

Wu, Chai Wah; Chua, Leon O.

Synchronization in an array of linearly coupled dynamical systems. (English) Zbl 0867.93042
IEEE Trans. Circuits Syst., I, Fundam. Theory Appl. 42, No. 8, 430-447 (1995).

Consider a system of mn ODEs

$$\dot{\mathbf{x}}_i = \mathbf{f}_i(\mathbf{x}_i, t) + \sum_{j=1}^m \mathbf{D}_{ij} \mathbf{x}_j, \quad \text{for } i = 1, \dots, n,$$

where $\mathbf{x}_i = (x_{i1}, \dots, x_{in})^T$, $\mathbf{x}_i \in R^n$, \mathbf{f}_i 's are uniformly Lipschitz continuous, \mathbf{D}_{ij} are $n \times n$ matrices. Various notions of synchronization are defined, which means that the trajectories of all the cells approach each other. Sufficient conditions for asymptotic synchronization of linearly coupled identical dynamic systems are proved and discussed for various coupling configurations using the main results of Lyapunov's direct method. The considered coupling configurations are described by symmetric matrices, irreducible matrices, normal matrices, circulant matrices, nonnegative matrices including their perturbations. Sufficient conditions for additive nonlinear coupling to make the synchronized state asymptotically stable are given.

Reviewer: [L.Bakule \(Praha\)](#)

MSC:

- [93C15](#) Control/observation systems governed by ordinary differential equations
- [93A15](#) Large-scale systems
- [93D20](#) Asymptotic stability in control theory

Cited in **227** Documents

Keywords:

[asymptotic stability](#); [synchronization](#); [coupling](#)

Full Text: [DOI](#)