Scopus

Document details

⇥ Export   ⬇ Download   🖶 Print   ✉ E-mail   Save to PDF   ☆ Add to List   More... ›

[Full Text] View at Publisher

Journal of Physics: Conference Series   Open Access
Volume 628, Issue 1, 9 July 2015, Article number 012034
11th International Conference on Damage Assessment of Structures, DAMAS 2015; Ghent UniversityGhent; Belgium;
24 August 2015 through 26 August 2015; Code 113046

Damage detection based on the natural frequency shifting of a clamped rectangular plate model (Conference Paper)

Hilmy, I.[a] ✉,   Wahab, M.M.A.[b],   Adesta, E.Y.T.[a],   Firdaus, T.[a]

[a]International Islamic University Malaysia, Faculty of Engineering, Department of Manufacturing and Materials Engineering, P. O. Box 10, Kuala Lumpur, Malaysia
[b]Department of Mechanical Construction and Production, Ghent University, Belgium

Abstract   ⌄ View references (12)

Damage detection of any structure becomes the main concern in a failure analysis. Early failure detection is very important as it can prevent any catastrophic failure by replacing or repairing the damage part at early stage. One of the non-destructive methods of damage detection is using frequency based vibration analysis. Identification and comparison of a set of natural frequencies before and after damage is the main concern of this research. A rectangular plate clamped at all edges represented an initial undamaged structure. Based on Kachanov's definition, damage existence in a structure is introduced in the presence of some circular voids. The voids are generated randomly at different level of damage value. To obtain the Natural Frequencies, a Finite Element Model (FEM) of a clamped plate with the updated value of Young's Modulus is analyzed. From the FEM analysis result, it is found that the Natural Frequencies are shifted as the void existence increase. Using curve fitting, the model of Natural Frequency shifting as a function of damage evolution has been generated. It is found that the shifting of the Natural Frequency is greater at higher frequency value as indicated by the higher absolute gradient.

Indexed keywords

Engineering controlled terms:

Curve fitting   Elastic moduli   Failure analysis   Finite element method   Natural frequencies
Nondestructive examination   Plates (structural components)   Vibration analysis

- Catastrophic failures
- Clamped rectangular plate
- Damage evolution
- Early failure detection
- Frequency-shifting
- Higher frequencies
- Nondestructive methods
- Rectangular plates

Engineering main heading: Damage detection

Metrics ⑦   View all metrics ›

3   Citations in Scopus
         82nd Percentile

3.22 Field-Weighted
          Citation Impact

PlumX Metrics   ⌄

Usage, Captures, Mentions, Social Media and Citations beyond Scopus.

Cited by 3 documents

The Fourier spectral Poincare map method for damage detection via single type of measurement
Yang, Z.-B. , Wang, Y.-N. , Zuo, H.
(2018) Measurement: Journal of the International Measurement Confederation

Damage detection in beam-like composite structures via Chebyshev pseudo spectral modal curvature
Yang, Z.-B. , Radzienski, M. , Kudela, P.
(2017) Composite Structures

Two-dimensional Chebyshev pseudo spectral modal curvature and its application in damage detection for composite plates
Yang, Z.-B. , Radzienski, M. , Kudela, P.
(2017) Composite Structures

View all 3 citing documents

Inform me when this document is cited in Scopus:

[Set citation alert ›]   [Set citation feed ›]

Related documents

Funding details

Funding number	Funding sponsor	Acronym
	Ministry of Higher Education	

References (12)

View in search results format >

☐ All   Export   🖶 Print   ✉ E-mail   Save to PDF   Create bibliography

☐ 1   Dems, K., Turant, J.

Structural damage identification using frequency and modal changes

(2011) *Bulletin of the Polish Academy of Sciences: Technical Sciences*, 59 (1), pp. 27-32. Cited 3 times.
http://www.ippt.gov.pl/~bulletin/(59-1)27.pdf
doi: 10.2478/v10175-011-0005-2

    View at Publisher

☐ 2   Kachanov, L.M.
Introduction to continuum damage mechanics
(1986) *Mechanics of Elastic Stability*, 10. Cited 10 times.

☐ 3   Kwak, M.K., Han, S.

Free vibration analysis of rectangular plate with a hole by means of independent coordinate coupling method

(2007) *Journal of Sound and Vibration*, 306 (1-2), pp. 12-30. Cited 26 times.
http://www.elsevier.com/inca/publications/store/6/2/2/8/9/9/index.htt
doi: 10.1016/j.jsv.2007.05.041

    View at Publisher

☐ 4   Nazmul, H., Nazmul Ahshan, K.H., Zahid Hossain, Md., Shahriar Islam, Md.
Effect on Natural Frequency of a Simply Supported Plate Due to Circular Cutouts
(2015) *Proceedings of 10th Global Engineering*

☐ 5   Kang, S.W., Kim, S.-H.

Vibration analysis of simply supported rectangular plates with unidirectionally, arbitrarily varying thickness

(2008) *Journal of Sound and Vibration*, 312 (4-5), pp. 551-562. Cited 7 times.
doi: 10.1016/j.jsv.2007.12.032

    View at Publisher

☐ 6   Brethee Khaldoon, F.
Free Vibration Analysis of A Symmetric and Anti-Symmetric Laminated Composite Plates with a Cutout at the Center
(2009) *Al-Qadisiya Journal for Engineering Sciences*, 2. Cited 3 times.

Calculating the frequency modes of flexible square plate using Finite Element and Finite Difference methods
Safizadeh, M.R. , Mat Darus, I.Z. , Mailah, M.
(2010) 2010 International Conference on Intelligent and Advanced Systems, ICIAS 2010

Effect of triaxiality on damage parameters in adhesive
Hilmy, I. , Abdel Wahab, M.M. , Crocombe, A.D.
(2007) Key Engineering Materials

Steady-state response of a cantilever plate subjected to harmonic displacement excitation at the base
Gorman, D.J. , Singhal, R.
(2009) Journal of Sound and Vibration

View all related documents based on references

Find more related documents in Scopus based on:

Authors >   Keywords >

7   Hosseini-Hashemi, S., Karimi, M., Rokni, H.

Natural frequencies of rectangular Mindlin plates coupled with stationary fluid

(2012) *Applied Mathematical Modelling*, 36 (2), pp. 764-778. Cited 11 times.
doi: 10.1016/j.apm.2011.07.007

View at Publisher

8   Safizadeh, M.R., Mat Darus, I.Z.

Natural frequency analysis of all edges clamped flexible thin plate

(2010) *International Review of Mechanical Engineering*, 4 (4), pp. 433-440. Cited 4 times.
http://www.praiseworthyprize.com/IREME_reviewers_only.htm

9   Geradin, M.
(2006) *Mechanical Vibrations: Theory and Application to Structural Dynamics*. Cited 447 times.

10   Geveci, B., Walker, J.D.A.

Nonlinear resonance of rectangular plates

(2001) *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 457 (2009), pp.
1215-1240. Cited 5 times.
http://rspa.royalsocietypublishing.org/
doi: 10.1098/rspa.2000.0716

View at Publisher

11   Mochida, Y., Ilanko, S.

Bounded natural frequencies of completely free rectangular plates

(2008) *Journal of Sound and Vibration*, 311 (1-2), pp. 1-8. Cited 15 times.
http://www.elsevier.com/inca/publications/store/6/2/2/8/9/9/index.htt
doi: 10.1016/j.jsv.2007.10.022

View at Publisher

12   Abdel Wahab, M.M., Hilmy, I., Ashcroft, I.A., Crocombe, A.D.
Damage Modelling of Adhesive Bonding
(2005) *4th International Conference on Fracture and Damage Mechanics*. Cited 2 times.

About Scopus

What is Scopus

Content coverage

Scopus blog

Scopus API

Privacy matters

Language

日本語に切り替える

切換到简体中文

切換到繁體中文

Русский язык

Customer Service

Help

Contact us

ELSEVIER   Terms and conditions   Privacy policy

RELX Gr