USING SUM-OF-SQUARE POLYNOMIALS FOR THE ANALYSIS AND CONTROL OF PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS
– talk –

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This talk covers the area of Sum-of-Squares Polynomials (SOSPs) for the analysis and control of parabolic partial differential equations (PDEs). SOS framework allows us to set up linear matrix inequality (LMI) constraints for the analysis and synthesis problem. Thus, the method discussed is an algorithmic approach for the analysis and control of PDEs. The problem of solving LMI problems is computationally tractable. Moreover, excellent algorithms exist to tackle these problems in polynomial time.

In particular, the talk will consider a one-dimensional linear parabolic PDEs with spatailly distributed coefficients. The coeffecients are distributed polynomially. This class of PDEs is considered since various physical quantities which undergo the processes of diffusion, advection and reaction can by modelled in a satisfactory manner using these PDEs.

This talk will go over the following topics:

- Introduction to SOSPs.
- Positive operators on Hilbert spaces parameterized by polynomials.
- Construction of Lyapunov functionals using polynomially parameterized operators.
- Full-state feedback based boundary controller synthesis.
- Observer based boundary controller synthesis using point observation.

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