An Alternate Approach for Analysis of Beams
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EXTENDED ABSTRACT

In this research, Virtual Instruments (VIs) are developed for studying the behavior of beams subjected to various beam and loading conditions using classical approaches in Mechanics of Materials. Segments of the VIs developed for this project employ MATLAB to produce the numerical results. In several earlier publications of my mentor in the proceedings of the ASEE’s conferences, various computing and programming tools and features of LabVIEW were discussed.

The LabVIEW programs developed in this project will specifically determine the distribution of shear force, bending moment, slope, and deflection along the length of the beam for several loading conditions. Using these distributions, maximum stresses and deflection of beams are also determined. An added component of the developed VIs additionally computes the “principal” normal and shearing stresses using the stress transformation equations to ensure that these stresses do not exceed the allowable stresses. In case of failure, a visual indicator placed on the front-panel of the created VIs will alert the designer.

One of the more important advantages of LabVIEW over other available software tools is its convenient and easy-to-use interface. Through utilizing this interface, the problem input can easily be modified to calculate and display the results in any desired form. The final developed VI for this project allows the user to select and add any combination of loads to compute the results for the specified problem. This program can be utilized as an educational tool to better understand the behavior of beams and aid the user in his or her design. Sample VIs developed for the poster presentation clearly illustrate how the tools and techniques developed for this project can be employed to determine the solution for more complicated problems. The proposed project can also be extended to analyze and test the beams experimentally in the laboratory. The available tools in LabVIEW are ideally suited to perform this experimental analysis.