



The Multi-Function Dynamics Laboratory

For the MFDL Website link, see www.engineering.olemiss.edu/~eke.



The University of Mississippi

Vision

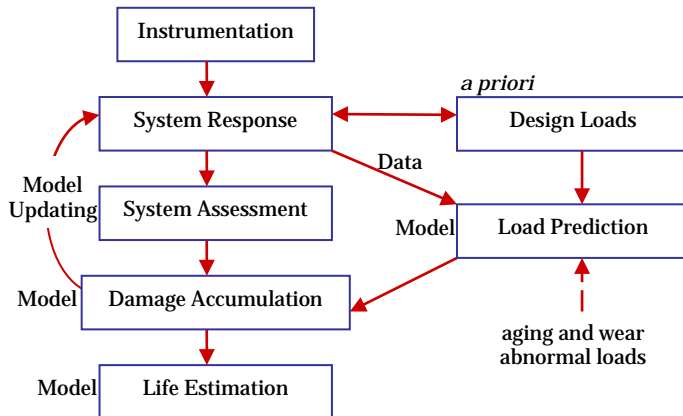
We desire safer infrastructure with enhanced survivability in response to abnormal loads as well as aging through **Structural Health Evaluation™**.

Long-Term Goals

- ✧ Examine dynamics phenomena to improve R&D in general.
- ✧ Improve damage detection from component to system levels.
- ✧ Determine appropriate sensing to characterize both ductile and brittle failure during progressive collapse.
- ✧ Aid in decision support for first and advanced responders for the four R's: **Repair, Rehabilitate, Raze, or Replace ?**
- ✧ Supply additional dynamic experimental studies to open literature.

Interest Areas

- ✧ Statistical threshold determination of structural "health" for decision-making
- ✧ Evaluation of damage indicators for real structural systems (*algorithm shown*).
- ✧ Response and damage due to various excitations, including generalized transients, contact/impact, blast, and multi-hazard combinations.
- ✧ Fundamental understanding of coupled axial, torsional, and transverse vibrations.
- ✧ Vibration reduction, absorption, and control techniques.
- ✧ Health and maintenance of nuclear structures, including fuel bundles and steam generator tubes.
- ✧ Multi-scale and self-sensing materials that could advance "smart" structures.
- ✧ Advanced instrumentation and sensing technology areas, such as shock resistance, piezoelectric energy harvesting, and RFID wireless acquisition.



Location

We are located on the famous Ole Miss circle in Brevard Hall. Come visit us in Rooms 32 and 55.

Model testing and damage visualization
 The University of Mississippi
 School of Engineering
 Typical Experiment

Core Competencies

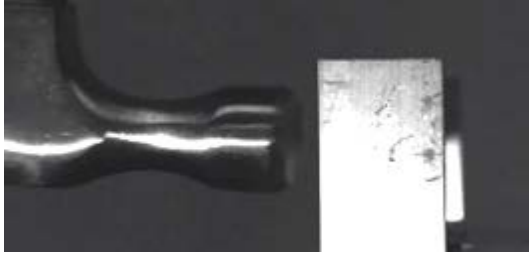
The research group is interdisciplinary: civil engineering, mechanical engineering, and computational signal processing. The staff possesses expertise in multiple commercial programs and can train others. The director has 15+ years of expertise in experimental dynamics with shock, vibration, and random excitation, including MIL standards.



Facility Resources *as of 04/2014*

Hardware

- ✧ Redlake IDT MotionPro Y4 high-speed camera; 5000 frames per second at 1024x1024 resolution. Necessary accessories: 3 lenses, 2 19-LED lights, camera synchronization and control module.



- ✧ LDS Model 650/PA2000 500-pound mechanical shaker system with air cooling (*below*)
- ✧ Vibration controllers, including PC-based Vibration World DVC-4 and hand-held function generation
- ✧ Portable 13-pound shaker with amplifier
- ✧ National Instruments USB data acquisition systems, including modular CompactDAQ and 6251 board
- ✧ Transducers, including shear and tri-axial accelerometers; force sensors; impact hammers
- ✧ Signal conditioners, both external and in-line
- ✧ Personal computers and wireless networking



Specialized Software

- ✧ SHE™ – *our own damage detection creation*
- ✧ MATLAB, Mathematica, Mathcad
- ✧ LabView by National Instruments
- ✧ StarModal by Spectral Dynamics
- ✧ MiDAS and ProAnalyst by Xcitex with Particle Dynamics and Image Stabilization modules

Funding/Collaborative Relationships

- ✧ U.S.DOT through NCITEC
- ✧ National Science Foundation
- ✧ U.S. Nuclear Regulatory Commission
- ✧ Defense University Research Instrumentation Program
- ✧ Oak Ridge Associated Universities
- ✧ University of Mississippi's Nano Group
- ✧ UM Office of Research & Sponsored Programs
- ✧ Ducommon Miltec
- ✧ U.S. Army Corps of Engineers Engineering Research and Development Center
- ✧ U.S. Army Research Office
- ✧ Air Force Research Laboratory
- ✧ Office of Naval Research
- ✧ U.S. Department of Agriculture
- ✧ Several commercial sensor and DAQ companies
- ✧ Numerous universities
- ✧ *Your organization here...*

Community Engagement

We desire to enhance education for all ages and levels and increase the visibility of underrepresented groups in engineering.



Demonstration

Visit our YouTube channel **ShakeNBreakLab** to see our fun high-speed videos. You can also see more videos at our lab's Shaking Page ([hyperlink](#)).



For a full and current list of publications, visit www.engineering.olemiss.edu/~eke/publications/



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