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Partial Synchronization in Pulse-Coupled Oscillator Networks II: A Numerical Study[1] BOLUN CHEN, JAN R. ENGELBRECHT, RENATO MIROLLO, Boston College — We use high-precision numerical simulations, to compute the dynamics of N identical integrate and fire model neurons coupled in an all-to-all network through α-function pulses. In particular, we determine the discrete evolution of the state of our system from spike to spike. In addition to traditional fully synchronous and splay states, we exhibit multiple competing partially synchronized ordered states, which are fixed points and limit cycles in the phase space. Close examinations reveal the bifurcations among different states. By varying the parameters, we map out the phase diagram of stable fixed points. Our results illustrate the power of dimensional reduction in complex dynamical systems, and shed light on the collective behaviors of neural networks.

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