

Effects of degree-frequency correlations on network synchronization: Universality and full phase-locking

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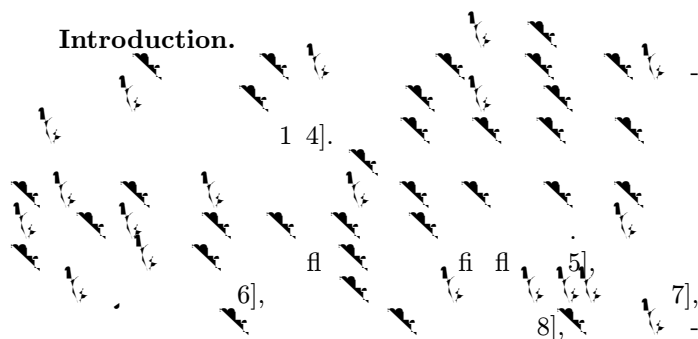
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- 05. 45. Xt – Synchronization; coupled oscillators
- 89. 75. Hc – Networks and genealogical trees

- We introduce a model to study the effect of degree-frequency correlations on synchronization in networks of coupled oscillators. Analyzing this model, we find several remarkable characteristics. We find a stationary synchronized state that is i) universal, i.e., the degree of synchrony, as measured by a global order parameter, is independent of network topology, and ii) fully phase-locked, i.e., all oscillators become simultaneously phase-locked despite having different natural frequencies. This state separates qualitatively different behaviors for two other classes of correlations where, respectively, slow and fast oscillators can remain unsynchronized. We close by presenting an analysis of the dynamics under arbitrary degree-frequency correlations.

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$$\begin{aligned}
 & \left(\omega \right) \quad \dots \quad] \quad 12] \\
 & \left(\dots \right) \quad \dots \quad] \\
 & \alpha \quad \dots \quad (1) \quad (2) \\
 & \mapsto \alpha \quad \dots \quad \alpha = 1 \\
 & \text{fi} \quad \dots \quad] \\
 & \beta \quad \dots \quad \beta = 1, \beta = 1, \beta = 1 \\
 & \text{fi} \quad \dots \quad \psi_n = \\
 & \sum \theta_m, \psi \quad \dots \quad = N^{-1} \sum \frac{n}{n}
 \end{aligned}$$

Description of solutions.

$$\begin{aligned}
 & (1) \quad (2) \\
 & \text{fi} \cdot 1 \quad \dots \quad N = 1000 \\
 & \left(\dots \right) \quad 22] \quad \beta = 1. \quad 1() \\
 & = 0.1, \quad \dots \quad 1, \\
 & = 1 \approx 0.2, \quad \dots \quad = 2 \approx 2() \\
 & A \quad \text{fi} \cdot 1(), \quad \dots \quad 13]. \\
 & (), \quad \dots \quad (), \quad \dots \quad 1, \approx 0 \\
 & \dots \quad 1 \quad 2, \quad \dots \\
 & (), \quad \text{fi} \cdot 1(). \\
 & \rho(\theta) \quad \dots \quad \text{fi} \cdot 1(), \\
 & () \quad \dots \quad \text{fi} \cdot 1(), \quad \dots \quad \text{fi} \cdot 1(), \quad () \\
 & \text{fi} \cdot 1() \quad \dots \quad \text{fi} \cdot 1() \\
 & () \quad \dots \quad () \\
 & () \quad \dots \quad () \approx 1^2 \text{ fi} \cdot 1()
 \end{aligned}$$

ff

