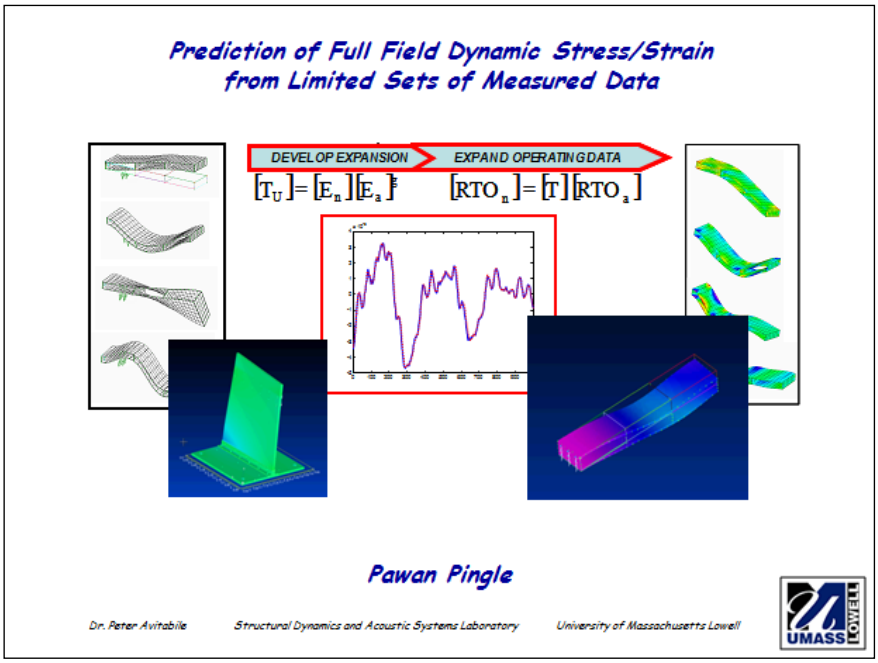
PHD DISSERTATION – PAWAN PINGLE

PREDICTION OF FULL FIELD DYNAMIC STRESS-STRAIN FROM LIMITED SETS OF MEASUREMENTS



Dynamic stress-strain predictions are important to determine the overall fatigue usage of structures. Usually finite element models are developed along with some estimation or approximation of the actual loading conditions that are often difficult to identify or predict rendering these models to have questionable accuracy.

A dynamic expansion technique in conjunction with the finite element model of the system has been successfully applied using limited sets of measured data that enable the prediction of the full field dynamic stress-strain. The measured data is expanded throughout the full field and then used in the finite element stress recovery process to predict dynamic stress-strain due to dynamic events. The solution procedure does not require the identification of loads or boundary conditions which is often the hardest part of the conventional approaches used.

Both analytical simulations of measured data and actual measured data are used to demonstrate the proposed approach. The cases studied show very good results overall. The technique provides a significant departure from the conventional approach and provides accurate data for the identification of full field dynamic stress-strain.

Peter_Avitabile@uml.edu *Christopher_Niezrecki@uml.edu* *Murat_Inalpolat@uml.edu* *Zhu_Mao@uml.edu*