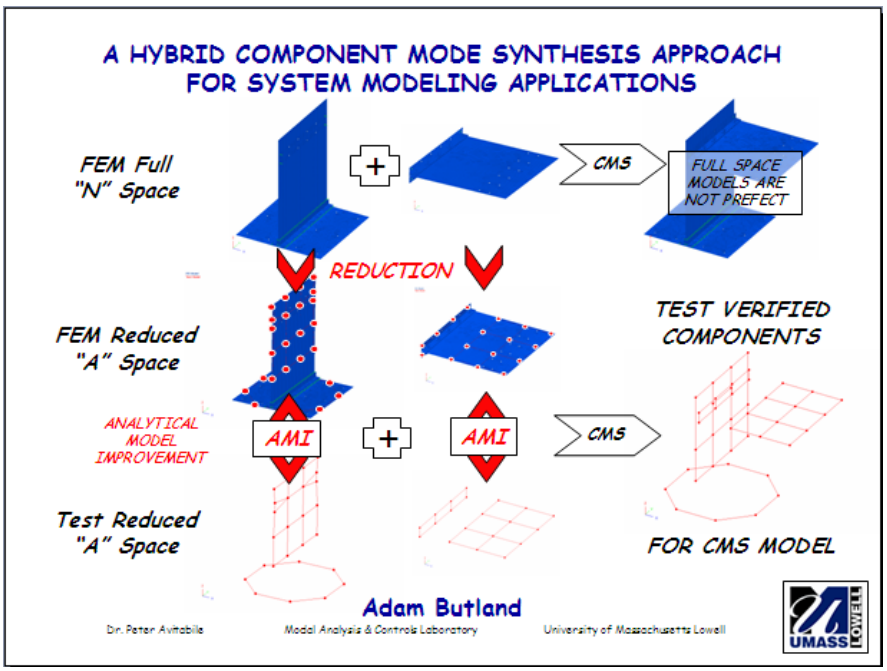
MASTER'S THESIS – ADAM BUTLAND

A HYBRID COMPONENT MODE SYNTHESIS APPROACH FOR SYSTEM MODELING APPLICATIONS



Component Mode Synthesis (CMS) using constraint modes is a very common approach used for the generation of large analytical system models. The major limitation of the method using experimentally derived components is inability to easily obtain the required information from testing. An alternate approach is proposed which utilizes frequency and shape information acquired from modal testing to update finite element models using analytical model improvement techniques on a reduced order model. The connection degrees of freedom are then rigidly constrained in the analytical model to provide the boundary conditions necessary for constraint modes and fixed interface normal modes.

Due to common measurement difficulties encountered with test data, extracted mode shape information must be further processed to smooth known contamination of the data. Using information from the finite element model, a new technique referred to as VIKING (Variability Improvement of Key Inaccurate Node Groups) is proposed to better condition the measured and extracted parameters. The CMS approach is then used with this test verified, reduced order, VIKING conditioned model to generate the system model for further analysis. A laboratory structure is used to show the application of the technique with both analytical and experimental components to describe the system. Comparisons are made to show the usefulness of the approach.

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