

Temporal evolution measurement of harmonic vibration induced over a rectangular plate using a high-speed ESPI system

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Abstract

The study of vibrations has taken a very important role in technological and scientific development. Some optical techniques have been used for this purpose. Examples of them are holography, fringe projection, Moiré Interferometry, Shearing Interferometry, Electronic Speckle Pattern Interferometry (ESPI) and Digital Holography, with the use of pulsed and continuous lasers. A limitation for vibration studies was the non-appearance of high speed cameras as well as continuous wave lasers with a higher power. Within the last year's evolution of technology, it is now possible to give a following of mechanical displacements with interferometric images. The purpose of this work is to get experimental data by the use of ESPI, a high speed camera and a continuous wave laser and compare this data with theoretical data to measure the temporal evolution of a complete cycle of vibration. A rectangular plate under harmonic vibration is used to classify the type of fringe pattern and to quantify the mechanical phase of this plate during vibrations. The influence in the fringe patterns acquired in high speed ESPI are investigated due to different exposure times, 1000, 2000 and 4000 frames per second for this case, because it has vibration measurement.