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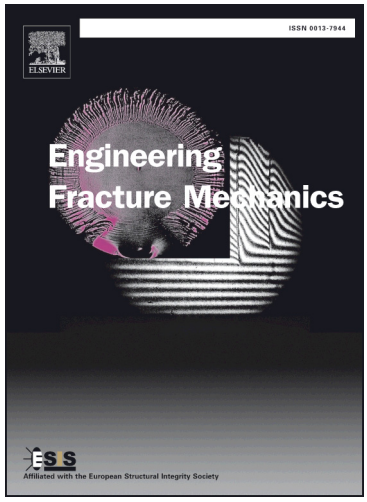

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Bifurcations behavior of bending vibrations of beams with two breathing cracks

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ABSTRACT

The lateral vibrations of the beams with two breathing cracks are considered. Two contact parameters are used to describe breathing of the cracks. The finite degrees of freedom nonlinear dynamical system with two constraints is derived to describe the beam vibrations. These constraints describe breathing of the cracks. The continuation technique is applied to analyze numerically the periodic vibrations. The periodic motions, their stability and bifurcations are investigated. It is analyzed the sub- harmonic motions, which originate from the period- doubling bifurcations. The sub-harmonic motions undergo the Naimark-Sacker bifurcations. Therefore, these motions are transformed into the quasiperiodic ones. The influences of the cracks lengths on the sub-harmonic motions are investigated numerically.

Keywords: Euler- Bernoulli beam, breathing crack, sub- harmonic vibration, quasiperiodic vibration, continuation algorithm

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