



NSF-Duke-NCSU-UNC

Joint MUMS Program Transition - SPUQ Workshop

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SPEAKER/ABSTRACT

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“Parameter-Dependent Surrogate Model Development and Control Design for PZT Bimorph Actuators Employed for Micro-Air Vehicles”

Abstract:

In the talk, we discuss the development of the homogenized energy model (HEM) and the surrogate model dynamical mode composition for a PZT bimorph actuator used for micro-air vehicles including Robobee. HEM quantifies the nonlinear, hysteretic, and rate-dependent behavior inherent to PZT in highly dynamic operating regimes. Due to computation complexity of HEM, we must develop a surrogate model. The surrogate model must be parameter and control dependent to be able to perform inverse problems or uncertainty quantification in different driving regimes. In the literature, DMD can be adapted to handle different control inputs. We will discuss using interpolation over the parameters to adapt the DMD to include parameter dependence. Finally, we will discuss control design using the surrogate model and quantifying the uncertainty in the controls.