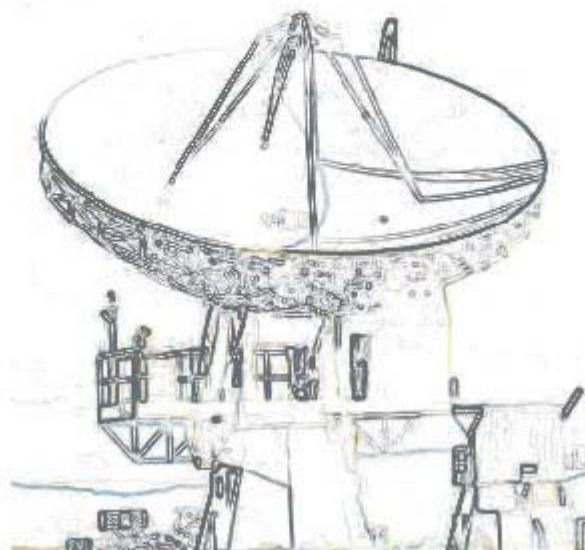

DEPARTMENT OF ELECTRONICS AND MULTIMEDIA TELECOMMUNICATIONS

Department Of
Electronics
& Multimedia Communications



Annual Report
2008

Technical University of Košice
Faculty of Electrical Engineering and Informatics

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

DEPARTMENT OF ELECTRONICS AND
MULTIMEDIA TELECOMMUNICATIONS

ANNUAL REPORT 2008

Edited by Ľuboš Ovseník

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1 DEPARTMENT PROFILE

1.1 Brief overview

The Department of Electronics and Multimedia Communications was founded in 1969. The original name of department was Department of Electronics. The Department offers three types of full-time courses:

Bachelor's Degree course lasts in normal way 3 years and is leading to degree Bc. The graduates get more-or-less practical skills in mastering

- ◆ Automotive electronics,
- ◆ Electronics,
- ◆ Telecommunications.

Master's Degree course lasts in normal way 2 years and is leading to degree Ing. The graduates get theoretical and practical skills in specialization

- ◆ Infoelectronics,
- ◆ Multimedia telecommunications.

Doctoral Study course lasts in normal way 3 years and is leading to degree PhD. The graduates get erudition in scientific areas

- ◆ Infoelectronics,
- ◆ Telecommunications,
- ◆ Measurement Techniques.

The subjects in the degree courses are orientated to the linear and non-linear analogue circuits, automotive electronics and diagnostic of cars, digital electronics, microwave technology, optoelectronics, signal and systems, acoustics, digital signal processing, digital filtering, signal processors and microcontrollers, electronic measurement systems, 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, A/D convertors modelling and testing.

1.2 Department staff and structure

Total number of staff members is 25.

- ◆ Professors: Anton Čižmár, Dušan Kocur, Dušan Levický, Stanislav Marchevský, Ján Mihalík, Linus Michaeli, Viktor Špány, Ján Turán
- ◆ Associate Professors: Ľubomír Doboš, Miloš Drutarovský, Pavol Galajda, Jozef Juhár, Ľuboš Ovseník, Ján Šaliga
- ◆ Assistant Professors: Mária Gamcová, Ján Gamec, Iveta Gladišová, Zita Klenovičová, Stanislav Ondáš, Radovan Ridzoň, Jozef Zavacký

- ◆ Research Assistant: Jozef Krajňák, Ľudmila Maceková, Michal Mirilovič, Ján Papaj, Matúš Pleva

- ◆ Support staff: Ing Juraj Aksamit, Božena Marchevská, Milan Peška, Viera Šumáková

2 DIVISIONS OF THE DEPARTMENT

2.1 Teaching and research laboratories

Laboratory of Multimedia Communications

Head: Professor: prof. Ing. Dušan Levický, CSc., Member of the IEEE
phone: +421-55-6335692, 6022029 e-mail: Dusan.Levicky@tuke.sk
fax: +421-55-636323989

Professor: Dr.h.c. prof. Ing. Anton Čižmár, CSc., Member of the IEEE, Member of the AES
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Associated professor: doc. Ing. Ľubomír Doboš, CSc.
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Associated professor: doc. Ing. Jozef Juhár, PhD., Member of the ISCA
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Assistant professor: Ing. Zita Klenovičová, CSc.
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Assistant professor: Ing. Stanislav Ondáš
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Assistant professor: Ing. Radovan Ridzoň, PhD.
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Research Assistant: Ing. Michal Mirilovič
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Research Assistant: Ing. Ján Papaj
phone: +421-55-6022298 e-mail: Jan.Papaj@tuke.sk

Research Assistant: Ing. Matúš Pleva
phone: +421-55-6022334 e-mail: Matus.Pleva@tuke.sk

Laboratory of Digital Signal Processing and Satellite Communications

Head: Professor: prof. Ing. Stanislav Marchevský, CSc.
Phone: +421-55-6022030 e-mail: Stanislav.Marchevsky@tuke.sk

Professor: prof. Ing. Dušan Kocur, CSc.
Phone: +421-55-6024233 e-mail: Dusan.Kocur@tuke.sk

Associated professor: doc. Ing. Miloš Drutarovský, CSc.
Phone: +421-55-6024169 e-mail: Milos.Drutarovsky@tuke.sk

Assistant professor: Ing. Mária Gamcová, PhD.
Phone: +421-55-6024180 e-mail: Maria.Gamcova@tuke.sk

Research Assistant: Ing. Ľudmila Maceková, PhD.
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Laboratory of Digital Image Processing and Videocommunication

<http://www.tuke.sk/fei-ldipv/>

Head: Professor: prof. Ing. Ján Mihalík, CSc.

Phone: +421-55-6022854

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Assistant professor: Ing. Jozef Zavacký, CSc.

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Assistant professor: Ing. Iveta Gladišová, CSc.

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Laboratory of Optoelectronic Communications

Head: Professor: prof. RNDr. Ing. Ján Turán, DrSc., Senior Member of the IEEE

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Associated professor: doc. Ing. Ľuboš Ovseník, PhD.

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Assistant professor: Ing. Ján Gamec, CSc.

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e-mail: Jan.Gamec@tuke.sk

Laboratory of Electronic Circuits & Measurement

Head: Professor: prof. Ing. Linus Michaeli, DrSc., Member of the IEEE

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Professor emeritus: prof. Ing. Viktor Špány, DrSc.

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Associated professor: doc. Ing. Ján Šaliga, CSc.

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Associated professor: doc. Ing. Pavol Galajda, CSc.

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e-mail: Pavol.Galajda@tuke.sk

2.2 Special laboratories and equipments

Laboratory of measurement is equipped by various analog and digital electronic instrumentations, data acquisition cards, computers and software as follows:

- Analogue and digital oscilloscopes by Tektronix, Hameg etc.,
- Spectral analyzers up to 3GHz,
- Network analyser R&S upto 3GHz,
- Various generators by Agilent, Stanford Research, Panasonic, Metex, etc.,
- Multimeters by. Agilent, Metex, Unitest, etc.,
- Logic analyzer Philips,
- Measurement system PXI by National Instruments,
- Multifunction data acquisition cards by National Instruments up to 2MHz and 18 bits,
- Communication cards and modules by National Instruments, e.g. GPIB, CAN, RS488, etc.,
- Department site license of all software by National Instruments (LabVIEW, LabWindows, SignalExpress, etc.),
- Special test stand (hardware and software) for analog-to-digital converters and interfaces testing up to 18 bits,
- Many other instrumentations, educational and research stands, and equipment for Bc. Ms. and PhD students.

Laboratory of communication technologies and advanced digital signal processing

- Advanced measurement equipments:
 - ◆ UWB m-sequence radar,
 - ◆ Anritsu MG3700A vector signal generator,
 - ◆ Tektronix digital storage oscilloscopes,
 - ◆ Agilent logic analyzer,
 - ◆ WiFi 802.11a/b/g link.
- Video and audio processing equipments:
 - ◆ Handycam SONY DCR SR 290,
 - ◆ 3CCD HDD camera Everio for HDD recording,
 - ◆ computer INTEL Pentium IV with satellite card STAR for reception and recording of packet oriented services and transmission of video-streams into IP networks,
 - ◆ satellite Dreambox receiver supported by computer with Linux operating system,
 - ◆ satellite receiver with 125cm parabola antenna and DISEC motor, combined DVB-S and DVB-T receiver,
 - ◆ GPS receivers ASUS, large plasma SAMSUNG display with 108 cm diagonal,
 - ◆ Pioneer sound laboratory system with recording and reproducing capabilities.
- Computers:
 - ◆ 4-core application DELL server,
 - ◆ 11 PC Pentium IV computers (2,8 GHz, HDD 200GB) and 10x 17''-LCD monitors.
- Software tools and development boards:
 - ◆ SystemView and IT ++ simulation software,
 - ◆ CAD-CAE development tools for FPGA Mentor Graphics (26 licenses) and Altera; FPGAs (16 licenses),
 - ◆ development tools for Analog Devices Blackfin DSPs (16 licenses),
 - ◆ Altera FPGA development boards:
 - 1x UP-1 basic development board for Altera FLEX10K FPGA family,
 - 2x UP-3 basic development board for Altera Cyclone FPAG family,

- 1x NIOS II development board for synthetic 32-bit soft processors in Altera Cyclone FPGAs,
- 1x Stratix DSP development kit for testing and development DSP algorithms in Stratix FPGA, support for analog signal processing up to 100 MHz , integrated AD and DA converter; 1xCyclone II DSP development kit with video input daughtercard for testing and development of video signals in Cyclone II FPGA.
- ◆ Analog Devices Blackfin DSP development boards:
 - 8x development board EZ-KIT 533 600 MHz with Analog Devices signal processor Blackfin ADSP21533,
 - 2x development board EZ-KIT 561 600 MHz with Analog Devices signal processor Blackfin ADSP21561,
 - 5x development board EZ-KIT 535 350 MHz signal processor Analog Devices Blackfin ADSP21535,
 - 2x extender for video signal processing with Blackfin DSPs; 1x HS-USB Emulator for Blackfin DSPs.
- ◆ Development boards for 32-bit Freescale microcontrollers:
 - 10 x development board of 32-bit microcontroller Freescale M52233DEMO with ColdFire V2 core and integrated Ethernet communication interface,
 - 2 x development board Freescale M5329EVB with ColdFire V3 core and cryptographic coprocessor.
- ◆ Freescale development tools for RadioFrequency (RF) ZigBee networks:
 - 1x 1321xNSK: Freescale Network Starter Kit with highly integrated chips (CPU + RF), external emulation interface,
 - 8x ZigBee RF interface with integrated 2.4 GHz antenna and SPI interface.
- ◆ Development tools for 8-bitové microcontrollers:
 - 7x development boards based on Analog Devices ADuC83x microconverters with embedded 16 a 24-bits AD converters.

Laboratory of optoelectronics

- Microwave measuring bench for cm waves with klystron power,
- Fiber optic education system,
- Fiber optic power meter,
- Fiber optic refractometer,
- Optically powered system,
- Optical bench with HeNe laser.

Laboratory of multimedia and network security

- Server (PC Pentium IV, 2.8 GHz, HDD 200GB),
- Switch (24 port Signamax),
- Wifi 802.11a/b/g Access Point (Asus WL 520g),
- 12 x PC Pentium IV (2,8 GHz, HDD 200GB, Windows/Linux),
- 13 x 17"-LCD monitors, LCD TV Samsung 40" Full HD,
- 6x Web cameras,
- 6x Cisco routers 1841,
- Videoconferencing system Eagle,
- Magio box.

Laboratory of speech technologies in telecommunications

- Telecommunication server, equipped with 12 port Dialogic D120JCT, three GSM gateways, Skype box, SIP Linksys Gateway a PSTN link,
- Telecommunication workstation with 4 port Dialogic D40JCT card,
- Smart speech telecommunication interface for research and development in the spoken language dialogue domain (prototype),
- Application server for research and development in the domain of speech and language technologies (XEON 2GB RAM, 2TB HDD, OS Debian Linux),
- Web and FTP server department of KEMT (OS Linux, 1GB RAM, 1TB HDD, kemt.fei.tuke.sk),
- MediaServer (cooperation with TV cable company S-team, recording of broadcast TV news corpus KEMT-BN, R+TV),
- CorpusServer (DVB-T, speech data recording, text data collecting),
- Collection of „opensource“ and own software tools for research and development of speech and language technologies,
- Speech and text corpuses,
- PC workstations (6 pcs) and notebooks (6 pcs).

3 TEACHING

3.1 Courses

Bachelor Degree Course (title Bc.) –Automotive electronics

The Bachelor degree course is orientated into the field of Automotive electronics into the basic automotive electronics systems. The students achieve good skills in automotive electrical measurement, automotive electronics components, digital electronics and digital signal processing.

Bachelor Degree Course (title Bc.) –Electronics

The Bachelor degree course is orientated into the field of Electronics into the basic electronics systems. The students achieve good skills in electrical measurement, electronics components, linear and non-linear circuits, digital electronics, microprocessors and signal processors and optoelectronics.

Bachelor Degree Course (title Bc.) –Telecommunications

The Bachelor degree course is orientated into the field of 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.) – Infoelectronics

The Master degree course is oriented into the field of Infoelectronics 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.

Master Degree Course (title Ing.) – Multimedia telecommunications

The Master degree course is oriented into the field of Multimedia telecommunications the students have been achieve good skills in digital communication and transmission systems, mobile and satellite communications, optoelectronics communication systems and multimedia communication.

Ph.D. Degree Courses (title Ph.D.) – Infoelectronics

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.

3.2 List of subjects taught

3.2.1 Study plan for Bc. degree

Undergraduate Study (Bc.) – Automotive Electronics

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Basics of electronics	2 nd	3/2	Micheali,
Circuit theory	3 rd	3/2	Kocur
Signals and systems	3 rd	3/2	Mihalík, Zavacký
Digital electronics	3 rd	3/3	Levický
Programming environments for electronics and communications	3 rd	1/2	Drutarovský, Šaliga
Electronic measurement systems	4 th	2/2	Šaliga
Electroacoustics	4 th	3/2	Juhár
FPGA circuits	4 th	2/2	Drutarovský, Galajda
CAD in electronics	4 th	2/2	Galajda
Microelectronics	4 th	3/2	Michaeli
Electromagnetic waves and antennas	4 th	3/2	Ovseník
Analog filters	4 th	3/2	Gamcová
Intelligent communication systems and networks	5 th	3/2	Marchevský
Semestral projects	5 th	0/3	Galajda
Automotive electronics	5 th	3/2	Gamec
Microprocessor technology	5 th	3/2	Drutarovský
High frequency and microwave technology	5 th	3/2	Gamec
Videocommunications	5 th	2/2	Mihalík
Bachelor work	6 th	0/4	Galajda
Automotive embedded systems	6 th	3/2	Drutarovský
Signal processing in technical diagnostics	6 th	3/2	Kocur
Active and passive safety systems	6 th	3/2	Gamec
Optoelectronic systems	6 th	3/2	Turán
Smart measurement systems	6 th	2/2	Šaliga
Satellite technology and services	6 th	3/2	Marchevský
Mobile networks and services	6 th	3/2	Doboš,

Undergraduate Study (Bc.) – Electronics

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Basics of electronics	2 nd	3/2	Micheali,
Circuit theory	3 rd	3/2	Kocur
Signals and systems	3 rd	3/2	Mihalík, Zavacký
Digital electronics	3 rd	3/3	Levický
Programming environments for electronics and communications	3 rd	1/2	Drutarovský, Šaliga
Electronic measurement systems	4 th	2/2	Šaliga
Microelectronics	4 th	3/2	Michaeli
Electroacoustics	4 th	3/2	Juhár
Electromagnetic waves and antennas	4 th	3/2	Ovseník
FPGA circuits	4 th	2/2	Drutarovský, Galajda
CAD in electronics	4 th	3/2	Galajda
Analog filters	4 th	3/2	Gamcová
High frequency and microwave technology	5 th	3/2	Gamec
Semestral projects	5 th	0/2	Galajda
Microprocessors technology	5 th	3/2	Drutarovský
Videocommunications	5 th	2/2	Mihalík
Automotive electronics	5 th	3/2	Gamec

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Bachelor work	6 th	0/4	Galajda
Optoelectronic systems	6 th	3/2	Turán
Smart measurement systems	6 th	2/2	Šaliga
Mobile networks and services	6 th	3/2	Doboš
Satellite technology and services	6 th	3/2	Marchevský
Signal processing in technical diagnostics	6 th	3/2	Kocur
Active and passive safety systems	6 th	3/2	Gamec

Undergraduate Study (Bc.) – Telecommunications

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Basics of electronics	2 nd	3/2	Micheali,
Circuit theory	3 rd	3/2	Kocur
Signals and systems	3 rd	3/2	Mihalík, Zavacký
Digital electronics	3 rd	3/3	Levický
Programming environments for electronics and communications	3 rd	1/2	Drutarovský, Šaliga
Electronic measurement systems	4 th	2/2	Šaliga
Electromagnetic waves and antennas	4 th	3/2	Ovseník
Introduction to telecommunication	4 th	3/2	Levický
Microelectronics	4 th	3/2	Michaeli
Electroacoustics	4 th	3/2	Juhár
FPGA circuits	4 th	2/2	Drutarovský, Galajda
Analog filters	4 th	3/2	Gamcová
Semestral projects	5 th	0/3	Galajda
Switching technology	5 th	3/2	Marchevský
Networks architecture	5 th	3/2	Čižmár
Access networks	5 th	3/2	Marchevský, Maceková
High frequency and microwave technology	5 th	3/2	Gamec
Microprocessor technology	5 th	3/2	Drutarovský
Videocommunications	5 th	2/2	Mihalík
Mobile networks and services	6 th	3/2	Doboš
Bachelor work	6 th	0/4	Galajda
Satellite technology and services	6 th	3/2	Marchevský
Network security	6 th	3/2	Levický
Optoelectronic systems	6 th	3/2	Turán
Smart measurement systems	6 th	2/2	Šaliga

3.2.2 Study plan for MSc. degree

Graduate Study (Ing.) – Infoelectronics

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Digital signal processing	1 th	3/2	Mihalík
Programmable logic Devices	1 th	2/2	Drutarovský, Galajda
Optoelectronics	1 th	2/2	Turán
Signal processors	1 th	3/2	Drutarovský
Theory of electromagnetic field	1 th	2/2	Gamec
Semestral projects	2 nd	0/3	Galajda
Microwave circuits and systems	2 nd	3/2	Gamec
Digital image processing and coding	2 nd	3/2	Mihalík
Processing and transmission of speech and audio	2 nd	3/2	Juhár
Optical communication systems	2 nd	3/2	Turán

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Digital filters	2 nd	3/2	Kocur
Applied cryptography	2 nd	3/2	Levický
Multimedia database	2 nd	3/2	Juhár
Digital television	3 rd	3/2	Marchevský
Photonics	3 rd	3/2	Turán
Multimedia technologies	3 rd	3/2	Levický
Master thesis	3 rd	0/5	Galajda
Vehicle diagnostics systems	3 rd	3/2	Galajda
Medical electronics	3 rd	3/2	Michaeli
Mobile communications	3 rd	3/2	Doboš
Satellite communications	3 rd	3/2	Marchevský
Project management	4 th	0/2	Marchevský
Master thesis	4 th	0/18	Galajda

Graduate Study (Ing.) – Multimedia telecommunications

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Digital signal processing	1 th	3/2	Mihalík
Switching system	1 th	3/2	Marchevský, Maceková
Optoelectronics	1 th	3/2	Turán
Communication channel modelling	1 th	3/2	Kocur
Theory of electromagnetic field	1 th	2/2	Gamec
Semestral projects	2 nd	0/3	Galajda
Communications systems theory	2 nd	3/2	Čížmár
NGN networks	2 nd	3/2	Doboš
Optical communication systems	2 nd	3/2	Turán
Processing and transmission of speech and audio	2 nd	3/2	Juhár
Digital filters	2 nd	3/2	Kocur
Applied cryptography	2 nd	3/2	Levický
Multimedia database	2 nd	2/2	Juhár
Spread-spectrum communication systems	3 rd	3/2	Kocur
Multimedia technologies	3 rd	3/2	Levický
Mobile communications	3 rd	3/2	Doboš
Satellite communications	3 rd	3/2	Marchevský
Master thesis	3 rd	0/5	Galajda
Photonics	3 rd	3/2	Turán
Digital television	3 rd	3/2	Marchevský
Interactive telecommunication systems and services	3 rd	3/2	Juhár
Project management	4 th	0/2	Marchevský
Master thesis	4 th	0/18	Galajda

3.2.3 Study plan for Ph.D. degree

Graduate Study (PhD.) – Telecommunications

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Communication system theory	1 th	0/2	
Foreign language	1 th	0/2	
Research project I.	1 th	0/2	
Foreign language	2 nd	0/2	
Advanced communication technology	2 nd	0/2	
Research project II.	2 nd	0/2	

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Specialization subject	3 rd	0/2	
Research work	3 rd	0/8	
Research project III.	3 rd	0/4	
Research work	4 th	0/8	
Research project IV.	4 th	0/2	
Research work	5 th	0/12	
Research project V.	5 th	0/2	
Thesis - Research work	5 th	0/9	

Graduate Study (PhD.) – Infoelectronics

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Theory of infoelectronics	1 th	0/2	
Foreign language	1 th	0/2	
Research project I.	1 th	0/2	
Foreign language	2 nd	0/2	
Infoelectronics systems	2 nd	0/2	
Research project II.	2 nd	0/2	
Specialization subject	3 rd	0/2	
Research work	3 rd	0/8	
Research project III.	3 rd	0/4	
Research work	4 th	0/8	
Research project IV.	4 th	0/2	
Research work	5 th	0/12	
Research project V.	5 th	0/2	
Thesis - Research work	5 th	0/9	

Graduate Study (PhD.) – Measurement technique

Subject	Semester	Lectures/exercises (hours per week)	Name of Lecturer
Topics from mathematics and physics	1 th	0/2	
Foreign language	1 th	0/2	
Research project I.	1 th	0/2	
Foreign language	2 nd	0/2	
Measure theory	2 nd	0/2	
Research project II.	2 nd	0/2	
Specialization subject	3 rd	0/2	
Research work	3 rd	0/8	
Research project III.	3 rd	0/4	
Research work	4 th	0/8	
Research project IV.	4 th	0/2	
Research work	5 th	0/12	
Research project V.	5 th	0/2	
Thesis - Research work	5 th	0/9	

4 RESEARCH AND PROJECTS

4.1 International scientific projects

Title of the Project: *Cross-Modal Analysis of Audio and Video Signals*

Funding: MVTS COST2102/07 (Cross-Modal Analysis of Verbal and Non-verbal Communication)

Collaboration: 160 partners from universities, research and industrial institutions from 30 European countries and from Canada and Japan.

Duration: 2006-2010

Co-ordinator on TUKE: prof. Ing. A. Čižmár, PhD.

Group members: J. Juhár, L. Doboš, M. Pleva, S. Ondáš, M. Mirilovič, M. Katrák, M. Papco, M. Lojka, L. Macková, J. Papaj

Scientific goals/research targets:

◆ The main objective of the action is:

The main objective of the Action is to develop an advanced acoustical, perceptual and psychological analysis of verbal and non-verbal communication signals originating in spontaneous face-to-face interaction, in order to identify algorithms and automatic procedures capable of identifying human emotional states. Several key aspects will be considered, such as the integration of the developed algorithms and procedures for application in telecommunication, and for the recognition of emotional states, gestures, speech and facial expressions, in anticipation of the implementation of intelligent avatars and interactive dialogue systems that could be exploited to improve user access to future telecommunication services.

◆ This COST Action is organized around three Working Groups as follows.

WG1:

- ◆ Task 1: Cross-modal analysis of audio and video.
- ◆ Task 2: Data analysis and feature correlations.

WG2:

- ◆ Task 3: Cultural differences and individual and socio-cultural variations.
- ◆ Task 4: Emotional states.

WG3:

- ◆ Task 5: Video and audio relationships synthesis and recognition.
- ◆ Task 6: Data encoding and definition of an extended MPEG-7 standard annotation.

Title of the Project: *Pervasive Mobile & Ambient Wireless Communications*

Funding: COST 2100

Collaboration: 56 partners from universities, research and industrial institutions from 26 European countries and from Canada and Japan.

Duration: 2006-2010

Co-ordinator on TUKE: doc. Ing. Lubomír Doboš, PhD.

Group members: A. Čižmár, J. Juhár, J. Papaj, M. Pleva, P. Patlevič, J. Ratica, S. Ondáš

Scientific goals/research targets:

◆ The main objective of the action is:

To increase knowledge of mobile and wireless network technologies by exploring and developing new methods, models, techniques, strategies and tools that will facilitate the implementation of next generation mobile radio communication systems and that will foster the development of the paradigms of pervasive and ambient wireless communications.

◆ This COST Action is organized around three Working Groups (WGs), dealing respectively with propagation and antenna issues, physical layer (i.e. mainly modulation and signal processing) aspects, and radio network aspects, as follows.

- ◆ WG1 – Transmission Techniques and Signal Processing
- ◆ WG2 – Radio Channel
- ◆ WG3 – Radio Network Aspects

Title of the Project: *High Altitude Platforms (HAPs) for Communications and Other Services*

Funding: COST 297

Collaboration with: 17 partners from university, research and industrial institutions

Duration: 2006-2009

Co-ordinator: doc. Ing. Pavol Galajda, CSc.

Group members: S. Marchevský, D. Kocur, M. Drutarovský, Ľ. Maceková, Ľ. Čopjan, P. Pavelka, H. Pabubová, J. Krajňák, J. Krahulec

Scientific goals/research targets:

The work is ongoing in Working Groups:

- ◆ WG1 Radio Communication Aspects. This group deals with wireless communication services (including backhaul aspects) based upon HAPs.
- ◆ WG2 Optical Communication Aspects. This group deals with free-space optical communication links and services to and from HAPs.
- ◆ WG3 Aerial Platform Developments. This group deals with development of HAP vehicles themselves, in the context of application for communication services, including control, telecommand, telemetry, critical HAP sub-systems, HAP navigation, and HAP operation.
- ◆ Our research group is focused on the tasks of working group no. 1. (WG1) such as Software Defined Radio, multi-carrier systems, multiple-access techniques, multi-user detection and interference suppression techniques in wireless communication services based on HAPs.
- ◆ Partial Goals:
 - ◆ The analysis of the state of art of channel modelling for communications from High Altitude Platforms.
 - ◆ The analysis of the models of high power amplifier nonlinearities in OFDM systems, power amplifier linearization and predistortion schemes for HAP applications.
 - ◆ The application of software defined radio for HAP systems.

Title of the Project: *Mainstreaming on Ambient Intelligence (MonAMI)*

Funding: EU 6th Framework Programme, IST (Information Society Technologies) Strategic Objective: eInclusion, Contract number: 035147

Duration: September 2006- September 2010

Co-ordinator: Swedish Institute of Assistive Technology (SIAT)

TUKE contractor: prof. Ing. Dušan Šimšík, PhD.

Project partners: 14 university and industry partners from seven EU countries

Work tasks leaders: P. Galajda, A. Galajdová, M. Drutarovský

Scientific goals/research targets:

The objective of the MonAMI project is to demonstrate that accessible, useful services for elderly and disabled persons living at home can be delivered in mainstream systems and platforms. This will be done in close cooperation with users and by involving key mainstream actors throughout the whole process.

The technology platforms to deliver the services will be derived from standard technology. They will integrate elements such as reliable self-organizing networks, wearable devices, and user interaction technology, monitoring capability and service infrastructures that ensure quality of service, reliability and privacy. The services will be delivered on mainstream devices such as digital-TV, third-generation mobile telephones and broadband Internet. To facilitate use and user interaction, MonAMI will develop an innovative wired and wireless interface.

The overall MonAMI project objectives are:

- ◆ *Comfort applications*: home control, personalized communication interface, activity planning
- ◆ *Health*: monitoring, medication
- ◆ *Safety and security*: safety at home, visitor validation, activity detection
- ◆ *Communication and information*

Research targets and results achieved at the Department:

- ◆ Investigation on specific standards that allow for control of most home automation (HA) applications (1- wire wiring standard and ZigBee wireless standard).
- ◆ Design and implementation of 1- wire sensor network for HA applications.
- ◆ Design of electronic modules for monitoring and control of HA sensors and actuators based on 1-wire bus standard.
- ◆ The 1-wire realization of humidity and temperature sensor modules, valve actuator module, module of movement detection, smoke detector, detector of fire and flights of gas and module for regulation of illumination according to the level of ambient luminosity.

Title of the Project: *Ultra Wideband Radio application for localisation of hidden people and detection of unauthorised objects*Acronym: RADIOTECTFunding: 6FP, Contract N° 032744Collaboration: Technische Universität Ilmenau (Germany), Meodat Meßtechnik (Germany), Geozondas Ltd. (Lithuania), Ingenieur Büro Ralf Klukas (Germany), Vrije Universiteit Brussel (Belgium), Technische Universiteit Delft (Netherlands), Statens Rådningssverk (Sweden), Crabbe Consulting Ltd. (Germany)Duration: January 1, 2007- June 30, 2009Co-ordinator: prof. Ing. Dušan Kocur, CSc.Group members: M. Drutarovský, J. Rovňáková, M. Švecová, M. Aftanas, P. Galajda, S. Marchevský, I. Hroncová, J. Gamec, M. GamcováScientific goals/research targets:

- ◆ **General Goal:**
Development of UWB radar systems with enhancing ability to detect and locate: **(1)** criminals including terrorists obscured from view e.g. behind walls, **(2)** trapped people after accidents or catastrophes and **(3)** unlawful objects hidden under clothes, including non-metallic.
- ◆ **Responsibility of RADIOTECT team from Technical University of Košice :**
 - ◆ Development of signal processing methods for through wall detection and localisation of moving persons.
 - ◆ Development of signal processing methods for through wall imagining of a room or building interior.

Results Achieved:

- ◆ The proposal of new method for through wall moving person detection and tracking based on a trace estimation method consisting of the following phases of UWB radar signal processing: (1) raw radar data pre-processing, (2) background subtraction, (3) post-processing of radargram with subtracted background, (4) distributed target detection, (5) simple target detection -trace estimation, (6) target localization, (7) wall effect compensation and (8) target tracking itself.
- ◆ The proposal of new method for through wall moving person detection and tracking based on an imaging method consisting of the following phases of UWB radar signal processing: (1) raw radar data pre-processing, (2) background subtraction, (3) post-processing of radargram with subtracted background, (4) data fusion from two antennas by imaging method, (5) distributed target detection by two-stage 2D-(N,k) detection, (6) simple target detection and localization, (7) wall effect compensation and (8) target tracking itself.

- ◆ Design of a new adaptive method of background subtraction based on motion detector application.
- ◆ Design of a new method of the target trace estimation based on the principal curve theory.
- ◆ Design of a new method of post-processing of radargram with subtracted background based on normalization and non-linear filtering.
- ◆ Design of a new distributed target detection by two-stage 2D-(N,k) detector.
- ◆ The design of a new effective and fast method of estimation of wall parameters (permittivity, permeability, conductivity and thickness) based on UWB radar measurement.
- ◆ Design of a new method of wall effect compensation improving the target position estimation.
- ◆ Design of Kalman filter applications for through wall target tracking.
- ◆ Design of a new simple two-stage tracking filter for through wall target tracking.
- ◆ Analyses of the performance properties of the proposed approaches for through wall target tracking based on processing of UWB radar signals obtained at measurement campaign held at Swedish Rescue Services Agency Center at Rosersberg (Sweden).
- ◆ Analyses of the robustness of the particular methods applied for through wall target tracking based on processing of UWB radar signals obtained at measurement campaign held at Swedish Rescue Services Agency Center at Rosersberg (Sweden).
- ◆ Implementation of the particular methods applied for through wall target tracking in C language for the purpose of application if UWB radar prototype developed within RADIOTECH project.
- ◆ Development of algorithms for through wall static object visualization by using SAR UWB radar.
- ◆ Design of a new method of through wall target tracking based on data fusion from two independent UWB radar systems.
- ◆ Design of a new method of target localization based on data fusion from two independent UWB radar systems.

Title of the Project: *Digital Processing of UWB Radar Signals*

Acronym: DSP-UWB-RAD

Funding: MVTS

Duration: January 1, 2007- December 31, 2008

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

Group members: M. Drutarovský, J. Rovňáková, M. Švecová, M. Aftanas, P. Galajda, S. Marchevský, I. Hroncová, J. Gamec, M. Gamcová

Scientific goals/research targets:

Development of digital signal processing methods of UWB radar signals for the purpose of through wall detection and localisation of moving persons and room or building interior imagining.

Results Achieved:

- ◆ The proposal of new method for through wall moving person detection and tracking based on a trace estimation method consisting of the following phases of UWB radar signal processing: (1) raw radar data pre-processing, (2) background subtraction, (3) post-processing of radargram with subtracted background, (4) distributed target detection, (5) simple target detection -trace estimation, (6) target localization, (7) wall effect compensation and (8) target tracking itself.
- ◆ The proposal of new method for through wall moving person detection and tracking based on an imaging method consisting of the following phases of UWB radar signal processing: (1) raw radar data pre-processing, (2) background subtraction, (3) post-processing of radargram with subtracted background, (4) data fusion from two antennas by imaging method, (5) distributed target detection by two-stage 2D-(N,k) detection, (6) simple target detection and localization, (7) wall effect compensation and (8) target tracking itself.

- ◆ The design of a new effective and fast method of estimation of wall parameters (permittivity, permeability, conductivity and thickness) based on UWB radar measurement.
- ◆ Development of algorithms for through wall static object visualization by using SAR UWB radar.

Title of the Project: *Engintest*

Funding: Medav GmbH

Duration: September 1, 2007- August 31, 2008

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

Group members: M. Drutarovský, I. Hroncová

Scientific goals/research targets:

Development of advanced signal analysis methods for the purpose of quality testing systems introduced into manufacturing lines for end-of-line testing with stress on car engine testing.

Results Achieved:

Analysis of the sets of car engines and other mechanical subsystems of cars produced by leading European and U.S.A. producers based on sound and vibration signal analyses at so-called cold-test. For that purpose, psychoacoustic analyses, higher order spectrum analyses and time-frequency analyses were used. The obtained results outlined that psychoacoustics and time-frequency analyses of vibration and sound signals could be relevant tools for diagnostics of mechanical subsystems of cars.

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

Funding: SOCRATES (EUR 15000)

Collaboration with: Italy, Hungary, Czech Republic, Portugal, Sweden

Duration: 2007-2008

Project subcoordinator: prof. Ing Linus Michaeli, DrSc.

Group members: J. Šaliga

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: *Metrological characterisation of the ADConverters "ADCWAN"*.

Funding: MIUR Italy (EUR 75000) call:(D. M. 5.8.2004, n. 262 – Programmazione del sistema universitario)

Collaboration with: Italy

Duration: 2006-2008

Project subcoordinator: prof. Ing Linus Michaeli, DrSc.

Group members: J. Šaliga

Scientific goals/research targets:

Research of the hardware and software tools of the Data Acquisition Systems integrated with the computerized information environment. The project meets needs of highly qualified graduates, experienced in the quality assessment of the virtual instruments utilised in the industry and their permanent monitoring.

Results Achieved:

- ◆ New testing methods for 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 contribution to their permanent up-dating.
- ◆ Production teaching materials for students and teacher related with Data Acquisition Systems.

Title of the Project: *Semantic Multimedia Analysis of Digital Media*

Funding: COST 292

Collaboration with: Hungary, United Kingdom (Project coordinator: prof. Dr. E. Izquierdo, Queen Mary College, University of London), Portugal, Spain, Italy, Serbia and Montenegro, Finland, Greece, Turkey, France, Germany, Belgium, Ireland, Norway, Austria, Croatia, Netherlands.

Duration: 2004-2008

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

Group members: J. Gamec, I. Gladišová, P. Filo, J. Futó, L. Maceková, S. Marchevský, L. Ovseník, T. Straka, J. Študenc

Results Achieved:

- ◆ The work is ongoing in Working Groups:
 - ◆ WG.1: Common Testing Data and Framework.
 - ◆ WG.2: Image and Video Segmentation, Shot Analysis and Key Frame Extraction, Efficient Extraction of Standardized Features.
 - ◆ WG.3: Reduction of the Dimension of the Feature Space and Multimodal Feature Fusion.
 - ◆ WG.4: Automatic Paradigms for Semantic Annotation.
 - ◆ WG.5: Semi-automatic Paradigms for Semantic Annotation.
 - ◆ WG.6: Applications.
 - ◆ WG.7: JPSearch.
- ◆ Our research group will focus on the development of advanced methods for digital image and video signal processing based of extraction of Low-level invariant transform and colour features; applications: coding of enriched and smart content and visualization.

Title of the Project: *Self Mobility Improvement in the eLderly by counteractING falls (SMILING)*

Funding: European Commission's 7th RTD Framework Programme – Specific Programme Cooperation, Theme 3 "Information and Communication Technologies", Objective ICT2007.7.1 "ICT and Ageing" under the contract No. 215493

Duration: January 2008-June 2010

Co-ordinator: Italian National Research Centres on Aging (INCA)

TUKE contractor: prof. Ing. Dušan Šimšík, PhD.

Project partners: 11 university and industry partners from seven EU countries

Work tasks leaders: M. Drutarovský, A. Galajdová, P. Galajda

Scientific goals/research targets:

Elderly people at risk of falling can be considered to be suffering from an involuntary and stereotyped motor behavior that restricts their participation in society. One method to overcome such a situation is to break the stereotyped motion schema and activate a new learning process to

better approach real life tasks in a better way. To pursue such a target, the SMILING project will use chaos theory and dynamic systems theory with applications in the training of the ageing populations.

The SMILING solution, a wearable non-invasive computer-controlled system, will perform chaotic perturbations to the lower extremities during active walking through small alterations of the height and slope of weight-bearing surfaces.

SMILING will develop innovative training programs for elderly people, to be accomplished at home, in fitness clubs and health centres, with the aims of improving walking and balance, and to prevent and counteract falling.

The overall SMILING project objectives are:

- ◆ To develop and construct an advanced prototype of a wearable non-invasive computerized miniature system for mechanical chaotic perturbations of gait pattern in order to counteract and prevent tendencies to fall.
- ◆ To develop an easy to use advanced version of the same system for easier exploitation by end-users.
- ◆ To develop stimulation algorithms fitted to suit individual user's specific needs.
- ◆ To implement a system for training to be spread in rehabilitation, health care and fitness centers for a reorganization of the rehabilitation process in ageing.

Scientific goals/research targets solved at the DEMC:

- ◆ Design and implementation of chaotic perturbations with suitable features.
- ◆ Design and implementation of embedded electronic module for monitoring and control of mechatronics SMILING shoe subsystem.
- ◆ Development of algorithms for real-time sensors (1-D gyroscope, temperature, load cells, incremental encoders, etc) signal monitoring and processing.
- ◆ Control unit firmware development.

4.2 National scientific projects

Title of the Project: *Remote Laboratory for Experimental Testing of Complex Reconfigurable Systems/Circuits based on FPGA Circuits*

Funding: KEGA, 3/5238/07

Duration: 2007-2009

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

Group members: P. Galajda, J. Šaliga, S. Marchevský, D. Kocur, E. Maceková

Scientific goals/research targets:

- ◆ Modern large FPGA devices have capacity equivalent to more than 10 million equivalent gates and contain large amount of embedded multipliers, DSP blocks, hierarchical memory subsystems, hard cores etc. Designs based on a single FPGA device can currently contain complex soft 32-bit RISC processors (even in the form of small networks), complete signal processing blocks (e.g. for Software Defined Radio) or other Systems on Programmable Chip (SoPC). Development of such complex designs requires access to the target hardware platform for experimental testing.
- ◆ A typical design process is an iterative process that requires compilation of a complete design and testing/detection of errors. The compilation process can take several tenth minutes for complex systems. Testing on real hardware (HW) platform after successful functional simulation of short time segments (timing simulation of complete complex systems is far beyond the capabilities of current simulation tools) is currently the only practical solution. A typical example is testing of HW and software (SW) components of embedded soft processor with custom HW peripherals/coprocessors. Real HW testing typically requires only a short

time for access to the target HW. Typical testing HW contains at least a target FPGA board, JTAG interface to the Host computer and Host computer. More advanced HW can contain Logic Analyzer, Oscilloscope and Generator. All these HW are quite expensive and are required just during a short time.

- ◆ Main research goal of the project is provide access to expensive HW in time multiplex and enable to use it within regular education courses oriented to FPGA technology and Digital Signal Processing related subjects provided at the Faculty of Electrical Engineering and Informatics of Technical University of Košice.

Title of the Project: *Automated voice-interactive telecommunication system and its applications*

Funding: AV 4/0006/07

Collaboration with: Institute of Informatics Slovak Academy of Science

Duration: 2007 – 2009

Project co-ordinator: doc. Ing. Jozef Juhár, CSc.

Group members: A. Čižmár, Ľ. Doboš, D. Levický, M. Pleva, S. Ondáš, M. Mirilovič, M. Katrák, M. Papco, M. Lojka, J. Staš

Scientific goals/research targets:

The main topics of the research project are speech technologies for voice driven telecommunication systems. Technological base of the project is IRKR Communicator, developed in the frame of previous project „Smart speech communication interfaces“. The aim of the project is 1) research, development and experimental evaluation of new, complex a user-friendly automatic spoken language dialogue applications and 2) research and development of new algorithms to improve robustness of the whole system.

Title of the Project: *SPEETIS – Speech technologies for advanced telecommunication and information services in Slovak language*

Funding: APVV-0369-07

Collaboration with: Institute of Informatics Slovak Academy of Science in Bratislava and University of Žilina

Duration: 2008-2010

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

Group members: Ľ. Doboš, A. Čižmár, D. Levický, M. Pleva, J. Papaj, S. Ondáš, M. Mirilovič, M. Katrák, M. Papco, M. Lojka, J. Staš

Scientific goals/research targets:

Project goals are focused on speech technologies for advanced, voice operated telecommunication and information systems and services with potential impact of research results on other areas like automatic speech transcription, searching in speech and audio records databases, speech-to-speech translation, semantic web etc. The goals of the project are strictly aimed at Slovak language and research of robust and large vocabulary continuous speech recognition, concatenative and corpus speech synthesis and advanced dialogue modelling and management for spoken dialogue systems. An originality and innovativeness of the proposed tasks lies in technical (speech and text corpora), theoretical (design of new algorithms and procedures) and knowledge (linguistic, acoustic, phonetic, phonological, prosodic and psychoacoustic) pre-requisites, which further improve a naturalness and reliability of the man-machine interfaces in Slovakia.

Title of the Project: *System for automatic analysis, recognition and transcription of audio recordings*

Funding: AV 4/2016/08

Duration: 2008 – 2010

Project co-ordinator: doc. Ing. Jozef Juhár, CSc.

Group members: A. Čižmár, Ľ. Doboš, D. Levický, M. Pleva, S. Ondáš, M. Mirilovič, M. Katrák, M. Papco, M. Lojka, J. Staš

Scientific goals/research targets:

Research and development of the system for automatic analysis, recognition and transcription of audio records, which will be able to fast searching and extracting information from audio archives. Automatic transcription of selected parts of speech records based on automatic speech recognition technology. Building of annotated speech corpuses.

Title of the Project: *Digital Signal Processing for Target Detection and Tracking in UWB Radars (DSP-UWB-RAD)*

Funding: Slovak Research and Development Agency under the contract No. LPP-0287-06

Duration: November 2006-November 2009

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

Group members: M. Švecová, J. Rovňaková

Scientific goals/research targets:

Ultra wideband (UWB) radars are of great interest for a vast number of applications such as surface penetrating radar, surveillance and emergency radar, medical instrumentation, non-destructive testing, industrial sensors and many others. UWB radar taken into consideration within *DSP-UWB-RAD* project utilizes a world-patented technique called the Maximum Length Binary Sequence technology and exploits the frequency bandwidth up to 5 GHz.

The main goal of *DSP-UWB-RAD* project is research and development of methods of target detection; localization and tracking by UWB radar based advanced digital signal processing methods. Within project, the research group will be focused on processing of signals obtained from targets represented by people in a room or building under rubble (so-called through-wall target detection and tracking) or snow.

Results Achieved:

- ◆ The proposal of new method for through wall moving person detection and tracking based on a trace estimation method consisting of the following phases of UWB radar signal processing: (1) raw radar data pre-processing, (2) background subtraction, (3) post-processing of radargram with subtracted background, (4) distributed target detection, (5) simple target detection -trace estimation, (6) target localization, (7) wall effect compensation and (8) target tracking itself.
- ◆ Static/dynamic background (clutter) removal for through wall moving targets detection by UWB radar. Design and evaluation of different methods for the improvement of signal to clutter ratio of weak signals scattered back by the moving persons (human bodies).
- ◆ Through wall moving targets detection by UWB radar. Design and evaluation of different methods for detection of moving persons (1D and 2D-(N,k) detectors, one-stage and two-stage 2D-(N,k) detectors, detector output post-processing by binary image processing methods).
- ◆ Cooperative positioning. The elaboration of the state-of-the-art in the field of target localisation based on combination of the time of arrivals and time differences of arrivals in 3D and 2D from one and two independent UWB radar systems.
- ◆ Gathering of real data according to through wall moving target detection by measurement with UWB radar systems. Evaluation of the method performance properties.

Title of the Project: *Multimedia communication security*

Funding: VEGA 1/4054/07

Duration: 2007-2009

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

Group members: A. Čižmár, S. Drutarovský, J. Juhár, Ľ. Doboš, Z. Klenovičová, M. Gamcová, R. Ridzoň, M. Pleva, P. Varchol, J. Papaj, M. Mirilovič, P. Patlevič, T. Tokár, S. Ondáš, J. Ratica, M. Katrák

Scientific goals/research targets:

- ◆ Design of new methods for multimedia content security of grey-scale and colour image by using digital watermarking as well as design of steganography techniques mainly for digital image steganography by using DCT, DWT and CDMA. Analysis of transmission parameters invisibility and security proposed method for application in NGN networks.
- ◆ Design of new multimodal methods for peoples recognition and verification by using human body characteristics (voice, palms) with reliable features extraction and better discriminability. Design of methods based on text - independent speaker verification and new method of biometrics feature fusion for multimodal systems
- ◆ 3. Design of new method for increasing of mobile networks security and QoS, mainly ad-hoc mobile networks security by using new routing a CAC protocols and algorithms for mobile terminals with limited computational capacity, such as PDA.

Results Achieved:

- ◆ Design of new methods of digital watermarking by using HVS models in still pictures
- ◆ Design of new methods of digital watermarking by using robust watermarks in still grey scale and colour pictures
- ◆ Design of new methods for digital image steganography by using DCT and CDMA
- ◆ Analysis of mobile ad-hoc networks CAC protocols
- ◆ Analysis of mobile multimodal telecommunications systems and services
- ◆ Design of new method for GMM implementation in biometric security systems

Title of the Project: *Reconfigurable platforms for broadband wireless telecommunication networks*Funding: VEGA, 1/4088/07Duration: 2007-2009Co-ordinator: prof. Ing Stanislav Marchevský, CSc.Group members: D. Kocur, M. Drutarovský, P. Galajda, J. Gamec, S. Benčo, Ľ. Maceková, Ľ. Čopjan, J. Krajňák, H. PalubováScientific goals/research targets:

Scientific project will be oriented to the elaborating and verifying of methods of design of reconfigurable platforms for broadband wireless telecommunication networks. Special emphasis is imposed on design of algorithms, protocols and design methods of reconfigurable hardware for packet oriented processing of video signals as well as on elaboration of new dynamic reconfigurable architectures of multiuser detectors for processing CDMA signals. Increasing of spectral efficiency, receiver sensitivity and number users are intended. The remark will be devoted to elaborating and verifying of design methods of reconfigurable software defined radio as well. The radio can be reconfigured via the wireless channel during the operation. Beside this, special remark will be focused to study authentication and security of terminals, operating in broadband wireless networks, design of authentication algorithms, methods and protocols, with regard to design of secure terminals based on reconfigurable hardware.

Title of the Project: *Metrological Characterisation of the Analog to Digital Interfaces and Improvement of its Properties*Funding: VEGA, 1/0103/08Duration: 2008-2010Co-ordinator: prof. Ing Linus Michaeli, DrSc.Group members: J. Šaliga, J. Buša, M. Sakmár, M. Chovanec

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: *Coding of the human head in the standard videocodec MPEG-4 SNHC*Funding: VEGA -1/3133/06Duration: 2006 – 2008Project subcoordinator: prof. Ing Ján Mihalík, CSc.Group members: J. Zavacký, I. Gladišová, V. Michalčin, R. Štefanišin, M. KasárScientific goals/research targets:

The research of algorithms of coding of the human head in the standard videocodec MPEG-4 SNHC for purpose of implementation of intelligent interfaces for communication of a human to machine, virtual studios and shops, virtual multimedia services (education, shopping, working, entertainment, etc.), virtual film and video production, but also the advanced videocommunications by cloned and virtual human heads. There are supposed new algorithms of modeling and animation of the human head on the basis of calibration, deformation, estimation of three dimensional motion and animation parameters, also generation and projection of the texture on the wireframe 3D model. Futher algorithms of calculation of the triangular spline functions and their application on calculation of DMS approximation of the surface of human head. Going on derivation of eingenfaces by using principal component analysis and optical flow equation, consequently their employing for tracking of the complex 3D movement of the human head. Finally the new modifications of coding of the texture on the basis DWT with lifting structure, optimal quantization and entropy coding also FAP by using difference arithmetic coding or vector quantization in DCT domain.

Title of the Project: *Digital Image Processing Using Class of Projecting Transforms*Funding: VEGA 1/3143/06Duration: 2006-2008Co-ordinator: prof. RNDr. Ing Ján Turán, DrSc.Group members: J. Gamec, L. Ovseník, D. Šiškovičová, J. Študenc P. Serfözö, J.Turán,Jr., P. Szoboszlai, T. Straka. J. FutóCollaboration with:

- ◆ prof. Dr. K. Fazekas, BUTE, Budapest, Hungary
- ◆ prof. Dr. A. Figueras and Prof. Dr. J. Cid-Sueiro, University Carlos III, Madrid, Spain
- ◆ prof. Dr. J. Tasic, TU Ljubljana, Slovenia
- ◆ prof. Dr. T. Adam, Technical University, Miskolc, Hungary
- ◆ prof. Dr. K. Skala, University Zagreb, Croatia

- ◆ prof.Dr. W. Stechele, TU Munich, Germany
- ◆ prof. Dr. A. Samcovic, University Belgrade, Serbia and Monte Negro
- ◆ prof. Dr. Tran Mihn Son, Université d'Evry, Paris, France

Project summary:

The project will solve new methods for digital image and image sequence processing using class of projecting transforms (Radon, Hough, Trace and Mojette transforms). Developed new methods will be used in the field of selecting non-traditional features, of images and image sequences which may be invariant, sensitive or which correlate well with some property we wish to identify in a sequence of images. This features will be used in invariant image recognition systems (associative image memory), for comparison images for fault or fraud detection or change detection, site monitoring and surveillance.

Scientific goals/research targets:

- ◆ Development new methods for image processing using class of projecting transform (Radon, Hough, Trace and Mojette).
- ◆ Study properties of the class of projecting transforms and its applications in distributed digital systems for image transmission and memories.
- ◆ Development new methods for sensitive feature selection based on class of projecting transforms and their use for comparison images for fault or fraud detection or change detection, site monitoring and surveillance.
- ◆ Study new applications of Hough Transform (robust system identification, metrology problems and signal processing).
- ◆ Development new methods for image processing using nonlinear invertible rapid transform

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 wave analysis.
- ◆ Invariant image recognition systems based on hybridisation of RT, NT with Hough, Radon and Trace transform.

5 CO-OPERATION

5.1 National co-operation

- Slovak Telecom
- VSE, Košice
- Volkswagen Slovakia a.s.
- Slovak Academy of Science
- Ingmetal s.r.o., Prešov
- Contineo s.r.o., Košice
- Elcom s.r.o., Prešov

5.2 International co-operation

- MEDAV GmbH, Germany
- Technische Universität Ilmenau, Germany
- Meodat Meßtechnik, Germany
- Geozondas Ltd., Lithuania
- Ingenieur Büro Ralf Klukas, Germany
- Vrije Universiteit Brussel, Belgium
- Technische Universiteit Delft, Netherlands
- Statens Rådningssverk, Sweden
- Crabbe Consulting Ltd, Germany
- Universitat Ramon Llull, Barcelona, Spain
- Technical University Budapest, Hungary
- Technical University of Ljubljana, Slovenia
- Technical University of Clju-Napoca, Romania
- University of Firenze, Italy
- University of Gent
- University of Maribor, Slovenia
- INESC Lisabon, Portugal
- University of Sannio, Italy
- University of Reggio Di Calabria, Italy
- University of Mediteranea, Italy
- Universite Jean Monnet-Saint-Etienne, France
- University of Gävle, Sweden
- ŠkodaAuto Mladá Boleslav, Czech Republic

6 FACULTY ESSAYS

Čižmár Anton

Full professor

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

Doboš Ľubomír

Associated professor

His current research interests include mobile and wireless communication systems with focus on Call Admission Control algorithms for next generation mobile systems, Routing protocols for Mobile Ad-Hoc systems, MIMO systems and Multimodal mobile systems and services (focus on Speech processing).

Drutarovský Miloš

Associated professor

His research interests include applied cryptography, digital signal processing, algorithms and architectures for embedded cryptographic architectures and sensor networks, digital signal processors, FPGAs, microcontrollers and soft microcontrollers embedded into the FPGAs.

Galajda Pavol

Associated professor

His research interests include nonlinear circuit's theory, nonlinearities in digital transmission systems, Chaos in spread spectrum communication systems, High Altitude Platforms (HAPs) 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.

Glaďšová 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.

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*Full professor*

His research interest is in spread spectrum communication systems; CDMA, MC-CDMA and UWB transmission systems; UWB radar signal processing, psychoacoustics and digital signal processing.

Levický Dušan*Full professor*

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

Maceková Ludmila*Research assistant*

Her main interests and activities are focused on both areas of channel modelling for HAP communications and access networks.

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 and DA converters and methods for correction of their uncertainties, industrial measurement and virtual instrumentation.

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 Luboš*Associated professor*

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

Radovan Ridzoň*Assistant professor*

His general research interests include multimedia, digital watermarking and network security.

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.

7 Ph.D. STUDENTS

<u>Name</u>	<u>Supervisor</u>	<u>Degree Course</u>
<i>First year of study</i>		
<u>Internal form:</u>		
Ing. Vladimír Bánoci	prof. Levický	Telecommunications
Ing. Radovan Blichá	doc. Galajda	Infoelectronics
Ing. Milan Čík	prof. Marcheviský	Telecommunications
Ing. Tomáš Kanócz	prof. Levický	Telecommunications
Ing. Anna Kolesárová	doc. Ovseník	Infoelectronics
Ing. Ján Staš	doc. Juhár	Infoelectronics
<i>Second year of study</i>		
<u>Internal form:</u>		
Ing. Gabriel Bugár	prof. Levický	Telecommunications
Ing. Marián Chovanec	prof. Michaeli	Measurement technique
Ing. Peter Drotár	doc. Galajda	Infoelectronics
Ing. Martin Fifik	prof. Turán	Infoelectronics
Ing. Juraj Gazda	prof. Kocur	Infoelectronics
Ing. Pavol Kocan	prof. Marcheviský	Telecommunications
Ing. Martin Lojka	doc. Juhár	Infoelectronics
Ing. Lenka Macková	prof. Čizmár	Telecommunications
Ing. Ján Mochnáč	prof. Marcheviský	Infoelectronics
Ing. Marek Papco	doc. Juhár	Telecommunications
Ing. Ján Šterba	prof. Kocur	Telecommunications
Ing. Michal Varchola	doc. Drutarovský	Infoelectronics
<u>External form:</u>		
Ing. Vlastimil Fuňak	prof. Turán	Infoelectronics
Ing. Alexander Gilányi	prof. Turán	Infoelectronics
Ing. Rastislav Konkol'	doc. Šaliga	Measurement technique
Ing. Kamil Šindlery	prof. Marcheviský	Infoelectronics
<i>Third year of study</i>		
<u>Internal form:</u>		
Ing. Michal Aftanas	doc. Drutarovský	Infoelectronics
Ing. Jozef Krahulec	prof. Marcheviský	Telecommunications
Ing. Jozef Ratica	doc. Doboš	Telecommunications
Mgr. Jana Rovňáková	prof. Kocur	Infoelectronics
Ing. Michal Sakmár	doc. Šaliga	Measurement technique
Mgr. Mária Švecová	prof. Kocur	Infoelectronics
Ing. Tamás Tokár	prof. Levický	Telecommunications
<u>External form:</u>		
Ing. Rastislav Kokoška	prof. Marcheviský	Telecommunications
Ing. Péter Szoboszlai	prof. Turán	Infoelectronics
Ing. Ján Turán jr.	prof. Marcheviský	Infoelectronics

Fourth year of studyExternal form:

Ing. Sakhia Darjan	prof. Čižmár	Telecommunications
Ing. Ľubomír Horniak	prof. Michaeli	Measurement technique
Ing. Miroslav Katrák	doc. Juhár	Telecommunications
Ing. Henrieta Palubová	doc. Galajda	Infoelectronics
Ing. Peter Patlevič	doc. Doboš	Telecommunications
Ing. Milan Rusko	doc. Juhár	Telecommunications
Ing. Tomáš Straka	prof. Turán	Infoelectronics
Ing. Peter Želinský	doc. Galajda	Infoelectronics

Fifth year of studyExternal form:

Ing. Miroslav Baboľ	prof. Čižmár	Telecommunications
Ing. Pavol Cabúk	prof. Michaeli	Measurement technique
Ing. Marek Domaracký	prof. Levický	Telecommunications
Ing. Imrich Harčár	doc. Šaliga	Measurement technique
Ing. Pavol Pavelka	doc. Galajda	Electronics
Ing. Péter Serfozo	prof. Turán	Electronics
Ing. Anton Štofa	doc. Doboš	Telecommunications
Ing. Jozef Študenc	prof. Turán	Electronics
Ing. Peter Varchol	prof. Levický	Telecommunications

8 MEMBERS

Čižmár Anton, Member of Technical Standardization Commission No.41 for Telecommunications.

Čižmár Anton, Member IEEE Affiliate Computer Society, No. 41237162

Čižmár Anton, Member of AES (Audio Engineering Society), New York, I.D. 44 154.

Doboš Lubomír, Member of Technical Standardization Commission No.80 for Radiocommunications.

Drutarovský Miloš, Member of the editorial board of the journal "Acta Electrotechnica et Informatica".

Juhár Jozef, Member of ISCA (International Speech Communication Association).

Juhár Jozef, Member of AES (Audio Engineering Society), Memb. No. 76122.

Juhár Jozef, Member of IEEE, Memb. No. 90402602.

Juhár Jozef, Member of ISCA International Affairs Sub-committee on Eastern Europe.

Juhár Jozef, Member of the editorial board "International Journal of Signal and Imaging Systems Engineering", Issued by Inderscience Publishers, Geneva, Switzerland.

Juhár Jozef, Member of Technical Standardization Commission No.55 for Electroacoustics and ultrasound.

Kocur Dušan, Executive editor 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 of the journal "Radioengineering".

Levický Dušan, Member of the editorial board of the journal "Acta Electrotechnica et Informatica".

Levický Dušan, Member of the editorial board of the journal "Slaboproudý obzor".

Levický Dušan, Member of the IEEE.

Levický Dušan, Member of Czech and Slovak Radioelectronics Society.

Michaeli Linus, Head of Slovak IMEKO National Committee and head of the Technical Committee TC-4 "Measurement of Electrical Quantities"

Michaeli Linus, Slovak Metrological Institute, Member of the Scientific Board.

Michaeli Linus, Member of the editorial board „Computer Standard & Interfaces“, Issued by Elsevier, Amsterdam, New York.

Michaeli Linus, Member of the reviewer board "Measurement". Journal IMEKO, Issued by Elsevier, Amsterdam, New York.

Michaeli Linus, Member of the Scientific Board University of Transport and Communication, Žilina, Slovakia.

Michaeli Linus, Member of the editorial board „Measurement Science Review“, Issued by SAV, Bratislava

Michaeli Linus, Co-ordinator of IMEKO Working Group "AD and DA metrology".

Michaeli Linus, Member of the IEEE, Instrumentation & Measurement Society.

Michaeli Linus, Scientific Grant Agency of Slovak Republic.

Michaeli Linus, Member of the editorial board of the journal "Acta Electrotechnica et Informatica".

Šaliga Ján, Member of Slovak IMEKO Technical Committee TC-4 "Measurement of Electrical Quantities".

Šaliga Ján, Member of the editorial board of the journal "Acta Electrotechnica et Informatica".

Turán Ján, Member of the Slovak Technical Standardization Committee No.53 for Cables, Conductors and Isolating Materials.

Turán Ján, Member of the Slovak Technical Standardization Committee No.43 for Terminology.

Turán Ján, Senior Member of the IEEE.

Turán Ján, Member of Czech and Slovak Radioelectronics Society.

Turán Ján, Member of the editorial board of the journal "Acta Electrotechnica et Informatica".

9 PUBLICATION ACTIVITY OF THE DEPARTMENT

9.1 Journal papers

1. DE VITO,L.-MICHAELI,L.-RAPUANO,S.: An Improved ADC-Error-Correction Scheme Based on a Bayesian Approach. In: IEEE Transactions on Instrumentation and Measurement, Vol.57, No.1, 2008, 128-133.
2. GAMEC,J.-GAMCOVÁ,M.: Estimation Algorithms of Motion Vectors Their Errors and Statistic. In: Properties Transactions of the Universities of Košice, 2/2008, 28-36.
3. GAMEC,J.-GAMCOVÁ,M.: The Fast Search Motion Estimation Algorithms and their Errors. In.: Acta Electrotechnica et Informatica, Vol.8, No.3, 2008, 26-30.
4. KRAJŇÁK,J.-DEUMAL,M.-PAVELKA,P.-KOCUR,D.-PIJOAN,Joan Lluís-GALAJDA, P.: Multi-user detection of Nonlinearly Distorted MC-CDMA Symbols by Microstatistic Filtering. In: Wireless Personal Communications, Vol.47, No.1, 2008, 149-160.
5. MARCHEVSKÝ,S.-MOCHNÁČ,J.: Hybrid Concealment Mechanism. In: Acta Electrotechnica et Informatica, Košice, Vol.8, No.1, 2008, 11 -15.
6. MIHALÍK,J.-KASÁR,M.: Human Face and Facial Feature Tracking by using Geometric and Texture Models. In: Journal of Electrical Engineering, Vol.59, No.5, 2008, 266-271.
7. MICHAELI,J.-ŠALIGA,J.-SOCHOVÁ,L.: Integral Nonlinearity Correction Algorithm Based on Error Table Optimizing and Noise Filtering. In: Measurement Science Review, Vol.8, No.2, 2008, 29-32.
8. MICHAELI,L.-MICHALKO,P.-ŠALIGA,J.: A New ADC Fast Testing Method Based on the Unified Error Model. In: Measurement, Vol.41, No.2, 2008, 192-197.
9. MICHAELI,L.-MICHALKO,P.-ŠALIGA,J.: Unified ADC Nonlinearity Error Model for SAR ADC. In: Measurement, Vol.41, No.10, 2008, 198-204.
10. SAMČOVIČ,A.-TURÁN,J.: Attacks on Digital Wavelet Image Watermarks. In: Journal of Electrical Engineering, Vol.59, No.3, 2008, 131-138.

9.2 Conference papers

1. AFTANAS,M.-ROVNÁKOVÁ,J.-DUTAROVSKÝ,M.-KOCUR,D.: Efficient Method of TOA Estimation for Trough Wall Imaging by UWB Radar. In: ICUWB 2008, Hannover, German, September 10-12, 2008, 101-104.
2. AFTANAS,M.-ZAIKOV,Y.-DUTAROVSKÝ,M.-SACHS,J.: Through Wall Imaging of the Objects Scanned by M-Sequence UWB Radar System. In: Proceedings of the 18th International Conference Radioelektronika 2008, Prague, Czech Republic, April 24-25, 2008, 33-36.
3. CORRADO,M.-MICHAELI,L.-RAPUANO,S.-ŠALIGA,J.: A Critical Analysis of Alternative Stimulus Signals for Histogram based Testing of ADCs. In: I2MTC 2008 - IEEE International Instrumentation and Measurement Technology Conference, Vancouver, Canada, May 12-15, 2008, 320-325.
4. ČOPJAN,J.-KRAHULEC,J.-MARCHEVSKÝ,S.: Blind Receiver Based on the LCCMA Algorithm for MC-CDMA Signals Detection Over the 3-States Channel Model. In: Proceedings of the 18th International Conference Radioelektronika 2008, Prague, Czech Republic, April 24-25, 2008, 13-17.
5. DOBOŠ,L.-PATLEVIČ,P.: Neuro-Fuzzy CAC for Wireless Cellular Networks. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 6p.

6. DOBOŠ,L.-PATLEVIČ,M.: Neuro-Fuzzy Based CAC Scheme for Mobile Networks. In: International Conference on Applied Electrical Engineering and Informatics 2008 AEI '2008, Košice, Slovakia, September 8-11, 2008, 97-101.
7. DROTÁR,P.-GAZDA,J.-KOCUR,D.-GALAJDA,P.: MC-CDMA Performance Analysis for Different Spreading Codes at HPA Saleh Model. In: Proceedings of the 18th International Conference Radioelektronika 2008, Prague, Czech Republic, April 24-25, 2008,79-82.
8. DRUTAROVSKÝ,M.-VARCHOLA,M.: Cryptographic System on a Chip Based on Actel ARM7 Soft-core with Embedded True Random Number Generator. In: 2008 IEEE Design and Diagnostics of Electronic Circuits and Systems, Bratislava, Slovakia, April 16-18, 2008, 164-169.
9. ENYEDI,B.-KONYHA,L.-FAZEKAS,K-TURÁN,J: Character Localization in Video Sequences. In: 6th International Workshop on Content-Based Multimedia Indexing CBMI-2008, London, UK, June 18-20, 2008, 504-511.
10. FIFIK,M.: Low Power Low Cost Video Processing Methods for Driver Assistance Systems. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 43-44.
11. FISHER,V.-BERNARD,F.-BOCHARD,N.-VARCHOLA.M.: Enhancing Security of Ring Oscillator-Based TRNG Implemented in FPGA. IEEE International Conference on Field Programmable Logic and Applications (FPL) 2008, Heidelberg, Germany, September 8-10, 2008, 245-250.
12. GALAJDA,P.-GALAJDA,P.,Jr.: The Combination of the Graphical and Numerical Methods for the Solutions of Linear and Non-Linear Differential Equations in Engineering Boundary Value Problems. In. 3th International Conference MFTI 2008, Moscow, Russia, March 25-28, 2008, 25-32.
13. GALAJDA,P.-ŠPÁNY,V.: Chua's singularities: The Source for Generation of Chua's chaos. In. 3th International Conference MFTI 2008, Moscow, Russia, March 25-28, 2008, 200-205.
14. GALAJDA,P.-MARCHEVSKÝ,S.-KOCUR,D.-GAMEC,J.: Wireless Sensor Network Applications. In: International Conference on Applied Electrical Engineering and Informatics AEI '2008, Košice, Slovakia, September 8-11, 2008, 174-181.
15. GAMEC,J.: Various Filtering Methods of Motion Vector Fields. In: Proceedings of 15th International Conference on Systems, Signals and Image Processing IWSSIP 2008, Bratislava, Slovakia, June 25-28, 2008, 519-522.
16. GAZDA,J.-DROTÁR,P.: Effects of Spreading Codes and Convolution Coding on the Performance of MC-CDMA System with Nonlinear Model of HPA. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 129-132.
17. CHOVANEC,M.-MICHAELI,L.-ŠALIGA,J.: Noise Shaping Structures of Band Pass Sigma Delta ADC and their Impact on Metrological Parameters. In: 16th IMEKO TC4 International Symposium : Exploring New Frontiers of Instrumentation and Methods for Electrical and Electronic Measurements, Florence, Italy, September 2008, 977-982.
18. KATRÁK,M.-JUHÁR,J.: The Classification English Phones Using Neural. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 3p.
19. KOCAN,P.: Selected Congestion Control Algorithms. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 136-139.
20. LEVICKÝ,D.-PODHRADSKÝ,P.-RIDZOŇ,R.-TRÚCHLY,P.-GAMEC,J.: Vocational Training and Certification in ICT Based on the E-learning. In: 50th International Symposium ELMAR-2008, Zadar, Croatia, .September 10-12, 2008, 365-368.

21. MACEKOVÁ,Ľ.-GALAJDA,P.: Transmitter Visibility for Terrestrial and HAP Communications Systems by Using Digital Relief Maps. In: International Conference on Applied Electrical Engineering and Informatics AEI '2008, Košice, Slovakia, September 8-11, 2008, 162-167.
22. MACKOVÁ,L.-ČIŽMÁR,A.: Emotion Recognition. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 4p.
23. MICHAELI,L.-ŠALIGA,J.-SAKMÁR,M.-BUŠA,J.: New Approximation Models for Processing Exponential Stimulus Histogram Test of ADC. In: 16th IMEKO TC4 International Symposium : Exploring New Frontiers of Instrumentation and Methods for Electrical and Electronic Measurements, Florence, Italy, September 2008, 1043-1047.
24. MIRILOVIČ,M.-JUHÁR,J.: Morphological Segmentation of Word Units for Large Vocabulary Automatic Speech Recognition in Slovak. In: The 3rd Baltic Conference on Human Language Technologies, Vilnius, Latvia, October 4-5, 2008, 189-195.
25. MIRILOVIČ,M.-JUHÁR,J.-ČIŽMÁR,A.: Large Vocabulary Continuous Speech Recognition in Slovak. In: International Conference on Applied Electrical Engineering and Informatics 2008 AEI '2008, Košice, Slovakia, September 8-11, 2008, 73-77.
26. MOCHNÁČ,J.-MARCHEVSKÝ,S.: Error Concealment Scheme Implemented in H.264/AVC. In: 50th International Symposium ELMAR-2008, Zadar, Croatia, September 10-12, 2008, 13-16.
27. MOCHNÁČ,J.-MARCHEVSKÝ,S.: Error Resilience Tools in the MPEG-4 and H.264 Video Coding Standards. In: Proceedings of the 18th International Conference Radioelektronika 2008, Prague, Czech Republic, April 24-25, 2008, 187-190.
28. ONDÁŠ,S.-JUHÁR,J.: Building of Reusable Dialogue Corpus for Voice Dialogue Design in Slovak. In: The 3rd Baltic Conference on Human Language Technologies HLT'2008, Vilnius, Latvia, October 4-5, 2008, 227-233.
29. ONDÁŠ,S.-JUHÁR,J.: The Recording System Based on Spoken Dialogue System. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 4p.
30. ONDÁŠ,S.-JUHÁR,J.-ČIŽMÁR,A.: Evaluation of the Slovak Spoken Dialogue System Based on ITU-T. In: 11th International Conference TSD 2008, Brno, Springer Berlin/ Heidelberg 2008 LNAI 5246, September 8-12, 2008, 633-640.
31. PALUBOVÁ,H.: Chaotic Sequences Using in DS CDMA System. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 63-66.
32. PAPA,J.-DOBOŠ,L.-ČIŽMÁR,A.: Security Service Vector in MANET. In: International Conference on Applied Electrical Engineering and Informatics 2008 AEI '2008, Košice, Slovakia, September 8-11, 2008, 130-138.
33. PAPA,J.-DOBOŠ,L.-ČIŽMÁR,A.: Security Service Vector in MANET. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 5p.
34. PAPA,J.: Integration Process of Security as QoS Parameter via Security Service Vector in MANET. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 108-111.
35. PAPCO,M.-JUHÁR,J.: Acoustic Models Trained on Speechdat Database Extended to Utterances Recorded from Users Interaction with IRKR System. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 4p.
36. PAPCO,M.: Using Gender-dependent Acoustic Models in Speech Recognition. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 98-101.

37. PATLEVIČ,P.-PULITANO,S.: Dynamic Bandwidth Allocation Issues for Geostationary Interactive Satellite Systems. In: 8th Scientific Conference of Young Researchers SCYR 2008, Košice, Slovakia, May 28, 2008, 15-18.
38. PLEVA,M.-ČIŽMÁR,A.-JUHÁR,J.-ONDÁŠ,S.-MIRILOVIČ,M.: Towards Slovak broadcast news automatic recording and transcribing service. In: Verbal and Nonverbal Features of Human-Human and Human-Machine Interaction: COST Action 2102 International Conference, Patras, Greece, October 29-31, 2007, 158-168; Berlin: Springer-Verlag, 2008, <http://www.springer.com/computer/user+interfaces/book/978-3-540-70871-1>.
39. PLEVA,M.-JUHÁR,J.-ČIŽMÁR,A.: Building of the Annotated Speech Utterances Database from the Slovak Spoken Dialog System Interactions. In: Research in Telecommunication Technology RTT 2008, Vyhne, Slovakia, Sep. 9.-12, 2008, 3p.
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