

# Robust controllers for parabolic systems using the Galerkin approximation

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This is a joint work with Lassi Paunonen and Petteri Laakkonen, Tampere University of Technology.

We consider the robust output tracking problem on state space  $H$

$\dot{x}(t) = A x(t) + B u(t)$ ,  $y(t) = C x(t) + D u(t)$ , where  $x$  is the state,  $u$  is the input (control), and  $y$  is the output (observation). Our goal is to design a dynamic feedback controller of the form  $\dot{z}(t) = G_1 z(t) + G_2 e(t)$ ,  $u(t) = K z(t)$ ,

where  $e(t) = y(t) - y_{ref}(t)$  is the regulation error in such a way that the output  $y(t)$  of the system converges asymptotically to a given reference signal  $y_{ref}(t)$ . We propose a new way of designing finite-dimensional robust controllers based on Galerkin approximations of infinite-dimensional controllers presented before in [Pau16]. For a class of sesquilinear form  $A$  and assumptions of approximation schemes proposed in [BI88, BI97, Mor94], we prove that the finite dimensional controllers solve the Robust Output Regulation Problem. \(\backslash\)

[BI88] H. T. Banks and K. Ito.

A unified framework for approximation in inverse problems for distributed parameter systems. Control Theory Adv. Tech., 1988.

[BI97] H. T. Banks and K. Ito. Approximation in LQR Problems for Infinite Dimensional Systems With Unbounded Input Operators.

J. Math. Systems Estim. Control, 1997.

[Mor94] K. A. Morris. Design of finite-dimensional controllers for infinite-dimensional systems by approximation.

J. Math. Systems Estim. Control, 4(2):30, 1994.

[Pau16] L. Paunonen. Controller Design for Robust Output Regulation of Regular Linear Systems. IEEE Transactions on Automatic Control, 61(10):2974–2986, Oct 2016.

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