsequently you will be asked to name the groups.

Comment: Data-comment, will be part of the file names (ps-images and avi-movies).

Button “Update”: This confirms all selections made in this panel. At the same time the ‘Selection: Measures’ panel is activated.

Panel “Selection: Measures”

This panel allows you to select the subplots which will be displayed if in the later ‘Selection: Plots’ panel the ‘Dissimilarity profiles’ option is selected. Please put consecutive integer numbers from 1 to ‘# subplots’. These numbers will define the order of the subplots (from top to bottom).

Edit “Stimulus”: This will add a subplot with a graphical representation of the stimulus. XXX Not yet finished XXX

Edit “Spikes”: This will add a subplot with the spike rasterplot where for each spike train (y-axis) the times (x-axis) of the spikes are marked by vertical lines.

Edit “PSTH”: This will add a subplot with the peristimulus time histogram. The PSTH can be smoothed with a Gaussian filter of desired kernel width.

Subpanel “Main”

Here you can select the dissimilarity profiles of the ISI-distance which is piecewise constant (with one constant value for each interval in the pooled spike train) and the SPIKE-distance which is piecewise linear.

Edit “ISI-distance”: This selects the ISI-distance whose dissimilarity profile is piecewise constant. For a description of this spike train distance refer to the first paper cited at the end.

Edit “Spike- distance”: This selects the SPIKE-distance whose dissimilarity profile is piecewise linear. For a description of this spike train distance refer to the second paper cited at the end.

Subpanel “Frames”

Edit “Instants”: Here you can select the individual time instants for which the instantaneous dissimilarity values will be calculated. Selected instants must be within the interval selected in the subpanel “Time” from the previous panel. Please use Matlab notation (e.g. 10 50 100 or 10:10:1000).

Edit “Selective averages”: Here you can select the time intervals over which you would like to average. Please use Matlab notation (for an example check the fifth entry in the listbox from the ‘Selection: Data’ panel). In case you would like to use data-dependent averages you can also put the name of a Matlab file which will be executed before the calculation.

Edit “Triggered averages”: Here you can select the time instants over which you would like to calculate a triggered average. Please use Matlab notation (for an example check the fifth entry in the listbox from the ‘Selection: Data’ panel). If you would like to use data-dependent averages you can also put the name of a Matlab file which will be executed before the calculation. An example is provided (see the file SPIKY_trig_ave.mat).

Button “Select”: This opens a graphical input form which lets you select either via keyboard or via mouse the individual time instants, the intervals for the selective averaging and the time instants for the triggered averaging.

Button “Calculate”: This opens a graphical input form which lets you select either via keyboard or via mouse the individual time instants, the intervals for the selective averaging and the time instants for the triggered averaging.

Panel “Selection: Plots”

Subpanel “Type”:

Checkbox “Dissimilarity profiles”: This will add a subplot with the stimulus/spikes/dissimilarity profiles selected in the panel ‘Selection: Measures’. Its position can be changed by clicking the left mouse on its axes.

Popupmenu “Spike train selection”: In case you have assigned spike train groups you can select whether you want to display only the dissimilarity profiles of all spike trains, of the individual groups (with more than one spike train) or of both.

Checkbox “Average line”: This will add a line with the average value to each dissimilarity profile.

Checkbox “Histograms”: This will add a spike count histogram on the right hand side of the spike trains.

Checkbox “Block matrices”: This will add subplots with block matrices (averages over groups of spike trains) of the dissimilarity measures selected in the panel ‘Selection: Measures’. The position of the matrices can be changed (either individually or all together) by clicking the left mouse on their axes.

Checkbox “Dendrograms”: This will add subplots with dendrograms (obtained from the dissimilarity measures selected in the panel ‘Selection: Measures’). The position of the dendrograms can be changed (either individually or all together) by clicking the left mouse on their axes.

Checkbox “Frame comparison”: This will compare the dissimilarity matrices selected in the panel ‘Selection: Measures’ for different time instants and/or selected or triggered averages. The position of the matrices can be changed (either individually or all together) by clicking the left mouse on their axes.

Checkbox “Frame sequence (movie)”: This will add subplots with the dissimilarity matrices selected in the panel ‘Selection: Measures’. Subsequent frames (time instant and selective or triggered averages) can then be viewed in sequence. The position of the matrices can be changed (either individually or all together) by clicking the left mouse on their axes.

Checkbox “Colorbar”: This will add colorbars to the dissimilarity matrices. The range of the colorbars as well as whether there are colorbars for each matrix or just for the last matrix depends on the setting of the Popupmenu “Matrix normalization” in the panel “Parameters: Figure”.

Subpanel “Time”

Edit “Start”: Beginning of the analysis window.

Edit “End”: End of the analysis window.

Subpanel “Spike trains”

Popupmenu “Spike train selection”: This allows you to select the subset of spike trains for which you would like to visualize the spike train distances.

Edit “Trains”: If ‘Select trains’ is selected, you can either identify the spike trains for which you would like to visualize the spike train distances directly using Matlab notation or use the bottom below and select them from a list.

Button “Select trains”: This allows you to select the spike trains for which you would like to visualize the spike train distances from a list.

Edit “Groups”: If ‘Select groups’ is selected, you can either identify the spike train groups for which you would like to visualize the spike train distances directly using Matlab notation or use the bottom below and select them from a list.

Button “Select groups”: This allows you to select the spike train groups you would like to visualize the spike train distances from a list.

Button “Plot”: This calculates the instantaneous values for the selected frames as well as the selected selective and triggered averages (see previous panel). All results will be stored within one large matrix of dimension “# selected measures * # spike trains * # spike trains * (#

selected frames + # selected averages + # triggered averages)” from which, depending on the choice of plot, the dissimilarity profiles and/or instantaneous or averaged dissimilarity profiles are extracted.

Panel “Parameters: Figure”

Edit “Subplot sizes”: This adjusts the relative sizes of the selected subplots with stimulus/spikes/dissimilarity profiles (see panel ‘Selection: Measures’). For example if three subplots were selected, the vector ‘1 2 1’ will result in the middle subplot being double the size as the other two subplots.

Checkbox “Title”: This adds a title to the figure which will appear on top of the spike panel. The default value is a combination of the data comment and the figure title but it can also be manually edited by pressing the left mouse button while hovering over it and then selecting the ‘String’ property.

Checkbox “Extreme spikes”: This marks the position of the last first spike and the first last spike in the profiles. In the interval in between these points there is no edge effect.

Subpanel “Time-axis”

Checkbox “Real-time mode”: This selects the real-time mode for which in the plot the zero time is kept fixed whereas the spikes move from right to left.

Edit “X-Offset”: This defines the offset on the x-axis of the dissimilarity profile subplot.

Edit “X-Scale”: This defines the basic time unit on the x-axis of the dissimilarity profile subplot. For example if the data are sampled in seconds, an x-factor of 3600 transforms the x-axis into units of hours.

Subpanel “Moving average”

Popupmenu “Selection”: Choice between only regular dissimilarity profile, only moving average or both superimposed.

Edit “Order of the moving average”: Order of moving average for the measure profiles (note that the moving average does not use a time window of fixed length but rather is adaptive since the window length depends on the local firing rate).

Edit “PSTH-window”: Kernel width of Gaussian filter for the Peristimulus time histogram (PSTH). Set to 0 for no filtering.

Popupmenu “Spike train color coding”: This defines the way the spike trains are color-coded. In particular in cases where there are too many spike trains it is not possible to label spike trains on the x-axis and then color-coding can help to identify spike trains either individually or

according to the spike train group they belong to (see subpanel 'Spike trains' in the panel 'Parameters: Data').

Popupmenu "Profile normalization": This defines the way the dissimilarity profiles are normalized. The first option 'Absolute possible' normalizes all subplots to the theoretically possible maximum value (typically 1), the second option 'overall occurring' normalizes all subplots to the one overall maximum (that actually occurs), the third option 'individual' normalizes each subplot to its own maximum value (that actually occurs).

Popupmenu "Matrix normalization": This defines the way the dissimilarity matrices are normalized. The first option 'Absolute possible' normalizes all matrices to the theoretically possible maximum value (typically 1), the second option 'overall occurring' normalizes all matrices to the one overall maximum (that actually occurs), the third option 'individual' normalizes each matrix to its own maximum value (that actually occurs).

Comment: Figure-comment, will be part of the file names (ps-images and avi-movies).

Panel "Parameters: Movie"

Edit "Interval divisions": Here you can define temporal intervals which in the movie will be marked in the title. For an example see the supplementary movie of the second reference cited below which is also provided on the webpage referred to at the end.

Edit "Interval names": Here you can define names for the temporal intervals (defined in the item right above) which in the movie will be marked in the title. For an example see the supplementary movie of the second reference cited below which is also provided on the webpage referred to at the end.

Subpanel "Output"

Edit "Frames per second": This defines the number of frames per second in the avi-file.

Checkbox "Print figures": If this check box is checked each individual frame will be printed into a postscript-file. To be used sparingly in case of very long movies.

Checkbox "Record movie": If this check box is checked the movie will be recorded into an avi-file.

Panel "Movie Console"

Subpanel "Speed"

Slider "Speed": This indicates and sets the speed of the movie. Shifting the marker to a certain position lets the movie use a speed corresponding to this position. Pressing the slider left or right of the current position of the marker lets the movie decrease or increase its speed, respectively.

Subpanel "Direction"

Radiobutton “Backward”: This lets the movie run towards the first frame. It will stop when this frame is reached. The direction can also be changed while the movie is running.

Radiobutton “Forward”: This lets the movie run towards the last frame. It will stop when this frame is reached. The direction can also be changed while the movie is running.

Subpanel “Position”

Slider “Position”: This indicates and sets the current position/frame within the movie. Shifting the marker to a certain position lets the movie jump to this position. Pressing the slider left or right of the current position of the marker lets the movie jump in the respective direction.

Button “Start”: Immediate jump to the beginning of the movie.

Button “Run”: This starts the movie from its current position with the speed defined below (see subpanel ‘Speed’) and in the direction defined below (see subpanel ‘Direction’).

Button “Stop”: This stops the movie at its current position.

Button “End”: Immediate jump to the end of the movie.

For the elements of the **Spike train generator** please confer the file ‘**STG-Elements.doc**’.

More information can be found here:

<http://www.fi.isc.cnr.it/users/thomas.kreuz/Source-Code/SPIKY.html>