

Geometric Ideas in the Stability Analysis of Delay Models in Biosciences

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Abstract

This chapter focuses on the stability analysis of various continuous-time delay systems encountered in biosciences. Our main interest is to characterize the effects induced by the presence of delays on the systems stability. More precisely, we present some intuitive and easy to follow geometric ideas for characterizing the behavior of the characteristic roots (or eigenvalues) of the corresponding linearized models with respect to the imaginary axis for the single and multiple discrete (constant) delays or for some particular classes of distributed delays (gamma-distribution with a gap). Several examples (human respiration, cell-to-cell spread models in well-mixed configurations or immune dynamics in chronic leukemia) complete the presentation.

Keywords: delay, stabilization, robustness.