Synchronization of the Kuramoto model on a regular network

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Abstract
Stable solutions of the Kuramoto model on a regular network are investigated. It is shown that there are two stable states: a completely synchronized state with an order parameter equal to one and a completely incoherent state with an order parameter equal to zero. Also, the situation that could lead to the order parameter just equal to one is found out. Furthermore, it is shown that the phase difference of neighboring oscillators must be less than $\pi/2$ for a getting a stable state. It is also proved that by having the degree of each node more than half of the total number of nodes, we could only have the order parameter equal to one in $(-\pi, \pi]$ for each initial phase condition.

Keywords: synchronization, Kuramoto model, order parameter, regular network, stability matrix

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