For a network of six mutually inhibiting units, assume (3):
The currents take the forms
frequency

The system of equations for a single bursting neuron model is (1):

The synapse variable \( s \) enters the postsynaptic cell:

The currents take the forms

The steady state gating variables are

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The following figures show gait transitions from tetrapod to tripod as \( \zeta \) increases in the network of 6-coupled bursting neurons represented by 24 ODEs. Each bar represents the swing phase of one leg. Note the transitional gait with partial overlap of swing phases in the middle row. In these simulations, \( c_1 = c_2 = c_5 \), and \( c_4 = c_6 = \tilde{c}_0 \).

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The following figures show gait transitions from tetrapod to tripod as \( \zeta \) increases in the network of 6-coupled bursting neurons represented by 24 ODEs. Each bar represents the swing phase of one leg. Note the transitional gait with partial overlap of swing phases in the middle row. In these simulations, \( c_1 = c_2 = c_5 \), and \( c_4 = c_6 = \tilde{c}_0 \).

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We show that when \( \zeta \) increases, a gait transition from tetrapod to tripod occurs.

We assume constant contralateral symmetry between the left and right legs:

There exists a unique \( \eta = \eta(\zeta) \), \( 0 \leq \eta \leq 1/6 \), such that

Phase transition yields a single equation for each bursting neuron. The coupling function is computed by convolving the phase response curve (PRC) with the synaptic current (4eq).

\[ \phi_0 = \omega_0 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]
\[ \phi_1 = \omega_1 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]
\[ \phi_2 = \omega_2 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]
\[ \phi_3 = \omega_3 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]
\[ \phi_4 = \omega_4 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]
\[ \phi_5 = \omega_5 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

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Gaits deduced from fruit fly data fitting

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Arising from the system defined by Equation (1), we deduce:


\[ \dot{H}(t - \zeta_1 - c_1) = \zeta_1 H(t - \zeta_1 - c_1) - c_1 H(t - \zeta_1 - c_1) \]

\[ \phi_0 = \omega_0 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_1 = \omega_1 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_2 = \omega_2 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_3 = \omega_3 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_4 = \omega_4 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_5 = \omega_5 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \dot{H}(t - \zeta_1 - c_1) = \zeta_1 H(t - \zeta_1 - c_1) - c_1 H(t - \zeta_1 - c_1) \]

\[ \phi_0 = \omega_0 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_1 = \omega_1 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_2 = \omega_2 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_3 = \omega_3 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_4 = \omega_4 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \phi_5 = \omega_5 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

\[ \dot{H}(t - \zeta_1 - c_1) = \zeta_1 H(t - \zeta_1 - c_1) - c_1 H(t - \zeta_1 - c_1) \]

\[ \phi_0 = \omega_0 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

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\[ \phi_3 = \omega_3 + c_1 H(t - \zeta_1 - c_1) + c_2 H(t - \zeta_1 - c_2) \]

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