

Temperature Compensation of sensor signal from Active Sensing

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Introduction

- SHM employs the use of actuator - sensor network for continuous monitoring of the health of a structure.
- Useful knowledge about the extent and location of damage can be extracted by its effect on Lamb wave propagation in the structure.
- Popular technique is to compare signal collected with structure in pristine state with signal in damaged structure state. Any damage causes changes in signal which provides useful information about the damage location and extent.

Problem Statement

Environmental factors like temperature elevation affects sensor signal in a way much similar to a possible damage. Hence it is necessary to distinguish the effect of temperature from that of damage.

Method of Approach

Test small coupons with multiple sensors under different temperatures to know how temperature affects sensor signal.

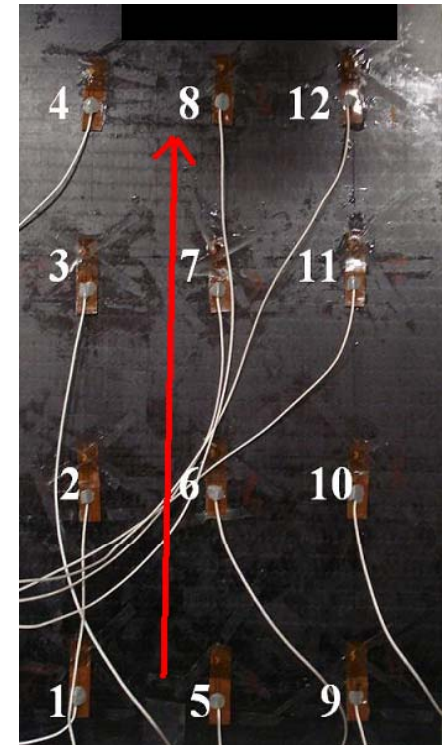
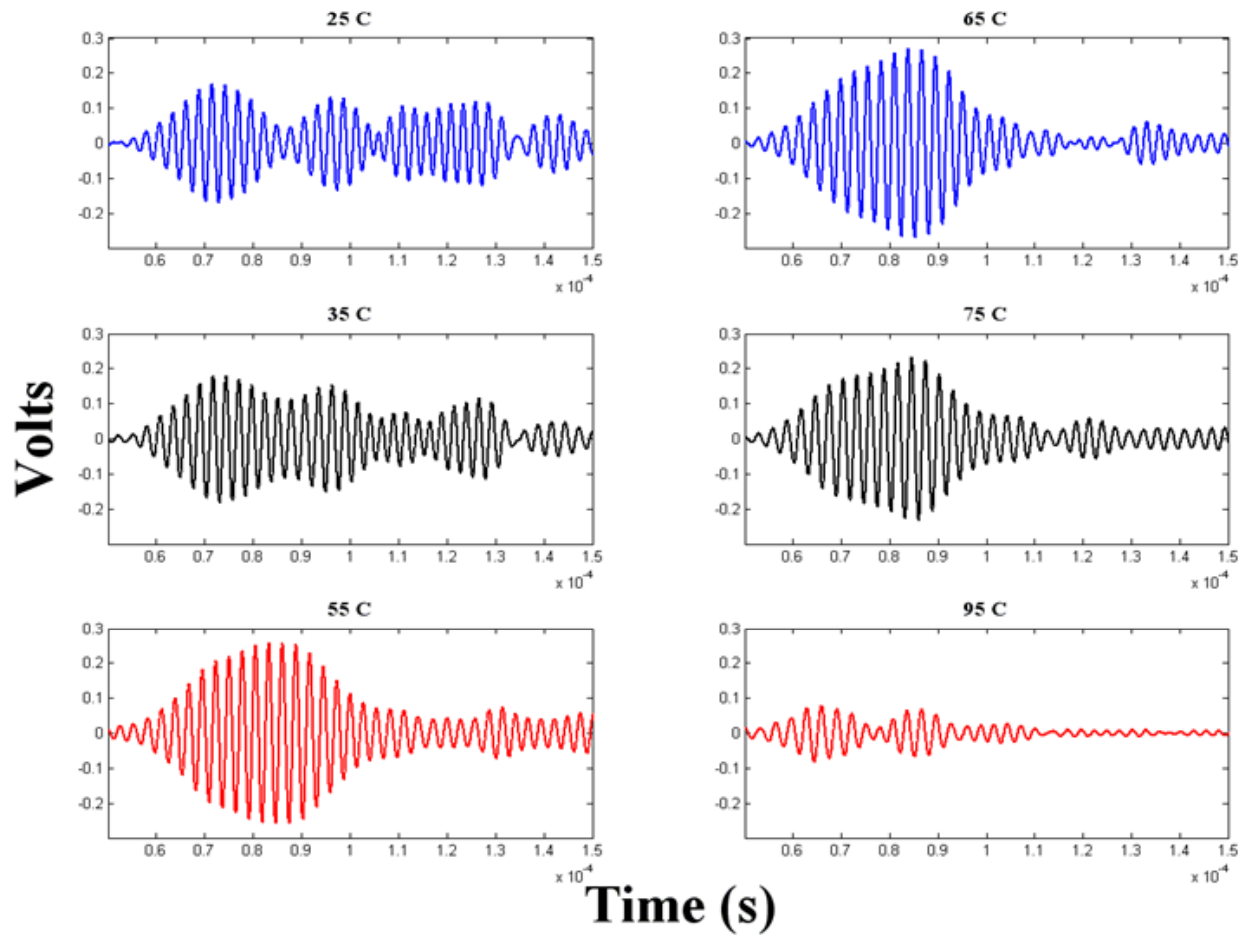
Since signal is a mixture of different Lamb wave modes, use signal processing techniques like Bayesian separation to separate different modes in the signal.

Study the effect of temperature on each mode by comparing signals from different sensors in a single row. Knowledge of change in modes speed, amplitude and width due to temperature can be obtained from this exercise. Repeat this to approximately scan all directions in the coupon for speed and amplitude change. This will provide us a detailed information for temperature effect in spatial domain.

Knowing the effect of temperature on each Lamb wave mode, we can predict the arrival time, width and amplitude of each mode. Then interference of different modes can be predicted to obtain effect of temperature on the whole signal.

Preliminary results

Lamb wave modes interfere due to differential change in speed due to temperature



Bio

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