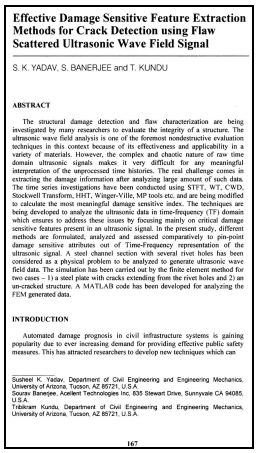
Effective Damage Sensitive Feature Extraction Methods for Crack Detection using Flaw Scattered Ultrasonic Wave Field Signal

S. K. YADAV, S. BANERJEE and T. KUNDU

ABSTRACT

The structural damage detection and flaw characterization are being investigated by many researchers to evaluate the integrity of a structure. The ultrasonic wave field analysis is one of the foremost nondestructive evaluation techniques in this context because of its effectiveness and applicability in a variety of materials. However, the complex and chaotic nature of raw time domain ultrasonic signals makes it very difficult for any meaningful interpretation of the unprocessed time histories. The real challenge comes in extracting the damage information after analyzing large amount of such data. The time series investigations have been conducted using STFT, WT, CWD, Stockwell Transform, HHT, Winger-Ville, MP tools etc. and are being modified to calculate the most meaningful damage sensitive index. The techniques are being developed to analyze the ultrasonic data in time-frequency (TF) domain which ensures to address these issues by focusing mainly on critical damage sensitive features present in an ultrasonic signal. In the present study, different methods are formulated, analyzed and assessed comparatively to pin-point damage sensitive attributes out of Time-Frequency representation of the ultrasonic signal. A steel channel section with several rivet holes has been considered as a physical problem to be analyzed to generate ultrasonic wave field data. The simulation has been carried out by the finite element method for two cases – 1) a steel plate with cracks extending from the rivet holes and 2) an un-cracked structure. A MATLAB code has been developed for analyzing the FEM generated data.

INTRODUCTION

Automated damage prognosis in civil infrastructure systems is gaining popularity due to ever increasing demand for providing effective public safety measures. This has attracted researchers to develop new techniques which can

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Ключевые слова:

Содержание.