Signal and Information Processing Laboratory

Prof. Dr. A. Lapidoth, Prof. Dr. H.-A. Loeliger, Dr. K. Heutschi

ANNUAL REPORT

2 0 0 7

Research Period  2007
Teaching Period  2006/2007

Address: Signal and Information Processing Laboratory
         ETH Zurich, Sternwartstr. 7, CH-8092 Zürich
Phone: +41- 44 - 632 2764
Fax: +41- 44 - 632 1208
Electronic mail: sekr@isi.ee.ethz.ch
World Wide Web: http://www.isi.ee.ethz.ch
Editor: B. Röösli
Foreword

We are looking back to another year in which we had the privilege to learn and to discover many things.

We had many visitors, including Willi-Hans Steeb, Michael Chertkov, and Tsachy Weissman, who held short courses.

Two members of our institute left us: Volker Koch finished his PhD thesis in December 2006 and Raphael Berner went to another institute. They both departed with our best wishes. We also welcomed two new PhD students: Georg Wilckens and Lukas Bolliger, both from ETH Zurich.

Another loss to our institute was less cheerful: Max Dünki, our senior system administrator, fell ill in September 2006, and in the course of 2007, it became clear that he would not be able to return to his workplace. In consequence, our whole computing infrastructure was drifting into jeopardy. In this situation, our senior engineer, Patrik Strebel, had to fill in. In an extraordinary effort, he superbly managed the transition to a new mode of operation. 2007 also saw the completion of a renewal (begun in 2006) of our "Fachpraktikum", as well as the beginning of the preparations for the 2008 Int. Zurich Seminar on Communications.

June 2008

Hans-Andrea Loeliger
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1. Personnel

Professor for Information Theory:

Prof. Dr. Amos Lapidoth

Professor for Signal Processing:

Prof. Dr. Hans-Andrea Loeliger

Adjunct Lecturer: Dr. Kurt Heutschi

Secretaries: Mrs. Bernadette Röösli
Mrs. Marion Brändle

Senior Researcher: Dr. Nikolai Nefedov

Research Assistants: Raphael Berner MSc ETH left on 31.1.07
Jonas Biveroni Dipl.EL.Eng.
Lukas Bolliger MSc ETH since 17.9.07
Murti Devarakonda Dipl.EL.Eng
Junli Hu Dipl.EL.Eng.
Tobias Koch Dipl.EL.Eng.
Maja Ostojic Dipl.EL.Eng.
Christoph Reller MSc ETH
Stephan Tinguely Dipl.EL.Eng.
Ligong Wang MSc ETH
Michèle Wigger Dipl.EL.Eng.
Georg Wilckens MSc ETH since 1.9.07

Technical Staff: Francesco Amatore
Dr. Max Dünki
Thomas Schärer
Patrik Strebel El.Eng.HTL
**Academic Guests:** (see 6.1 for report of activities)

<table>
<thead>
<tr>
<th>Academic Guest</th>
<th>Institution</th>
<th>Location</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. Kevin McGill</td>
<td>Rehabilitation R&amp;D Center</td>
<td>Palo Alto, CA., USA</td>
<td>24.01.-28.01.2007</td>
</tr>
<tr>
<td>Prof. Willi-Hans Steeb</td>
<td>University of Johannesburg</td>
<td>Auckland Park, South Africa</td>
<td>21.05.-15.06.2007</td>
</tr>
<tr>
<td>Dr. Chertkov Michael</td>
<td>Los Alamos National Lab.</td>
<td>Los Alamos, USA</td>
<td>17.06.-21.06.2007</td>
</tr>
<tr>
<td>Prof. Tsachy Weissman</td>
<td>Stanford University, Stanford, CA, USA</td>
<td></td>
<td>23.06.-26.06.2007</td>
</tr>
<tr>
<td>Prof. Andrew Eckford</td>
<td>York University, Toronto, Ontario, Canada</td>
<td></td>
<td>26.07.-28.07.2007</td>
</tr>
</tbody>
</table>
# 2. Teaching

## 2.1 Lectures

<table>
<thead>
<tr>
<th>Sem.</th>
<th>Instructors</th>
<th>Title</th>
<th>ETH-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7th</td>
<td>Prof. H.-A. Loeliger</td>
<td>Signal and Information Processing</td>
<td>227-0427</td>
</tr>
<tr>
<td>5th</td>
<td>Prof. H.-A. Loeliger</td>
<td>Stochastic Models and Signal Processing</td>
<td>227-0101</td>
</tr>
<tr>
<td>8th</td>
<td>Prof. H.-A. Loeliger</td>
<td>Algebra, Codes, and Signal Processing</td>
<td>227-0416</td>
</tr>
<tr>
<td>5/7th</td>
<td>Prof. A. Lapidoth</td>
<td>Applied Digital Information Theory I</td>
<td>227-0417</td>
</tr>
<tr>
<td>6th</td>
<td>Prof. A. Lapidoth</td>
<td>Information Transfer</td>
<td>227-0104</td>
</tr>
<tr>
<td>8th</td>
<td>Dr. H.P. Schmid</td>
<td>Analog Signal Processing and Filtering</td>
<td>227-0468</td>
</tr>
<tr>
<td>7th</td>
<td>Dr. K. Heutschi</td>
<td>Acoustics I</td>
<td>227-0477</td>
</tr>
<tr>
<td>8th</td>
<td>Dr. K. Heutschi</td>
<td>Acoustics II</td>
<td>227-0478</td>
</tr>
</tbody>
</table>

## 2.2 Practica

| 5/6th | Practica                | Laboratory for "Fundamentals in Electrical Engineering" | 227-0095  |
| 1st/2nd | T. Koch, M. Wigger  | Coding and Cellular Automata in Matlab              | PPS       |
| 3rd/4th | J. Hu                  | Practical Signal Processing using a DSP            | PPS       |
| 2nd/3rd | Th. Schaerer     | EMG Biofeedback Device                              | PPS       |
### 2.2 Semester Projects and Diploma Theses

During the winter semester 2006/07, summer semester and fall semester 2007, 9 Semester Projects (12 candidates) and 16 Diploma Theses (18 candidates) were carried out.

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Title</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semester Projects WS 2006/07</strong></td>
<td></td>
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</tr>
<tr>
<td>Rahel Weber</td>
<td>Calibration Methods for ADCs and DACs</td>
<td>J. Biveroni</td>
</tr>
<tr>
<td>Franziska Zbinden</td>
<td>Audio Signal Reconstruction from Cochleagram</td>
<td>H.-A. Loeliger</td>
</tr>
<tr>
<td>Philip Herter</td>
<td>Generation of Biofeedback in Robot</td>
<td>R. Banz/Unikl.</td>
</tr>
<tr>
<td>Stefan Müller</td>
<td>Aided Gait Rehabilitation</td>
<td>Balgrist</td>
</tr>
<tr>
<td>Claudio Santelli</td>
<td>Extracting a Sinusoid from a Modulated Sensor Signal</td>
<td>H.-A. Loeliger</td>
</tr>
<tr>
<td><strong>Semester Projects SS 2007</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrizia Mottl</td>
<td>Evaluation of Randomly Generated Circuits</td>
<td>M. Devarakonda J. Biveroni</td>
</tr>
<tr>
<td>Anh Tung Tran</td>
<td>Calibration Methods for DACs</td>
<td>H.-A. Loeliger</td>
</tr>
<tr>
<td>Schekeb Fateh</td>
<td>Extracting the Heart Beat from Pressure Pressure Sensors</td>
<td>J. Hu</td>
</tr>
<tr>
<td>Venkatesan Vinodh</td>
<td>Optimality of Gaussian Inputs for a Multi-Access Achievable Rate Region</td>
<td>M. Wigger</td>
</tr>
<tr>
<td>Tobias Müller</td>
<td>Extracting a Sinusoid from a Modulated Sensor Signal</td>
<td>Ch. Reller</td>
</tr>
<tr>
<td><strong>Semester Projects HS 2007</strong></td>
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<td></td>
</tr>
<tr>
<td>Christian Schürch</td>
<td>Discrete-Time Active Cochlea Models</td>
<td>Ch. Reller</td>
</tr>
<tr>
<td><strong>Diploma Theses WS 2006/7</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christian Lüthi</td>
<td>Seismosomnography: A Factor Graph Approach</td>
<td>V. Koch H.-A. Loeliger M. Devarakonda J. Hu</td>
</tr>
<tr>
<td>Lukas Kuhn</td>
<td>Feedback Suppression in Hearing Aids: Affine Projection Algorithm</td>
<td>S. Korl / Phonak H.-A. Loeliger</td>
</tr>
<tr>
<td>Name</td>
<td>Title</td>
<td>Supervisors</td>
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<tr>
<td>--------------------</td>
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</tr>
<tr>
<td>Georg Boecherer</td>
<td>The Discrete Noiseless Channel</td>
<td>V. Cardoso da Rocha Jun., C. José Lins Pimentel</td>
</tr>
<tr>
<td>Lukas Bolliger</td>
<td>Adaptation/Calibration of Analog Filter</td>
<td>H.-A. Loeliger, J. Biveroni, Ch. Reller</td>
</tr>
<tr>
<td>Matthias Grüter</td>
<td>High data-rate pulse position modulation for optical communication</td>
<td>M. Tuechler / Contraves Space</td>
</tr>
<tr>
<td>Ivo Trajkovic</td>
<td>Exploring the Minka Rule for CDMA/IDMA</td>
<td>H.-A. Loeliger, J. Hu</td>
</tr>
<tr>
<td>Georg Wilckens</td>
<td>Feedback Cancelling using Multiple Microphones</td>
<td>S. Korl / Phonak, H.-A. Loeliger</td>
</tr>
<tr>
<td>Matthias Grüter</td>
<td>Adaption/Calibration of Analog Filter – Extended</td>
<td>H.-A. Loeliger, J. Biveroni, Ch. Reller</td>
</tr>
<tr>
<td>Karin Weinmann</td>
<td>Diplom Theses SS 2007 Feedback Cancelling using Multiple Microphones</td>
<td>Prof. Morgenthaler, EPFL</td>
</tr>
<tr>
<td>Nico Bernold</td>
<td>Diplom Theses SS 2007 LDPC Decoding in Cryptography</td>
<td>Prof. Fossorier, Hawaii</td>
</tr>
<tr>
<td>Rahel Weber</td>
<td>Diplom Theses HS 2007 Diagnosis of Defects in Loudspeakers</td>
<td>Ch. Reller</td>
</tr>
<tr>
<td>Thomas Hug</td>
<td>A Watershed Algorithm with with Shape Constraints</td>
<td>Prof. J. Crespo, Politecnica Madrid</td>
</tr>
<tr>
<td>Wu Pengyu</td>
<td>Equalization for WCDMA/ HSDPA Receiver</td>
<td>Ch. Martelli, J. Hu, H.-A. Loeliger</td>
</tr>
<tr>
<td>Thomas Peter</td>
<td>High-Rate Optical Communication with Pulse Overlap PPM</td>
<td>M. Tüchler, Oerlikon Space AG</td>
</tr>
<tr>
<td>Michael Schatt</td>
<td>Robust Modulation for Optical Communication of Service Data with Pulse Beacon Laser</td>
<td>M. Tüchler, Oerlikon Space AG</td>
</tr>
<tr>
<td>Reto Pieren</td>
<td>Verwendung von Musiksignalen zur Bestimmung raumakustischer Parameter</td>
<td>K. Heutschli, EMPA</td>
</tr>
</tbody>
</table>
3. Research

3.1 Research Areas

The Signal and Information Processing Lab focuses on research and teaching in the following areas:

**Information Theory and Coding**

Information theory, error correcting codes, and their application to communication systems.

Current topics:
- Combined Source-Channel Coding for Multi-Access Networks
- Multi-Access Channels with Noisy Feedback
- Network Coding
- Capacity of Fading Channels
- Broadcasting Correlated Sources
- Multi-Path Channels
- Interference Networks
- Optical Channels

**Digital Signal Processing**

Current topics:
- Fundamentals and applications of graphical models (factor graphs)
- Model-based detection & estimation
- Channel estimation and equalization in communications receivers
- Digital calibration of analog circuits

**Analog and Hybrid Signal Processing**

Current topics:
- Digital-to-analog conversion and analog-to-digital conversion
- Joint synchronization and decoding
3.2 Current Research Projects

Information Theory and Coding

Error Exponents for the Gaussian Channel with Noisy Feedback
It is well known that, in the presence of a noise-free feedback link, the error exponents for the Gaussian channel can be greatly improved. Here we study the robustness of this result by studying the Reliability Function in the presence of a "small" feedback noise. Results change dramatically!

Contact Person: Prof. Dr. Amos Lapidoth, Room ETF E 107, Phone 044 632 5192
E-Mail: lapidoth@isi.ee.ethz.ch

The Capacity of a Channel that Heats Up
Motivated by on-chip communication scenarios, we study the capacity of a Gaussian channel corrupted by thermal noise, where the temperature is not only governed by the ambient room temperature but also by the amplitude of the previously-transmitted signals.

Contact Person: Prof. Dr. Amos Lapidoth, Room ETF E 107, Phone 044 632 5192
E-Mail: lapidoth@isi.ee.ethz.ch

MIMO Fading Channels at Low SNR
MIMO fading channels operating at low levels of SNR can sometimes model spread-spectrum systems utilizing multiple antennas. In this project we study the limiting ratio of the capacity of such channels to the SNR as the SNR tends to zero. This asymptotic regime corresponds to the wide-band limit.

Contact Person: Prof. Dr. Amos Lapidoth, Room ETF E 107, Phone 044 632 5192
E-Mail: lapidoth@isi.ee.ethz.ch

A Sensor Network with Feedback
We study the optimal mean squared-error in the transmission of a bi-variate Gaussian source over a Gaussian multiple-access channel. Transmitter 1 (resp. 2) computes the symbol to send at time k based on the first (resp. second) component of the source vector and on previous channel outputs.

Contact Person: Prof. Dr. Amos Lapidoth, Room ETF E 107, Phone 044 632 5192
E-Mail: lapidoth@isi.ee.ethz.ch

On the Capacity of a Gaussian MAC with Noisy Feedback
We study the capacity of the Gaussian MAC with noisy feedback. We prove that feedback strictly increases the capacity region irrespective of how noisy it is. Settling a longstanding open problem, we also show that the Cover-Leung region is sub-optimal even for the Gaussian MAC with partial feedback.
Broadcasting Correlated Gaussians
We study a one-to-two Gaussian broadcasting problem where the transmitter observes a bi-variate Gaussian source and each receiver wishes to estimate one of the source components subject to expected squared-error distortion. Communication is via an average power constrained broadcast channel.

Discrete Memoryless Relay Channel with Receiver-Transmitter Feedback
We consider a communication scenario with a relay and with feedback from the receiver to the transmitter. For this scenario we propose new coding schemes which outperform all previously known schemes in terms of achievable rates.

On Cognitive Interference Networks
We study general interference networks with cognitive transmitters. More precisely, we assume that each transmitter besides its own message knows a subset of other transmitters' messages. For such a scenario we study the high SNR asymptotics of the maximum achievable throughput.

The pre-log of Gaussian broadcast with feedback can be two
We give an example of a two-user Gaussian broadcast channel with a single antenna at the transmitter and at both receivers where perfect feedback allows to achieve pre-log 2. The result can also be extended to a two-user Gaussian interference channel.

The Gaussian MAC with Conferencing Encoders
We derive the capacity region of the Gaussian MAC with conferencing encoders. To this end we propose a novel technique to show the optimality of Gaussian input distributions under a Markov condition.

Multipath Channels of Bounded Capacity
We investigate the capacity of discrete-time, non-coherent, multipath fading channels where the number of paths is infinite in the sense that the channel output
is influenced by all previous channel inputs. We study conditions under which channel capacity is bounded in the allowed transmit power.

Contact Person: Prof. Dr. Amos Lapidoth, Room ETF E 107, Phone 044 632 5192
E-Mail: lapidoth@isi.ee.ethz.ch

The Free-Space Optical Intensity Channel at Low SNR
Free-space optical intensity channels are used to model infrared communication in an environment with strong ambient light. Hence of particular interest is the capacity at low SNR. We derive the asymptotic growth of the channel capacity at low SNR under average and/or peak power constraints.

Contact Person: Prof. Dr. Amos Lapidoth, Room ETF E 107, Phone 044 632 5192
E-Mail: lapidoth@isi.ee.ethz.ch

Digital Signal Processing

Fundamentals and Applications of Graphical Models
Most of our research is somehow related to graphical models (factor graphs) and to message passing algorithms on such graphs. We are interested in a wide variety of conceptual and algorithmical issues. Examples include
- applied signal processing by summary propagation
- adaptation and learning
- local formulation of Kalman filtering, expectation maximization, particle methods
- improved message passing with structured summaries
- electrical networks and other physical systems as factor graphs
- Fourier and Lagrange duality

Contact Person 1: Christoph Reller, Room ETF D109.1, Phone 044 632 2775
Email: reller@isi.ee.ethz.ch

Contact Person 2: Junli Hu, Room ETF D107, Phone 044 632 6560
Email: hu@isi.ee.ethz.ch

Contact Person 3: Maja Ostojic, Room ETF D108, Phone 044 632 3620
Email: ostojic@isi.ee.ethz.ch

Contact Person 4: Lukas Bolliger, Room ETF D109.3, Phone 044 632 7608
Email: bolliger@isi.ee.ethz.ch

Professor: Dr. Hans-Andrea Loeliger
Channel Estimation and Equalization in Communication Receivers

We study iterative ("message passing") methods for joint channel estimation, decoding, and equalization for linear channels.

Contact Person: Junli Hu, Room ETF D107, Phone 044 632 6560
Email: hu@isi.ee.ethz.ch

Professor: Dr. Hans-Andrea Loeliger

Digital Calibration of Analog Circuits

We study the use of digital calibration techniques to reduce the area and the power consumption of analog circuits such as, e.g., analog-to-digital converters and digital-to-analog converters.

Contact Person: Jonas Biveroni, Room ETF D103, Phone 044 632 3615
Email: biveroni@isi.ee.ethz.ch

Professor: Dr. Hans-Andrea Loeliger
3.3 Completed Projects

KOCH Volker Maximilian

A Factor Graph Approach to Model-Based Signal Separation

ETH-Diss. Nr. 17038 (Referee: Prof. Dr. H.-A. Loeliger)

This doctoral thesis is about a rather new model-based signal processing methodology that is based on factor graphs and message-passing algorithms. Using this, we have developed exemplary signal processing algorithms for various biomedical applications. The main application to evaluate and demonstrate this new methodology was in the field of electromyographic (EMG) signal analysis. EMG signals are electrical signals that are generated during muscle contractions. They can be measured using various kinds of electrodes, e.g., needle or fine-wire electrodes. Their analysis provides valuable information for the diagnosis of neuromuscular disorders, the study of neuromuscular control mechanisms, and the verification of anatomic hypotheses. EMG signals are essentially made up of superimposed action potential trains from several sources. For a thorough analysis, the measured EMG signals need to be decomposed into their constituent trains. However, this task can become difficult if action potentials from different sources overlap. Many EMG signal decomposition methods have been proposed. Traditional algorithms often use heuristic segmentation and clustering approaches. Especially in the case of difficult superpositions with many overlapping action potentials, these algorithms could often not decompose muscle signals correctly. Many other approaches are computationally not feasible when superpositions of many action potentials are to be resolved. To be able to decompose EMG signals with difficult superpositions, new signal processing algorithms based on factor graphs were developed. Factor graphs allow the systematic derivation of advanced model-based signal processing algorithms. A factor graph is a graphical model that represents a factorization of a function. Instead of starting with such a function, we explain how a factor graph for EMG signal decomposition can intuitively be obtained from a block diagram. Here, the block diagram is a simulation model for EMG signals. The factor graph approach allowed us to integrate action potential shape information, firing statistics, and other properties of EMG signals into the same model. Finally, we show how decomposition is achieved by means of the sum-product algorithm. It performs inference by passing messages along the edges of a factor graph. Since our factor graphs have cycles, we get sub-optimal iterative algorithms that allow handling complex models, which could not be used just a few years ago. We have developed several algorithms that differ, e.g., in the representation of the messages propagating in factor graphs. Our new algorithms allow the fast resolution of single and multi-channel superpositions consisting of many overlapping action potentials. We have also used the factor graph language to derive novel message-passing algorithms for several other biomedical applications. One example is the extraction of heart beats from pressure sensors that are located under bedposts (seismosomnography). The advantage of this method is that the signals can be recorded without attaching electrodes to a human subject while sleeping. Other examples include
the important topic of multi-channel neural spike sorting and blind-source separation for electroencephalographic signals. We present exemplary factor graphs for all these applications.

Keywords: Graphical models, factor graphs, signal modeling, model-based signal processing, sum-product algorithm, message passing, superpositions, signal decomposition, resolving superpositions, electromyography, seismosomnography, multi-channel neural spike sorting, blind source separation.

3.3 Completed Dissertations

KOCH Volker M. A Factor Graph Approach to Model-Based Signal Separation

ETH Diss. Nr. 17038
Referee: Prof. Dr. H.-A. Loeliger
Co-referee: Prof. K. McGill, Stanford University
4. Conferences, Meetings and Committees

4.1 Conference Organization

Prof. Lapidoth

Member of the Technical Program Committee for the 2008 International Zurich Seminar held Zurich, Switzerland from March 14-18, 2008.

Prof. Loeliger

Co-Chair, 2008 International Zurich Seminar on Communications, Zurich, Switzerland, March 14-18, 2008.

TPC Chair, 2008 International Symposium on Turbo Codes & Related Topics, Lausanne, Switzerland, September 1-5, 2008.

Member of TPC Chair, ISIT 2007, June 24-29, 2007. Nice, France.
4.2 Participation in Congresses and Meetings

Hu Junli

Koch Tobias

Koch Tobias

Lapidoth Amos

Lapidoth Amos

Lapidoth Amos
Joint Workshop on Coding and Communications 2007 (JWCC 2007), Dürnstein, Austria, 14.-17.10.2007.

Loeliger Hans-Andrea
2007 Information Theory and Applications Workshop, La Jolla, San Diego, CA, USA, 27.1.-3.2.2007.

Loeliger Hans-Andrea
Analog Decoding Workshop Montreal, Canada, 23.-28.5.2007.

Loeliger Hans-Andrea

Loeliger Hans-Andrea
KES 2007, 11th International Conference on Knowledge-Based and Intelligent Information and Engineering Systems, Vietri sul Mare, Italy, 12.-14.9.2007.

Loeliger Hans-Andrea
Workshop on Codings and Communications 2007, Dürnstein, Austria, 14.-17.10.2007.

Tinguely Stephane

Wigger Michèle

Wigger Michèle
4.3 Academic Visits Abroad

Tobias Koch
Universitat Pompeu Fabra, Barcelona, Spain 16.4.-15.6.2007

Wigger Michèle
Berkely University, California, USA 27.-31.8.2007

Ligong Wang
University of Cambridge, Cambridge, England 5.3.-14.3.2007
4.4 Service Activities and Society Memberships

Prof. Lapidoth

Fellow of the IEEE
Member of the IMS Institute of Mathematical Statistics, Bethesda, USA
Co-Chair, 2008 International Zurich Seminar on Communications
Research Affiliate in the Research Laboratory of Electronics (RLE) at the Massachusetts Institute of Technology (MIT)
Member of the Center for Communication and Information Technologies (CCIT), Technion, Haifa, Israel

Prof. Loeliger

Fellow of the IEEE
Chair, IEEE Switzerland Chapter on Digital Communication Systems
Associate Editor for Coding Techniques, IEEE Transactions on Information Theory
Co-Chair, 2008 International Zurich Seminar on Communications
TPC Chair, 2008 International Symposium on Turbo Codes & Related Topics
Member of Board of Governors, IEEE Information Theory Society

Dr. Heutschi

Member, Acoustical Society of America
Member, Audio Engineering Society
Member, Swiss Acoustical Society (SGA)
Member, German Acoustical Society (DEGA)
4.5 Presentations by Institute Members

Hu Junli  

Koch Tobias  

Koch Tobias  

Lapidoth Amos  

Lapidoth Amos  

Lapidoth Amos  

Lapidoth Amos  
“When are Analog Networks Optimal?”, Beer Sheva, Israel, Ben-Gurion University of the Negev, 24.12.2007.

Lapidoth Amos  

Lapidoth Amos  

Loeliger H.-A.  

Loeliger H.-A.  
“Calibration of analog-to-digital converters with low-precision components”, Analog Decoding Workshop, Montreal, Canada, 24.-25.5.07.

Loeliger H.-A.  

Loeliger H.-A.  
“On analog-to-digital converters and digital-to-analog converters with low-precision components”, 4th Joint Workshop on Coding and Communications (JWCC), Schloss Dürnstein, Austria, 14.-16.10.07.

Loeliger H.-A.  
“Factor graphs and message passing algorithms”, Lectures at Scuola Normale Superiore, Pisa, Italy, December 2007.

Tinguely Stephane  
“Sending a Bi-variate Gaussian Source over a Gaussian MAC with Feedback”, Nice, France, ISIT 2007, 28.06.2007.

Wigger Michèle  
4.6 Organization of Lectures, Seminars, and Colloquia

Colloquium Speakers for the Colloquium “Electronics and Communications” were:

Invited by Prof. Lapidoth:

Prof. Dr. Raymond Yeung,
The Chinese University of Hong Kong, China,
presented a talk on “Network Coding theory and Network Error Correction”. 22.01.2007

Prof. Dr. Marat Burnashev,
Russian Academy of Science, Moscow,
presented a talk on “On Gaussian Approximation, Asymptotically Optimal Linear and Nonlinear Detectors in CDMA and Multiuser Detection”. 10.04.2007

Prof. Dr. Anant Sahai,
Berkeley University, CA, USA,
presented a talk on “Delay, feedback and the price of ignorance”. 17.04.2007

Dr. Gerhard Kramer,
Bell Laboratories, Murray Hill, NJ, USA,
presented a talk on “Information Theory for Two-Receiver Broadcast Channels”. 27.04.2007

Prof. Dr. Sergio Verdu,
Princeton University, USA,
presented a talk on “Information Theory Today”. 21.06.2007

Prof. Dr. J.N. Laneman,
University of Notre Dame, Indiana, USA,
presented a talk on “Asymmetry in State-Dependent Networks”. 26.07.2007

Prof. Dr. Syed Ali Jafar,
University of California, USA,
held a talk on “Can 100 speakers talk for 30 min each in the same toom within 1 hour and with zero interference to each other?”. 30.08.2007

Prof. Dr. Ram Zamir,
Tel Aviv University, Israel,
held a talk on “The Rate Loss of Single Letter Characterizations”. 05.11.2007
Invited by Prof. Loeliger:

25.01.07 Prof. Kevin McGill, Rehabilitation R&D Center, Palo Alto, USA
“What EMG signals can tell us about muscle architecture”.

18.-20.6.07 Dr. Michael Chertkov, Los Alamos National Laboratory, Los Alamos, USA
“Loop Series for Discrete Models on Graphs”.

27.07.07 Prof. Andrew Eckford, York University of Toronto, Ontario, Canada
“Changing the channel: Reliable communication in the presence of time-dependent parameters”.

Colloquium Speakers for the Colloquium “Acoustics” were:

Invited by Dr. Heutschi:

17.01.07 Dr. Martin Neukom, Institute for Computer Music and Sound Technology, ICST Zurich
“Ambisonics, Theorie und Anwendungen in der Computermusik”.

31.01.07 Dr. Matthias Brechbühl, Norsonic Brechbühl AG, Grüinematt
“Die Akustische Kamera – Möglichkeiten und Grenzen bei der Ortung von Schallquellen”.

09.05.07 Ralf Schumann, Geigenbaumeister, Geigenbau Schumann, D-79244 Münstertal
“Jenseits der Lautstärke” Neue Möglichkeiten der Klangoptimierung von Musikinstrumenten mit Akupunktur.

31.10.07 Dr.-Ing. Philip Leistner, Fraunhofer-Institut für Bauphysik, Stuttgart
“Zur Akustik mehrschichtiger und mehrschaliger Bauteile in Gebäuden”.

28.11.07 Dipl.-Ing. Gregor Schguanin, ETH, Bundesamt für Umwelt BAFU, Bern
“Lärmindernde Strassenbeläge – Grundlagen, Praxis in der Schweiz und Ausblick”.

12.12.07 Prof. Dr. Jens Holger Rindel, Technical University of Denmark
“The acoustical heritage of the ancient Roman theatres”.
5. Publications

Frey Matthias
Loeliger Hans-Andrea

Khisti A.
Erez Uri
Lapidoth Amos
Wornell Gregory

Koch Tobias
Lapidoth Amos
Sotiriadis Paul P.

Koch Tobias,
Lapidoth Amos
Sotiriadis Paul P.

Lapidoth Amos
Jun Young-Han
Weissman Tsachy

Lapidoth Amos
Shamai (Shitz) Shlomo
Wigger Michèle A.

Lapidoth Amos
Tinguely Stephane

Loeliger Hans-Andrea
Dauwels Justin

Sethuraman Vignesh
Wang Ligong
Hajek Bruce
Lapidoth Amos
6. Guests, Visitors

6.1 Activities of Academic Guests at the Institute

Guests of Prof. Lapidoth:

Prof. Dr. Tsachy Weissman,
Stanford University, CA, USA,
held a short course: “An Information Theorist Cleans up Discrete Data”. 23.06.-26.06.07

Guest of Prof. Loeliger:

Prof. Kevin McGill
Rehabilitation R&D Center, Palo Alto, CA., USA
held a talk on “What EMG signals can tell us about muscle architecture”. 14.01.-28.01.07

Prof. Willi-Hans Steeb
University of Johannesburg, Auckland Park, South Africa
Collaboration with Prof. Loeliger and held a short course on “Classical Computing, Quantum Computing and Algorithms”. 24.05.-08.06.07

Dr. Michael Chertkov
Los Alamos National Laboratory, Los Alamos, USA
held 3 talks on “Loop Series for Discrete Models on Graphs”. 17.06.-21.06.07

Prof. Andrew Eckford
York University, Toronto, Ontario, Canada,
held a talk on “Changing the channel: Reliable in the presence of time-dependent parameters”. 26.07.-28.07.07