

## Case Study

### Topic: Numerical simulation of ultrasonic wave propagation in metallic plates

#### DESCRIPTION:

Structural Health Monitoring (SHM) systems are increasingly being considered as a viable next step in non-destructive testing for the various types of structures. SHM systems provide real-time integrity of the structure that makes the transformation from schedule-based maintenance to condition-based maintenance possible. Implementation of SHM systems for real structures depends largely on their effectiveness and cost-efficiency.

SHM methods generally can be divided into two main groups of algorithms: Ultrasonic Guided Wave-based (UGW) methods and vibration-based ones. The detection of the damage in UGW-based methods rests on the identification of the reflected wave from the crack or delamination in the structure. Numerical simulation of wave propagation is an important tool that can provide the required information for such analyses.

Based on this necessity, in this work, the propagation of ultrasonic waves in a plate should be modeled. The numerical simulation should be performed by using Finite Element (FE) analysis. For this purpose, a commercial FE package, ABAQUS, is provided. In this project, the effect of multiple parameters such as grid size, element type, time increment, etc. should be investigated. The result of this study should contribute to the recommendation of a reliable and efficient setup for numerical simulation of wave propagation.

#### REQUIREMENTS:

First experience with FE software such as ABAQUS  
Basic knowledge of MATLAB.

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