World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:14, No:06, 2020

Inverse Mode Shape Problem of Hand-Arm Vibration (Humerus Bone) for Bio-Dynamic Response Using Varying Boundary Conditions

Authors : Ajay R, Rammohan B, Sridhar K S S, Gurusharan N

Abstract : The objective of the work is to develop a numerical method to solve the inverse mode shape problem by determining the cross-sectional area of a structure for the desired mode shape via the vibration response study of the humerus bone, which is in the form of a cantilever beam with anisotropic material properties. The humerus bone is the long bone in the arm that connects the shoulder to the elbow. The mode shape is assumed to be a higher-order polynomial satisfying a prescribed set of boundary conditions to converge the numerical algorithm. The natural frequency and the mode shapes are calculated for different boundary conditions to find the cross-sectional area of humerus bone from Eigenmode shape with the aid of the inverse mode shape algorithm. The cross-sectional area of humerus bone validates the mode shapes of specific boundary conditions. The numerical method to solve the inverse mode shape problem is validated in the biomedical application by finding the cross-sectional area of a humerus bone in the human arm.

Keywords : Cross-sectional area, Humerus bone, Inverse mode shape problem, Mode shape
Conference Title : ICSM 2020 : International Conference on Solid Mechanics
Conference Location : Toronto, Canada
Conference Dates : June 18-19, 2020