Physics > Optics

Crowd synchrony and quorum sensing in delay-coupled lasers

Jordi Zamora-Munt, C. Masoller, Jordi Garcia-Ojalvo, Rajarshi Roy

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Crowd synchrony and quorum sensing arise when a large number of dynamical elements communicate with each other via a common information pool. Previous evidence in different fields, including chemistry, biology and civil engineering, has shown that this type of coupling leads to synchronization, when coupling is instantaneous and the number of coupled elements is large enough. Here we consider a situation in which the transmission of information between the system components and the coupling pool is not instantaneous. To that end, we model a system of semiconductor lasers optically coupled to a central laser with a delay. Our results show that, even though the lasers are non-identical due to their distinct optical frequencies, zero-lag synchronization arises. By changing a system parameter, we can switch between two different types of synchronization transition. The dependence of the transition with respect to the delay-coupling parameters is studied.

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