

Webinar on Advancements in Informatics Engineering & Research

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Linear Time Domain Bode Plots for Robust Controls

In robust controls for linear time-invariant uncertain systems, there are several themes exist that are largely unexplored. Some of them are pertaining to the gain margin (GM), phase margin (PM) and real parametric stability margin (RPSM). In literature, frequency domain stability analysis with GM and PM and time domain stability analysis with RPSM are independently conceived. However, the only way a nominal system upon a perturbation can go unstable is through the time domain matrix singularity principle (MSP). That is, one or more of the perturbed eigenvalues have to hit imaginary axis for the first time while the other eigenvalues are protected in the open left half plane of the complex plane. It is shown that the GM, PM and RPSM all satisfy MSP by which time and frequency domain stability analyses are shown analogous to each other. In this context, this talk will introduce a concept known as the “time domain Bode plots” (TDBP). TDBPs are shown to resolve many ambiguities of the stability margins, in particular of the multivariable phase margin, prevailing in the control community. TDBP also explain frequency domain dependent robust control results elegantly. The time domain linear time-invariant uncertain model with exogenous inputs, real parameter variations, and noise is considered and TDBPs are inferred robust stability and performance characteristics.

Biography

Dr. “Ashok”kumar obtained his doctoral degree from the Department of Aeronautical and Astronautical Engineering of Ohio State University in 1994. His specialization is in Robust Controls. He obtained his Masters from the Indian Institute of Science in Bangalore, India. Bachelor of Technology is from the Anna University in Chennai, India. He also obtained his Bachelor of Science in Mathematics, Physics and Mathematical Statistics from the New College of Madras University. Before moving to the United States for his graduate program, Ashok contributed significantly to India’s Prithvi rocket program and Light Combat Aircraft program. In United States, he was a Research Associate at the NASA Center for Research Excellence in North Carolina Agricultural and Technical State University in Greensboro, USA. He was a Visiting Assistant Professor at the University of Miami and a Professor at the Jain University, in Bangalore Rural, India. He secured twice the US National Academy of Science’s Fellowship from the National Research Council, working on cooperative systems at Air Force Research Laboratory in Eglin AFB, Florida and then on autonomy at US Air Force Academy. He is also working on F-16 and F-35 combat aircraft at the Office of Seek Eagle Office in Eglin AFB as an ERC, Inc., employee.

chimpalthradi@gmail.com



Chimpalthradi R. Ashokkumar,
SMARTTOOLS, LLC, USA