

SYNCHRO_GUI (Version 1.0)

Distribution and Reference:

Synchro_gui uses an algorithm developed by R. Quian Quiroga in its implementation. The graphic user interface has been designed by C. S. Koh.

Synchro_gui is provided free (and therefore without any warranty) for any non-commercial applications. For any commercial application please contact the authors (rodri@vis.caltech.edu; csk7@leicester.ac.uk). You can refer to this algorithm just by citing the paper where it is described:

Quian Quiroga R., Kraskov, A., Kreuz, T., Grassberger, P. (2002), Performance of different synchronization measures in real data: A case study on electroencephalographic signals, Physical Review E Vol. 65

Brief Explanatory Notes:-

1.0 Function

This program has been written to enable quick testing of data with newly-developed non-linear synchronisation measures in a graphical user interface environment in MATLAB. The calculation algorithm is done through a C file interfaced with MATLAB.

2.0 Operation

The GUI needs the following files to run successfully:

synchro_gui.fig
synchro_gui.m
synchro_parameters.m
sync.dll

Place the files in the same directory and run MATLAB from that directory. Type "guide" into the command line and open the existing file "synchro_gui.fig". The data manipulation and computation is described briefly below.

3.0 Buttons

LOAD X&Y DATA: This should be the first button clicked on. Select 2 files (of the same size) as x and y which will be plotted and their degree of synchronisation calculated. If you want to analyse a file with 2 columns of data only (one column for x and one for y) you can select that file and the program will automatically proceed to the calculations without asking for the second data file. *Please note that otherwise x and y must be separate data files.*

+ (ZOOM): This allows the user to zoom the specified x and y data graphs. Default zoom factor is approximately 2. Note that both graphs are zoomed together. Maximum default magnification occurs when the next click causes less than 20 samples to be plotted.

-- (*UNZOOM*): This does the opposite of the ZOOM button. Maximum default demagnification is 1000 samples plotted.

<< (*PREVIOUS*): This allows the user to scroll the data left by the current number of plotted points. If end of data will be reached the program will plot from the first point.

>> (*NEXT*): This allows the user to scroll the data right by the current number of plotted points. If end of data will be reached the program will plot to the last point.

CALCULATE!: This allows the user to make several changes to the parameters before asking the program to recalculate the non-linear interdependencies S, H and N. Click once to update the values of S, H and N.

SAVE: This saves the current parameter values and the current S, H, N and cross-correlation values of the data into a .mat output file and generates a screenshot of the GUI in a separate file. This screenshot save can be disabled (default is 'YES').

4.0 Fields

TAU(T); DELAY: The delay. Updating this field will automatically update the x and y attractor plots.

EMBEDDING DIM: The embedding dimension to use when calculating the non-linear interdependencies.

THEILER CORRECTION: The theiler correction to use when calculating the non-linear interdependencies.

NEAREST NEIGHBOURS: The number of nearest neighbours to compute to when calculating the non-linear interdependencies.

Remember to press 'RECALCULATE!' after updating these fields!

5.0 Extensions

Changing parameters: The default parameters can be altered from editing the data in the `synchro_parameters.m` file.

The saved .mat file (on pressing 'SAVE') can be loaded in the MATLAB workspace with `par` and results being the 2 arrays saved. Result is a 1x7 array with values in the following order:

{S(X|Y), S(Y|X), H(X|Y), H(Y|X), N(X|Y), N(Y|X), Cross Correlation}

6.0 Examples

There are 2 example files of a Rössler-driven Lorenz system with medium coupling (3.0) (from *R. Quian Quiroga's* research): `ross_x.asc` and `ross_y.asc`. These 2 files can be input on 'LOAD' and if you click on 'SAVE' immediately after that you will see the output as per the file `ross_x.asc_graphs.jpg`.

C. S. Koh (May 2006)