
Propagation of Guided Elastic Waves in Shell-Type Aircraft Structural Elements

A. ZAK[1], M. KRAWCZUK[1,2] and W. OSTACHOWICZ[1,3]

ABSTRACT

Any form of damage always presents a high risk to safe operation of aircraft structural elements. Failures of these elements caused by material fatigue or impacts can lead to damage initiation and growth. For that reason detection and localisation of cracks or delaminations at their earliest stage of development as well as estimation of their size is one of the most crucial factors for any damage detection method.

Structural health monitoring systems based on the phenomena of propagation of guided elastic waves in structural elements and their interactions with damage related discontinuities are very promising tools that offer not only damage detection capabilities, but also are meant to provide precise information about the state of the elements and their remaining lifetime. Because of that various techniques are employed to simulate and mimic the wave–discontinuity interactions and one of such techniques in the method of spectral finite elements.

Certain results of numerical simulation obtained by the use of the spectral finite element method are presented and discussed by the authors and related with propagation of guided elastic waves in shell-type aircraft structural elements. Two types of these elements are taken into account for this simulation. As the first case a fuselage section is investigated, while the second numerical example is related to wave propagation patterns in a wing section outer skin. The applicability of the results obtained is also discussed by the authors in the context of a structural health monitoring system.

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1031

Код: 10699

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Издательство DEStech Publications, Lancaster, 2010 год

8 стр; формат: 23,5 x 16 см; библиографический список: 20 единиц
ISBN: 978-1-60595-024-2

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Ключевые слова:

Содержание.