

Coalescence and Splitting Mechanisms of Time-Delay Systems' Spectral Values and their Effect on Stability

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For linear delay-differential equations, a question of ongoing interest is to determine conditions on the equation parameters that guarantee exponential stability of solutions. The starting point of this talk shall be a recent result showing a link between the stable manifold and the manifold corresponding to a given multiplicity of a spectral value hence enabling a spectral abscissa assignment. After a motivation of the tracking of multiple spectral values for analysis/control perspectives, some existing links between Birkhoff's interpolation problem and a result due to Pólya and Szegő on the number of quasipolynomial's roots in some horizontal strip shall be revisited. Later, some ideas of analytic proofs of the dominance of the quasipolynomial's root will be presented, setting up a reduced-complexity delayed stabilizing design. Sensitivity of the control design with respect to the parameters variation will be discussed. Finally, various reduced order examples will illustrate the applicative perspectives of the proposed control approach.