Author:

Iasson Karafyllis, National Technical University of Athens, Greece

Title:

ISS in different norms for 1-D parabolic PDEs with boundary disturbances

Abstract:

For 1-D parabolic PDEs with disturbances at both boundaries and distributed disturbances we provide ISS estimates in various norms. Due to the lack of an ISS Lyapunov functional for boundary disturbances, the proof methodology uses (i) an eigenfunction expansion of the solution, and (ii) a finite-difference scheme. The ISS estimate for the sup-norm leads to a refinement of the well-known maximum principle for the heat equation. The obtained results are applied to quasi-static thermoelasticity models that involve nonlocal boundary conditions. Small-gain conditions that guarantee the global exponential stability of the zero solution for such models are derived. Finally, the obtained results are applied to parabolic PDEs under observer-based boundary feedback control.