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Periodic vs. Transient Estimation of Phase Response Curves[1]
JIANXIA CUI, Georgia Institute of Technology, SRISAIRAM ACHUTHAN, CARMEN CANAVIER, LSU Health Sciences Center, ROBERT BUTERA, Georgia Institute of Technology — Phase response curves (PRCs) for a single neuron are often used to predict the synchrony of mutually coupled neurons. Previous theoretical work on pulse coupled oscillators used single pulse perturbations. We propose an alternate method in which functional PRCs (FPRCs) are generated using a train of pulses applied at a fixed delay after a spike. Experimental FPRCs in *Aplysia* pacemaker neurons were different from single pulse PRCs because of adaptation. Adaptation was incorporated by plotting the effective period, observed just after the pulse train is terminated, as a function of the entrained period during the pulse train. The effective intrinsic period was used iteratively in the prediction method instead of the unperturbed intrinsic period. Incorporating adaptation improved the accuracy of prediction of phase-locked modes in a model network of adapting oscillators characterized by both single pulse and multiple pulse PRCs compared to those characterized by single pulse PRCs alone.

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