ProcPlayer (version 2.1)

R code for processing GSR time series data for use with SyncCalc (see https://academic.mu.edu/peressini/synccalc/synccalc.htm).

Input: User-chosen CSV file with TIME as the first column, which is ignored by the R code. Participants' time series (GSR or other) appear in the next columns. If the user has time series that might be used in some analyses, but not in others, the optional time series should appear in the last columns on the right.

There are two lines of code that offer some flexibility in the analysis. One defines the intended lag length (scroll down the script file to see it): `Lag < - 1` [Line 58]. The numeral 1 indicates a lag of one unit. It can be changed to 2, 3, etc., as needed.

The other is `COLUMNS_TO_IGNORE <- 0` [Line 60]. The numeral 0 tells the program not to exclude any of the columns in the CSV file from the analysis. If 0 is changed to numeral 1, the program will ignore the last column in the spreadsheet. If 0 is changed to 2, it will ignore the last two columns, etc.

Output: Six files whose names are the same as the input file's name are produced as follows. They appear in the same directory folder as the CSV file.

1. `-out.txt`, complete output of statistical analyses for debugging and verification
2. `-lMat.txt`, the linear sync matrix for use with SyncCalc
3. `-nl1Mat.txt`, the Opt 1 nonlinear sync matrix for use with SyncCalc
4. `-nl2Mat.txt`, the Opt 2 nonlinear sync matrix for use with SyncCalc
5. `-nl3Mat.txt`, the Opt 3 nonlinear sync matrix for use with SyncCalc
6. `-sum.txt`, which contains a summary of the results of the analysis.

The linear model for the autocorrelations on the diagonal of the output matrix is: $X_n = ß_0 + ß_1X_{n-j}$. Off-diagonal entries are the regression weights $ß_2$ in the transfer equation: $X_n = ß_0 + ß_1X_{n-j} + ß_2P_{n-j}$. The three nonlinear model options are:

Option 1: $z_2 = A \cdot e^{B \cdot z_1} + e^{D \cdot p_1}$.

Option 2: $z_2 = A \cdot p_1 \cdot z_1 \cdot (1 - z_1)$.

Option 3: $z_2 = A \cdot p_1 \cdot z_1 \cdot e^{B \cdot z_1} + C$.

The nonlinear matrices are generated with the nonlinear autocorrelations' ($z_2 = A \cdot e^{B \cdot z_1}$) R (square root of R^2) on the diagonals (a[i,i]). The off-diagonals, a[i,j], i<>j, are populated with:

$$a_{i,j} = \sqrt{|R'^2 - R^2|},$$

where R'^2 is R^2 for the particular model (Option 1, 2, or 3) of player i's influence on player j, and R^2 is the nonlinear autocorrelation.

Getting Started

These instructions will get you a copy of the project up and running on your local machine for development and testing purposes.

Prerequisites

R programming language installation (32 bit or 64 bit) and time series data in a CVS file.

Installing

Simply download and run the script in R.

Running the tests

Test data set included: `EmergencyResponseTeam.cvs`

Output files from test data set:

```
EmergencyResponseTeam-lMat.txt
EmergencyResponseTeam-nl1Mat.txt
EmergencyResponseTeam-nl2Mat.txt
EmergencyResponseTeam-nl3Mat.txt
EmergencyResponseTeam-out.txt
EmergencyResponseTeam-sum.txt
```

Versioning

Version 2.0 employs three different nonlinear models in addition to the linear model. See this article for theoretical background:

> Guastello, S. J., & Peressini, A. F. (2021a). A comparison of four dyadic synchronization models. *Nonlinear Dynamics, Psychology, and Life Sciences*, 25(1), 19-39.
> http://www.societyforchaostheory.org/ndpls

Version 2.1 is a slightly better internally documented version of 2.0.

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