Continuous Pole Placement for Time Delayed Feedback Contrlolled Systems

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Abstract: We propose a continuous pole placement method for time-delayed feedback controlled systems. The method is based on solving the boundary values problem for the
Floquet functions and corresponding adjoint problems. The differentiation of Floquet equations in respect to components of the vector of feedback gains allows to find the matrix of sensitivity, i.e. the partial derivatives of the Floquet exponents in respect to the feedback gains. Having this matrix, we pseudoinverse it in order to find the necessary correction of the feedback gains corresponding to the desired shift of the Floquet exponents. We thus correct the feedback gains for many steps thus moving the Floquet exponents in a necessary direction. As an example, we have successfully moved the Floquet exponents of the TDFC-controlled period-one UPO in the Lorenz system from an unstable region (with a diagonal control matrix) into a stable one. The obtained result shows a deeper minima of the leading Floquet exponent compared with that obtained by K.Pyragas and V.Novičenko [Phys. Rev. E **88**, 012903 (2013)].

Keywords: Time-delayed feedback control method, Floquet exponents, pole placement, boundary conditions problem, ajoint problem.