

Vibration Course Enhancement through a Dynamic MATLAB[®] Graphic User Interface

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EXTENDED ABSTRACT

From the string of a guitar to the radio wave, vibration occurs all the time and everywhere. Although vibration is an everyday phenomenon, related topics tend to be difficult for both undergraduate and graduate students. The ability to visualize motion through differential equation analysis is essential for subject comprehension. In order to help students have deeper understanding of vibration as well as inspire the interest of high school students, a MATLAB[®] Graphic User Interface (GUI) program has been formulated at the University of Mississippi.

As MathWorks MATLAB[®] is commonly used in the engineering field, any exercise that has students using this program is helpful for their professional education. A GUI provides high-technology interactive demonstration tools that can aid learning. Setup requirements include appropriate software packages and knowledgeable programmers, but novice users can operate the GUI. Named GUIde, the MATLAB[®] package also provides the display framework for GUI construction.

The GUI described herein includes the analysis of four different types of systems: single-degree-of-freedom (SDOF), multi-degree-of-freedom (MDOF), axial rod, and transverse beam. All the features and interfaces have been given detailed description in the paper. Sample analysis cases have been included for each type of system as well.

Assessment thus far shows that the program aids dynamics comprehension for both inexperienced and experienced users. For those with little or no understanding of vibrations, the GUI can provide informative animations with interactive options. Although controlled by differential equations of motion, the visible system can be understood without mathematics. For students with some vibration knowledge, the GUI can visualize derived equations to provide deeper command of the material. The relationship between SDOF systems and continuous systems can also be illuminated for both undergraduate and graduate students.

Future plans include larger distribution of the GUI; to post online, conversion to a programming language is required. Despite a few remaining glitches, the program will be expanded to include further modal analysis.