

Vibration Response of Soundboards of Classical Guitars

Authors : Meng Koon Lee, Mohammad Hosseini Fouladi, Satish Narayana Namasivayam

Abstract : Research is focused on the response of soundboards of Classical guitars at frequencies up to 5 kHz as the soundboard is a major contributor to acoustic radiation at high frequencies when compared to the bridge and sound hole. A thin rectangular plate of variable thickness that is simply-supported on all sides is used as an analytical model of the research. This model is used to study the response of the guitar soundboard as the latter can be considered as a modified form of a rectangular plate. Homotopy Perturbation Method (HPM) is selected as a mathematical method to obtain an analytical solution of the 4th-order parabolic partial differential equation of motion of the rectangular plate of constant thickness viewed as a linear problem. This procedure is generalized to the nonlinear problem of the rectangular plate with variable thickness and an analytical solution can also be obtained. Sound power is used as a parameter to investigate the acoustic radiation of soundboards made from spruce using various bracing patterns. The sound power of soundboards made from Malaysian softwood such as damar minyak, sempilor or podo are investigated to determine the viability of replacing spruce as future materials for soundboards of Classical guitars.

Keywords : rectangular plates, analytical solution, homotopy perturbation, natural frequencies

Conference Title : ICAV 2018 : International Conference on Acoustics and Vibration

Conference Location : Sydney, Australia

Conference Dates : January 29-30, 2018