Stochastic resonance in a simple comparate-and-fire model

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The well-known Leaky Integrate-and-Fire (LIF) neural model yields an operational description of the neural encoding process which, although oversimplified, reproduces the main qualitative features of the experimental behaviour, and in particular the refractoriness of the spike discharge and its phase-locking to a periodic stimulus. That is why it has received so much attention, first in its deterministic version (1), then in the stochastic ones (2, 3). The Stochastic Resonance (SR) effect has been demonstrated and characterised in the LIF model with noise on the input signal (5-7), and even in the LIF with noise on the firing threshold (8). In the present report, SR is investigated in an even simpler model, where a sinusoidal signal can reach the firing threshold only due to the noise. However, to provide this comparate-and-fire model with some realistic refractoriness, at every spike the noise amplitude is set at zero, and then exponentially returned to its steady-state value. The possibility the model exhibits *bona fide* SR is also checked.

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