

CURRICULUM VITAE: FREDRIK LINGVALL

Name: Fredrik Lingvall

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1 Previous Work

[(**summer**) **2010–present**] Research scientist at NORSAR and research scientist and developer at WaveTrain A/S. Acoustic signal processing and system design (acoustic sensors and embedded systems).

[(**fall**) **2008–2010 (summer)**] Research scientist at the research institute NORSAR, Kjeller, Norway. Research and software engineering (for earthquake loss estimation and seismic event location codes).

[**2005–2008 (spring)**] Post doc position at the Department of Informatics, Group for Digital Signal Processing and Image Analysis at the University of Oslo. Research topic: statistical methods for high resolution ultrasonic array imaging.

[**1997–2004**] Uppsala University, Sweden. Research in the field of non-destructive testing (NDT) and ultrasonic imaging. In particular, acoustic field modeling, classification and detection of defects using both ultrasonic and eddy current techniques, and more recently, high resolution ultrasonic array imaging methods.

2 Education

- Ph. D. in Electrical Engineering with specialization in Signal Processing, Uppsala University 2004.
 - F. Lingvall, “Time-Domain Reconstruction Methods for Ultrasonic Array Imaging: A Statistical Approach”, Uppsala University, October, 2004.
- Licentiate
 - F. Lingvall, “Efficient Data Representations for Eddy Current and Ultrasonic Applications”, Uppsala University, March 13, 2000.
- M.Sc. in Engineering physics, Uppsala University 1997, (Teknisk Fysik 180p)

- University certificate in electronics, Uppsala University 1992 (80p).

The Ph.D. and Lic. theses are available in PDF format at: <http://folk.uio.no/fl/>

3 Programming Skills

The main tools that I have worked with is Matlab (and **Octave**) and C/C++. I have also worked with LabView, which I have used both in teaching and for various measurement applications. Furthermore, I have worked with large-scale problems for which I have used and developed parallel tools, using both thread based and message passing (MPI) based methods, for modern multi-core and network connected Unix (Linux) systems. I am also familiar with Windows (and to a lesser extent) MacOS environments.

I am also the main developer of an open source project for acoustic modeling (see Section B in the Publications list) which is written in C/C++ and m-code; the software is a multi-threaded toolbox for Matlab and Octave.

I have also used revision control system tools (i.e., **subversion**), for cooperative software development, and document preparation tools such as: \LaTeX and Adobe Illustrator/Acrobat. Furthermore, I have basic knowledge in standard office tools, (bash) scripting and, HTML coding, Fortran, etc.

4 Analytical Skills

My main research profile, in the area of statistical signal processing, is Bayesian methods for (acoustic) measurement problems. This methodology involves both model design and parameter estimation and I have done research on both these topics. More specifically,

- I have designed models for ultrasonic array imaging and developed various methods to estimate the model parameters.
- In the acoustics area I have also worked with robust Bayesian methods to compensate for speaker and room effects for audio reproduction.

My interest in Bayesian methods is due to the inherent ability, of such methods, to optimally process information and to obtain both model parameter estimates and a measure of the parameter uncertainties.

Even though, my main profile is on acoustic problems the methodology I have worked with is very general and can, therefore, be applied to a wide range of problems.

5 Teaching

As a part of my Ph.D. programme I have been involved in teaching (20%) in courses in,

- Pattern recognition,
- Neural networks,
- Micro computer construction (using micro controllers),
- Measurement systems (a LabView based project course),
- Non-destructive testing.

A Publications

A.1 Papers in Journals

- F. Lingvall and L.-J. Brännmark
“Multiple-Point Statistical Room Correction for Audio Reproduction: Minimum Mean Squared Error Correction Filtering”, *Journal of the Acoustic Society of America*, JASA, Vol. 124 (4), April 2009, pp. 2121–2128.
- F. Lingvall and T. Olofsson
“Statistically Motivated Design of Input Signals for Modern Ultrasonic Array Systems”, *Journal of the Acoustic Society of America*, JASA, Vol. 123 (5), May 2008, pp. 2620–2630.
- F. Lingvall and T. Olofsson
“**On Time-domain Model Based Ultrasonic Array Imaging**”, *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, Special Issue on High Resolution Ultrasonic Imaging in Industrial, Material and Biomaterial Applications, vol 54, no 8, 2007, Aug. 2007, pp. 1623–1633.
- F. Lingvall
“A Method of Improving Overall Resolution in Ultrasonic Array Imaging using Spatio-Temporal Deconvolution” *Ultrasonics*, Volume 42, pp. 961–968, April 2004.
- F. Lingvall, T. Olofsson and T. Stepinski
“Synthetic Aperture Imaging using Sources with Finite Aperture—Deconvolution of the Spatial Impulse Response”, *Journal of the Acoustic Society of America*, JASA, vol. 114 (1), July 2003, pp. 225-234.
- F. Lingvall and T. Stepinski
“Automatic Detecting and Classifying Defects During Eddy Current Inspection of Riveted Lap-Joints”, *NDT&E International*, vol. 33, no 1, 2000, pp. 47–55.

A.2 Papers in Conferences

- F. Lingvall and T. Olofsson
“Statistically Motivated Design of Input Signals for Ultrasonic Array Imaging”, *Ultrasonics Symposium*, 2006 IEEE.
- F. Lingvall and T. Olofsson
“High Resolution Ultrasonic Array Imaging using Positivity Constraints on the Scattering Amplitudes”, *IEEE International Ultrasonic Symposium*, September 19-21, Rotterdam, The Netherlands, 2005.
- F. Lingvall, T. Olofsson, E. Wennerström and T. Stepinski
“Optimal Linear Receive Beamformer for Ultrasonic Imaging in NDE”, *6th World Congress of NDT*, Montreal, August, 2004.
- T. Stepinski and F. Lingvall
“Optimized Algorithm for Synthetic Aperture Imaging”, *IEEE International Ultrasonic Symposium*, 24–27 August, Montréal, Canada, 2004.
- F. Lingvall and T. Stepinski
“Compensating Transducer Diffraction Effects in Synthetic Aperture Imaging for Immersed Solids”, *IEEE International Ultrasonic Symposium*, October 8-11, Munich, Germany, 2002.
- F. Lingvall and T. Stepinski
“Two-dimensional synthetic focusing using large apertures—Deconvolution of the spatial impulse response”, *J. Acoust. Soc. Am.*, Vol. 110, No. 5, Pt. 2, 2001.

- T. Stepinski and F. Lingvall
“Automatic Defect Characterisation in Ultrasonic NDT”, 15th World Conference on NDT Rome, 15–21 October, 2000.
- F. Lingvall and T. Stepinski
“Automatic Detection of Defects in Riveted Lap-joints using Eddy Current”, 7th European Conference on Non-destructive Testing (7th ECNDT), Copenhagen, Denmark, 26–29 May, 1998.

B Software Projects

- F. Lingvall, B. Piwakowski and G.M. Zang
“The DREAM (Discrete REpresentation Array Modeling) toolbox”. An open source Matlab/Octave toolbox for simulating acoustic fields radiated from common ultrasonic transducer types and arbitrarily complicated ultrasonic transducers arrays. Available at: <http://www.signal.uu.se/Toolbox/dream/>.
- “The SELENA - RISe Open Risk Package”. Two open software tools to assist in computing earthquake damage scenarios. <http://selena.sourceforge.net>.
- F. Lingvall
“ALSA Interface for Octave”. An (open source) Octave package for, playing, recording, and simultaneous (duplex) play and record of audio data on Linux (Octave is an open source Matlab clone). <http://folk.uio.no/fl/aaudio.shtml>.

C Projects

SELENA (at NOR SAR). Software project for earthquake loss estimation.

HYPOSAT (at NOR SAR). Software project for seismic event location (Fortran to C translation).

SKB project “Inspection of Copper Canisters for Spent Nuclear Fuel”: (at Uppsala Univ.) Long term project for inspecting welds in copper canisters for storing spent nuclear fuel. I have been working with the ultrasonic array imaging task in this project. Specifically, I have worked with high resolution array imaging techniques for inspecting electron beam (EB) welds.

SKi project “Ultrasonic Characterization of Defects”: (at Uppsala Univ.) A project aimed at, by means of ultrasound, characterize and classify different types of defects in V-type welds in steel.

CANDIA: (at Uppsala Univ.) European project (Brite Euram project TR151-1-0-1) for detecting defects in riveted lap joints in aircraft structures using eddy current inspection.

IMRA: (at Uppsala Univ.) European project for estimating room temperature distributions using airborne ultrasound.