Data acquisition methods based on encoded signal processing for ultrasound testing

Summary

School of Engineering, Department of Civil Engineering and Architecture offers a 4-year PhD position in mechanical engineering/electronics.

Research field:	Building and civil engineering and architecture
Supervisors:	Madis Ratassepp
	Paul Annus
Availability:	This position is available.
Offered by:	School of Engineering
	Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

Current efforts in non-destructive evaluation research are focusing on the development of more quantitative inspection methods and exploitation of automation to eliminate time-consuming inspection methods and procedures. Ultrasonic array based techniques to image different structures has become widely used methods. One critical aspect in these methods is the duration of data acquisition. Conventionally, signals are acquired by exciting each transducer in turn which makes the process time consuming. To reduce the total data acquisition time, one approach is to excite all transmitters simultaneously. The aim of this project is to investigate the performance of encoded signal processing to separate individual signals from simultaneous excitations. The key for successful separation is to select a series of excitation signals that have good correlation performance; i.e. a sharp autocorrelation and a flat cross-correlation. In this project, an optimized framework for signal selection, sequence formulation, separation and quality control will be developed based on the multi-input and multi-output plant testing procedure. The proposed sequences will be validated on test systems using real ultrasound signals from FE modelling and experimental tomography.

Qualifications

The candidates should have Master's Degree in Physics or Mechanical or Electrical Engineering.

The applicants should fulfill the following requirements:

- High level of interest and motivation towards and deep understanding of signal processing or computational mechanics are required.
- A suitable background in mechanical engineering, engineering physics, telecommunication, or related disciplines is also necessary.
- It is advantageous when candidates have previous experience in signal processing or mathematical modelling.
- The candidates should also have good English writing and communication skills.

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