Conference proceedings | © 2022

Advances in Structural Mechanics and Applications

Proceedings of ASMA-2021 (Volume 3)

Editors: José António Fonseca de Oliveira Correia, Satyabrata Choudhury, Subhrajit Dutta

Part of the book series: Structural Integrity (STIN, volume 27)

Conference series link(s): ASMA: International Conference on Advances in Structural Mechanics and Applications

Conference proceedings info: ASMA 2021.

Sections

Table of contents (32 papers)

Search within book

← Previous Page 2 of 2 Next →

← Previous Page 2 of 2 Next →

Back to top ↑

Other Volumes

1. Advances in Structural Mechanics and Applications
2. Advances in Structural Mechanics and Applications
3. Advances in Structural Mechanics and Applications

Back to top ↑

About this book

The proceedings of the conference is going to benefit the researchers, academicians, students and professionals in getting enlightened on latest technologies on structural mechanics, structure and infrastructure engineering. Further, work on practical

applications of developed scientific methodologies to civil structural engineering will make the proceedings more interesting and useful to practicing engineers and structural designers.

Back to top ↑

Keywords

Structural Mechanics

Sustainable and Resilient Structures

Smart Structures

Fluid-Structure Interaction

Vibration and Control

Back to top ↑

Editors and Affiliations

Faculty of Engineering, University of Porto, Porto, Portugal
José António Fonseca de Oliveira Correia

Department of Civil Engineering, National Institute of Technology Silchar, Silchar, India
Satyabrata Choudhury, Subhrajit Dutta

Back to top ↑

Bibliographic Information

Book Title	Book Subtitle	Editors
Advances in Structural Mechanics and Applications	Proceedings of ASMA-2021 (Volume 3)	José António Fonseca de Oliveira Correia, Satyabrata Choudhury, Subhrajit Dutta
Series Title	**DOI**	**Publisher**
Structural Integrity	https://doi.org/10.1007/978-3-031-04793-0	Springer Cham
eBook Packages	**Copyright Information**	**Hardcover ISBN**
Engineering, Engineering (R0)	The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2022	978-3-031-04792-3
eBook ISBN	**Series ISSN**	**Series E-ISSN**
978-3-031-04793-0	2522-560X	2522-5618
Edition Number	**Number of Pages**	**Number of Illustrations**
1	VII, 430	58 b/w illustrations, 229 illustrations in colour

Topics
Structural Materials, Engineering Mechanics

Back to top ↑

International Conference on Advances in Structural Mechanics and Applications

ASMA 2021: **Advances in Structural Mechanics and Applications** pp 344–352

Source Localization in a Framed Structure for Effective Damage Detection Using Acoustic Emission Technique

Anupam Kumar Biswas, Aloke Kumar Datta, Pijush Topdar & Sanjay Sengupta

Conference paper | First Online: 03 June 2022

Part of the Structural Integrity book series (STIN,volume 27)

Abstract

Acoustic Emission (AE) technique is capable of detecting real time small-scale damage long before failure in a structure. However, the placement of sensors in a framed structure is an important issue for effective damage detection, which remains a challenge for many researchers. In this study, an experimental investigation is carried out for the localization of mounted AE sensors on a prototype rigid framed structure, and by detecting simulated AE source using Pencil Lead Break (PLB), on

different beam and column locations of each floor levels of the framed structure. Then with the recorded AE signal waveforms, frequency analyses have been performed using the wavelet transform to get the signal's energy concentration. To localize the damage the wavelet transform is used in the time-frequency domain along with the group velocity. From the data comparison and analysis, it is found that for effective damage detection a single AE sensor can to be placed at the beam-column joints of each floor level of framed structure on every plane of the frame.

Keywords

Acoustic emission technique

Structural health monitoring

Wavelet transformation

Hsu-Nielsen pencil lead break

References

Biswas, A.K., Datta, A.K., Topdar, P., Sengupta, S.: On Effective placement of acoustic emission sensor in steel framed structure for damage detection. In: National Conference on Emerging Trends on Sustainable Technology and Engineering Applications (NCETSTEA-2020), pp. 1–5, IEEE, February 2020

Datta, A.K., Shrikhande, M., Paul, D.K.: On the optimal location of sensors in multi-storeyed buildings. J. Earthq. Eng. **6**(01), 17–30 (2002)

Isabelle, B., Gallimard, L., Nikoukar, S.: Optimal piezoelectric actuator and sensor location for active vibration control, using genetic algorithm. J. Sound Vib. **329**(10), 1615–1635 (2010)

Dong, L., Li, X.: Three-dimensional analytical solution of acoustic emission or microseismic source location under cube monitoring network. Trans. Nonferrous Metals Soc. China **22**(12), 3087–3094 (2012)

Gary, J., Hamstad, M.A.: On the far-field structure

of waves generated by a pencil lead break on a thin plate. J. Acoust. Emiss. **12**(3–4), 157–170 (1994)

Michael, G.R., Prosser, W.H.: AE source orientation by plate wave analysis. J. Acoust. Emiss. **9**(4), 283-–288 (1991)

Schumacher, T., Linzer, L., Grosse, C.U.: Signal-based AE analysis. In: Grosse, C.U., Ohtsu, M., Aggelis, D.G., Shiotani, T. (eds.) Acoustic Emission Testing. Springer Tracts in Civil Engineering, pp. 51–99. Springer, Cham (2022). https://doi.org/10.1007/978-3-030-67936-1_5

Hao, Q., Zhang, X., Wang, Y.S., Makis, V.: A novel rail defect detection method based on undecimated lifting wavelet packet transform and Shannon entropy-improved adaptive line enhancer. J. Sound Vib. **425**, 208–220 (2018)

Hsu, N.N.: Characterization and calibration of acoustic emission sensors. Mater. Eval. **39**, 60–68 (1981)

Li, Z.N., Tang, J., Li, Q.S.: Optimal sensor locations for structural vibration measurements. Appl. Acoust. **65**(8), 807–818 (2004)

Alireza, P., Bunnori, N.M., Vakili, A.H.: Damage

source identification of reinforced concrete structure using acoustic emission technique. Sci. World J. **2013** (2013)

Sengupta, S., Datta, A.K., Topdar, P.: Structural damage localisation by acoustic emission technique: a state of the art review. Latin Am. J. Solids Struct. **12**(8), 1565–1582 (2015)

Suzuki, H., Kinjo, T., Hayashi, Y., Takemoto, M., Ono, K., Hayashi, Y.: Wavelet transform of acoustic emission signals. J. Acoust. Emiss. **14**, 69–84 (1996)

Zhang, X., Cui, Y., Wang, Y., Sun, M., Hu, H.: An improved AE detection method of rail defect based on multi- level ANC with VSS-LMS. Mech. Syst. Signal Process. **99**, 420–433 (2018)

Zhang, X., Feng, N., Wang, Y., Shen, Y.: Acoustic emission detection of rail defect based on wavelet transform and Shannon entropy. J. Sound Vib. **339**, 419–432 (2015)

Ziola, M.S., Gorman, M.R.: Source location in thin plates using cross-correlation. J. Acoust. Soc. Am. **90**(5), 2551–2556 (1991)

Author information

Authors and Affiliations

NIT Durgapur, Durgapur, India

Anupam Kumar Biswas

Department of Civil Engineering, Dr. B C Roy Engineering College, Durgapur, India

Anupam Kumar Biswas

Department of Civil Engineering, NIT Durgapur, Durgapur, 713209, W.B., India

Aloke Kumar Datta & Pijush Topdar

Dr. B.C. Roy Engineering College, Durgapur, 713206, W.B., India

Sanjay Sengupta

Corresponding author

Correspondence to Anupam Kumar Biswas .

Editor information

Editors and Affiliations

Faculty of Engineering, University of Porto, Porto, Portugal

José António Fonseca de Oliveira Correia

Department of Civil Engineering, National Institute of Technology Silchar, Silchar, India

Prof. Satyabrata Choudhury

Department of Civil Engineering, National Institute of Technology Silchar, Silchar, Assam, India

Prof. Subhrajit Dutta

Rights and permissions

Reprints and Permissions

Copyright information

About this paper

Cite this paper

Biswas, A.K., Datta, A.K., Topdar, P., Sengupta, S. (2022). Source Localization in a Framed Structure for Effective Damage Detection Using Acoustic Emission Technique. In: Fonseca de Oliveira Correia, J.A., Choudhury, S., Dutta, S. (eds) Advances in Structural Mechanics and Applications. ASMA 2021. Structural Integrity, vol 27. Springer, Cham. https://doi.org/10.1007/978-3-031-04793-0_26

.RIS .ENW .BIB

DOI
https://doi.org/10.1007/978-3-031-04793-0_26

Published	Publisher Name	Print ISBN
03 June 2022	Springer, Cham	978-3-031-04792-3

Online ISBN	eBook Packages
978-3-031-04793-0	Engineering Engineering (R0)