Miroslav Krstic (krstic@ucsd.edu), Department of Mechanical & Aero. Eng., University of California, San Diego, *Infinite Dimensional Backtepping for Boundary Control of Parabolic PDE's*

Boundary stabilization of a broad class of linear parabolic partial integro-differential equations is considered via strictly infinite dimensional backstepping, independent of any spatial discretization. The problem is formulated as a design of an integral operator whose kernel is shown to satisfy a well posed hyperbolic P(I)DE. This P(I)DE is then converted to an equivalent integral equation and, by applying a Peano-Baker-like approximation, a unique smooth solution for the kernel is found. For important special cases, feedback laws are constructed explicitly. It is also shown how to extend the approach to design inverse optimal controllers, and how to use adaptation to minimize the gain of the inverse optimal controllers (starting the gain from zero and raising it to a sufficient value to achieve stability). Finally, output-feedback boundary controllers (actuation on one boundary, sensing on the other boundary) are designed and the corresponding compensators' transfer functions (which are not rational) are found explicitly.