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

Foreword

We are looking back to another year in which we had the priviledge 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

Contents

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)

Prof. Kevin McGill	Rehabilitation R&D Center Palo Alto, CA., USA	24.01.-28.01.2007
Prof. Willi-Hans Steeb	University of Johannesburg Auckland Park, South Africa	21.05.-15.06.2007
Dr. Chertkov Michael	Los Alamos National Lab. Los Alamos, USA	17.06.-21.06.2007
Prof. Tsachy Weissman	Stanford University, Stanford, CA, USA	23.06.-26.06.2007
Prof. Andrew Eckford	York University, Toronto, Ontario, Canada	26.07.-28.07.2007

2. Teaching

2.1 Lectures

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

2.2 Practica

Sem.	Instructors	Title	ETH-No.
5/6th	Practica	Laboratory for "Fundamentals in Electrical Engineering"	227-0095
1st/2nd	T. Koch, M. Wigger S. Tinguely	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.

Candidates	Title	Supervisor
Semester Projects WS 2006/07		
Rahel Weber Franziska Zbinden	Calibration Methods for ADCs and DACs	J. Biveroni H.-A. Loeliger
Philip Herter	Audio Signal Reconstruction from Cochleagram	Ch. Reller H.-A. Loeliger
Stefan Müller Claudio Santelli	Generation of Biofeedback in Robot Aided Gait Rehabilitations	R.Banz/Unikl. Balgrist H.-A. Loeliger
Semester Projects SS 2007		
Patrizia Mottl	Evaluation of Randomly Generated Circuits	M. Devarakonda J. Biveroni
Anh Tung Tran Schekeb Fateh	Calibration Methods for DACs	H.-A. Loeliger J. Biveroni
Venkatesan Vinodh	Optimality of Gaussian Inputs for a Multi-Access Achievable Rate Region	M. Wigger
Tobias Müller	Extracting the Heart Beat from Pressure Pressure Sensors	J. Hu H.-A. Loeliger
Yinan Zhang	Extracting a Sinusoid from a Modulated Sensor Signal	Ch. Reller H.-A. Loeliger
Semester Projects HS 2007		
Christian Schürch	Discrete-Time Active Cochlea Models	Ch. Reller
Diploma Theses WS 2006/7		
Christian Lüthi	Seismosomnography: A Factor Graph Approach	V. Koch H.-A. Loeliger M. Devarakonda J. Hu
Lukas Kuhn	Feedback Suppression in Hearing Aids: Affine Projection Algorithm	S. Korl / Phonak H.-A. Loeliger

Georg Boecherer	The Discrete Noiseless Channel	V. Cardoso da Rocha Jun. C. José Lins Pimentel
Lukas Bolliger Matthias Grüter	Adaptation/Calibration of Analog Filter	H.-A. Loeliger J. Biveroni Ch. Reller
Ivo Trajkovic	High data-rate pulse position modulation for optical communication	M. Tuechler / Contraves Space
Georg Wilckens	Exploring the Minka Rule for CDMA/IDMA	H.-A. Loeliger J. Hu

Diploma Theses SS 2007

Karin Weinmann	Feedback Cancelling using Multiple Microphones	S. Korl / Phonak H.-A. Loeliger
Matthias Grüter	Adaption/Calibration of Analog Filter – Extended	H.-A. Loeliger J. Biveroni Ch. Reller

Diploma Theses HS 2007

Franziska Zbinden	Statistische Methoden für die Wettervorhersage	Prof. Morgenthaler EPFL
Nico Bernold	LDPC Decoding in Cryptography	Prof. Fossorier, Hawaii
Rahel Weber Thomas Hug	Diagnosis of Defects in Loudspeakers	Ch. Reller
Samuel Braendle	A Watershed Algorithm with with Shape Constraints	Prof. J. Crespo Politecnica Madrid
Wu Pengyu	Equalization for WCDMA/ HSDPA Receiver	Ch. Martelli J. Hu H.-A. Loeliger
Thomas Peter	High-Rate Optical Communication with Pulse Overlap PPM	M. Tüchler Oerlikon Space AG
Michael Schatt	Robust Modulation for Optical Communication of Service Data with Pulse Beacon Laser	M. Tüchler Oerlikon Space AG
Reto Pieren	Verwendung von Musiksignalen zur Bestimmung raumakustischer Parameter	K. Heutschi EMPA

3. Research

3.1 Research Areas

The Signal and Information Processing Lab focusses 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 Reliablity 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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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 optimiality of Gaussian input distributions under a Markov condition.

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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.

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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.

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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

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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
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Professor: Dr. Hans-Andrea Loeliger

Digital Calibration of Analog Circuits

We study they 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	Third IEEE Workshop on Advance Signal Processing for Wireless Communication Systems, Copenhagen, Denmark, 16.11.2007.
Koch Tobias	2007 IEEE International Symposium on Information Theory (ISIT2007), Nice, France, 24.-29. 6.2007.
Koch Tobias	2007 Information Theory Workshop (ITW 2007), Lake Tahoe, California, 2.-6.9.2007.
Lapidoth Amos	Signal Processing for Wireless Communications (SPWC) 2007, London, Great Britain, 6.-8.6.2007.
Lapidoth Amos	2007 IEEE International Symposium on Information Theory (ISIT2007), Nice, France, 24.-29. 6.2007.
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	2007 IEEE International Symposium on Information Theory (ISIT2007), Nice, France, 24.-29.6.2007.
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	2007 IEEE International Symposium on Information Theory (ISIT2007), Nice, France, 24.-29. 6.2007.
Wigger Michèle	2007 IEEE International Symposium on Information Theory (ISIT2007), Nice, France, 24.-29. 6.2007.
Wigger Michèle	2007 Information Theory Workshop (ITW 2007), Lake Tahoe, California, 2.-6.9.2007.

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   "Equalization by message passing: Kalman-smoothing for binary data and state space splitting", Third IEEE Workshop on Advanced Signal Processing for Wireless Communication Systems, Copenhagen, Denmark, 16.11.2007.

Koch Tobias   "A Channel that Heats Up", Nice, France, ISIT 2007, 26.6.2007.

Koch Tobias   "A Hot Channel", Lake Tahoe, USA, ITW 2007, 5.9.2007.

Lapidoth Amos   "Heat-Limited Communications or A Channel With Memory That Fights Back", London, GB, SPWC 2007, 6.6.2007.

Lapidoth Amos   "Heat-Limited Communications", Jerusalem, Israel, Hebrew University of Jerusalem, 7.09.2007.

Lapidoth Amos   "The Matched Filter Theorem Done Right", Duernstein, Austria, JWCC 2007, 15.10.2007.

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

Lapidoth Amos   "The Gaussian Channel with Noisy Feedback", Nice, France, ISIT 2007, 25.6.2007.

Lapidoth Amos   "Low SNR Capacity of Fading Channels - MIMO and Delay Spread", Nice, France, ISIT 2007, 27.6.2007.

Loeliger H.-A.   "The factor graph approach to signal processing: a progress report", The 2007 Information Theory and Application Workshop, La Jolla, CA, USA, 1.2.2007.

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.   "The factor graph approach to model-based signal processing", Keynote lecture at KES 2007, 11th Int. Conference on Knowledge-Based and Intelligent Information and Engineering Systems, Vietri sul Mare, Italy, 12.-14.9.2007.

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   "On Cognitive Interference Networks", Berkeley, California, University of Berkeley, 31.8.2008.

Wigger Michèle   "A Linear Interference Network with Local Side-Information",
                      Nice, France, ISIT 2007, 28.6.2007.

Wigger Michèle   "A Schalkwijk-Kailath Type Encoding Scheme", Nice, France,
                      ISIT 2007, 26.8.2007.

Wigger Michèle   "On Cognitive Interference Networks", Lake Tahoe, USA,
                      ITW 2007, 4.9.2007.

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, Ontaria,
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, Grünematt
" 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 Klangopti-
mierung 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
"Lärmmindernde 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	"On the static resolution of digital corrected analog-to-digital and digital-to-analog converters", IEEE Transactions on Circuits and Systems-I: Regular Papers, January 2007, nr. 1, vol. 54, pp 229-237.
Khisti A. Erez Uri Lapidoth Amos Wornell Gregory	"Carbon copying onto dirty paper", IEEE Transactions on Information Theory, IT-53, No. 5, pp. 1814-1827, May 2007.
Koch Tobias Lapidoth Amos Sotiriadis Paul P.	"A Channel that Heats Up, in Proceedings of the IEEE International Symposium on Information Theory (ISIT)", Nice, France, June 24 – 29, 2007.
Koch Tobias, Lapidoth Amos Sotiriadis Paul P.	"A Hot Channel", in Proceedings of the IEEE Information Theory Workshop (ITW), Tahoe City, CA, USA, September 2 - 6, 2007.
Lapidoth Amos Jun Young-Han Weissman Tsachy	"The Gaussian Channel with Noisy Feedback", in Proceedings 2007 IEEE International Symposium on Information Theory (ISIT'07), Nice, France, June 24 - 29, 2007.
Lapidoth Amos Shamai (Shitz) Shlomo Wigger Michèle A.	"A Linear Interference Network with Local Side-Information", Proceedings 2007 IEEE International Symposium on Information Theory (ISIT'07), Nice, France, June 24 - 29, 2007.
Lapidoth Amos Tinguely Stephane	"Sending a Bi-Variate Gaussian Source over a Gaussian MAC with Feedback", in Proceedings IEEE International Symposium on Information Theory (ISIT), Nice, France, June 24 - 29, 2007.
Loeliger Hans-Andrea Dauwels Justin	"The factor graph approach to model-based signal processing", Proceedings of the IEEE, June 2007, pp. 1295-1322.
Sethuraman Vignesh Wang Ligong Hajek Bruce Lapidoth Amos	"Low SNR Capacity of Fading Channels -MIMO and Delay Spread," in Proceedings IEEE International Symposium on Information Theory (ISIT), Nice, France, June 24 - 29, 2007.

6. Guests, Visitors

6.1 Activies 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