Kesten and Langevin Simulator

Hazan L, Ziv NE (2020) Activity dependent and independent determinants of synaptic size diversity. J Neuroscience (in press)

Microsoft Excel files containing code in Visual Basic for Application (VBA) for simulating synaptic size fluctuations and distributions as a Kesten Process or a corresponding non-linear Langevin process as explained in the aforementioned paper.

Four files are provided

- Kesten and Langevin Simulator Fig 5 control.xlsm
- Kesten and Langevin Simulator Fig 5 silenced.xlsm

- Kesten and Langevin Simulator Fig 6 control.xlsm
- Kesten and Langevin Simulator Fig 6 silenced.xlsm

The VBA code in each pair of files is identical.

Within each pair, the files differ in the parameters used for the simulation (obtained from control or silenced networks)
In the first pair, η is set to 1-ϵ.

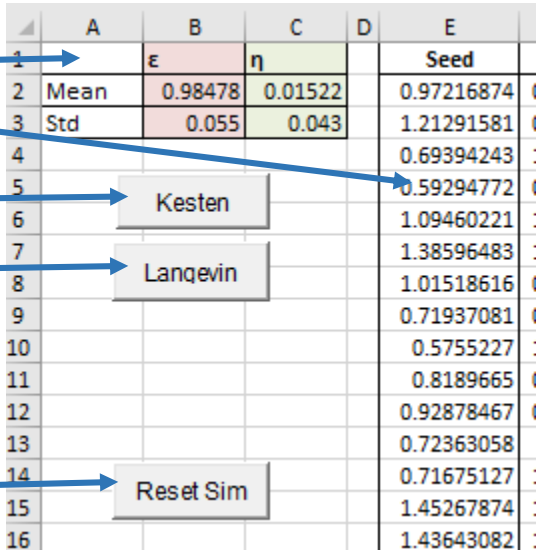
In the second pair, η and ϵ are the values derived from the fits in Fig 6 A and B

All simulations are seeded with the experimentally obtained data for control and silenced networks (1922 and 2032 synapses, respectively)

The simulations in the first pair are set to run for 320 simulation steps, and in the second pair for 40 simulation steps. Apart from this, the VBA code in all files is identical.

To run the simulations,

1) Set the simulation parameters here
2) Seed the initial synapse sizes here (up to 5000 consecutive values, normalized to mean synaptic size)
3) Run the simulation as a Kesten process by pressing this button
4) Run the simulation as a non-linear Langevin process by pressing this button
5) Select the tab “Trajectories” to see the size trajectories for all synapses (rows) at all time points (columns)
6) To view the VBA code, press Alt F11 and inspect the code for “Sheet1 (Frontend)”
7) To Reset the simulation, press this button



Important Notes:

1) The simulations take 1-2 minutes to run – during which the spreadsheet will be unresponsive.
2) To run the simulations, Macros must be enabled (File→Options→Trust Center→Trust Center Settings→Macro Settings→Enable All Macros