

### **M3 : Periodic Hybrid Infinite Dimensional Systems**

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Since 1990<sup>th</sup> the H-infinity control problem has been solved for the following cases:

- Finite dimensional continuous time systems with nonlinearities satisfying arbitrary integral quadratic constraints
- Finite dimensional systems with continuous-time state equations and discrete-time measurements
- Infinite dimensional continuous-time systems with time-invariant unbounded operators (Pritchard-Salamon systems) and standard quadratic functional
- Finite dimensional continuous-time systems with periodic operators

A theory which contains all these results as special cases is developed in the course. Namely, we set and solve the H-infinity control problem for feedback systems such that

- State-space equation, control, and measurements may contain both continuous and discrete time parts
- Operators A, B, C, D in the state-space and measurement equations may be periodic and unbounded
- System may contain nonlinearities satisfying arbitrary integral quadratic constraints (IQC)

A possible area of applications includes distributed parameter systems, and systems with delays, as well as periodic continuous-time systems with discrete-time measurements and nonlinearities satisfying IQC.

After a short introduction, the main definitions of admissible input and output operators are given. Auxiliary perturbation results are followed by the detailed study of dual systems. Main stability results are gathered in the next section. Then we introduce and analyze the dynamic output feedback. Full information problem is solved in terms of a description of all admissible controllers. Finally, the general output feedback problem is solved.



Nikita E. Barabanov received M.S. and Ph.D. degrees in mathematics from Leningrad University, USSR, in 1976 and 1979 respectively, and Doctor of Science Degree from Kiev Institute of Cybernetics, USSR, in 1990. Between 1979 and 2002 he has been with St.-Petersburg Electrotechnical University, Russia, where he has got a position of Full Professor since 1991. Since 2002 he is with the department of Mathematics of North Dakota State University. He had Visiting Professor's positions in Ford Motor Company (USA), Newcastle University (Australia), Perth University (Australia), and Supelec (Paris). He is the author of more than 70 scientific papers in peer-reviewed journals. He was a supervisor of Ph.D. students in applied mathematics and control theory, and a member of Ph.D. committees in Russia, Australia, France, and USA. He was a winner of many grants in control theory and differential equations. In 1980 he has got the Award of the Leningrad Mathematical Society. He is a member of Leningrad Mathematical Society, American Mathematical Society, and IEEE. His biography was published in 11th Edition of Marquis "Who Is Who in the World".