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Title: A Backstepping-KKL observer for a cascade of a nonlinear ODE with a heat equation

Abstract: In this presentation, we propose an observer design for a cascaded system composed of an arbitrary nonlinear ordinary differential equation (ODE) with a 1D heat equation. The nonlinear output of the ODE imposes a boundary condition on one side of the heat equation, while the measured output is on the other side. The observer design combines an infinite-dimensional Kazantzis-Kravaris/Luenberger (KKL) observer for the ODE with a backstepping observer for the heat equation. This construction is the first extension of the KKL methodology to infinite-dimensional systems. We establish the convergence of the observer under a differential observability condition on the ODE. The effectiveness of the proposed approach is illustrated in numerical simulations.