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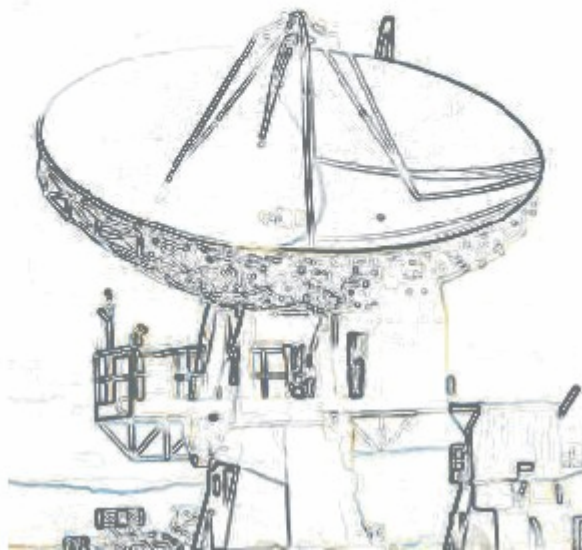
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# DEPARTMENT OF ELECTRONICS AND MULTIMEDIA TELECOMMUNICATIONS

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Department Of  
Electronics  
& Multimedia Communications



## Annual Report 2004

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Technical University of Košice  
Faculty of Electrical Engineering and Informatics

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**TECHNICAL UNIVERSITY OF KOŠICE**  
**Faculty of Electrical Engineering and Informatics**  
**(Slovak Republic)**

**DEPARTMENT OF ELECTRONICS AND**  
**MULTIMEDIA TELECOMMUNICATIONS**

**ANNUAL REPORT 2004**

**Edited by Ľuboš Ovseník**



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## BRIEF OVERVIEW

**The Department of Electronics and Multimedia Communications** is responsible for degree course Electronics and Telecommunication Engineering at MSc. level as well as for degree courses Electronics, Telecommunications and Measurement Techniques at PhD. level.

The subjects in degree course Electronics and Telecommunications Engineering are orientated to the linear and non-linear analogue circuits, digital electronics, microwave technology, optoelectronics, signal and systems, acoustics, digital signal processing, digital filtering, VLSI processors and microcontrollers, radioelectronic measurements, television systems, signal recording, digital communication and digital transmission systems, optoelectronic communication systems, photonics, sensor systems, multimedia communication systems, mobile and satellite communication systems, digital image communication systems and medical electronics.

The basic research activities of Department are concentrated on digital image and speech processing, multimedia communications, digital filtering, optoelectronics and optical communication, implementation on neural network in digital signal processing and A/D converters modelling.

**The history of the Department:** The Department of Electronics and Multimedia Communications was founded in 1969. The original name of department was Department of Electronics and first head of department was Prof. Špány. In the first 5 years Department was responsible for some subjects in the field of electronics.

The name of Department has been change to Department of Electronic Circuits and System in 1974. It was responsible for the new degree course Electronics Systems. First students have been finished his study in this degree course at 1976. The new degree course Radioelectronics at the Department has been started in 1979, which was orientated in the field of microwave technology, analog and digital electronics, digital signal processing and radioelectronic systems. The name of Department has been change to Department of Radioelectronics. Since 1986 the head of Department is Prof. Levický. The process of degree course Radioelectronics transformation to the new degree course Electronics and Telecommunication engineering at the department has been finished in 1997. The recent name of department since 1997 is Department of Electronics and Multimedia Communications.

## DEPARTMENT STAFF AND STRUCTURE

Total number of staff members is 26.

- ◆ Professors: Čižmár Anton, Levický Dušan, Marcheviský Stanislav, Mihalík Ján, Michaeli Linus, Turán Ján
  
- ◆ Associated Professors: Doboš Ľubomír, Drutarovský Miloš, Galajda Pavol, Juhár Jozef, Kocur Dušan, Šaliga Ján
  
- ◆ Assistant Professors: Gamec Ján, Gamcová Mária, Gladišová Iveta, Hovančák Rastislav, Klenovičová Zita, Lihan Slavomír, Ovseník Ľuboš, Zavacký Jozef
  
- ◆ Research Assistant: Čížová Jana, Hroncová Ingrid, Maceková Ľudmila
  
- ◆ Support staff: Chocholová Pavlina, Lenárt Jozef, Marcheviská Božena, Šumáková Viera
  
- ◆ Ph.D. students:  
**Internal form:** Čopjan Ľubomír, Filo Peter, Floriš Peter, Gaňová Renáta, Grega Marián, Kasár Miroslav, Krajňák Jozef, Michalko Peter, Mirilovič Michal, Ondáš Stanislav, Pavelka Pavol, Ridzoň Radovan, Sochová Lenka, Šimka Martin, Štefanišin Radoslav, Štofa Anton, Šurin Stanislav, Varchol Peter  
**External form:** Baboľ Miroslav, Cabúk Pavol, Csernok Szabolcz, Domaracký Marek, Fedor Stanislav, Florek Vladimír, Gamcová Mária, Gebeová Gyongyike, Goril Jozef, Harčár Imrich, Homolya Viktor, Hrušovský Igor, Chochol Peter, Kačír Miloš, Kováč Miloš, Kravecová Daniela, Krivda Marián, Lipovský Štefan, Lukáč Martin, Mihalčík Ladislav, Mohamoud Ali Omer, Molent Ľubomír, Novikmec Jozef, Papaj Ján, Pillár Slavomír, Siman Roman, Šoltés Adrián, Študenc Jozef, Švač Pavol, Zlacký Marián

## DIVISIONS OF THE DEPARTMENT

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## **COURSES**

### ***Bachelor Degree Course (title BcC.) – Telecommunications Engineering***

The Bachelor degree course is orientated into the field Telecommunication mainly into the basic telecommunication systems and networks. The students achieve good skills in telecommunication services, management of telecommunication networks and economics in telecommunications.

### ***Master Degree Course (title Ing.) – Electronics and Telecommunication Engineering***

The Master degree course is orientated into the field of Electronics and Telecommunications. In the field of Electronics the students have been achieve good skills in mathematics, physics, electromagnetic field, electrical measurement, electronics components, linear and non-linear circuits, digital electronics, microprocessors and signal processors, optoelectronics and digital signal processing.

In the field Telecommunications the students have been achieve good skills in digital communication and transmission systems, mobile and satellite communications, optoelectronics communication systems and multimedia communication.

### ***Master Degree Course (title Ing.) – Measurement Techniques***

The Master degree course is orientated into the field of Measurement techniques. The degree course is the specialisation of the general programme Electronics. In the field of Mesurement techniques the students have been achieve good skills in electrical measurement, metrology, electronics components, linear and non-linear circuits, digital electronics, microprocessors and signal processors, digital signal processing targeted on enhancement of the metrological properties, virtual instrumentation using ICT, measurement in the biomedicine, measurement in the telecommunications, industrial measurement for process control and TQM.

### ***Ph.D. Degree Courses (title Ph.D.) – Electronics***

The Ph.D. degree course is orientated into the field of digital image and speech encoding and transmission, optoelectronics systems and digital filtering as well as design of electronic and optoelectronics systems, sensor systems and digital circuit's simulation.

***Ph.D. Degree Courses (title Ph.D.) – Telecommunications***

The Ph.D. degree course is orientated into the field of multimedia communications, mobile and satellite communications as well as modern telecommunication technologies and networks and digital signal processing in telecommunications.

***Ph.D. Degree Courses (title Ph.D.) – Measurement Techniques***

The Ph.D. degree course is focused into the methodology of instrumentation in industry, scientific research and monitoring of physical parameters. The related scientific areas are metrology, sensors of different physical qualities, digital signal processing and pre-processing, calibration and self-diagnostic as well as virtual instrumentation.

## LIST OF SUBJECTS TAUGHT

### Master Degree Course (Ing.) *Electronics and Telecommunications*

<b>Subjects</b>	<b>Hours/Week Lecture/Seminar</b>	<b>Lectures</b>
<b>2nd year of study:</b>		
<b>3rd year of study:</b>		
Transmission of Information in Electroenergetics	2/2	Čižmár
Analog Electronic Systems	2/2	Galajda
Electronic Systems	3/2	Galajda
Linear Analog Circuits	4/3	Kocur
Microwave Technology	3/2	Gamec
Digital Electronics	3/2	Levický
Electronic Devices	3/3	Gamec
Digital Communication Systems	3/3	Levický
Non-Linear Analog Circuits	4/3	Michaeli
Signals and Systems	3/3	Mihalík, Zavacký
Design of Electronic Equipment	3/2	Doboš
Acoustics	3/2	Juhár
Electronic Systems with FPGA Circuits	2/3	Galajda, Drutarovský
<b>4th year of study:</b>		
Radioelectronic Measurement	3/3	Šaliga
Electronic Systems with Microprocessors	3/2	Drutarovský
Digital Signal Processing	3/3	Mihalík
Optoelectronics	3/2	Turán
Switching Systems	3/2	Marchevský
Coding and Modulation	2/2	Čižmár
Semestral Projects	0/2	Galajda
Digital Transmission Systems	3/2	Čižmár
Signal Processors in Telecommunications	3/2	Drutarovský
TV Systems	3/2	Marchevský
Analog & Digital Interfaces	3/2	Michaeli, Šaliga
Optoelectronic Communications Systems	3/2	Turán
Digital Filters	2/2	Kocur, Drutarovský
Applied Cryptography	2/2	Levický
Digital Proc. and Transmission of Speech and Audio	3/2	Juhár
<b>5th year of study:</b>		
Photonics	3/2	Turán
Medical Electronics	3/2	Michaeli
Sensor Systems	3/2	Michaeli
Radioelectronic Systems	3/2	Doboš
Multimedia Communications	3/2	Levický
Satellite Communications	3/2	Marchevský
Digital Image Communication Systems	3/3	Mihalík
Mobile Communications Systems	3/2	Doboš
Spread Spectrum Communication Systems	3/2	Kocur

**Master Degree Course (Ing.) Measurement Techniques**

<b>Subjects</b>	<b>Hours/Week Lecture/Seminar</b>	<b>Lectures</b>
<b>4th year of study:</b>		
Radioelectronic Measurement	3/3	Šaliga
Electronic Systems with Microprocessors	3/2	Drutarovský
Digital Signal Processing	3/3	Mihalík
Electromagnetic Compatibility	3/2	Marton
Sensor Systems	2/2	Mojžiš
Semestral Projects	0/2	Michaeli
Digital Transmission Systems	3/2	Čižmár
Signal Processors in Telecommunications	3/2	Drutarovský
Technical Diagnostic	3/2	Smrczek
Virtual instrumentation	3/2	Šaliga
Modelling and Measurement	3/2	Kováč
Measurement in High Voltage Technology	2/2	Kolcunova
Measurement in Electroenergetic	2/2	Leščinský
Digital Filters	2/2	Kocur,
Applied Cryptography	2/2	Levický
Measurement in Experimental Physics	2/2	Kudela
<b>5th year of study:</b>		
Signal Processing in Measurement	3/2	Michaeli
Medical Electronics	3/2	Michaeli
Measurement in Telecommunication	3/2	Šaliga
Diagnostic of Electrical Systems	2/2	Kolcunova
Technology of Sensors	2/3	Banský

**Undergraduate Study (Bc.) Telecommunications**

<b>Subjects</b>	<b>Hours/Week Lecture/Seminar</b>	<b>Lectures</b>
<b>1st year of study:</b>		
Electronic Devices	3/3	Gamec
<b>2nd year of study:</b>		
Linear Analog Circuits	4/3	Kocur
Microwave Technology	3/2	Gamec
Signals and Systems	3/2	Mihalík, Zavacký
Digital Electronics	3/2	Levický
Data Acquisition Systems	3/3	Michaeli, Šaliga
Optoelectronics	3/2	Turán
Digital Signal Processing	3/2	Mihalík
Basics of Telecommunication Systems	3/2	Levický
Circuits for Communications Systems	4/3	Michaeli
<b>3rd year of study:</b>		
Telecommunications Networks	3/2	Čižmár
Transmissions Systems	3/2	Čižmár
Switching Systems	3/2	Marchevský
Semestral Projects	0/2	Galajda
Measurement in Telecommunications	3/2	Šaliga
Optoelectronic Communications Systems	3/2	Turán
Videocommunications	3/2	Mihalík
Telecommunications Services	3/2	Čižmár
Management of Telecommunication Networks	3/2	Čižmár
Security of Communications Networks	3/2	Levický
Multimedia Communications	3/2	Levický
Satellite Communications	3/2	Marchevský
Mobile Communications Systems	3/2	Doboš

**Undergraduate and Graduate Study for Foreign Students (in English Language)**  
**Study plan for MSC degree in *Telecommunication technology***

<b>Subjects</b>	<b>Hours/Week Lecture/Seminar</b>	<b>Lectures</b>
<b>1st year of study:</b>		
Digital Signal Processing	3/3	Mihalík
Coding in Communication Systems	3/2	Levický
Optoelectronics	3/2	Turán
Digital Filtration in Communications	3/2	Marchevský
Microwave Technology	3/2	Turán
Telematic Systems	3/2	Levický
Digital Speech in Communication Systems	3/2	Marchevský
Optoelectronic Communications Systems	3/2	Turán
Image Coding	3/2	Mihalík
VLSI Processors in Telecommunications	3/2	Drutarovský
Digital Transmission Systems	3/2	Čižmár
Digital Filters	2/2	Kocur, Drutarovský
<b>2nd year of study:</b>		
Multimedial Communications	3/2	Levický
Satellite Communications	3/2	Marchevský
Mobile Communications	3/2	Doboš
Digital Image Communication Systems	3/3	Mihalík
Digital Proc. and Transmission of Speech and Audio	3/2	Juhár
Distributed Virtual Instrumentation	3/2	Michaeli
Photonics	3/2	Turán
Semestral Projects	0/5	Galajda

## RESEARCH AND PROJECTS

**Title of the Project:** *Digital Signal Processing, Transmission, Recognition and Protection in Multimedia Communications*

**Funding:** VEGA 1/1057/04

**Duration:** 2001-2003

**Co-ordinator:** Prof. Ing. Dušan Levický, CSc.

**Group members:** A. Čížmár, E. Matúš, S. Marchevský, D. Kocur, M. Drutarovský, J. Juhár, Ľ. Doboš, Z. Klenovičová, M. Gamcová, Ľ. Maceková, R. Hovančák, R. Ridzoň, S. Lihan, P. Foriš, J. Čížová, J. Krajňák, M. Pleva, M. Šimka, S. Šurin,

**Scientific goals/research targets:**

- ◆ Design of the new methods for image coding and digital image watermarking in information technologies for multimedia communications as well as new methods for message transmission by using steganography
- ◆ Verification of robustness watermarks in proposed methods
- ◆ Design of the new method of speech recognition in voice interactive dialog systems.
- ◆ Design of new methods of digital signal transmission by using CDMA and multi-user detection.
- ◆ Design of the new methods for digital image filtration from point of view digital image processing and image quality enhancement.

**Results Achieved:**

- ◆ Design of new method for digital watermarking of color image by using DWT and DCT and methods for multiembedding watermarks.
- ◆ Analysis selected types of attacks on digital watermarks and robustness of watermark techniques.
- ◆ Design of new methods for buiding up subliminal channels in steganography
- ◆ Design of new embedded architectures based on gates arrays for cryptography
- ◆ Design of new method of speech recognition and its implementation in interactive information system.
- ◆ Design new modifications of adaptive LMS filters for image filtering.
- ◆ Application of Volterra filters in estimators for DS-SS receivers multi-user detection.
- ◆ Analysis and design of the applications of non-linear filters (especially Volterra and microstatistic filters) for the narrowband, wideband and combined interference



cancellation in mobile communication system based on direct sequences spread spectrum systems.

- ◆ Design of time-invariant and LMS adaptive multi-channel microstatistic filters.

**Title of the Project: *Digital signal processing in secure communications and interactive telecommunication services***

Funding: Institutional grant

Duration: 2003-2005

Co-ordinator: Prof.Ing. Dušan Levický,CSc.

Group members: A. Čížmár, S. Marchevský, D. Kocur, M. Drutarovský, J. Juhár, L. Doboš, Z. Klenovičová, P. Foriš, M. Gamcová, Ľ. Maceková, J. Čížová, R. Hovančák, M. Grega, S. Lihan, L. Longauer, M. Pleva, R. Ridzoň, M. Šimka, S. Šurin

Scientific goals/research targets:

- ◆ Design of new methods in steganography for conceals the existence of message transmission.
- ◆ Design of new methods and hardware for data encryption.
- ◆ Design of new methods for speech recognition in interactive telecommunication services.
- ◆ Application of new approaches of i multi-user detection for communication systems based on CDMA.
- ◆ Design of new methods of digital watermarks implementation in multimedia.
- ◆ Design of new methods of digital image filtration.

Results Achieved:

- ◆ Designs of new methods for conceal the message existence in steganography by using CDMA.
- ◆ Design and verification of new type of random sequence generators for data encryption.
- ◆ Design of HVS models for digital image watermarking in transform domain.
- ◆ Design of new method of machine speech recognition for Slovak language based SpeechDat-Sk and analysis of proposed point of view implementation in interactive telecommunication services.
- ◆ Analysis of CDMA systems from point of view MUD.

**Title of the Project: *ICT networks and services convergency in communication infrastructure of SR***

Funding: S000095 / National programme for R&D "Building of information society"

Collaboration with: STU Bratislava, ŽU Žilina, VUS B. Bystrica

Duration: 2004-2005

Co-ordinator: doc. Ing. Ľubomír Doboš, CSc. (WP6)

Prof. Ing. Dušan Levický, CSc. (WP4, WP13)

Group members: M. Drutarovský, P. Foriš, R. Hovančák, R. Ridzoň, M. Šimka, S. Šurin

Scientific goals/research targets:

- ◆ The main objective of the project is research and development of telecommunication network and services for NGN in public and private telecommunication networks of SR.
  - ◆ WP4 : Data security analysis in NGN
  - ◆ WP6: R&D of NGN conception for SR infrastructure from point of view data security
  - ◆ WP13: Implementation of data security in NGN environment

Results Achieved:

- ◆ Analysis of methods for data security in NGN based on enciphering.
- ◆ Analysis of ownerships protection by using digital watermarking in NGN.

**Title of the Project: *Spoken Language Interaction in Telecommunication***

Funding: COST 278

Collaboration with: 29 academic and commercial research institutions from 18 European countries

Duration: 2001-2005

Co-ordinator: Prof. Ing. Anton Čižmár, CSc.

Group members: L. Doboš, J. Juhár, S. Lihan, D. Levický, M. Baboľ, J. Papaj, M. Pleva

Scientific goals/research targets:

- ◆ To improve the knowledge of the issues and problems involved in general in spoken language interaction in telecommunication.
- ◆ To achieve knowledge of issues related to robustness and multi-linguality within spoken language processing.
- ◆ To achieve knowledge of spoken language interaction in the context of multi-modal communication.

- ◆ To achieve knowledge of human-computer dialogue theories, models and systems and associated tools for the establishment of such systems.
- ◆ To achieve knowledge of and evaluate telecommunication applications that applies spoken language as one out of more input or output modalities.

Results Achieved:

- ◆ Initiation of Slovak language analysis for the purpose of automatic spoken language interaction in telecommunication services.
- ◆ Developing a reference automatic speech recognition system based on hidden Markov modelling and SpeechDat-Slovak database.
- ◆ Developing a reference spoken language dialogue system based on Galaxy II hub architecture and VoiceXML dialogue management.
- ◆ Developing an experimental automatic voice service "Departmental telephone numbers directory" based on VoiceXML accessible through PSTN.

**Title of the Project: *Towards Mobile Broadband Multimedia Networks***

Funding: COST 273

Collaboration with: academic and commercial research institutions and groups from 18 European countries

Duration: 2001-2005

Co-ordinator: doc. Ing. Ľubomír Doboš, CSc.

Group members: J. Juhár, A. Čižmár, M. Pleva, J. Goriš, J. Novikmec

Scientific goals/research targets:

The main objective of the Action is to increase the knowledge on the radio aspects of mobile broadband multimedia networks, by exploring and developing new methods, models, techniques, strategies and tools towards the implementation of 4th generation mobile communication systems. It will consider frequencies ranging from the upper UHF up to millimetre waves, and data rates higher than 2 Mb/s (probably up to 155 Mb/s).

It is also expected that the Action will contribute to the deployment of systems that are very close to completion of their standardisation phase, in particular UMTS and HIPERLAN 2.

Results Achieved:

- ◆ Analysis Medium Access Control protocol for wireless ATM.
- ◆ Design and simulation of new Call Admission Control algorithm for wireless ATM networks.
- ◆ Analysis and simulation OFDM technique for high speed mobile communications.

**Title of the Project: *Non-linear Speech Processing***

Funding: COST 277

Collaboration with: academic and commercial research institutions and groups from 15 European countries

Duration: 2001-2005

Co-ordinator: doc. Ing. Jozef Juhár, CSc.

Group members: D. Kocur, L. Doboš, A. Čižmár, S. Lihan, M. Lukáč, M. Pleva

Scientific goals/research targets:

- ◆ The ultimate objective of this Action is to improve the voice services in telecommunication systems through the development of new nonlinear speech processing techniques.
- ◆ The new technologies developed within the Action are to provide:
  - ◆ higher quality speech synthesis,
  - ◆ more efficient speech coding,
  - ◆ improved speech recognition, and
  - ◆ improved speaker identification and verification.
- ◆ The methods are expected:
  - ◆ to contribute significantly to the acceptance of voice interfaces for information systems such as the mobile Internet (by improved synthesis and recognition) and
  - ◆ to improve efficiency in future generations of speech coders used in wireless networks, including packet-based wireless networks.
- ◆ The Action intends to accomplish the stated goals by developing techniques based on nonlinear speech processing.

Results Achieved:

- ◆ A robust non-linear method for speech recognition in adverse environment has been studied with concentration on:
  - ◆ noise robust features extraction techniques,
  - ◆ noise immune auditory features and
  - ◆ noise-removal preprocessing techniques.

**Title of the Project: *Biometrics-Based Recognition of People over the Internet***

Funding: COST 275

Collaboration with: academic and commercial research institutions and groups from 13 European countries

Duration: 2001-2005

Co-ordinator: doc. Ing. Jozef Juhár, CSc.

Group members: L. Doboš, A. Čižmár, S. Lihan, M. Pleva, M. Kováč, D. Levický, P. Varchol

Scientific goals/research targets:

- ◆ The main objective of the Action is to investigate effective methods for the recognition of people over the Internet based on voice and facial characteristics in order to facilitate, protect, and promote various financial and other services over this growing telecommunication medium.
- ◆ The main objectives can be specified as follows.
- ◆ To improve knowledge of the issues and problems involved.
- ◆ To study the current techniques for voice and face recognition and to evaluate their performance in the medium considered.
- ◆ To investigate methods for the fusion of the considered biometric data and the interpretation of the results.
- ◆ To analyse the implementation problems including user-interface issues and investigate effective solutions.
- ◆ To identify the potential applications and analyse the requirements of these.
- ◆ To develop standard methods and tools for the assessment of biometrics-based identification methods.

Results Achieved:

- ◆ Preparation of a review of biometrics-based recognition of people over the Internet is being in progress with stress on:
  - ◆ speaker recognition, verification and identification algorithms,
  - ◆ development tools and toolkits, that can be used and
  - ◆ Voice over IP transmission techniques and protocols.

**Title of the Project: *Smart spoken language communication system***

Funding: S00034 / National programme for R&D "Building of information society"

Collaboration with: STU Bratislava, SAV Bratislava, ŽU Žilina

Duration: 2003-2005

Co-ordinator: doc. Ing. Jozef Juhár, CSc.

Group members: L. Doboš, A. Čížmár, D. Levický, S. Lihan, M. Pleva, M. Kováč, J. Papaj,  
M. Baboľ, M. Lukáč, S. Ondáš, M. Mirilovič, P. Varchol, J. Gamec, I.  
Gladišová

**Scientific goals/research targets:**

- ◆ The main objective of the project is research and development of a smart automated voice-interactive dialogue system, enabling the access to distributed information via conversational human-machine dialogue. The solution should have the the following main properties:
  - ◆ The dialogue system will enable spoken language interaction in Slovak.
  - ◆ Communication through PSTN, GSM and VoIP telecommunication network
  - ◆ The system will consists of I/O telephone unit, speech recognition unit, natural language understanding unit, dialogue management unit, natural language generation unit, speech synthesis module and module for communication with external database.
  - ◆ Open and modular architecture allowing further extensibility to other languages, modalities, and ability to modify them for different purposes.
  - ◆ The functionality of the system will be proved with minimal two pilot applications from two specific domains (e.g. telecommunications, traveling, ...).

**Title of the Project: *Spectrum and Power Efficient Broadband Communications***

Funding: COST 289

Collaboration with: 15 partners from university, research and industrial institutions from 10 European countries

Duration: 2003-2007

Co-ordinator: doc. Ing. Dušan Kocur, CSc.

Group members: M. Drutarovský, P. Galajda, S. Marchevský, J. Čížová, J. Krajňák, L.  
Longauer, I. Hrušovský, Ľ. Molent

Scientific goals/research targets:

- ◆ General Goal:
  - ◆ Design of new architectures of communication systems with intention to increase the capacity of communication systems within a specified transmission bandwidth with minimum available transmitter power, bearing in mind the cost effectiveness and the practical implementability of the system.
- ◆ Partial Goals:
  - ◆ Analysis of multiple access principles (e.g. CDMA, MC-CDMA, CC-CDMA, OFDM, etc.) with regard to design the 4G mobile communication systems and heterogeneous networks.
  - ◆ Design of sub-systems of the 4G mobile communication systems and heterogeneous networks, especially the multi-user receivers and interference canceller design.
  - ◆ Design of the software defined radio architectures, mapping selected the software defined radio blocks into the high performance FPGAs.

Results Achieved:

- ◆ The design of a new multi-user piece-wise linear CDMA receiver referred to microstatic multi-user CDMA receiver.
- ◆ The design of a optimum and sub-optimum microstatic multi-user CDMA receiver based on scanning method, genetic algorithm application and the method of input signal histogram analysis.
- ◆ The analysis of the performance properties of the microstatic multi-user CDMA receiver.
- ◆ The analysis of the performance properties of an adaptive blind multi-user MMSE CDMA receiver.
- ◆ The comparison of the performance properties of the microstatic and blind multi-user MMSE CDMA receivers.
- ◆ The analysis of the state of art in the field of MC-CDMA transmission systems.
- ◆ The analysis of the state of art in the field of software defined radio.
- ◆ The analysis of the state of art in the field of the 4th generation of the transmission systems (4G).

**Title of the Project: Enginetest**

Funding: industrial co-operation

Collaboration with: Medav GmbH (Germany)

Duration: 2004-2005

Co-ordinator: doc. Ing. Dušan Kocur, CSc.

Group members: M. Drutarovský, P. Galajda, I. Hroncová

Scientific goals/research targets:

- ◆ General Goal:
  - ◆ Development of methods for engine diagnostics based on advanced digital signal processing applications.

Results Achieved:

- ◆ Development of the knowledge database intent on engine diagnostics based on advanced digital signal processing applications.
- ◆ Development of the robust engine diagnostic method based on the application of order analysis and non-linear digital signal processing.

**Title of the Project: Packet-Oriented Service Delivery via Satellite**

Funding: COST 272

Collaboration with: 16 research and industrial institutions from European countries

Duration: 2001-2005

Co-ordinator: Prof. Ing. Stanislav Marchevský, CSc.

Group members: D. Kocur, M. Drutarovský, P. Galajda, M. Gamcová, L. Maceková, S. Benčo, L. Longauer, M. Grega,

Scientific goals/research targets:

- ◆ General Goal:
  - ◆ To contribute to the identification of key requirements, analysis, performance comparison, architectural design and protocol specification of future packet-oriented satellite communication systems, with a clear focus on Internet-type system concepts, applications and protocols/techniques on the various layers.
- ◆ Partial Goals:
  - ◆ the design of efficient receivers with low consumption for mobile terminals,
  - ◆ the design of low cost reconfigurable terminals
  - ◆ design and implementation multi-user detection receiver for CDMA signals from satellites,



- ◆ to identify suitable models integrating Internet services and worldwide communication
- ◆ to identify the tradeoffs between complexity and effectiveness for supporting QoS in multi-network environments using different media or networking technologies

Results Achieved:

- ◆ development of multi-user detection receivers for CDMA signals using FIR filters,
- ◆ development of multi-user detection receivers for CDMA signals using blind adaptive filtering,
- ◆ development of optimum and sub-optimum multi-user detection receivers for CDMA signals using microstatistic filtering,
- ◆ development of transport protocols for VoIP using satellite channels.

**Title of the Project: Embedded Architectures for Applied Cryptography**

Funding: French national research program ACI Cryptologie - the project CryptArchi

Collaboration with: academic institutions from France and USA

Duration: 2002-2004

Co-ordinator: doc. Ing. Miloš Drutarovský, CSc.

Group members: M. Drutarovský, D. Kravecová, M. Šimka

Scientific goals/research targets:

- ◆ General Goal:
    - ◆ Development of architectures for embedded cryptographic systems.
  - ◆ Partial Goals:
    - ◆ Evaluation of the possibilities of hardware/software co-design within different families of configurable logic devices - CPLDs, FPGAs.
    - ◆ Estimation of the possibilities of parallelism in hardware (pipeline structures) and in software (multiprocessors structures).
    - ◆ Development of the parameterised cryptographic functions adapted to implementation in reconfigurable devices (RSA, ECC, AES-Rijndael, SHA, TRNG, ...).
    - ◆ Adaptation of the existing algorithms for implementation in reconfigurable devices in order to obtain the best performance.
    - ◆ Measurement of the security and performance of the proposed systems.
    - ◆ Evaluation of the possibilities of side-channel attacks and finding a way how to increase the resistance of reconfigurable devices against this kind of attacks.
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**Results Achieved:**

- ◆ Design of new true random number generator (TRNG).
- ◆ Implemented parameterised TRNG IP block embedded in Altera CPLDs.
- ◆ Implemented scalable Montgomery multiplication coprocessor.

**Title of the Project: *The algorithms of standard videocodecs H.263 and MPEG-4*****Funding:** VEGA, 1/0384/03**Duration:** 2003-2005**Co-ordinator:** Prof. Ing Ján Mihalík, Ph.D.**Group members:** J. Zavacký, I. Gladišová, M. Dulina, V. Michalčín, R. Štefanišin, M. Kasár**Scientific goals/research targets:**

The research of algorithms of standard videocodecs H.263 and MPEG-4 for purpose of implementation of videocommunications and multimedia services in heterogenous telecommunication networks with very low bit rates. There are supposed new algorithms of vector quantization of video and texture of videoobjects in domain of DCT or wavelet transform. Next, effective algorithms of arithmetic encoding of binary shapes of videoobjects also chain coding their contour representations. Then precise algorithms of motion estimation with variable block size and mesh based with bilinear or affine transformation. Further, modelling and animation of human head on the basis of algorithms of its calibration, deformation, estimation three-dimensional motion and animation parameters, also generation and projection of its texture on wireframe model. Going on in morphing of the texture by using of algorithms of scatter data spline interpolation. Finally shape generalized DCT and wavelet representations of the texture of videoobjects.

**Title of the Project: *Methods for testing of unconventional analog-to-digital converters and reducing their uncertainty*****Funding:** VEGA, 1/9030/02**Duration:** 2002-2004**Co-ordinator:** Prof. Ing Linus Michaeli, DrSc.**Group members:** J. Šaliga, V. Pirč, P. Galajda, M. Kollár, P. Michalko, Ľ. Horniak, P. Mikulík**Scientific goals/research targets:**

- ◆ The global scientific goal is the improvement of the metrological parameters of systems converting the analogue signals to its digital representation. The effort of the

research performed will be focused on the following represent ants of interfacing blocks:

- ◆ Analogue to Digital Converter as a quantisator of one analogue input signal.
- ◆ Flip-flop switching sensor as the direct converters of physical quantity to digit.
- ◆ The common objective is the study of methods how to increase their accuracy and reliability and is split to following three areas.
- ◆ The first one is dedicated to simple user - friendly method for AD interface testing appropriate for implementation on Data Acquisition Boards and Analogue to Digital Converters for self-diagnostic. The link to the standardised testing approach is a complementary task.
- ◆ The second area is oriented on the digital signal processing methods for uncertainty reduction of Analogue to Digital Converters. Processing algorithm will be based on time redundancy in data acquisition and implementation of Volterra filters for enhancement of dynamic Analogue to Digital Converter resolution.
- ◆ Last one area is targeted to auto-compensative flip-flop sensor in a structure with high resistance to the parasitic EMI noise and environmental impact.

**Title of the Project: *Metrological Quality Enhancement of the Analog to Digital Interfaces by the Digital Signal Processing Methods***

Funding: VEGA, 1/2180/05

Duration: 2005-2007

Co-ordinator: Prof. Ing Linus Michaeli, DrSc.

Group members: J. Šaliga, V. Pirč, P. Galajda, M. Drutarovský, M. Kollár, P. Michalko, L. Horniak, Sz. Csernok, P. Cabúk, V. Frolek, P. Mikulík

Scientific goals/research targets:

- ◆ The project objective is the improvement of the metrological properties of the measuring system converting analogue signal to its digital representation. The research will be focused on the following represent ants of the analog-to-digital converters.
- ◆ Low passes analog-to digital converters.
- ◆ Sigma-delta converters of the selected parameters modulated in the high frequency signal or converters of measured physical quantity to the number.
- ◆ The common effort is the study of the testing methods in the end-user laboratories and methods enhancing their accuracy. The main research effort is spitted into three research areas:

- ◆ Fast ADC testing methods based on the known error model convenient for the testing of the DAQ boards and their traceability to the standardised approaches.
- ◆ Digital signal processing methods for ADC error reduction. The proposed algorithm will be utilised time redundancy in the data flux and implementation of the appropriate filters for dynamic resolution enhancement.
- ◆ Design of the methods for the band-pass sigma-delta ADC testing for demodulation of software radio signals and sigma delta structures for physical quantity sensors.

**Title of the Project: *Summer school on "Data Acquisition systems"***

Funding: SOCRATES (EUR 15000)

Collaboration with: Italy, Hungary, Czech Republic.

Duration: 2002-2004

Project coordinator: Prof. Ing Linus Michaeli, DrSc.

Group members: J. Šaliga, R. Holcer

Scientific goals/research targets:

The IP course is aimed on the preparation graduates in the hardware and software design of the Data Acquisition Systems integrated with the computerized information environment. It allows achieving the requirements of industrial partners for graduates skilled in the relevant field for the organisation according to TQM. The project meets needs of highly qualified graduates, able to work in multinational teams.

Results Achieved:

- ◆ Student's skills how to design Data Acquisition Systems using modern approaches from the area of information and communication technologies.
- ◆ Knowledge about metrological parameters of DAQ according to actual International standards and inform them about ambiguity of the interpretation among various producers.
- ◆ Student's skills in the simple testing methods for metrological parameter assessment coherent with ISO standards
- ◆ Production teaching materials for students and teacher related with Data Acquisition Systems.

**Title of the Project: *Fibre Optic Sensors***

Funding: Institutional grant, G - 4442

Duration: 2003-2005

Co-ordinator: Prof. RNDr. Ing Ján Turán, DrSc.

Group members: J. Gamec, R. Gaňová, P. Filo, P. Serfőző, Ľ. Ovseník, J. Študenc

Collaboration with:

- ◆ Prof. E.F. Carome, John Carrol University, Cleveland, USA

Scientific goals/research targets:

- ◆ Development *Fiber Optic Refractometer* remotely controlled through WWW.
- ◆ Development *Optically Powered Fiber Optic Sensor* with frequency output.
- ◆ *Multiplex* in optically powered fiber optic sensor.

Results Achieved:

- ◆ Fiber optic refractometer as:
  - ◆ laboratory equipment;
  - ◆ portable equipment;
  - ◆ monitoring equipment.
- ◆ GUI for refractometer control through WWW.
- ◆ Optically powered fiber optic sensory system with low power consumption.

**Title of the Project: Transform Systems for Digital Image Processing**

Funding: VEGA 1/0381/03

Duration: 2003-2005

Co-ordinator: Prof. RNDr. Ing Ján Turán, DrSc.

Group members: J. Gamec, R. Gaňová, P. Filo, P. Serfőző, Ľ. Ovseník, J. Študenc

Collaboration with:

- ◆ Prof. K. Fazekas, TUB, Budapest, Hungary
- ◆ Prof. A. Figueras and Prof. J. Cid-Sueiro, University Carlos III, Madrid, Spain
- ◆ Prof. J. Tasic, TU Ljubljana, Slovenia
- ◆ Prof. T. Adam, Technical University, Miskolc, Hungary
- ◆ Prof. M. Najim, University Bordeaux, France
- ◆ Prof. K. Skala, University Zagreb, Croatia
- ◆ Prof. M. Ansorge, University Neuchatel, Switzerland

**Scientific goals/research targets:**

- ◆ Development new methods for invariant feature selection based on hybridisation of fast translation invariant transforms (CT, RT and NT) with Radon or Hough Transform.
- ◆ Development, implementation and experimental verification of new invariant image recognition systems based on feature selection-using hybridisation of CT with Radon or Hough Transform.
- ◆ Study properties of Trace Transform and int application to image processing.
- ◆ Study new applications of Hough Transform (robust system identification, metrology problems and signal processing).

**Results Achieved:**

- ◆ Development new methods for invariant feature extraction based on CT, RT, NT, Radon and Hough Transform.
- ◆ New Continuous Kernel Hough Transform (CKHT) and its application to feature extraction and system parameters estimation.
- ◆ System parameters estimation tool based on CKHT.
- ◆ Motion estimation based on inverse rapid transforms.
- ◆ Invariant associative memory based on STIR transforms.
- ◆ 3D-object recognition system based on using RT for reflected acoustic waves analysis.
- ◆ Invariant image recognition systems based on hybridisation of RT, NT with Hough and Radon transform.

**Title of the Project: *Information and Knowledge Management for Integrated Media Communication*****Funding:** COST 276**Collaboration with:** France, Italy, Norway, Hungary, Spain, Slovenia (Project coordinator: Prof. J. Tasic, University of Ljubljana), Greece, Switzerland, Croatia, Czech Republic, Portugal, Romania, Turkey, Ireland.**Duration:** 2001-2005**Co-ordinator:** Prof. RNDr. Ing Ján Turán, DrSc.**Group members:** J. Gamec, R. Gaňová, P. Filo, P. Serfőző, L. Ovseník, J. Študenc**Scientific goals/research targets:**

- ◆ Development advanced multimedia data and knowledge management technologies for personal systems and services, including specific signal processing and implementation techniques.

**Results Achieved:**

The work is ongoing in Working Groups:

- ◆ WG.1: Multimedia information, knowledge management and data management;
- ◆ WG.2: Agent architectures for agent communication and agent mobility;
- ◆ WG.3: Technologies for user interface personalisation;
- ◆ WG.4: Dedicated advanced methods for signal, video, speech and sound processing and coding.
- ◆ Our research group will focus on development advanced methods for image processing based on the use of fast, linear and non-linear selected transforms (CT, RT, Hough, Radon, Trace, Mojette Transform) and GUI design for teleworking and teleeducation applications.

## EQUIPMENTS

### ***Teaching and Research Laboratories and Special Measuring Instruments and Equipment.***

<b><i>Laboratory</i></b>	<b><i>Equipment</i></b>
ATM Laboratory	ATM Laboratory Network, ATM Switch.
DSP Laboratory	<p>Development tools for Analog Devices digital signal processors ADSP218x, ADSP219x, ADSP21535 – Blackfin and ADSP21161 SIMD SHARC.</p> <p>Laboratory is supported by the Analog Devices University program (<a href="http://www.kemt.fei.tuke.sk/adsp">www.kemt.fei.tuke.sk/adsp</a>).</p> <p>Floating licences for Altera FPGA development tools, development kits UP-1, UP-3.</p> <p>Laboratory is supported by the Altera University program (<a href="http://www.kemt.fei.tuke.sk/fpga">www.kemt.fei.tuke.sk/fpga</a>).</p>
Laboratory of Measurement	<p>Laboratory of Measurement (Special precise measurement system for dynamic ADC testing. Testing stand is equipped by calibrated Stanford Research DS 360, Data acquisition system with software tools based on LabWindows/CVI for ADC parameter estimation according to IEEE 1057, IEEE 1241 Std). Data Acquisition Systems controlled by LabVIEW for laboratory and industrial virtual measurement based on Allan Bardley HW components.</p>
Laboratory of Embedded Microcontrollers	<p>Development tools for single chip Analog Devices ADuC 83x MicroConverters (Intel 8052 compatible), Microchip PIC microcontrollers, Cypress PSOC mixed-signal array microcontrollers, embedded Altera RISC soft processor NIOS II.</p>
Laboratory of Optoelectronics	Development tools for optical fibre communications training systems and optical desk with He-Ne laser.
Laboratory of TV System	Special TV system for teaching.
Laboratory of Microwave Technology	Development tools for microwave training systems.
Laboratory of Speech Technology for Telecommunications	Development tools for automatic speech recognition systems and automatic voice services in telecommunications and Internet.



## CO-OPERATION

### Co-operation in Slovakia

<i>Institution</i>	<i>Type of activity</i>
Slovak Telecom Bratislava	Research, Leonardo
Alcatel SEL Liptovský Hrádok	Leonardo
Siemens Software House Bratislava	Leonardo
Ericsson Slovakia	Leonardo
Telenor Slovakia	Leonardo
Alcatel Business System Bratislava	Leonardo
VSE, Košice	Research
Volkswagen Slovakia a.s.	Development and education
Slovak Academy of Science	Research and development

### International Co-operation

<i>Institution</i>	<i>Type of activity</i>
Alcatel SEL Stuttgart	Leonardo
Siemens Viena	Leonardo
UPC Barcelona	Leonardo
Politecnico di Torino	Leonardo
Loracom France Nancy	INCO/COPERNICUS
University of Catania Italy	INCO/COPERNICUS
University of Mining and Metallurgy Krakow	INCO/COPERNICUS, JOINT
MEDAV GmbH Germany	Bilateral Contract
Technical University Ilmenau Germany	SOCRATES
Technical University Budapest	COST
Technical University of Ljubljana	COST
Technical University of Delft	COST
Technical University of Cluj-Napoca	COST
University of Firenze Italy	COST
University of Gent	COST
University of Maribor	COST
INESC Lisabon	COST
University of Sannio Italy	Leonardo / SOCRATES
University of Calabria Italy	Leonardo / SOCRATES
University of Mediteranea Italy	SOCRATES
Universite Jean Monnet-Saint-Etienne France	SOCRATES
Universite Jean Monnet-Saint-Etienne France	CryptArchi
ŠkodaAuto Mladá Boleslav, Czech Republic	Bilateral Contract

## FACULTY ESSAYS

### **Čižmár Anton**

*Full professor*

His research interests include speech processing, data compression, digital communications, project management, telecommunication technologies and services.

### **Čížová Jana**

*Research assistant*

Her research interests include spread spectrum communication systems, CDMA systems, and multi-user detection receivers.

### **Doboš Ľubomír**

*Associated professor*

His current interests are in the linear adaptive digital filters, least Mean Square algorithms, QR decomposition and wireless communication systems (GSM, UMTS), wireless ATM and wireless LAN.

### **Drutarovský Miloš**

*Associated professor*

His research interests include applied cryptography, digital signal processing (digital filters and order spectral analysis), algorithms and architectures for embedded cryptographic architectures, digital signal processors, FPGAs and soft microcontrollers embedded into the FPGAs.

### **Galajda Pavol**

*Associated professor*

His research interest is in nonlinear circuit's theory, CHAOS in spread spectrum communication systems, Software Defined Radio (SDR) and programmable logic devices-ALTERA and FPGA circuits.

### **Gamec Ján**

*Assistant professor*

His general research interests include digital signal processing, block - matching algorithm and motion estimation.

### **Gamcová Mária**

*Assistant professor*

Her general research interests include one and two-dimensional processing based on the method of digital filtering.

### **Gladišová Iveta**

*Assistant professor*

Her research interests are in the digital signal processing, geometric source coding and vector quantization, an algorithm for lattice and pyramid quantizers and codes.

### **Hovančák Rastislav**

*Assistant professor*

His research interests are in the digital watermarking, multimedia communications and cryptography.

**Hroncová Ingrid***Research assistant*

Her professional area of interests is digital signal processing, digital speech processing, transform coding and metropolitan area networks.

**Juhár Jozef***Associated professor*

His research interests are in digital speech/audio processing and transmission, automatic speech/speaker recognition, speech synthesis, dialogue modelling and application of speech technologies in developing and deploying automatic voice services in telecommunications and Internet.

**Klenovičová Zita***Assistant professor*

Her research interests include digital circuits and digital picture processing.

**Kocur Dušan***Associated professor*

His research interest is in digital signal processing, spread spectrum communication systems, CDMA systems, adaptive linear and non-linear filters, polyspectral signal analysis and psychoacoustics.

**Levický Dušan***Full professor*

His main interests and activities are in the multimedia communications, cryptography and watermarking.

**Lihan Slavomír***Assistant professor*

His research interests are in digital speech processing and transmission, automatic speech/speaker recognition, speech synthesis, and application of speech technologies in automatic voice services in telecommunications..

**Maceková Ľudmila***Research assistant*

Her general research interest includes design and implementation algorithms for two and three-dimensional filters for image processing.

**Marchevský Stanislav***Full professor*

His main research interests are multidimensional digital filters, linear and non-linear digital filters for image processing, and design of multi-user detectors for CDMA signals from satellites.

**Michaeli Linus***Full professor*

His research interests are the pre-processing systems in the instrumentation, modelling of AD converters and methods for correction of their uncertainties.

**Mihalík Ján***Full professor*

His current research interest includes signal and information theory, image and video coding, digital image and video processing, application the techniques of coding and processing in the standard image and video codecs, finally multimedia videocommunications in PSTN, mobile, ISDN, ATM telecommunication networks and Internet on the basis of the standards.

**Ovseník Ľuboš***Assistant professor*

His general research interests include fiber optics, fiber optical sensors and the fiber optical application in the microwave domain.

**Šaliga Ján***Associated professor*

His general research interests include ADC testing, distributed measurement systems, measurement instruments, systems and methods.

**Špány Viktor***Professor Emeritus*

His main interests and activities are in the non-linear circuits theory, smart sensors, flip-flop sensors, integrated functional blocks and statistical sensors.

**Turán Ján***Full professor*

His main interests and activities are in the digital signal processing, Hough transform, rapid transform, fiber optics and its applications in communications, sensing and signal processing.

**Zavacký Jozef***Assistant professor*

His current interest includes signal and information theory, sampling of the one-dimensional and multidimensional signals.

## Ph.D. STUDENTS

<i>Name</i>	<i>Supervisor</i>	<i>Degree Course</i>
<b>First year of study</b>		
Čopjan Ľubomír	Marchevský	Telecommunications
Mirilovič Michal	Čižmár	Telecommunications
Ondáš Stanislav	Juhár	Telecommunications
Pavelka Pavol	Galajda	Electronics
Sochová Lenka	Michaeli	Measurement technique
Štofa Anton	Doboš	Telecommunications
Varchol Peter	Levický	Telecommunications
Cabúk Pavol (df.)	Michaeli	Measurement technique
Domaracký Marek (df.)	Levický	Telecommunications
Harčár Imrich (df.)	Šaliga	Measurement technique
Hrušovský Igor (df.)	Galajda	Electronics
Lipovský Štefan (df.)	Doboš	Telecommunications
Molent Ľubomír (df.)	Galajda	Electronics
Šoltés Adrián (df.)	Turán	Electronics
<b>Second year of study</b>		
Gaňová Renáta	Turán	Electronics
Kasár Miroslav	Mihalík	Telecommunications
Krajňák Jozef	Kocur	Electronics
Ridzoň Radovan	Levický	Telecommunications
Baboľ Miroslav (df.)	Čižmár	Telecommunications
Fedor Stanislav (df.)	Doboš	Telecommunications
Kačír Miloš (df.)	Doboš	Telecommunications
Lukáč Martin (df.)	Juhár	Telecommunications
Študenc Jozef (df.)	Turán	Electronics
<b>Third year of study</b>		
Filo Peter	Turán	Electronics
Floriš Peter	Levický	Telecommunications
Grega Marián	Marchevský	Telecommunications
Michalko Peter	Michaeli	Measurement technique
Šimka Martin	Drutarovský	Electronics
Csernok Szabolcz (df.)	Michaeli	Measurement technique
Florek Vladimír (df.)	Michaeli	Measurement technique
Homolya Viktor (df.)	Juhár	Telecommunications
Kravecová Daniela (df.)	Drutarovský	Telecommunications
Siman Roman (df.)	Doboš	Telecommunications
Zlacký Marián (df.)	Doboš	Telecommunications
<b>Fourth year of study</b>		
Štefanišin Radoslav	Mihalík	Telecommunications
Šurin Stanislav	Levický	Telecommunications
Gamcová Mária (df.)	Marchevský	Telecommunications
Gebeová Gyongyike (df.)	Čižmár	Telecommunications
Kováč Miloš (df.)	Juhár	Telecommunications
Krivda Marián (df.)	Levický	Electronics

Mohamoud Ali Omer (df.)	Doboš	Telecommunications
Novikmec Jozef (df.)	Doboš	Telecommunications
Papaj Ján (df.)	Čižmár	Telecommunications
Pillár Slavomír (df.)	Marchevský	Telecommunications
Švač Pavol (df.)	Kocur	Electronics
<b>Fifth year of study</b>		
Goriš Jozef (df.)	Doboš	Telecommunications
Chochol Peter (df.)	Marchevský	Telecommunications
Mihalčík Ladislav (df.)	Marchevský	Electronics

## MEMBERS

- Čižmár Anton**, Member of Technical Standardization Commission No.41 for Telecommunications in Slovakia.
- Čižmár Anton**, Member IEEE Affiliate Computer Society, No. 41237162
- Čižmár Anton**, Member of AES (Audio Engineering Society), New York, I.D. 44 154.
- Doboš Ľubomír**, Member of Technical Standardization Commission No.80 for Radiocommunications in Slovakia.
- Galajda Pavol**, Member of the editorial board of the journal "Radioengineering".
- Juhár Jozef**, Member of the Audio Engineering Society, New York, I.D. 44164
- Juhár Jozef**, Member of Technical Standardization Commission No.55 for Electroacoustics and ultrasound in Slovakia.
- Kocur Dušan**, Chairman of the editorial board of the journal "Acta Electrotechnica et Informatica".
- Kocur Dušan**, Member of the editorial board of the journal "Acta Polytechnica Hungarica".
- Levický Dušan**, Member of the editorial board "Radioengineering".
- Levický Dušan**, Member of the IEEE.
- Levický Dušan**, Member of Czech and Slovak Radioelectronics Society.
- Levický Dušan**, Scientific Grant Agency of Slovak Republic.
- Marchevský Stanislav**, Member of the Scientific Board Military Academy, Liptovský Mikuláš.
- Marchevský Stanislav**, Member of Technical Standardization Commission No. 60, Sound, Image and Audiovideo Equipment and Systems in Slovakia.
- Marchevský Stanislav**, Member of Scientific Board of Faculty of Environmental and Manufacturing Technology, Technical University of Zvolen.
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## PUBLICATION ACTIVITY OF THE DEPARTMENT

### **Books:**

1. Mihalík,J.-Závacký,J.-Gladišová,I.: Signály a systavy (Návody na cvičenia). FEI TU Košice, 2004, ISBN 80-8073-138-1, pp. 0-241.
2. Michaeli,L.-Šaliga,J.: Data Acquisition Systems. Textbook Summer school on DAQ. Technical University of Košice, 2004, pp.0-263.

### **Textbooks:**

1. Michaeli,L.: ADC Modelling for Fast Testing and Error Suppression. 4<sup>th</sup> Summer School on Data Acquisition Systems. TU Košice, 2004, M-2-1/M2-25.
2. Michaeli,L.: Theory of SC Circuits. 4<sup>th</sup> Summer School on „Data Acquisition Systems, TU Košice, 2004, M-3-1/M-3-9.
3. Michaeli,L.: Signal Conditional Blocs for DAQ, 4<sup>th</sup> Summer School on „Data Acquisition Systems, Košice TU, 2004, p1-21.
4. Šaliga,J.: Introduction to Analogue-to Digital Converters Testing. 4<sup>th</sup> Summer School on Data Acquisition Systems, TU Košice, 2004, pp.1-19.
5. Šaliga,J.: Modular DAQ Systems and Interfaces. 4<sup>th</sup> Summer School on Data Acquisition Systems, TU Košice, 2004, pp.1-30.
6. Šaliga,J.: Modular DAQ. 4<sup>th</sup> Summer School, TU Košice, 2004.
7. Šaliga,J.: Definition of Basic ADC Parameters. 4<sup>th</sup> Summer School, TU Košice, 2004.
8. Šaliga,J.: Introduction to Analogue-to-Digital Converters Testing. 4<sup>th</sup> Summer School on Data Acquisition Systems, TU Košice, 2004.
9. Šaliga,J.: ADC Static Test Method. 4<sup>th</sup> Summer School on Data Acquisition Systems, TU Košice, 2004.
10. Šaliga,J.: ADC Sine-Wave Histogram Test Method. 4<sup>th</sup> Summer School on Data Acquisition Systems, TU Košice, 2004.
11. Šaliga,J.: ADC Dynamic Test Method. 4<sup>th</sup> Summer School, TU Košice, 2004.

### **Journal Papers:**

1. Bojkovic,Z.-Turán,J.-Samcovic,A.-Ovseník,L.: Coding, Streaming and Watermarking – Some Principles in Multimedia Signal Processing. Acta Electrotechnica et Informatica, No.3, Vol. 4, 2004, ISSN 1335-8243, pp. 13-20.
2. Drutarovský,M.-Šimka,M.: Custom FPGA Cryptographic Blocks for Reconfigurable Embedded NIOS Processor. Acta Electrotechnica et Informatica, Vol. 4, No. 2, 2004, pp.33-39.
3. Gamcová,M.-Marchevský,S.-Gamec,J.: Higher Efficiency of Motion Estimation Methods. Radioengineering, Vol.13, No.4, 2004, ISSN 1210-2512, pp.58-64.
4. Hovančák,R.-Levický,D.: Digital Image Watermarking in Color Models Using DCT Transformation. Radioengineering, April 2004, Vol.13, Num.1, ISSN 1210-2512, pp.22-25.



5. Kocur,D.-Čížová,J.-Marchevský,S.: Microstatistic Multi-User Detection Receiver. Journal of Advanced Computational Intelligence and Intelligent Informatics, Vol.8, No.5, Sept.2004, pp.482-487.
6. Levický,D.-Foriš,P.: Human Visual System Models in Digital Image Watermarking. Radioengineering, Vol.13, No.4, 2004, ISSN 1210-2512, pp.38-43.
7. Longauer,L.-Marchevský,S.-Kocur,D.: BAMUD Features Demonstration by System View. Radioengineering, Vol.13, No.3, 2004, ISSN 1210-2512, pp.47-52.
8. Maceková,L.-Marchevský,S.: A New Image and Video Quality Criterion. Acta electrotechnica et Informatica, Vol.4, No.2, 2004, ISSN 1335-8243, pp.15-19.
9. Mihalík,J.-Michalčin,V.: 3D Motion Estimation and Texturing of Human Head Model. Radioengineering, April 2004, Vol.13, No.1, ISSN 1210-2512, pp.26-31.
10. Mihalík,J.-Michalčin,V.: Texturing of Surface of 3D Human Head Model. Radioengineering, Vol.13, No.4, 2004, ISSN 1210-2512, pp.44-47.
11. Mihalík,J.-Štefanišin,R.: Algoritmy kvantovania štandardných videokodekov. Acta Electrotechnica et informatica, No.1, Vol.4, 2004, ISSN 1335-8243, pp.47-54.
12. Michaeli,L.: Testovanie automatizovaných meracích systémov. Časopis pre elektrotechniku a energetiku. Vol.10, No.2, 2004, ISSN 1335-2547, pp.31-33, ALCATEL Slovakia. a.s. Liptovský Hrádok.
13. Pleva,M.-Juhár,J.-Čížmár,A.: Vývoj a evaluácia multilingválnej databázy pre systémy automatickej transkripcie správ elektronických médií. (About development and evaluation of multilingual database for automatic broadcast news transcription systems). Acta Electrotechnica et Informatica, Vol.4, No.2, 2004, ISSN 1335-8243, pp. 56-59.
14. Turán,J.-Ovseník,L.: Fiber Optic Refractometer Instrument Used for Measurement Practicing in Applied Photonics Multimedia Courseware. Electronics Vol.8, No.1, May 2004, ISSN 1450-5843, pp.37-40.
15. Turán,J.-Ovseník,L.-Benča,M.-Turán,J.jr.: Implementation of CT and IHT Processors for Invariant Object Recognition System. Radioengineering, Vol, 13, No.4, 2004, ISSN 1210-2512, pp.65-71.
16. Turán,J.-Ovseník,L.-Turán,J. jr.: Invariant Pattern Recognition System Using RT and GMDH. Acta Electrotechnica et Informatica, No.2, Vol.4, 2004, ISSN 1335-8243, pp. 5-10.

#### **Conference papers:**

1. Čížová,J.: Performance of the Microstatistic Multi-User Receiver in the Base-Band DS-CDMA Transmission System. Budapest, Hungary, 7-9 July 2004. (on CD)
2. Čížová,J.-Longauer,L.-Marchevský,S.-Kocur,D : MSF – MUD and BA - MUD Receivers: Principles and Comparison. Proceedings of Second IEEE International Conference on Computational Cybernetics, Vienna, Austria, 2004, pp. 453-457, ISBN 3-902463-02-3, pp.453-457.
3. Čížová,J.: Microstatistic Multi-User Receiver with Determining Decomposer Threshold Values by Genetic Algorithm. Zborník zo IV. Doktorandskej konferencie a ŠVOS TU v Košiciach FEI, 13.5.2004,TU FEI v Košiciach, ISBN 80-968395-9-4, pp.21-22.
4. Čížová,J.-Kocur,D.-Marchevský,S.: Performance of the Microstatistic Multi-User Receiver for the Pass-Band DS-CDMA Transmission System. Zborník zo

- 6.medzinárodnej konferencie Nové trendy v rozvoji letectva, Letecká elektrotechnika, Košice, 9-19.9.2004, Košice, Slovakia, ISBN 80-7166-050-7, pp.9-14.
5. De Vito,L.-Michaeli,L.-Rapuano,S.: Non linearity Correction of ADCs in Software Radio Systems Proceedings of 9<sup>th</sup> International Workshop on „ADC Modeling and Testing“ IWADC'2004, Athens, Greece, Sept.29-Oct.1, 2004, ISBN 960-254-645-X, pp.887-891.
  6. Doboš,L'-Gladišová,I.-Juhár,J.-Čižmár,A.: Methodology for Dialog Design of Slovak Telephone Based Railway. ICETA 2004, 3rd International Conference on Emerging Telecom. Technologies and Applications, Košice, Slovakia, 16-18.sept.2004, ISBN 80-89066-85-2, pp.111-118.
  7. Drutarovský,M.-Fischer,V.: Implementation of a 3-D Switching Median Filtering Scheme with an Adaptive LUM- Based Noise Detector. Proceedings of 14<sup>th</sup> International Conference Field-Programmable Logic and Applications - FPL 2004, Antwerp, Belgium, August 30 - September 1, 2004, LNCS 3203, Springer, Berlin, pp.1146-1148.
  8. Drutarovský,M-Fischer,V.-Šimka,M.: Comparison of Two Implementations of Scalable Montgomery Coprocessor Embedded in Reconfigurable Hardware. Proceedings of the XIX Conference on Design of Circuits and Integrated Systems, DCIS 2004, Bordeaux, France, November 24-26, 2004, pp.240-245.
  9. Juhár,J.-Lihan,S.-Žgank,A.-Kačič,Z.-Diehl,F.-Vicsi,K.-Szaszak,G.: The COST 278 MASPER Initiative-Cross lingual Speech Recognition with Large Telephone Databases. Proceedings of the 4th International Conference on Language Recourses and Evaluation. Lisbon, Portugal, May 26-28, 2004, Vol.VI, ISBN 2-9517408-1-6, pp.2107-2110.
  10. Filo,P.: Non-Linear System Parameter Estimation Based on CKHT. Zborník zo IV. Doktorandskej konferencie a ŠVOS TU v Košiciach FEI, May 13, 2004, ISBN 80-968395-9-4, pp.27-28.
  11. Fischer,V.-Drutarovský,M.-Šimka,M.-Celle,F.: Simple PLL-Based True Random Number Generator for Embedded Digital Systems. Proceedings of the 7<sup>th</sup> IEEE Design and Diagnostics of Electronic Circuits and System Workshop. Stara Lesná, Slovakia, April 18-21, 2004, ISBN 80-969117-9-1, pp.129-136.
  12. Fischer,V.-Drutarovský,M.-Šimka,M.-Bochard,N.: High Performance True Random Number Generator in Altera Stratix FPLDs. Proceedings of 14<sup>th</sup> International Conference Field-Programmable Logic and Applications - FPL 2004, Antwerp, Belgium, August 30 - September 1, 2004, LNCS 3203, Springer, Berlin, pp.555-564.
  13. Foriš,P.: DCT-Domain Watermarking Technique for Still Images Using HVS Models. Zborník zo IV. Doktorandskej konferencie FEI TU Košice, 13.5.2004, Košice, Slovakia, ISBN 80-968395-9-4, pp.29-30.
  14. Galajda,P.-Galajda,P.jr.: Реформирование образования и обучения в Словацкой республике и дорога в Европейскую унию в свете европейских интеграционных процессов. International Scientific Conference, August 22-27, 2004. Vysoké Tatry-Slovakia. Москва, Изд-во РУДН, Россия, ISBN 5-209-022479-2, pp.21-27.
  15. Galajda,P.: Reformy vzdelávania v Slovenskej Republike v svete európskych integračných procesov. Medzinárodná vedecká konferencia: „Vzdelávanie, veda a ekonomika na vysokých školách“, Vysoké Tatry, Slovakia, August 22.-27, 2004.

16. Gáňová,G.: Invariant associative Image memory based on trace transform. Zborník zo IV. Doktorandskej konferencie a ŠVOS, FEI TU Košice, Slovakia 13.5.2004, ISBN 80-968395-9-4, pp.31-32.
17. Grega,M.-Marchevský,S.-Kocur,D.: Paketovo orientované služby poskytované cez satelit. COFAX-Telekomunikácie 2004. Zborník prednášok, Bratislava,19-20.4.2004, ISBN 80-967019-6-7, pp.113-116.
18. Grega,M.: Propagation Modelling of Satellite Communication Systems. Zborník zo IV.Doktorandskej konferencie a ŠVOS FEI TU v Košiciach, 13.5.2004, Košice, Slovakia, ISBN 80-968395-9-4, pp.37-38.
19. Hovančák,R.-Foriš,P.-Levický,D.: Digital Image Watermarking based on HVS Model. Radioelektronika 2004, 27.-28.04.2004, Bratislava, Slovakia, ISBN 80-227-2017-8, pp.166-169.
20. Hovančák,R.-Levický,D.: Digital Image Watermarking in different Colour Models. 2nd Slovakian-Hungarian Joint Symposium on Applied Machine Intelligence, Herľany, Slovakia, January 16.-17, 2004, ISBN 963 715423X, pp.251-257.
21. Juhár,J.-Čižmár,A.-Hintoš,L.: Speech-Enabled Information Services. Proceedings of 5th International Carpathian Control Conference ICCS 2004. Zakopane, Poland, May 25-28, 2004. Krakow, Poland, Vol.5, No.1, ISBN 83-89772-00-0, pp.837-842.
22. Juhár,J.-Čižmár,A.-Pleva,M.-Lihan,S.: Building Intelligent Speech Communication Interface On Various Architectures. ICETA 2004, Information and Telecommunications Technologies in Education, Košice, Slovakia, 16-18.9.2004, ISBN 80-89066-85-2, pp.135-137.
23. Kasár,M.: Principal component analysis of images. Zborník zo IV. Doktorandskej konferencie a ŠVOS, FEI TU Košice, 13.5.2004, Košice, Slovakia, ISBN 80-968395-9-4, pp.57-58.
24. Kocur,D.-Košč,P.: E-portál pre e-vzdelávanie na Technickej univerzite v Košiciach. DIVAI 2004 - aplikovaná informatika. Univerzita Konštantína filozofa v Nitre. Nitra, 20.5.2004.
25. Kocur,D.-Benčo,S.-Košč,P.: Implementácia e-learning na TU Košice a systém zabezpečenia kvality kurzov. BELCOM '04 - Building Effective Learning Communities. Praha, 2.-3.2.2004. Publikácia na CD nosiči.
26. Košč,P.-Sinay,J.-Kocur,D.-Benčo,S.: Institutional Implementation of e-Learning Technologies in Higher Education. The 3rd International Conference on Emerging Telecommunications Technologies and Applications (ICETA'2004). September 16-18, 2004, Košice.
27. Krajňák,J.: Maximum Likelihood Receiver for DS-CDMA systems. Zborník IV. Doktorandskej konferencie a ŠVOS, 13.5.2004, FEI TU Košice, Slovakia, ISBN 80-968395-9-4, pp.63-64.
28. Krajňák,J.-Kocur,D.: Multi Carrier modulations: Basics and Fundamentals. Zborník 6.medzinárodnej konferencie Nové trendy v rozvoji letectva, Letecká elektrotechnika, Košice, Slovakia, 9.9.2004, ISBN 80-7166-050-7, pp.15-19.
29. Levický,D.-Foriš,P.: A New Perceptual Watermarking Method for Still Images in DCT-Domain. RTT 2004 Communication with future, 2004, Český ráj, ČTU Praha 6, Czech Republic, September 15-17, 2004, 2004 (on CD)

30. Levický,D.-Foriš,P.-Klenovičová,Z.-Šurin,S.: Súčasný stav a perspektívy využitia digitálnych vodoznakov. COFAX-Telekomunikácie 2004, Zborník prednášok, Bratislava, Slovakia D&D Studio,s.r.o., 19.-20.4.2004, ISBN 80-967019-6-7, pp.165-168.
31. Lihan,S.-Juhár,J.-Čižmár,A.: Implementácia hlasom ovládanej služby „telefónny zoznam.In. Komunikácia v optických systémoch. CIOS 2004, Bratislava, Slovakia, 3.2.2004, Internetova stránka:www.inteziva.sk/sk/multicast., pp.1-4.
32. Longauer,L.: CDMA spreading PN sequences. Zborník IV. Doktorandskej konferencie a ŠVOS, 13.5.2004, FEI TU Košice, Slovakia, ISBN 80-968395-9-4, pp.73-74.
33. Michalčín,V.: 3D global motion estimation of human head by using optical flow. Zborník zo IV. Doktorandskej konferencie a ŠVOS, 13.5.2004, FEI TU Košice, Slovakia, ISBN 80-968395-9-4, pp.75-76.
34. Michalko,P.: ADC Integral Nonlinearity Estimation by Harmonic Analysis. Zborník zo IV. Doktorandskej konferencie a ŠVOS, 13.5.2004, FEI TU Košice, Slovakia, ISBN 80-968395-9-4, pp.77-78.
35. Michaeli,L.-Šaliga,J.-Holcer,R.: Noise influence on exponential histogram ADC test, Proceedings of 9<sup>th</sup> International Workshop on „ADC Modelling and Testing“ IWADC'2004, Athens, Greece, Sept.29-Oct.1, 2004, ISBN 960-254-645-X, pp.824-829.
36. Michaeli,L.-Šaliga,J.-Serra,C.-da Silva,M.-Ramos,P.: Fast ADC Testing by Spectral and Histogram. IMTC2004 Instrumentation and Measurement Technology Conference, Como, Italy, 18-20 May 2004, ISBN 0-7803-8248-X/04, pp.823-828.
37. Ovseník,L.-Turán,J.-Tihamér,A.: Zapojenia opticky napájaného senzorového systému. Optické komunikácie 2004, Prague, Czech Republic, October 21-22, 2004, ISBN 80-86742-06-7, pp.127-136.
38. Palkov,J.-Kmec,M.: Meranie kapacít na čípe s využitím preklápacieho obvodu (On Chip Capacitance Measurement Based on the Use of a Flip-Flop Circuit). Microwave and Technology 2004, September 13-14, Košice, Slovakia, pp. 30-32.
39. Pavelka,P.-Bertheas,V.-Fischer,V.-Fresse,V.: Adaptation of Altera Stratix DSP Board for real-time stereoscopic image processing. Proceedings of the XIX Conference on Design of Circuits and Integrated Systems, DCIS 2004, Bordeaux, France, November 24-26, 2004, pp.392-396.
40. Pleva,M.: Building European Broadcast News Database. Zborník zo IV. Doktorandskej konferencie a ŠVOS, FEI TU Košice, 13.5.2004, ISBN 968395-9-4, pp.85-86.
41. Pleva,M.-Čižmár,A.: The COST278 pan-European Broadcast News Database. LREC 2004, International Conference, 26-28 May 2004, Portugal, Lisbon, Proceedings Vol.VI76, ISBN 2-9517408-1-6, pp.873-876.
42. Serra,A.C.-Da Silva,M.F.-Ramos,P.-Michaeli,L.-Šaliga,J.: Fast ADC Testing by Spectral and Histogram Analysis, Proceedings of 21<sup>st</sup> IEEE Instrumentation and Measurement Technology Conference, IMTC/2004, Como, Italy, 18-20 May, 2004, ISBN 0-7803-8248-X/04, pp.823-828.
43. Ridzoň,R.-Foriš,P.-Klenovičová,Z.: Útoky na digitálne vodoznaky. COFAX-Telekomunikácie 2004, Zborník prednášok, D&D, Bratislava, Slovakia, 19-20.4.2004, ISBN 80-967019-6-7, pp.313-314.

44. Ridzoň,R.-Levický,D.-Klenovičová,Z.: Attacks on Watermarks and Adjusting PSNR for Watermarks. Radioelektronika 2004, 27-28.04.04, Bratislava, Slovakia, ISBN 80-227-2017-8, pp.374-377.
45. Ridzoň,R.: Adaptive Approach of Quality Metric in Digital Watermarking. Zborník zo IV. Doktorandskej konferencie a ŠVOS, FEI TU Košice, 13.5.2004, Košice, Slovakia, ISBN 80-968395-9-4, pp. 89-90.
46. Serfőző,P.-Sallai,K.-Turán,J.: Development Watermarking test Bench Tool Based on Mojette Transform. ICC'2004, 5th International Carpathian Control Conference, Zakopane, Poland, May 25,28, 2004, ISBN 83-89772-00-0, pp.323-328.
47. Serfőző,P.: Development programme package for computing the Mojette transform. Zborník zo IV. Doktorandskej konferencie a ŠVOC, FEI TU Košice, 13.5.2004, Košice, Slovakia, ISBN 80-968395-9-4, pp.93-94.
48. Sinay,J.-Košč,P.-Benčo,S.-Kocur,D.: Implementácia e-vzdelávacích (e-learningových) technológií do výučby na TU v Košiciach. E-learn Žilina 3.-4.2.2004. Žilinská univerzita v Žiline, EDIS, 2004, pp. 225-229.
49. Sinay,J.-Kocur,D.-Košč,P.-Benčo,S.: Experiences with e-Learning Implementation at the Technical University of Košice. Proceedings of The 5th International Conference Information Technology Based Higher Education and Training 2004 (ITHET 2004), Istanbul, Turkey, May 31-Jun 2, 2004.
50. Šaliga,J.-Michaeli,L.-Holcer,R.: Noise Influence On Exponential Histogram ADC Test. IMEKO TC4, Technical Committee on Measurement of Electrical Quantities, Athens, Greece, 2004, ISBN 960-254-645-X, pp.824-829.
51. Šimka,M.: Testing True Random Number Generators Used in Cryptography. Zborník zo IV. Doktorandskej konferencie a ŠVOS, FEI TU v Košiciach, 13.5.2004, Košice, Slovakia, ISBN 80-968395-9-4, pp.95-96.
52. Šiškovičová,D.-Turán,J.: Object Parameter Estimation System Using Zernike Moments. Radioelektronika 2004, 27.-28.04.2004, Bratislava, Slovakia, ISBN 80-227-2017-8, pp.120-123.
53. Štefanišin,R.: Variable size block matching motion estimation algorithm. Zborník zo IV. Doktorandskej konferencie a ŠVOS, 13.5.2004, FEI TU Košice, Slovakia, ISBN 80-968395-9-4, pp.101-102.
54. Štefanišin,R.-Mihalík,J.: Hierarchická estimácia pohybu vo videosekvencii. Zborník z vedeckej konferencie Nové smery v spracovaní signálov VII. Tatranské Zruby, Slovakia, 12-14.5.2004, VA Liptovský Mikuláš, Slovakia, ISBN 80-8040-232-9, pp.3-7.
55. Študenc,J.: System for Invariant feature selection based on Trace Transform. Zborník zo IV. Doktorandskej konferencie a ŠVOS, FEI TU Košice, 13.5.2004, Košice, Slovakia, ISBN 80-068395-9-4, pp.103-104.
56. Šurin,S.-Hovančák,R.-Ridzoň,R.: Moderné metódy steganografie. COFAX-Telekomunikácie, Zborník prednášok, D&D Bratislava, Slovakia. 19-20.04.04, ISBN 80-967019-6-7, pp.317-318.
57. Šurin,S.: Self-Encoded Spread Spectrum Communications. IV. Doktorandská konferencia a ŠVOS, Zborník z konferencie a súťaže, Košice, Slovakia, 13.5.2004, ISBN 80-968395-9-4, pp. 107-108.

58. Turán,J.-Ovseník,L.-Turán,J,jr.-Fazekaš,K.: Multimedia Modules in Web-controlled Applied Photonics Laboratory. 6th COST 276 Workshop, Thessaloniki, Greece, May 6-7, 2004, ISBN 960-88136-0-3, pp.117-121.
59. Turán,J.-Ovseník,L.-Turán,J,jr.-Fazekaš,K.: Design Web-Controlled Multimedia Laboratory. Proceedings ELMAR-2004, 14th International Symposium Electronics in Marine, Zadar, Croatia, 16-18 June, 2004, ISSN 1334-2630, pp.154-159.
60. Turán,J.-Ovseník,L.-Benča,M.-Filo,P.: VHDL Implementation of CT Processor. 11th International Workshop on System, Signals and Image Processing, IWSSIP'04, Poznań, Poland, September 13-15, 2004, ISBN 83-906074-8-4, pp.175-178.
61. Turán,J.-Ovseník,L.-Turán,J,jr.-Fazekas,K.: Web-Based Laboratories in the Applied Photonics Multimedia Distance Education Courseware. MIPRO 2004, 27th International Convention, Opatija, Croatia, May 24-28, 2004, pp.218-221.
62. Turán,J.-Filo,P.-Ovseník,L.-Fazekas,K.: Software Tool for Trace Transform Image Processing. 7th COST 276 Workshops, Ankara, Turkey, November 4-5, 2004. (on CD)
63. Turán,J.-Ovseník,L.: Multimedia Courseware: Teaching and Modelling Digital and Analogue Fiber Optical Networks. POSTEL2004 - XXII Symposium on new technologies in postal and telecommunication traffic, Beograd, Serbia, December 7-8, 2004, pp. 185-194.
64. Turán,J.-Ovseník,L.: Web-Based Laboratories in the Distance Education Courseware. COFAX-Telekomunikácie 2004, Zborník prednášok, 19-20.04.2004, 10.medzinárodná vedecká konferencia, Bratislava, Slovakia, ISBN 80-967019-6-7, pp.319-320.
65. Turán,J.-Filo,P.: Continuous Kernel High Transform as a System Parameter Identification Tool. Radioelektronika 2004, Bratislava, 27-28.4.2004, ISBN 80-227-2017-8, pp.116-119.
66. Turán,J.-Ovseník,L.: Development of an Optically Powered Sensory System (Vývoj opticky napájaného senzového systému). Mikrovlnová a bezdrôtová technika 2004, Košice, Slovakia, 13-14.10.2004, Vol.2, ISBN 80-88922-87-9, pp.94-98.
67. Vandecasteyne,A.-Martens,J.P.-Neto,J.-Meinedo,H.-Mateo,C.G.-Dieguez,J.-Mihelic,F.-Zibert,J.-Nouza,J.-David,P.-Pleva,M.-Čižmár,A.-Papageorgiou,H.-Alexandris,Ch.: The COST278 pan-European Broadcast News Database. Proceedings LREC 2004. ELRA-European Language Resources Association. Lisbon, ISBN/ISSN: 2-9517408-1-6, pp.873-876.

### **Thesis**

1. Benča,M.: Možnosti technickej realizácie invariantných systémov na rozpoznávanie obrazov. PhD. diz. práca FEI TU Košice, Slovakia, December 2003, pp. 1-82 (in Slovak).
2. Farkaš,P.: Houghova transformácia so spojitým transformačným jadrom a jej využitie vo vybraných aplikáciách. PhD. diz. práca FEI TU Košice, Slovakia, December 2003, pp. 1-91 (in Slovak).

### **Other**

1. Drutarovský, M.: ANOVIS Fault Engine Detection: An Algorithm for Automatic Detection of "Hydraulischer Ventilspiel Ausgleich (HVA) 3. Zylinder Fehlt".Research report 9/2004 under the Enginetest contract No. 2004 0417 for Medav GmbH, Germany, Spetember 2004, pp.1-24.

2. Juhár,J.-Čižmár,A.: IRKR project – Smart Speech Interactive System. 7th MCM COST 278, Mons, Belgium. January 18-21, 2004, <http://cost278.org/meetings>.
3. Lihan,S.-Juhár,J.-Čižmár,A.: Implementácia hlasom ovládanej služby „telefónny zoznam.In. Komunikácia v optických systémoch. CIOS 2004, Bratislava, Slovakia, 3.2.2004, Internetova stránka:[www.inteziva.sk/sk/multicast](http://www.inteziva.sk/sk/multicast)., pp.1-4.
4. Michaeli,L.-Šaliga,J.: 4th Summer School on „Data Acquisition Systems. TU Košice, 2004, pp.0-184.
5. Šaliga,J.-Michaeli,L.: 4th Summer School on Data Acquisition Systems. TU Košice, 2004.Michaeli,L.-Šaliga,J.: 4<sup>th</sup> Summer School on „Data Acquisition Systems. TU Košice, 2004, pp.0-184.

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