

1884. Numerical study for single and multiple damage detection and localization in beam-like structures using BAT algorithm

Samir Khatir¹, Idir Belaidi², Roger Serra³, Magd Abdel Wahab⁴, Tawfiq Khatir⁵

^{1, 2}Energetic Mechanics and Engineering Laboratory, Research Team of Mechanics and Systems and Processes Engineering, 35000 Boumerdes, Algeria

³Laboratoire de Mécanique et Rhéologie INSA Centre Val de Loire, LMR, 3 Rue de la Chocolaterie, 41000 Blois, France

⁴Soete Laboratory, Faculty of Engineering and Architecture Ghent University, Technologie Park Zwijnaarde 903, B-9052 Zwijnaarde, Belgium

⁵Institute of Science and Technology University Centre Salhi Ahmed, Naama 45000, Algeria

¹Corresponding author

E-mail: ¹khatir_samir@hotmail.fr, ²idir.belaidi@gmail.com, ³roger.serra@insa-cvl.fr,

⁴magd.abdelwahab@ugent.be, ⁵khatir-tawfiq@hotmail.fr

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Abstract. This paper presents a new damage detection and localization technique based on the changes in vibration parameters using BAT and Particle Swarm Optimization algorithm. The finite element method is used to apply damage at specific element(s) of the considered beams. The damage is represented by a reduction in Young's modulus and the identification of damage is formulated as an optimization problem using objective function based on Modal Scale Factor and changes in natural frequencies. A procedure for detecting and locating damage of beam-like structures based on BAT algorithm is used. This approach presents a method that can be used to detect the single and multiple-damage positions and the rate of damage in structural elements with high accuracy after the first iteration. The results obtained using BAT algorithm are compared to those obtained using Particle Swarm Optimization Algorithm. By taking noise into account in the damage detection and localization problem, it is shown that our approach based on BAT algorithm can detect the damage locations with high accuracy.

Keywords: damage detection, localization, beam structure, particle swarm optimization, vibration analysis, BAT algorithm.

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