Zhang, Calvin; **Lewis, Timothy J.**
Robust phase-waves in chains of half-center oscillators. (English) Zbl 1370.34064
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A half-center oscillator is a pair of neurons (or populations of neurons) each of which inhibits the other. If the neurons also have some form of slow adaptation, the pair will produce anti-phase periodic oscillations. Here, the authors consider chains of such (pairs of) oscillators each with local coupling to their nearest neighbours in the chain. There are four possible configurations of this coupling, and the authors find that each configuration gives a stable oscillation in which the phase difference between neighbouring oscillators is either approximately 0, 1/4, 1/2 or 3/4. These phase waves are robust, in the sense that the phase relationships remain roughly constant even when the period of oscillation varies. They are also robust with respect to varying the length of the chain, the difference in strengths of connections in the two directions along the chain, and the number of nearest-neighbour connections. Two models are used: (i) each half-center oscillator is formed from a pair of Morris-Lecar neurons, (ii) each half-center oscillator is modeled by a single phase oscillator. In the latter case, stability of a phase wave can be easily calculated.

Reviewer: Carlo Laing (Auckland)

MSC:

34C15	Nonlinear oscillations and coupled oscillators for ordinary differential equations	Cited in **4** Documents
92C20	Neural biology	
34C25	Periodic solutions to ordinary differential equations	
34D06	Synchronization of solutions to ordinary differential equations	
34D20	Stability of solutions to ordinary differential equations	

Keywords:

phase constancy; phase wave; central pattern generator; half-center oscillator; metachronal coordination; synchrony

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