PREDICTING PHASE – LOCKED MODES IN A HYBRID CIRCUIT FROM THE PHASE RESETTING CURVE

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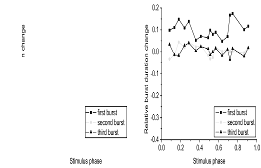

Figure 10. The relative change of the burst duration of the biological neuron coupled with the model2 (left panel) and model6 (right panel) neuron. The burst duration of the biological neuron is almost constant.

Figure 11. The relative change of the burst duration of model2 (left panel) and model6 (right panel) neuron. The average burst duration of the model neuron increases as the coupling strengthens.

ENTRAINMENT MODES IDENTIFICATION WHEN BURST IS TRUNCATED

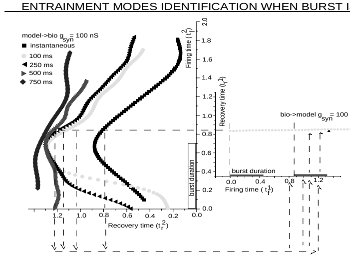

Figure 7. The firing pattern for model3 neuron coupled with PD neuron. The biological neuron PRCs for different pulse durations were previously obtained (Oprisan et al, Soc. Neurosci. Abstr., 2001). The biological neuron receives an input of $b^1[1]$=.45s duration at t_f^{bio}=.85s from the model3 neuron and its recovery time is t_r^{bio}=1.2s. Because $t_r^{bio}=t_f^{model}$ the model neuron receives an input at t_f^{model}=1.2s which truncates the second burst down to $b^1[2]$=.35s. The iteration repeats with shorter bursts until the recovery time of the biological neuron falls

THE COMPUTATIONAL PROCEDURE FOR MODE PREDICTION

Computational procedure (Canavier et al., 1997, 1999; Oprisan and Canavier, 2001, 2002):

1. using the PRC of neuron "1", determine the recovery time ($t_r^1[n]$) for a given firing (stimulus) time ($t_f^1[n] = P_i^1\ _f^1[n]$) after n^{th} iteration based on (2a).
2. the recovery time of neuron "1" equals the firing time of neuron "2" ($t_r^1[n] = t_f^2[n]$).
3. using the PRC of neuron "2" determine the recovery time ($t_r^2[n]$) for the firing (stimulus) time ($t_f^2[n] = P_i^2\ _f^2[n]$) found at the step 2 after n^{th} iteration based on (2b).
4. the recovery time of neuron "2" equals the firing time of neuron "1" in the next iteration ($t_r^2[n] = t_f^1[n+1]$).
5. iterate through steps 1-4 until steady recovery times $(t_r^1)_{steady}$ and $(t_r^2)_{steady}$ are found.
6. compute the steady entrained period $(t_r^1)_{steady} + (t_r^2)_{steady} = P_e$.