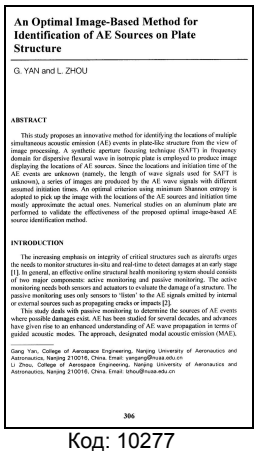

An Optimal Image-Based Method for Identification of AE Sources on Plate Structure

G. YAN and L. ZHOU

ABSTRACT

This study proposes an innovative method for identifying the locations of multiple simultaneous acoustic emission (AE) events in plate-like structure from the view of image processing. A synthetic aperture focusing technique (SAFT) in frequency domain for dispersive flexural wave in isotropic plate is employed to produce image displaying the locations of AE sources. Since the locations and initiation time of the AE events are unknown (namely, the length of wave signals used for SAFT is unknown), a series of images are produced by the AE wave signals with different assumed initiation times. An optimal criterion using minimum Shannon entropy is adopted to pick up the image with the locations of the AE sources and initiation time mostly approximate the actual ones. Numerical studies on an aluminum plate are performed to validate the effectiveness of the proposed optimal image-based AE source identification method.

INTRODUCTION

The increasing emphasis on integrity of critical structures such as aircrafts urges the needs to monitor structures in-situ and real-time to detect damages at an early stage [1]. In general, an effective online structural health monitoring system should consists of two major components: active monitoring and passive monitoring. The active monitoring needs both sensors and actuators to evaluate the damage of a structure. The passive monitoring uses only sensors to "listen" to the AE signals emitted by internal or external sources such as propagating cracks or impacts [2].

This study deals with passive monitoring to determine the sources of AE events where possible damages exist. AE has been studied for several decades, and advances have given rise to an enhanced understanding of AE wave propagation in terms of guided acoustic modes. The approach, designated modal acoustic emission (MAE),

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Ключевые слова:

Содержание.