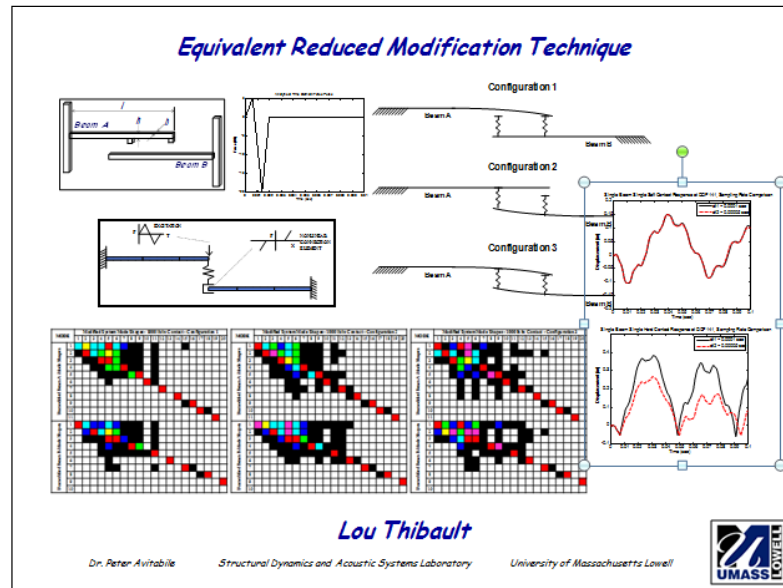




MASTER'S RESEARCH – LOU THIBAUT

EQUIVALENT REDUCED MODEL TECHNIQUE DEVELOPMENT FOR NONLINEAR SYSTEM DYNAMIC RESPONSE



The dynamic response of structural systems commonly involves nonlinear effects. Often times, structural systems are made up of several components, whose individual behavior is essentially linear compared to the total assembled system. However, the assembly of linear components using highly nonlinear connection elements or contact regions causes the entire system to become nonlinear. Conventional transient nonlinear integration of the equations of motion can be extremely computationally intensive, especially when the finite element models describing the components are very large and detailed.

In this work, the Equivalent Reduced Model Technique (ERMT) is developed to address complicated nonlinear contact problems. ERMT utilizes a highly accurate model reduction scheme, the System Equivalent Reduction Expansion Process (SEREP). Extremely reduced order models that provide dynamic characteristics of linear components, which are interconnected with highly nonlinear connection elements, are formulated with SEREP for the dynamic response evaluation using direct integration techniques. The full space solution will be compared to the response obtained using drastically reduced models to make evident the usefulness of the technique for a variety of analytical cases.