

Lyapunov and Input-to-State Stability of Stochastic Differential Equations

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Abstract : Input-to-State Stability (ISS) is widely used in deterministic control theory but less known in the stochastic case. Roughly speaking, the theory explains when small perturbations of the right-hand sides of the system on the entire semiaxis cause only small changes in the solutions of the system, again on the entire semiaxis. This property is crucial in many applications. In the report, we explain how to define and study ISS for systems of linear stochastic differential equations with or without delays. The central result connects ISS with the property of Lyapunov stability. This relationship is well-known in the deterministic setting, but its stochastic version is new. As an application, a method of studying asymptotic Lyapunov stability for stochastic delay equations is described and justified. Several examples are provided that confirm the efficiency and simplicity of the framework.

Keywords : asymptotic stability, delay equations, operator methods, stochastic perturbations

Conference Title : ICMMM 2021 : International Conference on Mathematics and Mathematical Models

Conference Location : London, United Kingdom

Conference Dates : May 24-25, 2021