Electronic Supplementary Information

Controllable switching between stable modes in small network of pulse-coupled chemical oscillators

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Description of the algorithm written in the program LabView.

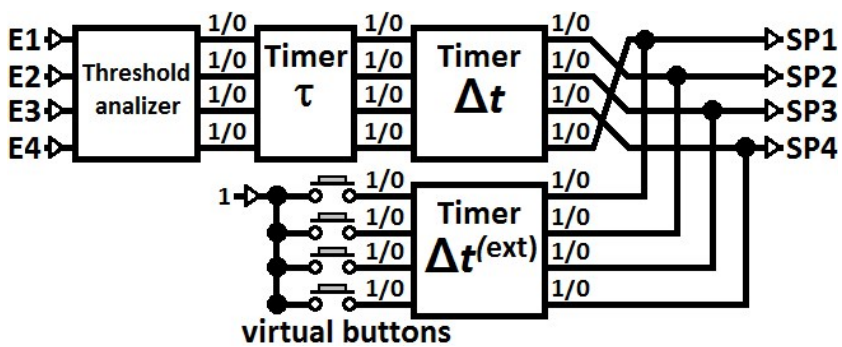

Figure ESI-1. The block scheme of the LabView software for unidirectional inhibitory pulse coupling with time delay and external inhibitory pulses.

Analog signals from the photodiode receivers, PD1 - PD4, are converted to the digital E1 - E4 signals, respectively. The module "Threshold analyzer" defines the excess signal E of the PD receiver over the threshold value E_{th} = 8 V and works as a trigger for the next module. "1/0" means digital line. The module "Timer τ" is responsible for the time delay τ between the operations of modules "Threshold analyzer" and "Timer $\Delta t^{(ext)}$". The module "Timer Δt" is responsible for the duration of the internal injection Δt, while the module "Timer $\Delta t^{(ext)}$" is responsible for the duration of the external pulse injection, $\Delta t^{(ext)}$. SP1 - SP4 are digital inputs which operate syringe pumps of the A3 type. "Virtual buttons" is used for controlling external pulses manually. Logical "1" is a constant signal that can be given to the input of a needed channel of module "Timer $\Delta t^{(ext)}$" by pressing the corresponding virtual button.

Four lines in each module from top to bottom correspond to oscillators #1 - #4, respectively. Each line in the modules works separately. Let us describe how our algorithm works for the j^{th} oscillator (j = 1, 2, 3, 4) and corresponding j^{th} channel. Signal E_j of the PD_j comes to the input of the "Threshold analyzer". If E_j exceeds the threshold value E_{th} = 8 V, the digital output of the "Threshold analyzer" is equal to "1", and "0" otherwise. Note that the threshold value E_{th} can be equated to any value between 5 V and 9 V. The module "Timer τ" starts to count τ seconds (time delay), if its input is equal to logical "1". During this time (time of counting), the "Timer τ" cannot read any input signals. When the counter reaches τ seconds, the value of the j^{th} output of the "Timer τ" switches from logical "0" to logical "1". As soon as the input of the next module "Timer Δt" changes from "0" to "1", this module starts to count Δt seconds. During this time of counting, the j^{th} output of the module "Timer Δt" is equal to logical "1" and the model cannot read any new j^{th} input. Since we use unidirectional coupling on the ring, the j^{th} output of the "Timer Δt" is connected to the input of a syringe pump SP_{j+1} (if j = 4, j + 1 = 1). The module "Timer $\Delta t^{(ext)}$" is designed to create short external pulses that can be controlled manually by "virtual buttons". If the virtual button in the j^{th} line is pressed, what is equivalent to setting logical "1" to the j^{th} input of the module "Timer $\Delta t^{(ext)}$", this module starts working by the same manner as module "Timer Δt", but with its own time $\Delta t^{(ext)}$, which can be changed from one to another experiment.