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Dissipative Dynamical Systems: Basic Input-Output and State Properties â˜†

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Abstract

A complete account is given of the theory of so-called dissipative dynamical systems. The concept of dissipativeness is defined as a general input-output property which includes, as notable special cases, passivity and other properties related to finite-gain. The aim is to treat input-output and state properties side-by-side with emphasis on exploring connections between them. The key connection is that a dissipative system in general possesses a set of energy-like functions of the state. The properties of these functions are studied in some detail. It is demonstrated that this connection represents a direct generalization of the well-known Kalman-Yakubovich lemma to arbitrary dynamical systems. Applications to stability theory and passive system synthesis are briefly discussed for non-linear systems.

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