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”SHM#2 - On the time reversal method for fault diagnosis on a beam: some preliminary results”

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Controlling the health state of mechanical and structural systems for early replacements of some damaged elements, is an important issue for prevention of losses in terms of human, environmental and also economical. This control is leading to extension of usability durations of systems. The structural health monitoring covers large categories of techniques ranging from vibration based to ultrasonic or magnetic field and radiographic methods. All of these techniques analyze changes on mechanical/physical system parameters under excitation sources and then relate them to the state of the systems. In the current work, we use the time reversal (TR) method which can be categorized in the ultrasonic techniques for condition monitoring of materials and systems. The method is based on the symmetry of solutions of the wave equation with respect to the time in a lossless medium. One or several beams with different damage conditions are considered and the TR method is applied to the systems for detections and quantifications of damages. The illustration of the exploited method will be based on numerical and finite element modellings of the system accompanied by some experimental results (depending to the progress of the experimentation and availabilities of data) on beams with different damage states.

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