Title: Simulation methods for guided wave-based structural health monitoring: a review

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Abstract: This paper reviews the state-of-the-art in numerical wave propagation analysis. The main focus in that regard is on guided wave-based structural health monitoring (SHM) applications. A brief introduction to SHM and SHM-related problems is given, and various numerical methods are then discussed and assessed with respect to their capability of simulating guided wave propagation phenomena. A detailed evaluation of the following methods is compiled: (i) analytical methods, (ii) semi-analytical methods, (iii) the local interaction simulation approach (LISA), (iv) finite element methods (FEMs), and (v) miscellaneous methods such as mass-spring lattice models (MSLMs), boundary element methods (BEMs), and fictitious domain methods. In the framework of the FEM, both time and frequency domain approaches are covered, and the advantages of using high order shape functions are also examined.