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Synchronization in a network of phase-coupled oscillators: the role of learning and time delay LIAM TIMMS, LARS ENGLISH, Dickinson College — We investigate numerically the interplay of network "learning" and finite signal speed in one and two-dimensional arrays of coupled Kuramoto oscillators. The finite signal speed is introduced into the dynamical system via a time-delay in the coupling. The network structures we examine include various one and two-dimensional arrays with both long and short-range connectivity; the structure of these arrays is imposed via a time delay and a connection matrix. The learning is governed by the Hebbian learning rule which allows the coupling strengths between pairs of oscillators to vary dynamically. It corresponds to a neurological type of learning in which the synapses between neural oscillators increase in strength when they fire action potentials together. We explore the coherent spatio-temporal patterns that can emerge as a function of model parameters such as learning rate and signal speed.

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