



CONFERENCIA MARTES 17 DE ENERO DE 2023 A LAS 12:00

The exponential input-to-state stability property — characterisations and feedback connections

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The exponential input-to-state stability property is a stability (boundedness and asymptotic behaviour) property for controlled, also called forced, systems of nonlinear ordinary differential equations. Input-to-state stability (ISS) is a concept from mathematical systems and control theory which traces its roots back to the seminal work of Eduardo Sontag in the late 1980s, and has been further studied since.

A brief introduction to ISS shall be provided, motivating the concept, and key differences to traditional Lyapunov or asymptotic stability discussed. The exponential ISS property shall be recalled, and a recent characterisation presented. The characterisation includes the necessity of a suitable Lyapunov function for the exponential ISS property, a type of result often called a converse Lyapunov theorem.

Further, a key aim of control theory is to understand the dynamic behaviour of two systems connected in feedback. Roughly, the aim is to specify conditions on the subsystems and the feedback connection which subsequently yields desired properties of the overall feedback system. Here, we shall show that the feedback connection of two exponentially ISS systems is itself exponentially ISS provided a suitable inequality is satisfied.

The talk aims to be accessible to a broad mathematical audience, with no prior knowledge of the area assumed.

Lugar: Aula Luis Rodríguez Marín del Departamento de Matemática Aplicada de la UNED (Aula 2.32). E.T.S.I. Industriales.