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# Distribution of lifetimes for transient bursting states in coupled noisy excitable systems

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*Abstract*: In ensembles of coupled oscillators, intrinsic fluctuations often enable notrivial dynamics in seemingly simple situations. We investigate this effect on the example of two coupled FitzHugh-Nagumo oscillators subjected to external noise. At the considered parameter values, the unique global attractor of the deterministic system is its state of rest. Additive white noise of low or moderate intensity leads to the onset of transient bursting regime: series of intermittent bursts (patches of spikes), followed by the abrupt decay to the state of rest. Depending on the noise strength and the initial conditions, the number of bursts before the ultimate decay displays strong variations. Our numerical studies have disclosed that in the sufficiently large ensembles of realizations, the statistics of lifetimes for the transient bursting states follows the exponential distribution. The distribution slope (i.e. the mean duration of the bursting regime) depends on the noise intensity, being small for very weak noise and asymptotically diverging when the noise becomes stronger. Observations on the statistics of transient bursting regimes have been qualitatively and quantitatively confirmed by our experiments with the coupled analog electronic circuits, modeling the FitzHugh-Nagumo dynamics. We relate the exponential character of the distribution to the probability that the trajectory of the system, under the action of noise, escapes the local basin of attraction of the state of rest.

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