

Different approaches to integral action in infinite-dimensional nonlinear dynamics

Wednesday, October 18, 2023 2:00 PM (1 hour)

We discuss some recent advances in set-point output regulation for nonlinear systems in infinite dimension. We investigate two distinct approaches: (i) passivity arguments and constrained integral control; (ii) Lyapunov techniques and forwarding-based control. For nonlinear plants modelled by monotone differential inclusions, the passivity-based approach allows us to achieve constant reference tracking with simple output feedback control. Additionally, the integrator state can be constrained into a desired convex subset of the output space. On the other hand, the forwarding-Lyapunov approach does not require impedance passivity of the system, and relies instead on the existence of a suitable invariant manifold for the plant-integrator cascade. This motivates the introduction of a new class of nonlinear operator Sylvester equations, which we are able to handle in some relevant particular cases. Both approaches are applied to selected nonlinear PDE models. Joint work with Lucas Brivadis, Pietro Lorenzetti, Lassi Paunonen and George Weiss.

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