

Using delay for control

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Abstract:

In this talk by "using delays" I understand either Time-Delay Approaches to control problems (that originally may be free of delays) or intentionally inserting delays to the feedback. I will start with an old Time-Delay approach - to sampled-data control. In application to network-based control with communication constraints, this is the only approach that allows treating transmission delays larger than the sampling intervals. I will continue with "using artificial delays" via simple Lyapunov functionals that lead to feasible LMIs for small delays and to simple sampled-data implementation.

Finally, I will present a New Time-Delay approach - this time to Averaging. The existing results on averaging (that have been developed for about 60 years starting from the works of Bogoliubov and Mitropolsky) are qualitative: the original system is stable for small enough values of the parameter if the averaged system is stable. Our approach provides the first quantitative bounds on the small parameter making averaging-based control (including vibrational and extremum seeking control) reliable.