SYNCHRONOUS BEHAVIOR IN IDENTICAL PULSE COUPLED OSCILLATORS

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We studied synchronization and clustering in three types of identical pulse coupled relaxation oscillators in a global coupling configuration. We considered a mean field approach as well as a distance dependence coupling. The groups of oscillators under study were real light-controlled oscillators (LCOs)[1], simplified LCOs and integrate-and-fire oscillators. In order to study the synchronous behavior, we have used two criteria (phase difference and period) introduced in [2]. We have compared the synchronous behavior of the three types of oscillators by means of the total synchronization probability. We found that LCOs' behavior is similar in most of cases. On the other hand, the integrate-and-fire oscilators exhibit expected results under the mean field approach but the results for the distance dependence coupling contrast with the intuiton. In all cases, the duration of the transient has been computed and the results show that under the mean field approach, the transient grows logarithmically with the number of oscillators.

[1] G. M. Ramirez Avila, J. L. Guisset, and J. L. Deneubourg, "Synchronization in light-controlled oscillators," Physica D, 182, 3-4, pp. 254--273, 2003.
[2] G. M. Ramirez Avila, J. L. Guisset, and J. L. Deneubourg, "Synchronization in chains of light-controlled oscillators," Journal of Physics: Conference Series, 23, pp. 252--258, 2005.