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Event-triggered feedback in a noise-driven phase oscillator JUSTUS ALFRED KROMER, Humboldt-Universität zu Berlin, BENJAMIN LINDNER, LUTZ SCHIMANSKY-GEIER, Humboldt-Universität zu Berlin, Bernstein Center of Computational Neuroscience Berlin — Using a stochastic nonlinear phase oscillator model, we study the effect of event-triggered feedback on the statistics of interevent intervals (IEI). Whenever the oscillator enters a new cycle, i.e., an event occurs, feedback is applied to the system by increasing (positive) or decreasing (negative) the oscillators frequency. Such models can be used to study spike-triggered currents in neurons, or feedback mechanisms in laser physics. Beside the known excitable and oscillatory regime positive feedback can lead to bistable dynamics and a change of the excitability class. Furthermore, in the excitable regime the feedback has a strong influence on noise-induced phenomena like coherence resonance or anti-coherence resonance, i.e., the minimization or maximization of IEI variability for a certain amount of noise. Interestingly, positive feedback increases IEI variability for a weak noise, but reduces the variability in the strong noise regime, whereas negative feedback acts in the opposite way. Therefore, both types of feedback can enhance the coherence resonance effect by further reducing the IEI variability, but only positive feedback can lead to anti-coherence resonance, which does not occur in the absence of feedback.

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