Faculty of Electrical Engineering, Automatics, Computer Science and Electronics

Department of Electronics http://www.ke.agh.edu.pl/en
http://www.dsp.agh.edu.pl/Eg

Department of Telecommunications http://www.kt.agh.edu.pl/

WP1 Intelligent Monitoring and Automatic Detection of Threats
INDECT Meeting in Gdańsk, 16 April 2009
Number of branches of science and specializations:
Number of branches of science: 30, including over 170 specializations

Number of students (as on 30th November, 2008)
**total number:** 33 419
full-time students: 22 128
part-time students: 9 379
foreign students: 82
doctoral students: 501
postgraduate students: 2 289

Number of staff (as on 31th July, 2008)
**total number:** 3 849

teaching and research staff: 1 835
• full professors: 152
• associate professors with title: 81
• associate professors without title: 188
• assistant professors with postdoctoral qualifications: 48
• other assistant professors: 992
• assistants: 374 (including assistants with doctor's degree: 59)

teaching staff: 210
• senior lecturers: 129
• lecturers: 62
• teachers: 17
• instructors: 6
The Faculty of Electrical Engineering, Automatics, Computer Science and Electronics is one of the largest faculty of this kind at Polish universities. It is highly ranked among educational units both in Poland and abroad. The Faculty is entitled to confer doctoral degrees (including Doctor Habilitatus) in engineering in the following disciplines: electrical engineering, automatics and robotics, computer science, electronics and telecommunications.
Activities:

• Research
• International cooperation
• Industrial cooperation
• Conferences
• Seminars
• Education
Staff

Department of Electronics
- 10 professors
- 52 lecturers
- 11 research fellows
- 1 senior lecturer
- 8 administrative specialists
- 10 engineering and technical specialists
- 4 postgraduate students

Department of Telecommunications
- 6 professors
- 4 lecturers
- 24 research fellows
- 8 administrative specialists
- 1 engineering and technical specialist
- 8 postgraduate students
Research Areas

Department of Electronics
- Signal processing
- Reconfigurable computing systems
- Optoelectronics, Fiber-Optics and Microwaves
- Detection microsystems and optoelectronics
- Magnetic multilayers and spin electronics
- Semiconductor thin films based on metal oxides and nitrides
- Microelectronics, circuits and systems
- Nano and Microsystems
- Microelectronics

Department of Telecommunications
- Digital Telecommunications and Information Processing
- Network Management
- High-speed Networking and Switching
- Mobile Networks and Networking
- Telecommunication Networks and Services
- Broadband Access Networks and Multimedia Services
AUDIO & SPEECH TECHNOLOGY
Previous experience, participation in similar projects

„Speech technology applications to public security systems”

Project objectives
• Creating a prototype of speech analysis system with voice interface consisting of five modules:
  – speech analysis,
  – speaker recognition,
  – Polish speech recognition,
  – semantic analysis with dialogue system,
  – speech synthesis system.
Tools and equipment

- **Laboratories**
  - Sound Processing
  - Digital Signal Processing

- **equipped with**
  - Quad-core Multithread, 4-8 GB RAM DDR3, PC units
  - Soundproof lecture cabine
  - Hi-performance USB, IEEE1394 and SCSI audio multi-channel AD/DA and MIDI interfaces
    - Digidesign, Lexicon, M-Audio, Presonus, CASIO
  - Audio and voice-dedicated microphones
    - AKG, Alphard, Logitech, Creative
  - Audio monitoring, and multi-channel speakers amplifiers and headphones
    - Audiolab, JBL, Yamaha, AKG, Bayerdynamics, Creative
  - Specialized DSP and Audio processing software
    - MATLAB/Simulink, Adobe Audition, REAKTOR 4, Pro Tools LE, Cubase LE, Dragon, HTK, Sound Forge, IVONA
VIDEO QUALITY OF EXPERIENCE
Quality of Service? Quality of Experience?

PERCEIVED QUALITY

CLIENT

Transport Network

QUALITY OF NETWORK SERVICES

SERVER

TRANSPORT LAYER

Quality of Experience

Quality of Service
No-Reference Approach

**Pros**
- Real time applications
- in-service system
- Does not require reference

**Cons**
- Pure correlation with MOS
- Complicated implementation
- CPU and time limitations

**In-service applications**
- Monitoring
- Alarms generation
- Quality-based billing

**Metrics**
- V-Factor
Quality of Experience

Measurable Factors
• packet losses PLR
• delay, jitter
• PSNR, MSE
• video artifacts (blockiness, noise, blur, …)

Service Environment
• the type of display terminal
• personalization
• friendly interface
• way to authenticate

Quality of Experience
5 – excellent quality
4 – good quality
3 – fair quality
2 – poor quality
1 – bad quality
Comparison of Quality

LEFT
PSNR = 33.46 [dB]

RIGHT
PSNR = 35.10 [dB]
A Comparison of Quality: PSNR

![Graph showing PSNR over time for RIGHT and LEFT]
Video capture and analog-to-digital conversion
- Noise
- Out-of-focus
- Over/Under-exposure

Inherent for User-Generated content
Scalable coding

Lossy compression
- Quantization domain
- Spatial domain
- Temporal domain
Network transmission
- Artifacts cause by a packet loss
End user’s preferences

Application/scenario specific parameters
- Provided with user’s responses
Previous experience

• 3rd Generation Fax (Fax over IP) service quality assessment Quality of fax images assessment in full-reference scenario
  – 7 different image quality aspects

• Video Quality of Experience assessment
  – Perceptual metrics for video quality assessment in no-reference scenario
  – Source material quality and coding artifacts measurement
THANK YOU