Stability of equilibrium and bifurcation analysis in delay differential equations

Griselda R. Itovich[1], Franco S. Gentile[2,4] and Jorge L. Moiola[3,4]

[1]Escuela de Producción, Tecnología y Medio Ambiente
Sede Alto Valle y Valle Medio
Universidad Nacional de Rio Negro

[2]Dpto. de Matemática, Universidad Nacional del Sur

[3]Dpto. de Ingeniería Eléctrica y Computadoras, Universidad Nacional del Sur

[4]Instituto de Investigaciones en Ingeniería Eléctrica - IIIE
(UNS-CONICET)

When delay differential equations are considered, the determination of the stability of an equilibrium is connected with the location of the roots of an exponential polynomial. Applying some results of Pontryagin (1955), Danskin, Bellman and Cooke (1954, 1963), some theorems have been set. They give necessary and sufficient conditions to guarantee the asymptotic stability of the equilibrium points.

The models are written as retarded and neutral delay differential equations. So, these results, expressed as inequalities in terms of the involved parameters, allow to find areas of stability as well as its frontiers: the Hopf bifurcation curves. These results together with those coming from the frequency domain methodology (Moiola and Chen, 1996), this last to study limit cycles and its bifurcations, complete the description of the dynamic behavior.

References:

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