Lionel Koenig

PhD
Signal Processing

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Experiences

November 2012 – May 2012 **Researcher/Engineer in Audio technologies**, *IRIT - University of Toulouse*, Toulouse, France.
Developing a state-of-art automatic speech recognition system which integrate Toulouse Computer Science Research Institute (IRIT) technologies.
Support for an music information retrieval evaluation campaign for the QUAERO project (`http://www.quaero.org`): I developed a submission portal (Probo) using the python Django web application framework.
- Automatic speech recognition,
- Acoustic to articulatory inversion,
- Scientific writings,
- Web application,

November 2011 – June 2011 **Researcher in Audio technologies**, *Audiogaming*, Toulouse, France.
Research and development of a real time and interactive synthesizer of meteorological sounds: AudioWeather (`http://www.audiogaming.net/audioweather`).
Based on state of art approach, I developed and improved procedural audio models for real-time synthesis of realistic rain sounds. I implemented in C and tested on target all signal processing components involved in the model. We ported it as an FMOD plugin on XBox 360, PC, PlayStation 3 and as a Steinberg VST plugin.
- Bibliography,
- Prototyping and implementation,
- R&D Framework development,
- Architecture and API,
- Procedural audio.

May 2011 – February 2011 **Postdoc / Technology transfer engineer**, *GIPSA/Lab - Grenoble INP*, Grenoble, France.
Technology transfer of a full automatic spectral analyser (AStrion) targeted for condition monitoring of rotating machines. R&D of a harmonic series detector.
I was in charge of finding industrial partnerships to make AStrion an industrial grade spectrum analyser. Meanwhile I improved the quality of the AStrion's code. I also prototyped in MATLAB and in C an harmonic peaks regrouping algorithm. I wrote most of the marketing and technical collaterals.
- Technical lead of 5 people,
- Finding partnership (lead to the KAStrion European Project),
- Research and prototyping,
- Technical support.

January 2011 **Associate researcher**, *University Paul Sabatier/IRIT*, Toulouse, France.
Articulatory parameters generation using unsupervised hidden Markov model.
I took part in the research and development of an acoustic-to-articulatory inverser system involving unsupervised trained hidden Markov models.
- Scientific publication on-going.

December 2010 – October 2007 **R&D Engineer / PhD Student**, *Freescale semiconductor / Toulouse Research Institute in Computer Science (IRIT)*, Toulouse, France.
R&D of advanced Packet Loss algorithms for Voice over IP.
I implemented state of art systems in fixed point C. I made research and developed algorithms for speech packet loss concealment using unsupervised trained hidden Markov model. This work led to several scientific publication in major conferences.
List of publications and detailed abstract below
- Bibliography,
- Embedded development (Fixed point, DSP, C, MATLAB),
- Publications (see list below),
- Research prototyping and tests.

January 2011 – February 2008 **Evaluation Engineer**, *Project QUAERO / IRIT*.
Evaluation of music information retrieval (genre, structure, multipitch, chords) algorithms for the QUAERO project.
I ran all algorithms provided by partners on test corpora. Assessed results an wrote reports and publications for the Quaero consortium.
- Evaluation campaign organisation,
- Music information retrieval.

2009 **Lecturer Assistant**, *Institut supérieur de l'aéronautique et de l'espace*, Toulouse.
- Stochastic process tutorials (2h),
- Labs for introduction of MATLAB as a signal processing tools: development of a guitar tuner (16h).

June 2007 – February 2007 **Assistant Researcher**, *PHASE Lab/Toulouse University*, Toulouse, France.
Researcher assistant in charge of the development of a high resolution ultrasound medical imaging method. This method is based on the time domain topological energy (TDTE) and involves advanced optimisation algorithms and numerical simulations.
- Acoustics,
- Finite differences simulation,
- MATLAB.

September 2006 – June 2006 **Industrial placement: Product Engineer Assistant**, *Freescale Semiconductor*, Toulouse, France.
Characterisation and qualification (AEC-Q100) of an e-switch product targeted for automotive target. Use of automatic electronic tester.
- Electronic final test for automotive qualification,
- Electrical characterisation.

January 2006 – July 2005 **JAVA Developer**, *Accenture Consulting*, Prague, Czech Republic.
Design and development of a plugin between a ticket tracking system (JIRA) and the company (HP) mail system.
I specified and developed in JAVA plugins for the Atlassian JIRA ticket tracking system which permit the use of JIRA as an order tracking tools for Hewlett Packard. I made remote technical support on these plugins for Accenture Prague from Toulouse during six months.

Educations

January 2011 **PhD**, *University of Toulouse*, Toulouse, Packet loss concealment on voice over IP.
Doctor in Signal Image, Audio Processing and Optimisation
Packet loss due to misrouted or delayed packets in voice over IP leads to huge voice quality degradation. Packet loss concealment algorithms try to enhance the perceptive quality of the speech. The huge variety of vocoders leads us to propose a generic framework working directly on the speech signal available after decoding. The proposed system relies on one single "hidden Markov model" to model time evolution of acoustic features. An original indicator of continuous voicing is added to conventional parameters (Linear Predictive Cepstral Coefficients) in order to handle voiced/unvoiced sound. Finding the best path with missing observations leads to one major contribution: a modified version of the Viterbi algorithm tailored for estimating missing observations. All contributions are assessed using both perceptual criteria and objective metrics.

June 2007 **Master Thesis in Signal, Audio and Images Processing**, *Institut National Polytechnique*, Toulouse, Ultrasonic Imaging Using Time Domain Topological Energy.
The Time Domain Topological Energy has been defined as a promising technique for nondestructive testing of complex materials. It uses mathematical tools derived from shape optimisation and the refocusing properties of time reversal allowing an efficient solution of the inverse problem of acoustical imaging. This method has been successfully adapted to the imaging of low impedance media, with properties near those of biological tissues and has proved to be reliable on real breast imaging. The main drawback of the method remains its time consumption. Yet, its efficiency and reliability open important perspectives in acoustical imaging.

June 2007 **Engineer degree (Master Thesis) in electronics and signal processing**, *ENSEEIHT - Toulouse National Institute of Technology*, Toulouse, *Engineer*.

June 2002 **Baccalauréat S ('A' Level in Mathematics, Physics, and Chemistry)**, *Lycée Jean-Moulin*, Forbach.

Skills

Embedded system	Design, prototyping and development of signal processing algorithms
Simulation Validation	Matlab/Simulink, Python/Numpy/Scipy
Implementation	Embedded C (DSP), fixed point arithmetic, assembly language
Development tools	SCM, Python, MATLAB, shell, UNIX (Linux and Mac OsX) and Windows
Miscellaneous	Bibliography, Technical writing, Team working

Languages

French	Native speaker
English	Fluent
German	Elementary

Extra Activities

Music	Musician playing the trombone. Active member of Ensemble Instrumental de l'Ariège, a concert band.

Selected Publications

Lionel Koenig. *Masquage de pertes de paquets en voix sur IP*. PhD thesis, Institut de Recherche en Informatique de Toulouse / Université de Toulouse, 2011.

Lionel Koenig, Régine André-Obrecht, Corinne Mailhes, and Serge Fabre. Modèles de markov cachés appliqués au masquage de pertes de paquets en voix sur IP. In *XXIIe colloque GRETSI*, Sep 2009.

Lionel Koenig, Régine André-Obrecht, Corinne Mailhes, and Serge Fabre. A new feature vector for hmm-based packet loss concealment. In *European Signal Processing Conference*, Aug 2009.

Lionel Koenig, Hélène Lachambre, and Régine André-Obrecht. Modèles de Markov Cachés en mode non supervisé pour l'inversion acoustico-articulatoire en parole (regular paper). In *Groupe de Recherche et d'Etudes du Traitement du Signal et des Images (GRETSI), Bordeaux, 05/09/2011-08/09/2011*, page (support électronique), http://www.traitementdusignal.fr/, 2011. GRETSI CNRS.

Lionel Koenig, Corinne Mailhes, Régine André-Obrecht, and Serge Fabre. A continuous voicing parameter in the frequency domain. In *International Conference on Speech and Computer (SPECOM)*, Jun 2009.

Hélène Lachambre, Lionel Koenig, and Régine André-Obrecht. Articulatory Parameter Generation using Unsupervised Hidden Markov Model (regular paper). In *European Signal and Image Processing Conference (EUSIPCO), Barcelone, 29/08/2011-02/09/2011*, page (electronic medium), http://www.eurasip.org/, 2011. EURASIP.

Maxime Le Coz, Hélène Lachambre, Lionel Koenig, and Régine André-Obrecht. A Segmentation-based Tempo Induction Method (regular paper). In *International Society for Music Information Retrieval Conference, Utrecht, Netherlands, 09/08/2010-13/09/2010*, pages 27–31, http://drops.dagstuhl.de/, août 2010. Internationales Begegnungs- und Forschungszentrum fuer Informatik (IBFI).