

Vibroacoustic Characteristics of a Utility Terrain Vehicle. Part I: Vibration Analysis

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This paper presents vibroacoustic analyses of a full-size Utility Terrain Vehicle (UTV) by using the HELS (Helmholtz Equation Least Squares) method through visualization of three-dimensional (3D) complex vibration patterns including the resonance modes and the corresponding acoustic field. The main advantages of using the HELS method rather than measurement-based approach include but not limited to: 1) obtain a holistic view of the vibroacoustic characteristics by taking a relatively fewer measurement points; 2) determine the vibroacoustic characteristics over an entire surface of interest rather than the locations on which measurements are taken; and 3) facilitate the correlations between structural vibrations and acoustic radiation so as to identify the critical components of the structural vibrations that are responsible for acoustic radiation. Part I is focused on the analyses of the structural vibrations including resonance modes of the steering wheel, floor panel, and driver seat frame. These three areas are recognized as the major contributors toward the vibration issues experienced by a driver. Results of these analyses have clearly shown the root causes of structural vibrations, from which engineers can devise cost-effective vibration mitigation strategies.