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LABORATORY OF DIGITAL
VIDEO PROCESSING

LABORATORY OF DIGITAL VIDEO PROCESSING (LoDVP)

UNIVERSITY OF ŽILINA
FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY
DEPARTMENT OF MULTIMEDIA AND INFORMATION-COMMUNICATION TECHNOLOGY
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MiCT

LABORATORY OF DIGITAL VIDEO PROCESSING

LABORATORY OF HEALTH APPLICATIONS

STAFF

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BD 319

VIDEO*lab* – Laboratory of semantic analysis of still images and video

BD 317

PROTOTYPE*lab* – Laboratory of applied research and prototype solution of electronic systems

BD 328

GAME*lab* – Laboratory of computer vision, virtual reality and gaming

BD 333

IOT*lab* – Laboratory of IoT

BD 334

3D GRAPHIC*lab* – Laboratory of 3D graphic, 3D scanning and 3D printing

AMT

HEALTH*lab* – Laboratory of cognitive sciences

UVP A1.11

TEXTILE*lab* – Laboratory of design and production of prototype electronics

UVP A0.07

LUIZA – Laboratory of AI at University of Zilina

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PhD. STUDENTS

Ing. Jakub ŠUŠKA

Ing. Jakub ZAGORA

Ing. Silvia ŠÚCHALOVÁ

Ing. Oleh KRYVOSHEI

Ing. Andrej PISARČÍK

SUB-LABS – I.

VIDEO*lab* – Laboratory of semantic analysis of still images and video

- Image pre-processing
  - Noisy image filtering (adaptive order-statistics filters, PDF detection, DLNN, ...)
  - Segmentation
- Low-level feature extraction (color, texture, shape, …)
- Object detection and classification
- Semantic image/video description
- Videoconcealment
- Semantic web
- Computer vision and Machine learning
- Deep learning, neural network architecture design and hyperparameter tunning

PROTOTYPE*lab* – Laboratory of applied research and prototype solution of electronic systems

- HW/SW design and production
- Intelligent textile and electronics
- Textile sensors (ECG, EMG, muscle activity, etc.)
- Measurements and design of electroconductive textile yarn

SUB-LABS – II.

HEALTH*lab* – Laboratory of congnitive sciences

- EEG sensing
- Explainability of AI models in EEG and fMRI
- Brain-computer interface

TEXTILE*lab* – Laboratory of design and production of prototype electronics

- Intelligent textile sensors (embroidery by Ag/PA, Ag/PE, yarn, Ag microwires)
- Digital embroidery design and realisation, textile printing
- PCB rapid prototyping by direct laser processing
- 3D cover design and printing (photopolymere)

LUIZA – Laboratory of AI at University of Zilina

- Computer graphic and computer vision teaching
- Blended AI courses

Server room, data storage, AI training infrastructure

- Servers, cloud data storage
- nVIDIA based training infrastructure

SUB-LABS – III.

GAME*lab* – Laboratory of computer vision, virtual reality and gaming

- Virtual reality environments design and testing
- Game design and testing

IOT*lab* – Laboratory of IoT

- IoT system design and IoT notes prototyping
- Mobile application design and development

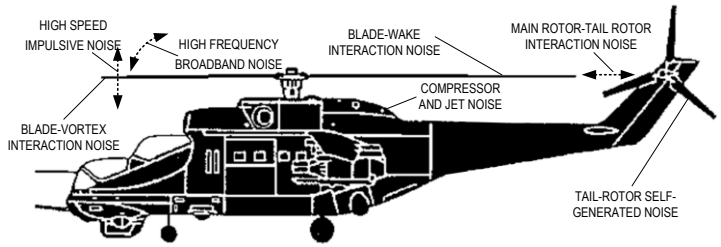
3D GRAPHIC*lab* – Laboratory of 3D graphic, 3D scanning and 3D printing

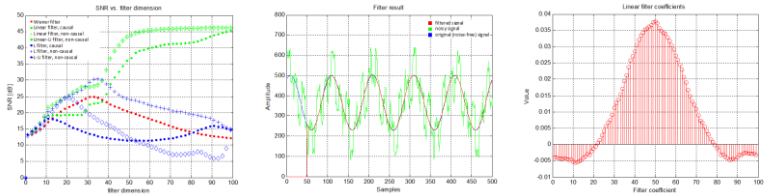
- Enhanced 3D stereoscopic scene reconstruction
- 3D classification, registration and retrieval
- 3D face recognition
- 3D scanning (stereoscopic, laser, photogrammetry, IR) and modelling
- 3D reconstruction
- 3D printing (composite, ABS, PLA, FLEX, ASA, Carbon, ...) and prototyping

DIGITAL IMAGE AND VIDEO FILTRATION

- IFM (Image Filtering Machine)
  - median, mean, Wiener, Frost, Kuan, Lee, Lopes, …
  - blur, sharpen, emboss, edge detection, contrast, operators, …
- Gaussian, impulsive and mixed noise suppression
- Adaptive signal-depending L-filtration
- Order-statistics and texture spatial impulse detectors







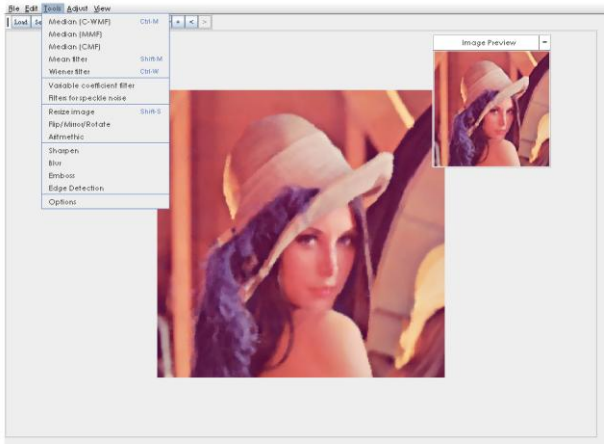


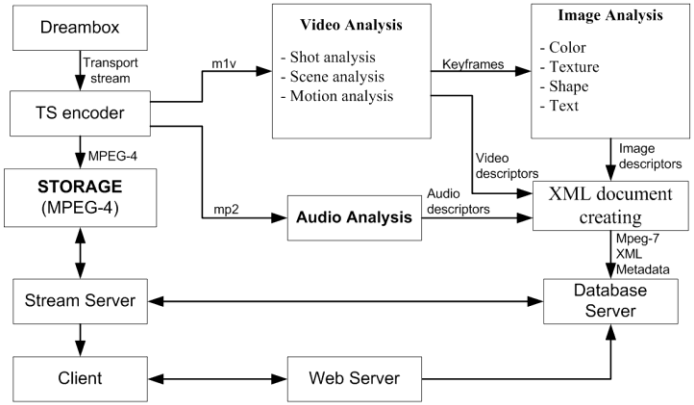
IMAGE CONTENT ANALYSIS

- Combined low-level descriptor
- INteractive Image REtrieval System – INIRES



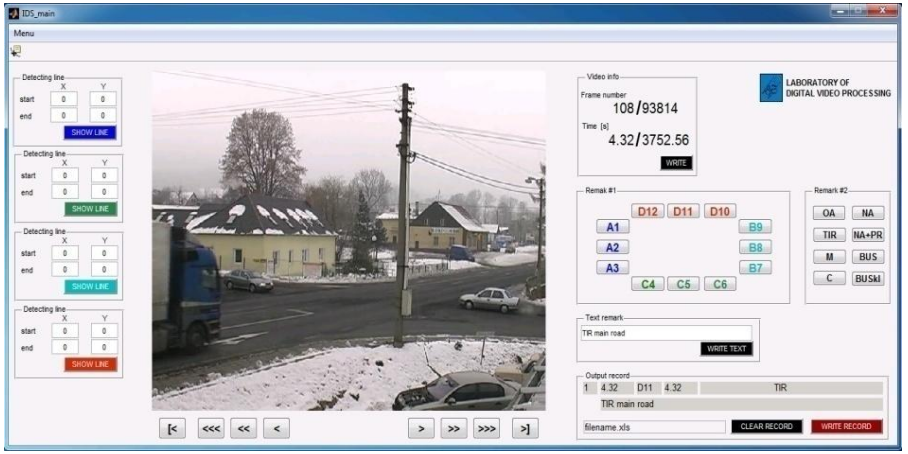


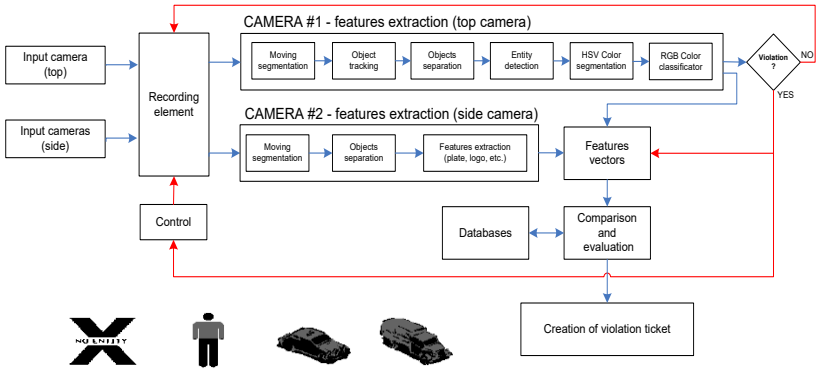
- DVB-S downloading and streaming system



TRAFFIC VIDEO SYSTEMS

- Plate and nationality identifications
- Moving object features recognition
- Object tracking and separation
- Entity detection (human, car, truck)
- Intersection statistics calculation







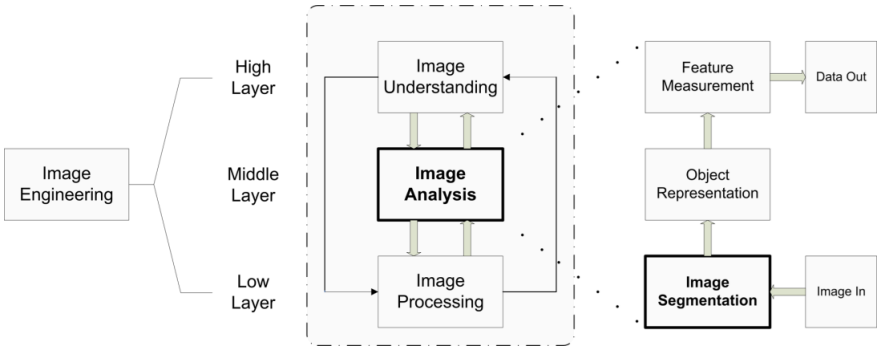


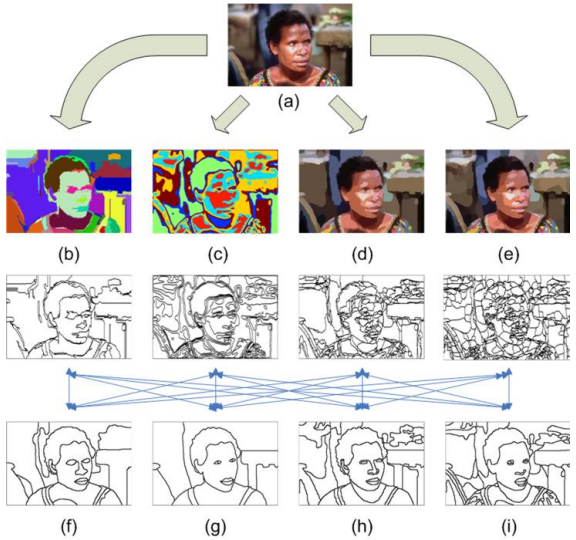
ADVANCED IMAGE SEGMENTATION

- Algorithms
  - Efficient Graph based Algorithm
  - K-means Algorithm
  - Mean Shift Algorithm
  - Modified EGA

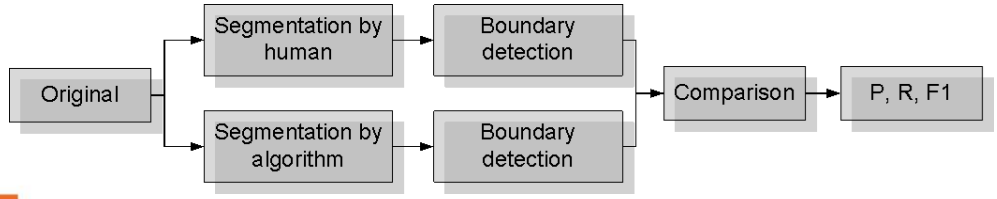






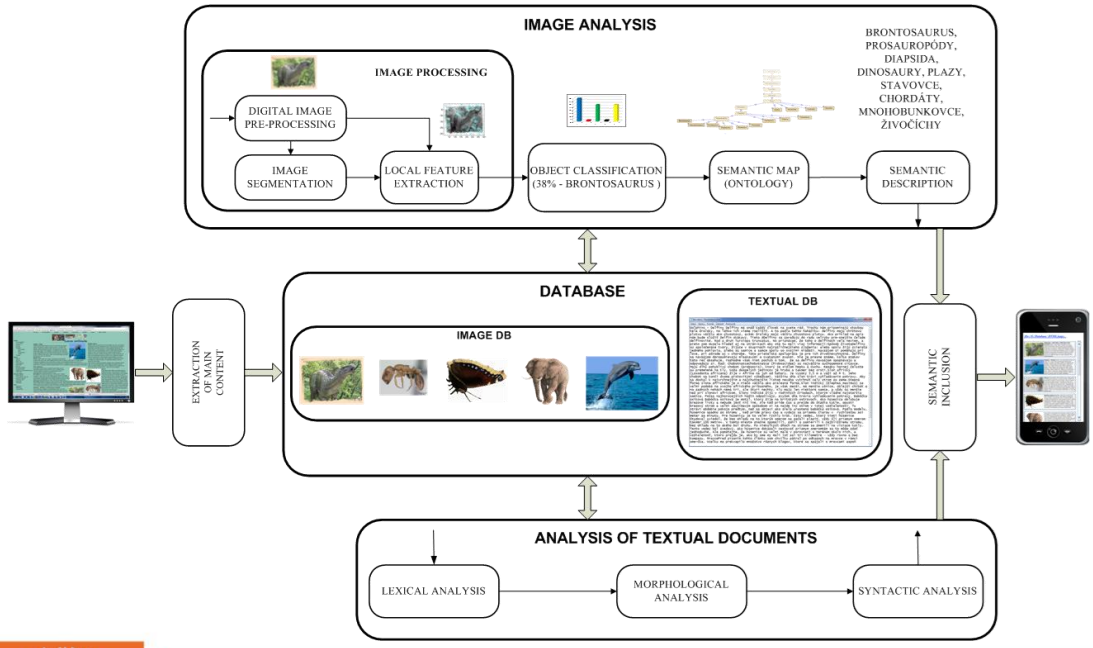


- Evaluation



SEMANTIC WEB BASED ON ONTOLOGY

- Extraction the main content from web pages
- Image analysis and retrieval by semantic description of image
- Textual segment extraction from main web code
- Semantic inclusion of textual and non-textual segments

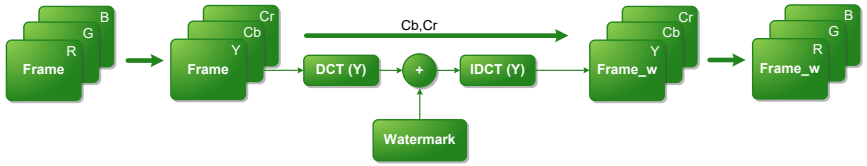


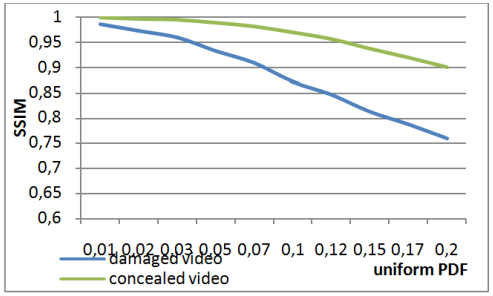


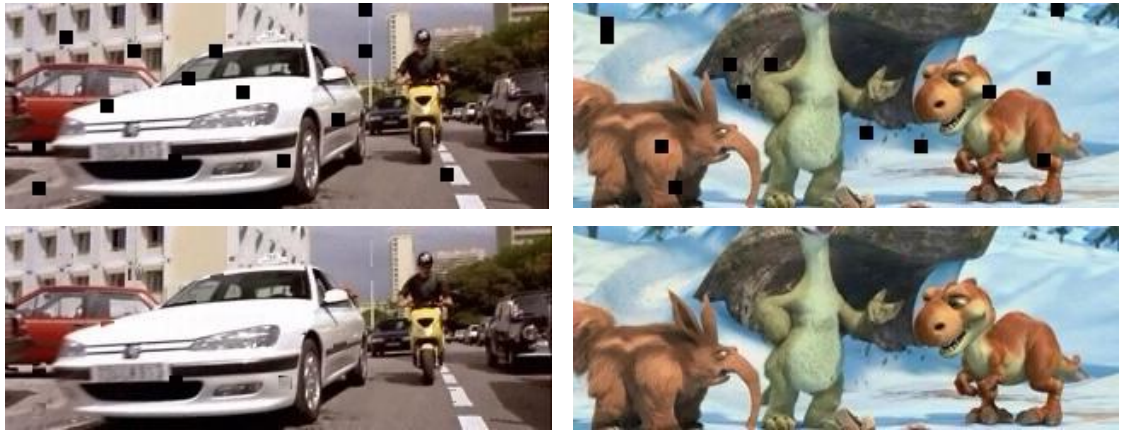
VIDEOCONCEALMENT

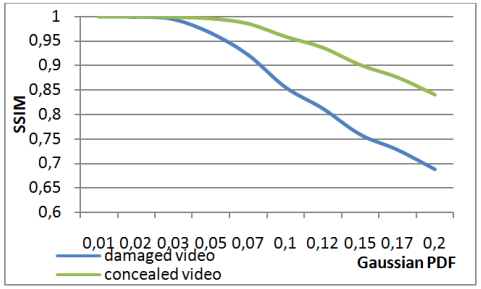
- Videoconcealment at decoder side
- Post-processing Video methods
- Detection of corrupted waternarks in frequency domain
- Time pixel estimator (VMF) in lossy DCT blocks









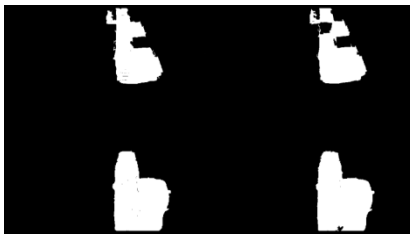


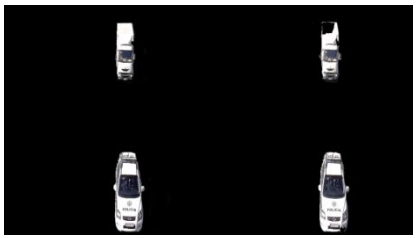
3D MODEL OBJECT RECOGNITION

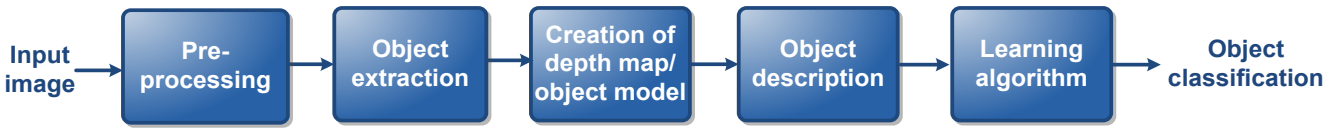
- Object extraction from video from traffic flow
- Creation of object model based on depth map
- Object description by SIFT descriptors
- Object classification by learning algorithm





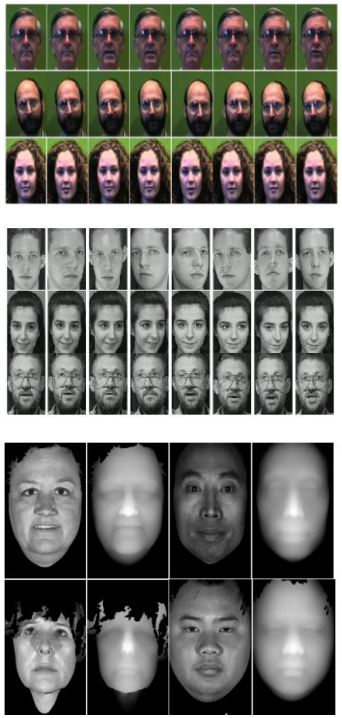




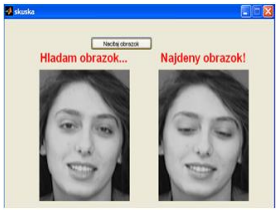


3D FACE RECOGNITION

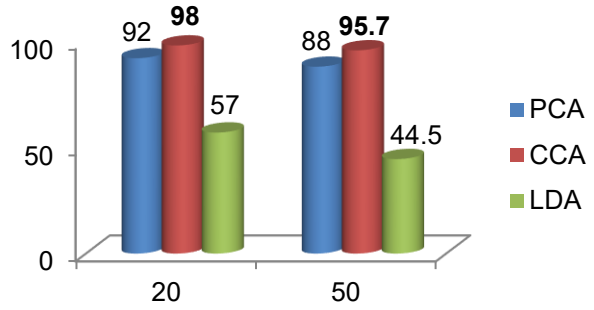
- 2D Face Recognition based on Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) and Canonical Correlation Analysis (CCA) methods.
- Proposing a modified method for 2D-3D Face Recognition using Canonical Correlation Analysis (CCA)

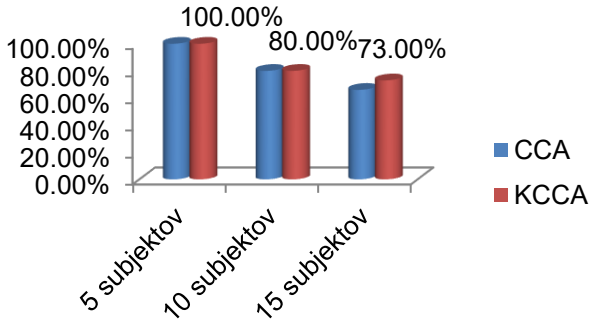








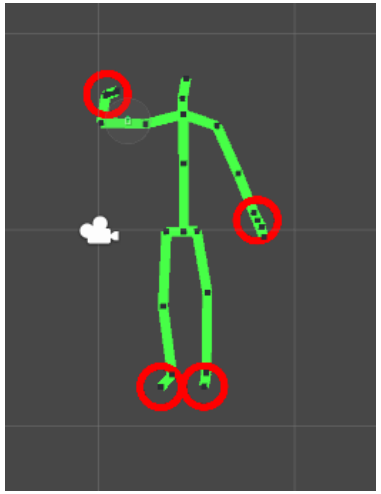




ADVANCED IMAGE SENSORS

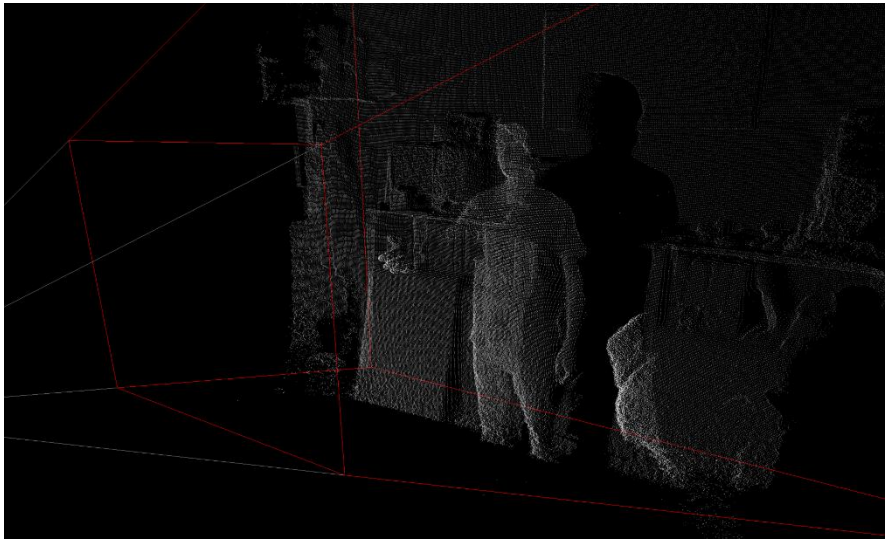
- Depth map processing
- Advanced object recognition
- Human skeleton tracking
- Point cloud





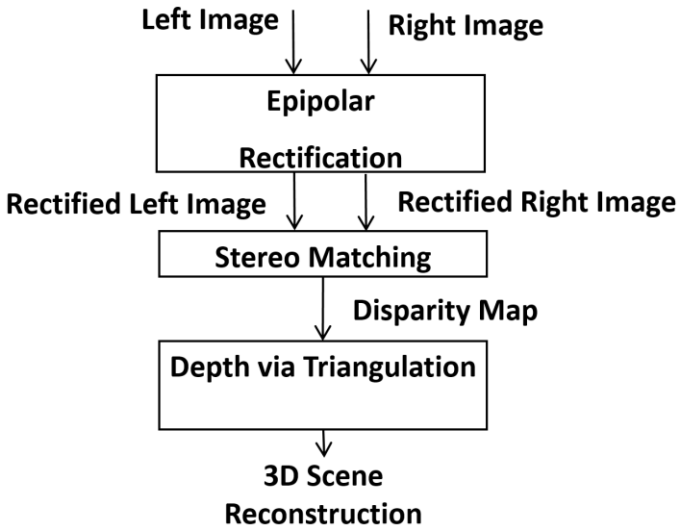




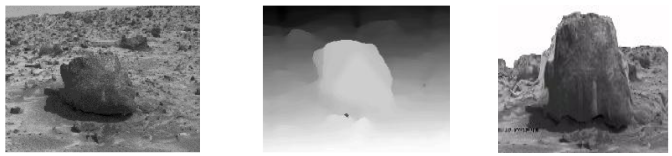


3D SCENE RECONSTRUCTION

- Input: 2 (or more) images taken with calibrated cameras
- Output: 3D structure of scene
  - Rectification, Matching, Depth filtration and estimation
- Edge methods
- SOM Neural Net
- Principal Component Analysis





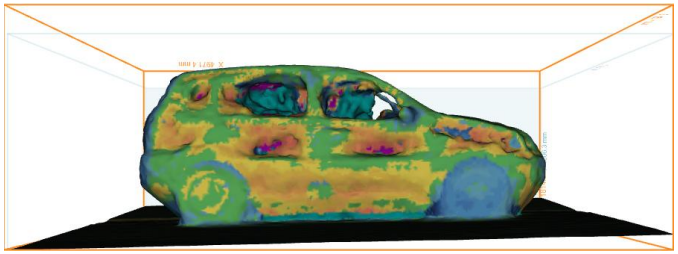


3D RECONSTRUCTION, VIRTUAL REALITY

3D Reconstruction and Measurement

- Laser scanning, Photogrammetry, 3D Measurement solution, Mesh and texture optimalization



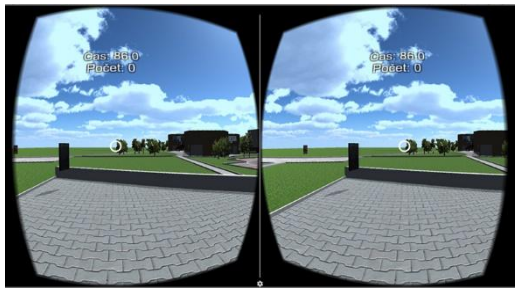


Aplications of Virtual Reality

- Low-end VR, Augmented VR, Projected VR, Immersive VR

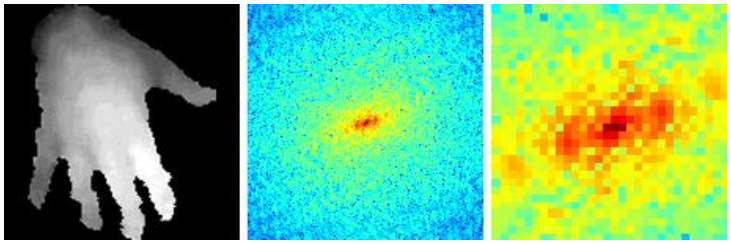


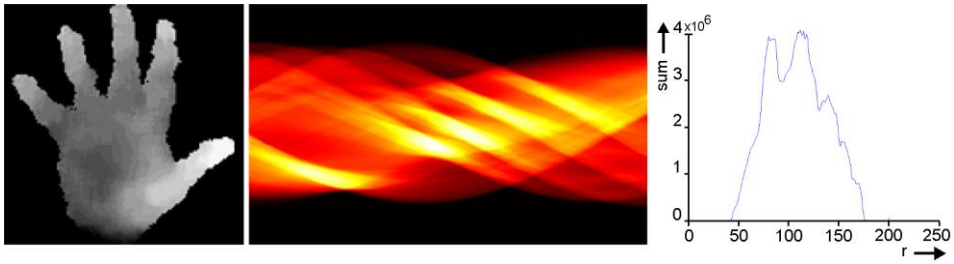


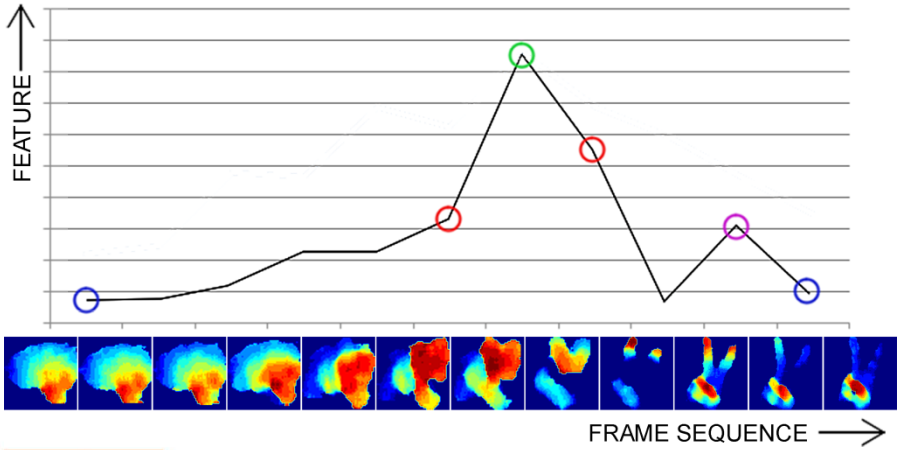


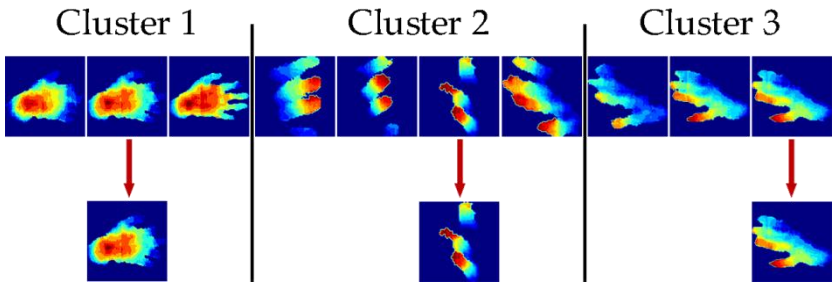
HYBRID SHAPE-MOTION DESCRIPTION

- Gesture recognition in human–computer interaction
- Video analysis and retrieval by semantic description of video





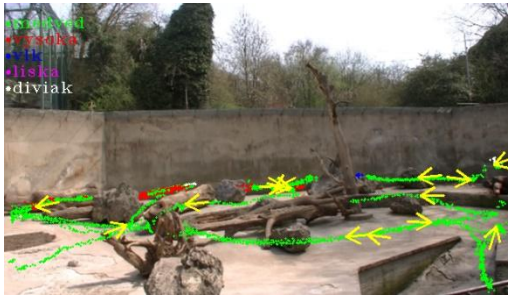




WILDLIFE ANIMAL RECOGNITION

- Low-level feature extraction and description
- Moving object segmentation algorithms
- SURF, SIFT, Fourier descriptors
- Classification using BOW
- SVM, Naive Bayes, SOM
- 3D animal modeling





Visible



NIR

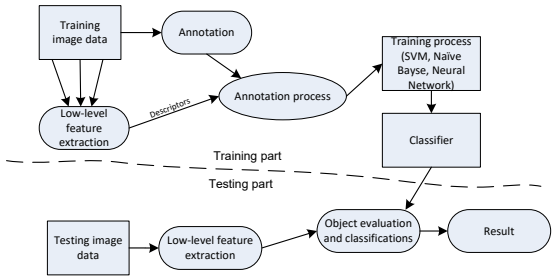


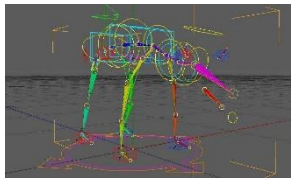
		PREDICTED			
		1	2	3	4
TARGETED	1	21	0	0	0
	2	0	25	1	0
	3	1	0	25	2
	4	0	2	0	23

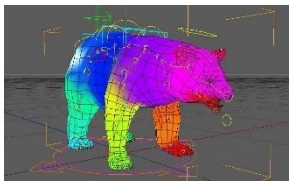
MobileNet

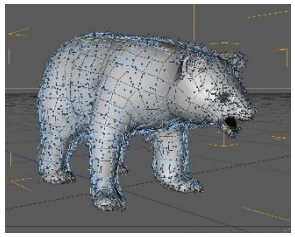
		PREDICTED			
		1	2	3	4
TARGETED	1	20	1	0	0
	2	1	24	0	1
	3	0	1	26	1
	4	2	0	1	22

ResNet







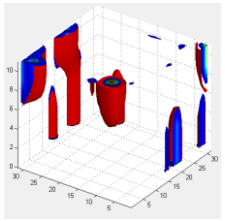


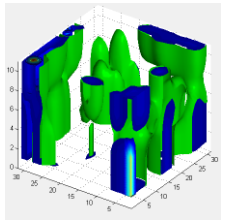


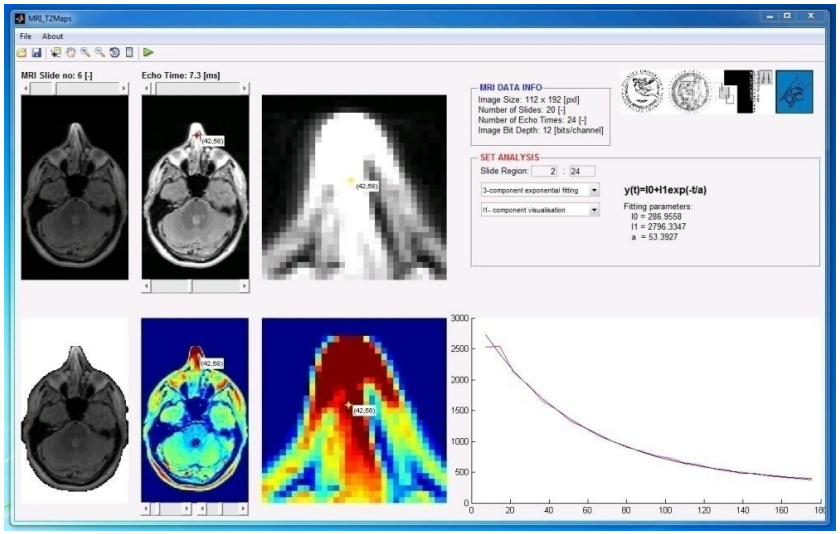


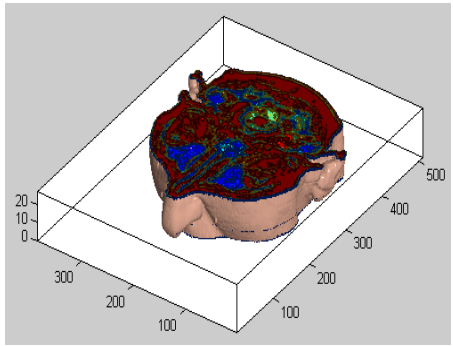
CANCER DETECTION AND VISUALISATION

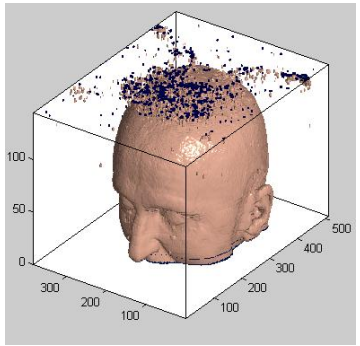
- DICOM v3.0 image data visualisation (Siemens MRI)
- MRI slice's data filtration and segmentation
- 3D Head/Brain surface reconstruction,
- 3D voxel interpolation
- 3D metabolite processing and visualisation (Cholin, Alanin, etc.)
- Brain cancer localisation, T2 relaxation maps (MRI) fitting







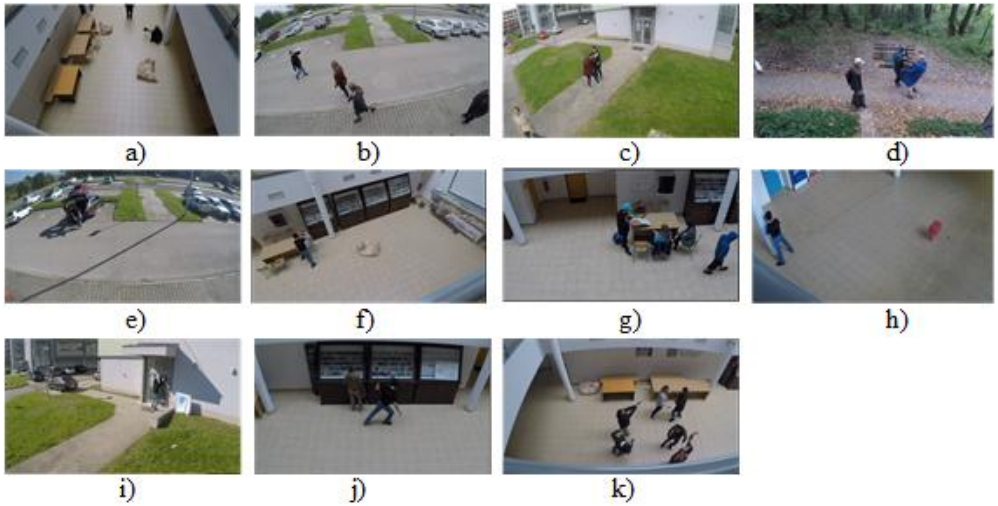


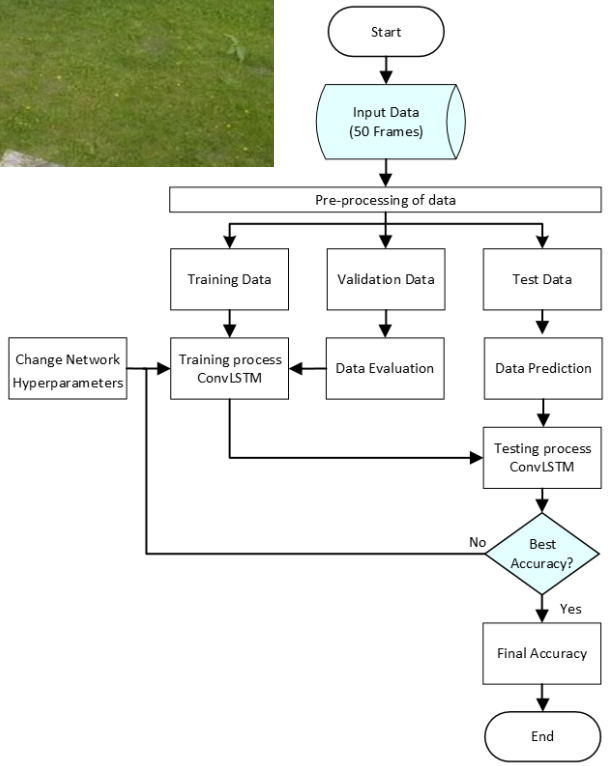


ABNORMAL HUMAN ACTIVITIES RECOGNITION

- Abnormal Human activities classification (hijack, harassment, begging, etc.)
- 3DCNN and ConvLSTM network

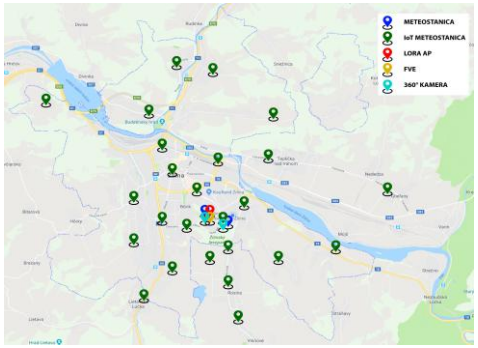


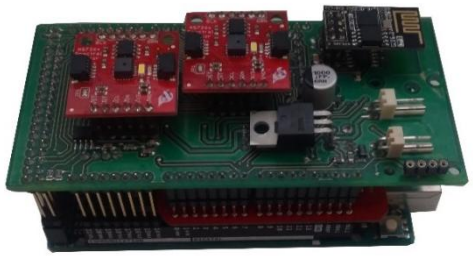


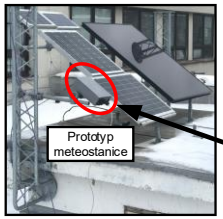


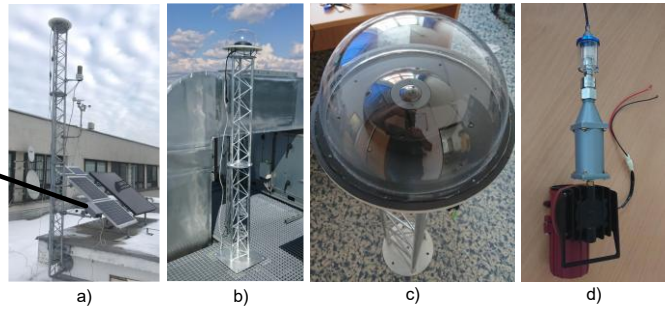
SHORT-TERM PREDICTION OF PVE

- Cloud classification (cirrus, altocumulus, nimbostratus, etc.)
- Short-term prediction of PV power plant (5 to 30 minutes)
- Intensity of solar irradiance forecasting by DL NN
- 3D cloud relief by stereoscopic 360° cameras' system
- METEO data sensing by IoT architecture from wide area
- LORA/WiFi communication
- Local METEO factors effect to prediction







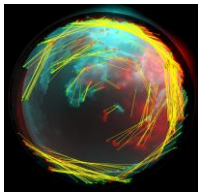








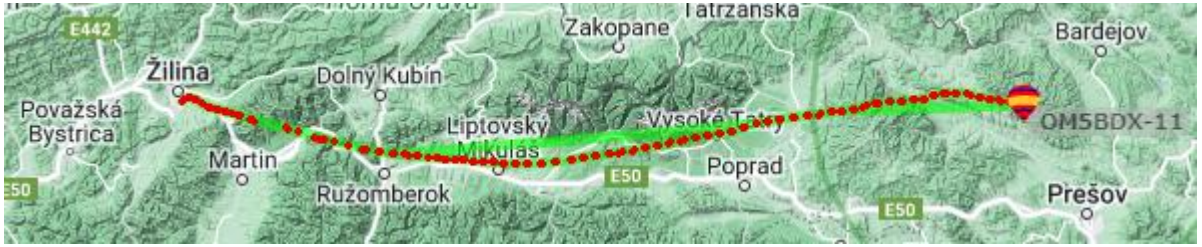




HIGH-ALTITUDE BALLOON



- STUDENT PROJECT
  - SEVERAL STRATOSPHERIC BALLOONS (ALTITUDE OF 30 KM)
- PROPRIETARY SYSTEM
  - DUAL APRS (144.8 MHZ) AND GSM COMMUNICATION
  - SD CARD STORAGE FOR MEASUREMENTS
  - GPS, THERMAL, PRESSURE, ACCELEROMETER AND OTHER SENSORS
  - MULTIPLE SUB-SYSTEMS TO INCREASE AUTONOMOUS CONTROL
  - CUSTOM MODULAR PCB AND 3D PRINTED CASE





3D MODELLING, 3D PRINTING

3D Modeling and Animation

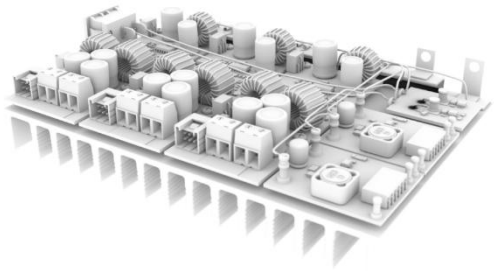
- Polygonal and Curve modeling, Digital sculpting, Animation and VFX

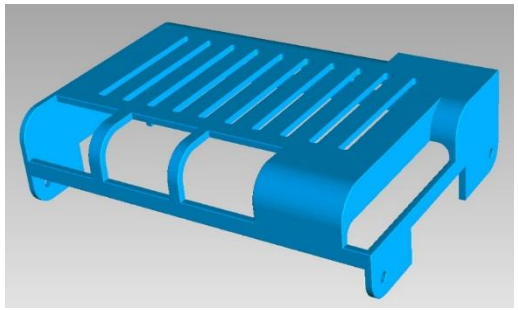


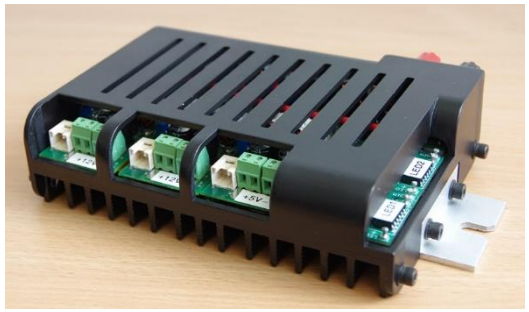


Rapid Prototyping and 3D Printing

- Computer Aided Engineering and Design, Polymer and Composite 3D printing







PROF. ING. RÓBERT HUDEC, PHD.
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LABORATORY OF HEALTH APPLICATIONS

LABORATORY OF HEALTH APPLICATIONS (LoHA)

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LABORATORY OF HEALTH APPLICATIONS

- **Structural health monitoring (nonliving)**
  - Non-destructive monitoring of electro-conductive materials
  - Digital signal filtration and preprocessing
  - Crack classification via SVM+PSO and GMM
  - On-board unit design HW and SW (C++, DELPHI, JAVA, PHP, MATLAB, etc)
  - DB design and mining
- **Human health state monitoring (living)**
  - Remote health state monitoring
  - Personal terminal HW and SW development
  - Development of primary health sensors (ECG, temperature, SpO2, heart rate, EMG, 3D patient position, etc.)
  - Design of health and assistance services (health state on demand, continuous monitoring, self-monitoring, environment monitoring, etc.)
  - Patients DB design and mining
  - Systems and services of inteligent clothing
- **Intelligent textile**
- **2D/3D computer vision**
  - Health data preprocessing (DICOM v 3.0)
  - Digital image processing (MRI, CT, RG)
  - Design and 3D modeling of equipment prototype for prostate cancer healing

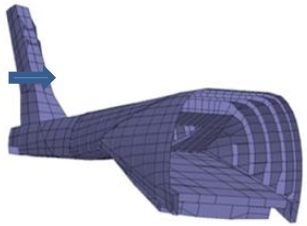
STRUCTURAL HEALTH MONITORING

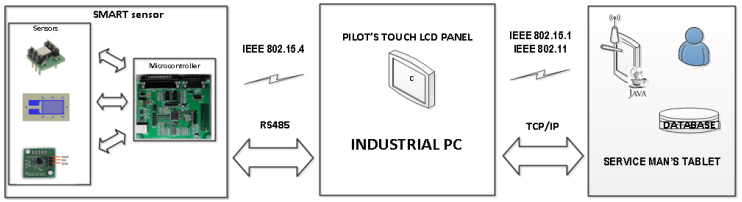
HECTOR-HElicopter fuselage Crack moniToring and prognosis through on-board sensOR network (European Defense Agency)

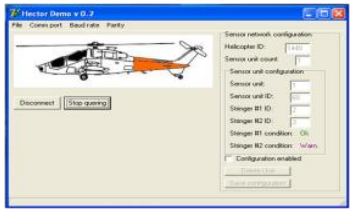
- Wireless and/or wired sensor net architecture development.
- Smart sensor development based on strain gauges.
- On Board Unit for Helicorter (HW & SW prototype development).
- Algorithm for detection, classification and crack prognosis.

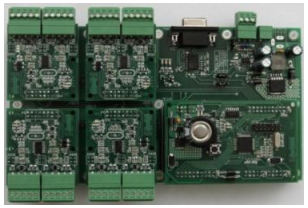


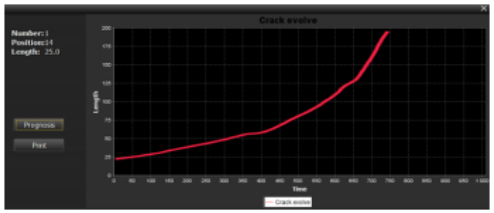






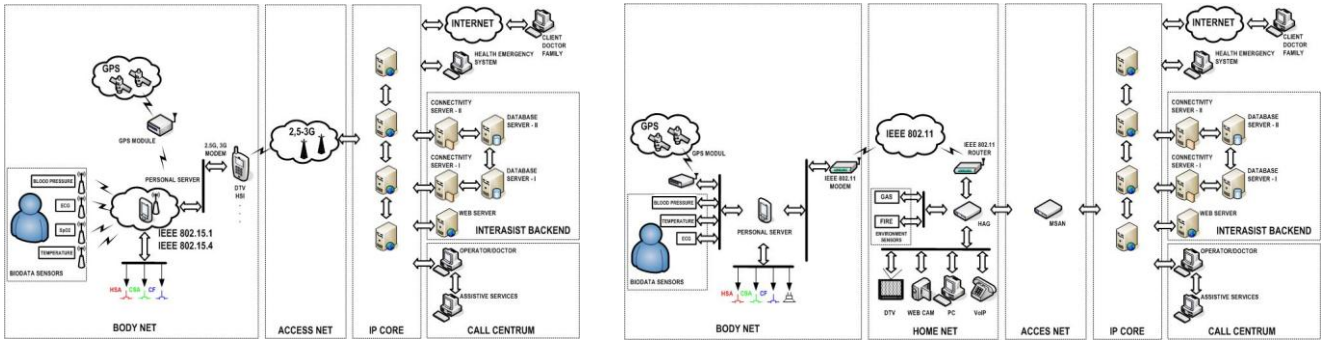


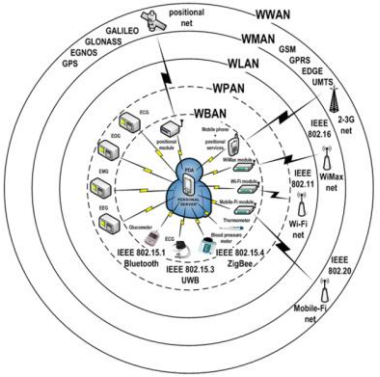




HUMAN HEALTH STATE MONITORING

- SYDMOS system (SYstem for Distant MOnitoring of the health State).
  - TEBID (TErminal for collecting and transmission of BIoData).
  - SYDES system (SYstem of connectivity to the Data of the E-health State).
- TEBID-ASCII protocol
- Services (Client Personalisation, Position via GSM Network, Health Condition on Demand, ECG monitoring, SpO_2 monitoring, …)



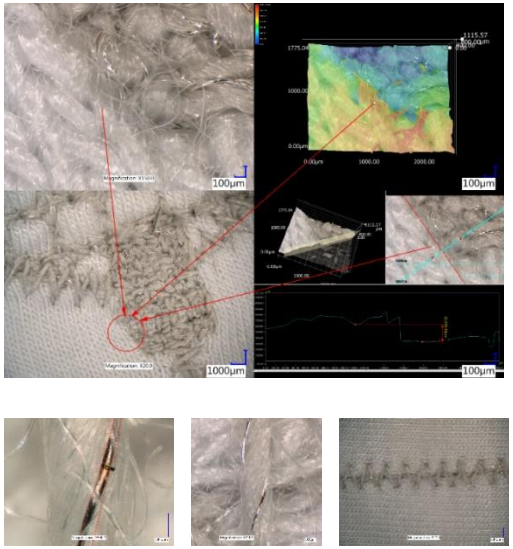


SYDMOS

INTELLIGENT TEXTILE - I.

- Design of wearable clothing based on Ag coated yarn, Cu-microwire (power&data transsmission, system, etc.)
- Design of electronic components of wearable clothing for measuring (ECG, body temperature, activity, humidity, etc.)

Applications: smart T-shirt (ECG, temperature, activity), smart chair (human posture at sitting), smart topper (ECG, activity at bed),

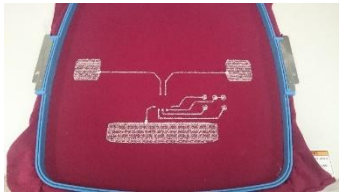


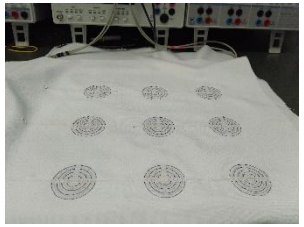






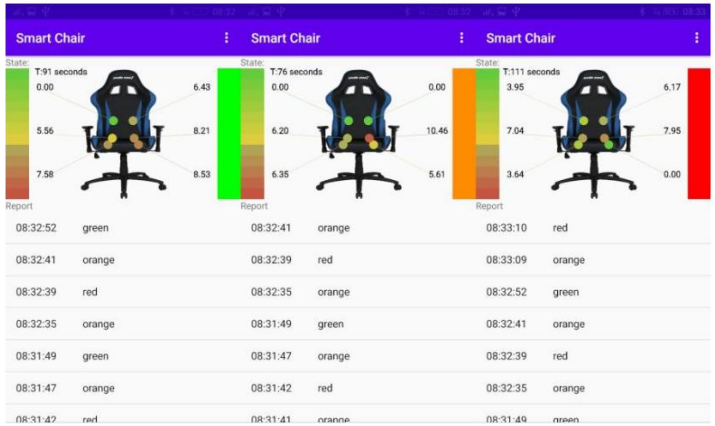


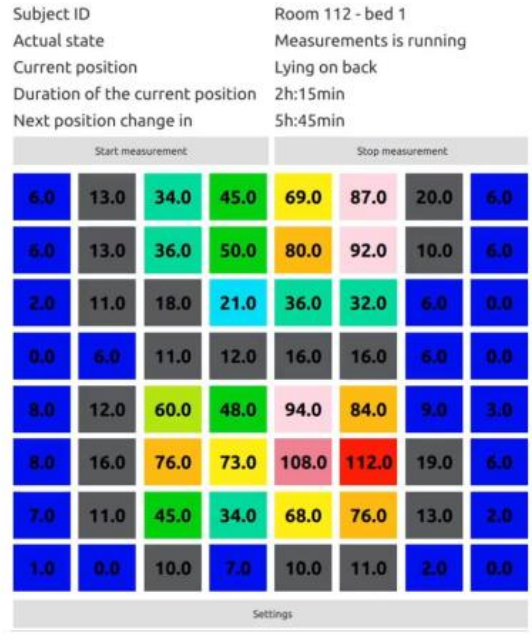


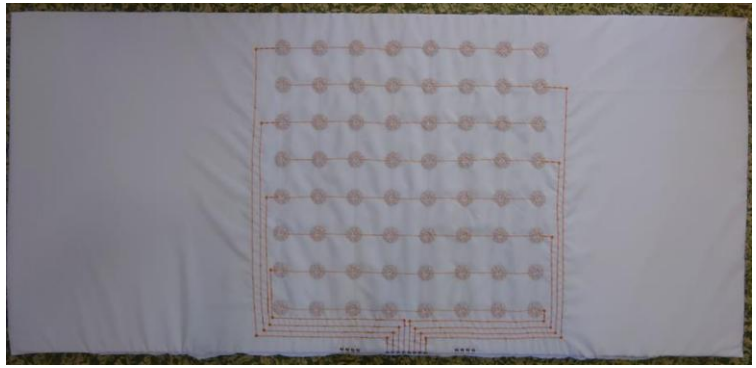


INTELLIGENT TEXTILE – II.

Applications: A Smart System for Sitting Posture Detection Based on Force Sensors and Mobile Application, smart topper (activity at bed - Detecting the Position of Lying Person),



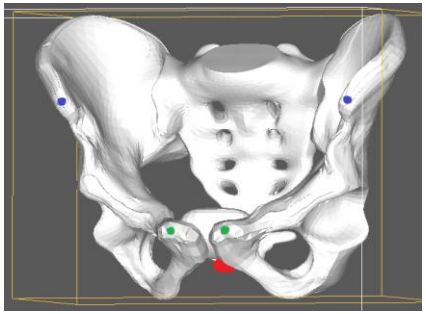


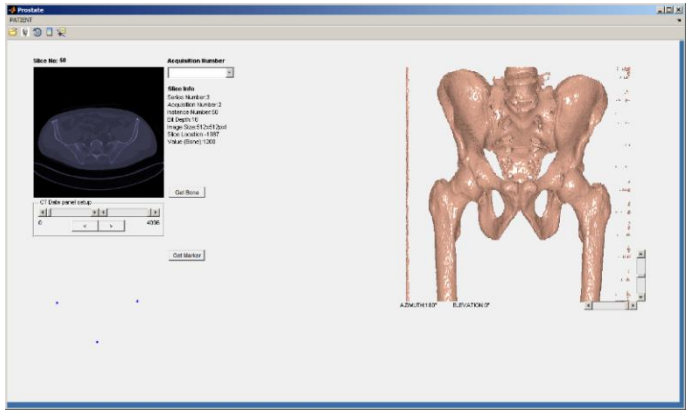


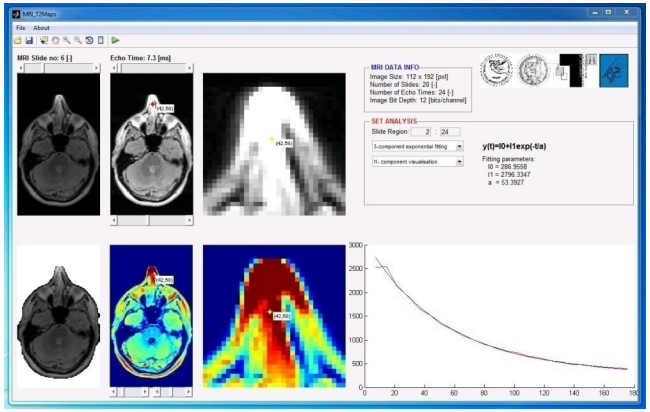
DIAGNOSTIC OF CANCER DESEASES

Research of advanced methods for biomadical data processing

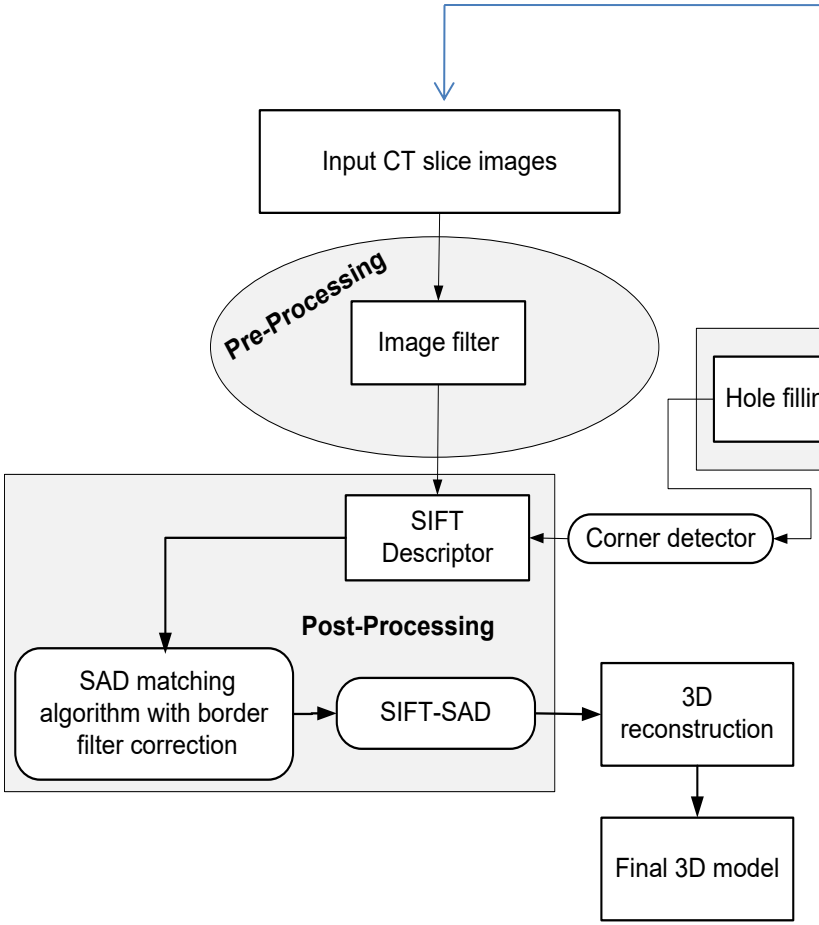
- Image registration for fusion of various coordinate systems
- Designation of correct patient position for therapy process
- 3D reconstuction and visualisation of CT, MRI, ultrasound and other modalities

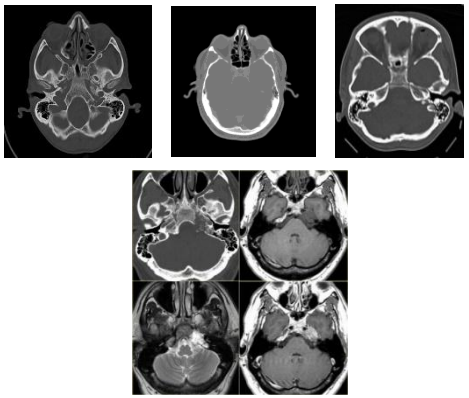






3D RECONSTRUCTION OF BIOMEDICAL DATA – I.

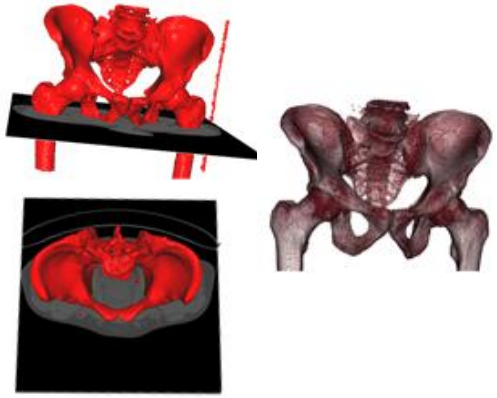


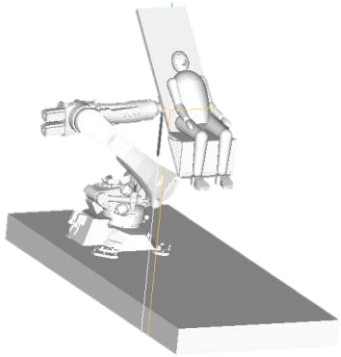


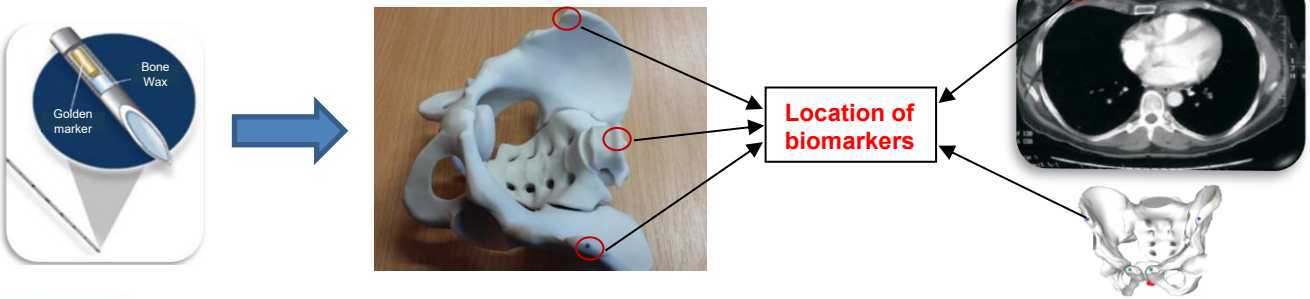
- Proposed method:
  - Image filtering by Mean Shift filter
  - Filtered image is splited into segments
  - Edge extraction using Canny edge detector
  - Integrated the Mean-Shift segmentation algorithm with the SIFT-SAD method

3D RECONSTRUCTION OF BIOMEDICAL DATA – II.

- Transformation
  - To determine the correspondence between the intra-operative imaging environment and the coordinates of the pre-operative volumetric data (to find a way to align the imaging and the world coordinate systems).
- Metric
  - The identification of fiducial markers in the input datasets in order to determine the best alignment.
- Optimizer
  - To execute a local search in the parameter space by evaluating the objective function at different locations according to a pattern.

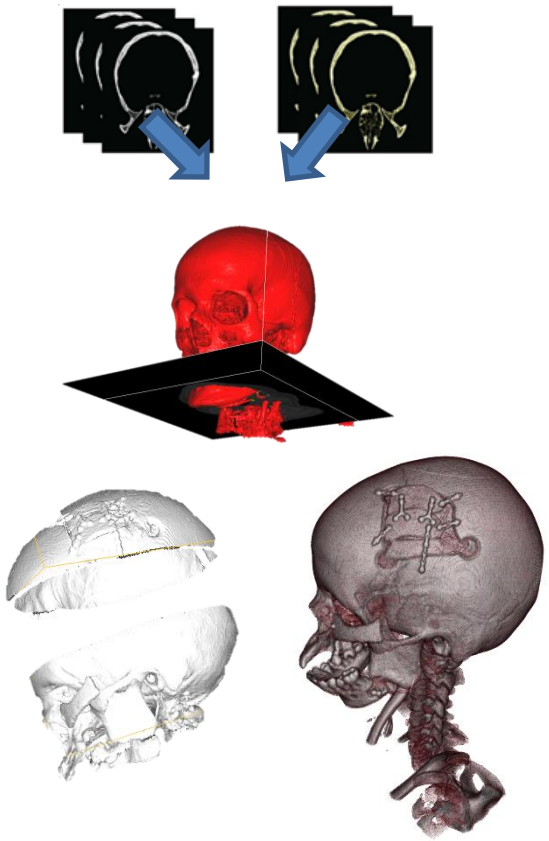






3D RECONSTRUCTION OF BIOMEDICAL DATA – III.

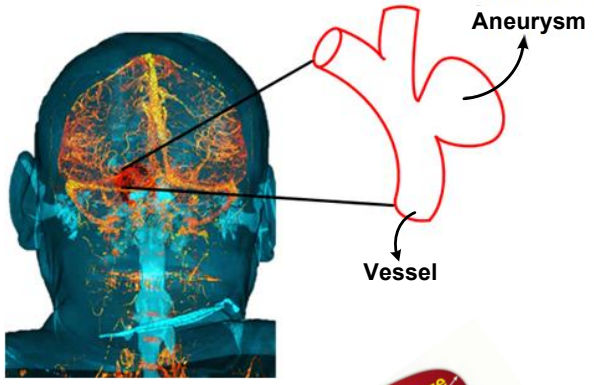
- Pre-Processing
  - Image artefacts filtration
  - Edges extraction
  - To find points that are clearly identifiable between multiple input data (these points are used to dividing the image into different segments)
- Image segmentation
  - Image splitting into segments
  - Each segment – corresponding points
  - Determining pairs of different key points within the segments
- SIFT-SAD
  - Corresponding points – min. value of 2D correlation
  - Calculation of 3D coordinates on the basis of the Finding corresponding points
  - Optimizing the final 3D model (hole filling)



INTRACRANIAL ANEURISMS DETECTION

- Detecting brain aneurysms is a critical area of research:
  - Brain aneurysm - weak spot in the wall of a blood vessel inside the brain.
- Dataset of brain aneurysm
  - The test dataset consists of full 3D models of brain vessels that contain aneurysms.

    (IntrA: 3D Intracranial Aneurysm dataset [1])
- Classification of brain aneurysms using NN (3DCNN Architecture)
  - The architecture consists of two 3DCNN layers and two MaxPooling3D layers.
  - The 3DCNN layer employs sliding cubic convolution filters to process the 3D input.
  - At the end of the architecture are the dense and flatten layers.

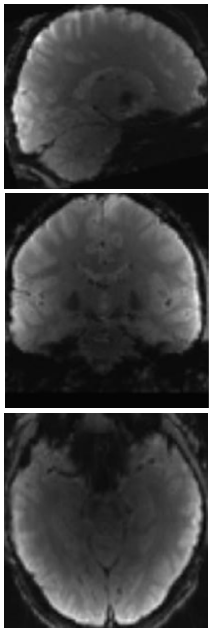


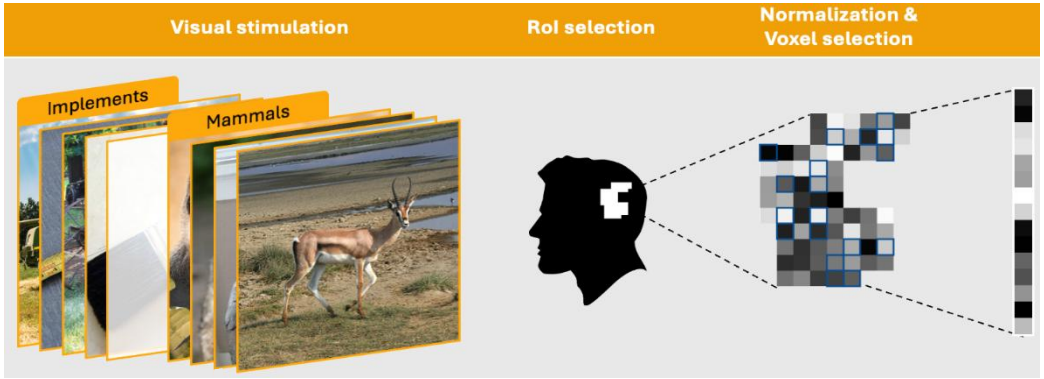


[1] X. Yang, D. Xia, T. Kin, and T. Igarashi, "IntrA: 3D Intracranial Aneurysm Dataset for Deep Learning," In IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), Seattle, WA, USA: IEEE, June 2020, pp. 2653–2663.

INTERPRETATION OF FMRI

- The fine-grained classification of human signals from the visual part of the brain that were stimulated by image data
  - ROI level analysis for low, middle, and semantic processing of visual signals (e.g. V1, V2, FFA, LOC, IT, ...)
- The utilization of latent space and alignment derived from reconstruction models, in conjunction with semantic vision-language embeddings, facilitates classification
- Datasets: Natural Object Dataset and ImageNet



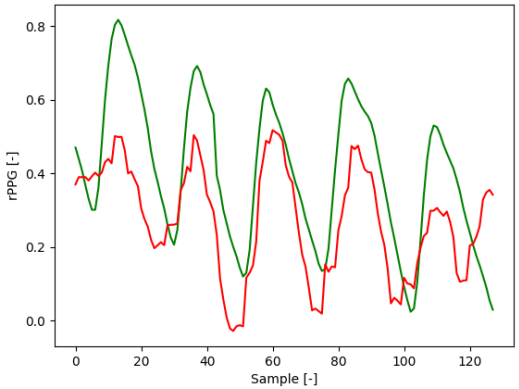


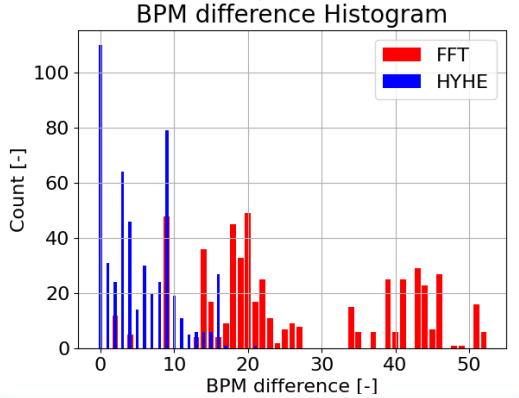
Suchalova S., Calcagno S., Hudec R., Spampinato C.,; Fine-grained fMRI Classification of Visual Stimuli Using CLIP Embedding Alignment, IEEE Access (Early Access), ISSN-2169-3536, 2026, (Q2)

NON-CONTACT VITAL SIGNS ESTIMATION

- Camera-based remote photoplethysmography (rPPG) with machine-learning models for contactless vital-sign estimation from face video
- Design of datasets & acquisition protocols (ViFaR) with synchronised face video and physiological signals in realistic scenarios (adults and children).
- DySpect-Net neural models learning frequency spectra directly from irregular, noisy signals (values + time gaps), reusable for broader signal-processing tasks.
- Hybrid pipelines & evaluation metrics (HYHE, FAVE) for robust, low-error heart-rate estimation on real-world video data



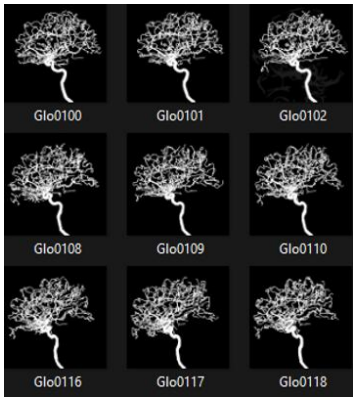


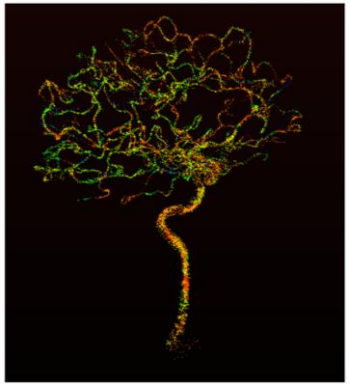


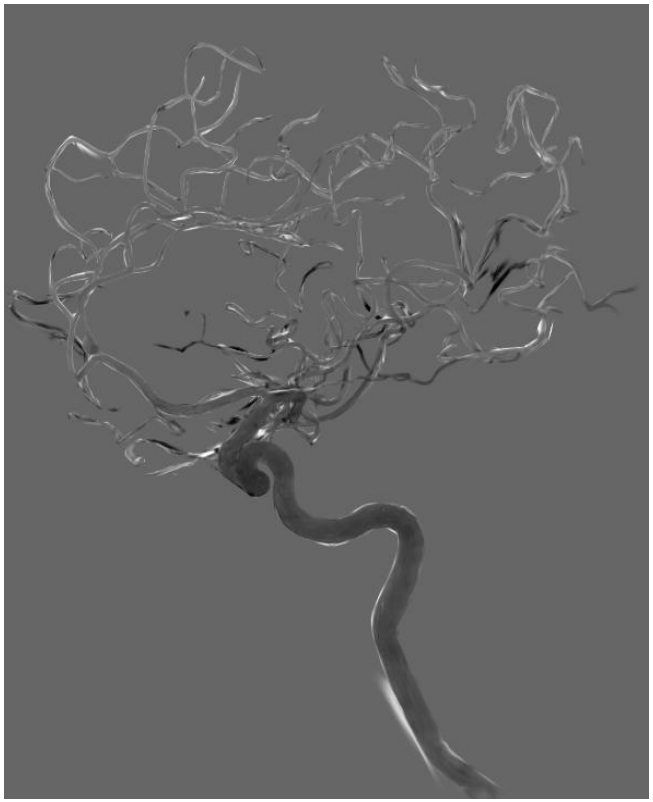
J. Sturekova, P. Kamencay, P. Sykora, S. Suchalova, D. Matthes and M. Fuchs, "DySpect-Net: Neural Network Predicting Spectrum From Non-Uniformly Sampled Data," in IEEE Access, vol. 13, pp. 157634-157650, 2025,

3D VASCULAR TREE RECONSTRUCTION





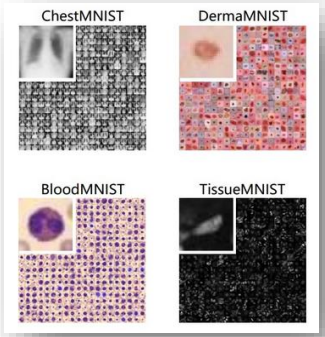




- 3D Reconstruction of Brain Vascular Structures Using Neural Radiance Fields Enhanced with Gaussian Splatting

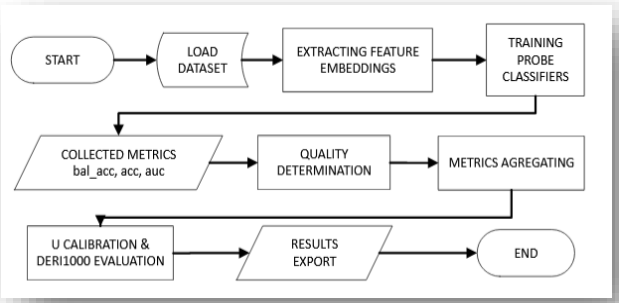
TRUSTWORTHY AI IN MEDICINE

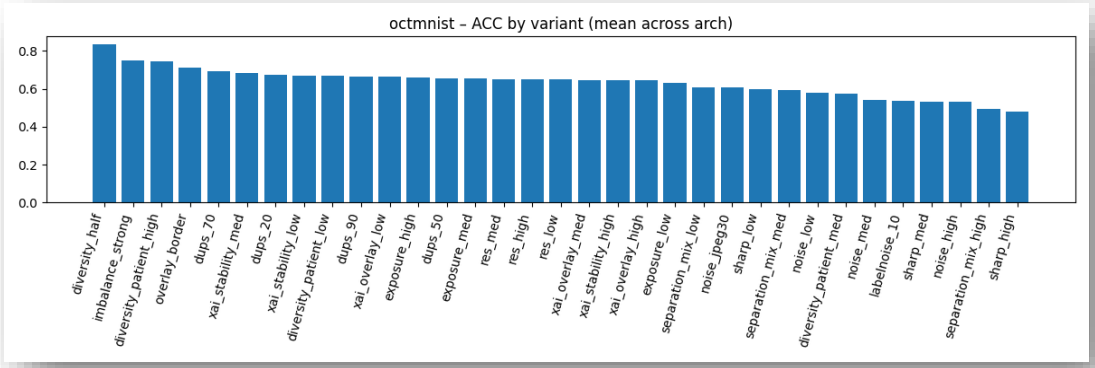
- Developing methods for explainability and trust in neural networks
- Identifying model vulnerabilities and analyzing decision-making processes
- Evaluating the impact of data imbalance across multiple architectures



DERI1000 Benchmark:

- Providing a unified framework for robustness and reliability evaluation
- Covering 1000 tasks with noise levels, modality shifts, and adversarial scenarios
- Enabling comparison based on explainability, stability, and fairness
- Integrated UMAP and advanced visualization tools for deeper insight
- Automated auditing tools for trustworthy AI systems







LABORATORY OF DIGITAL VIDEO PROCESSING



LABORATORY OF HEALTH APPLICATIONS

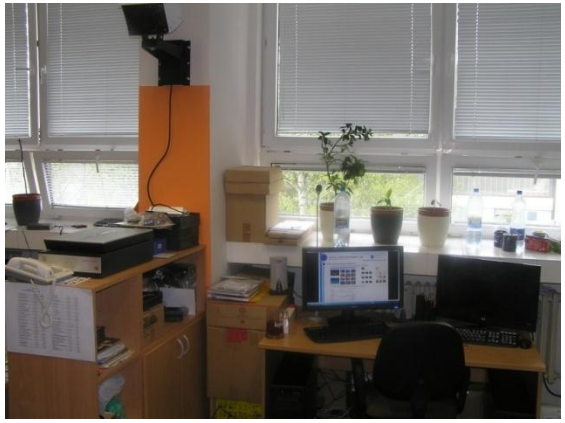
SUB-LABS



VIDEOLAB

LABORATORY OF SEMANTIC ANALYSIS OF STILL IMAGES AND VIDEO

- 2D scanning and projection equipments (BOSH REG Z1/D1, AXIS, IPcams, TPlink, CANON EOS650, CANON 6D, SONY DCR-SR50, A/D HW encoders, Kinect PC Xbox360, projectors, etc.),
- DVB STB-T, -C, -S, -H, IPTV equipments for receiving and measurements (DM8000PVR, DM7020, ROVER Atom, etc.),
- Set of audio equipments for recording and production ,
- 1x32-core workstations HeavyHorse, GPU
- 4x16-core workstations HeavyHorse, industry PC, military PC GETAC M230, 10xlaptops, tablets, etc.
- MATLAB (professional license) site with paraller computing,
- HP servers and 8TB RAID
- Databases (Corel, Essex, ORL, YELL, FERET, etc.)



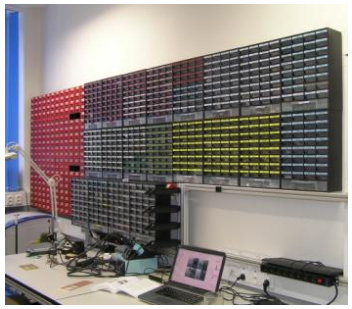


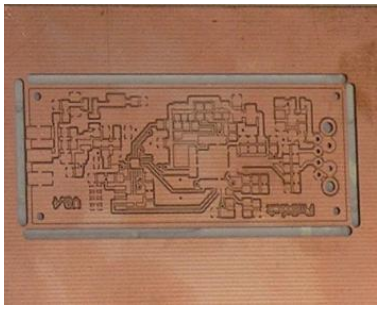


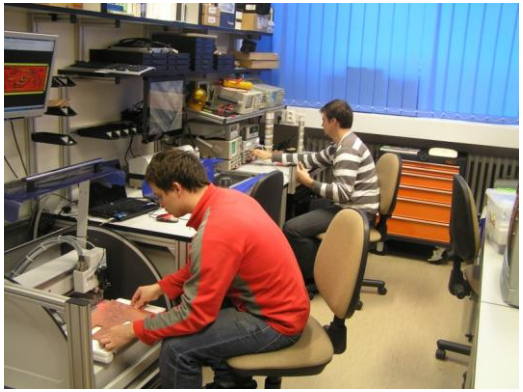
PROTOTYPE*LAB*

LABORATORY OF APPLIED RESEARCH AND PROTOTYPE SOLUTION OF ELECTRONIC SYSTEMS

- Circuit Board Plotter – LPKF Protomat S103
- Through-Hole Plating – LPKF Minicontact RS
- Multilayer – LPKF MultiPress S
- SMT Assembly – LPKF ProtoPlace S
- Soldering (reflow owen) – LPKF ProtoFlow E
- Soldering (Sn bath) – MiniSol MS-2LF
- Soldering (solder stations) – Weller WR 3M
- SW EAGLE v5.9
- Development kits - Freescale, Virtex, Atmel, etc.
- HW measurement equipments (thermocam, D/A oscilloscopes, spectral analyzers, AC and DC power sources, RLC bridge, V/A precise multimeters, signal generators, scopemeter, etc.)











GAMELAB

LABORATORY OF COMPUTER VISION, VIRTUAL REALITY AND GAMING

- Education:
  - Interactive Application Development
  - Game design
- Multiple options for deployment
  - Xbox, Windows, Android
  - 3 VR-sets and VR platform
  - 11 x PC (i7-9700, 32GB, RTX 2070)
  - 11xRealsence, 11xLeapmotion
  - 2x HTC VIVE
- International project for gamedev
  - Interreg PL-SK GAME JAM

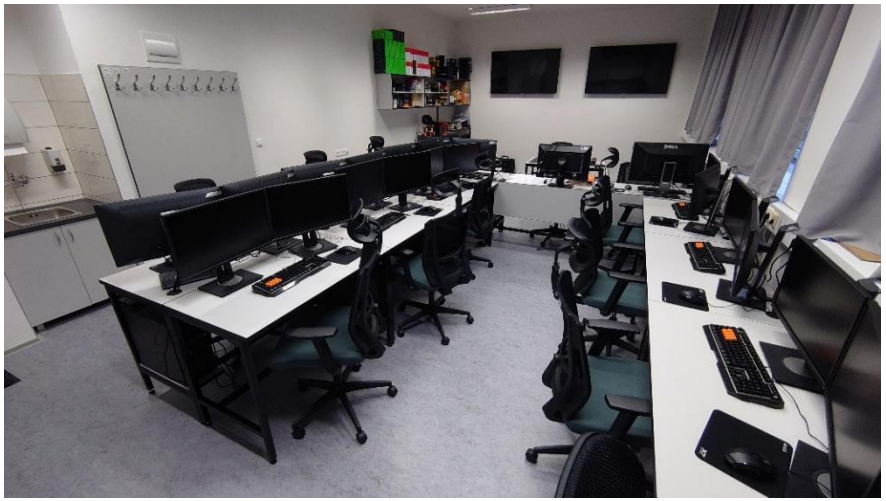
Video Games and Virtual Space Design in Cieszyn









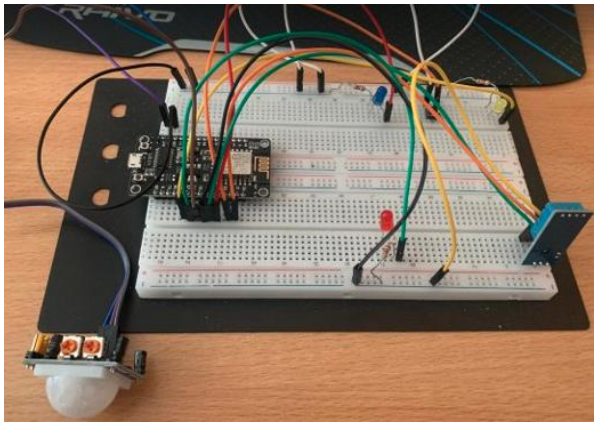


IOT*LAB*

LABORATORY OF IOT

- Education:
  - Internet of Things
  - Mobile application development
- Lab equipment:
  - 12x mobile phone IGET BLACKVIEW GBV5500 PLUS
  - 1x mobile phone MOTO G 5G PLUS SURFING BLUE
  - IoT Development kit - ESP IoT nodes (ESP32, ESP8266), actuators, sensors, ...
  - 18x computers (Windows/Linux) with SW: Visual Studio, Android Studio, Python, Spyder IDE, ...
- Students works:
  - Smart home
  - Smart Greenhouse
  - Smart system for car accident detection and evaluation





3D GRAPHIC*LAB*

LABORATORY OF 3D GRAPHIC, 3D SCANNING AND 3D PRINTING

- 3D scanner – RevScan (Z700)
- 3D color printer – Z650
- 32-core workstation HeavyHorse, 4-core workstation HP Z600
- 3D SW – Geomagic v12, ZScan
- 3D SW – Agisoft Metashape
- 3D cams - Kinects PC Xbox360, Bumblebee® 2 Stereo Vision System, JVC 3D FULL Everio GS-TD1BE
- 3D projection (3D TV, 3D flat projector, 3D glases)







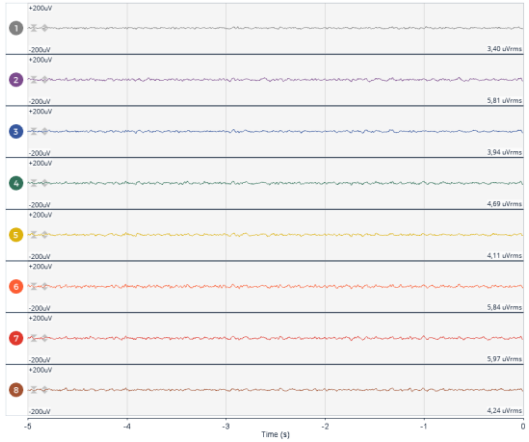




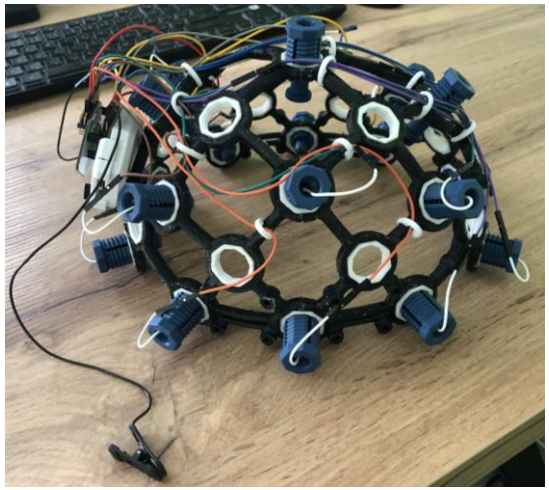
HEALTH*lab*

Laboratory of congnitive sciences

- BCI: Brain–Computer Interface
- 16-channer openBCI EEG cap
- Explainability of EEG signals by deep learned neural networks
- Visual evoked EEG potentials







TEXTILE*lab*

LABORATORY OF DESIGN AND PRODUCTION OF PROTOTYPE ELECTRONICS

- Programmable embroidery machine BARUDAN BEXT-S1501 CII
- Printer on textile EPSON SC F-2000
- LPKF's PCB technology - Protolaser U3, Protomat S103, Protoflow S, Protoprint S, Protomat D4, UV Exposure, Pro Mask, Pro Legend
- WELLER's soldering technology - WXD 2020, WHP 1000, WR3000M
- HAMEG's equipments - HMP2030, HM8118, HMO3524, HMS3010, HMF2550, HM8115-2, HM8123, HM8134-3
- 3D printer - Objet24
- Pick and place machine LS-60V
- Thermocam FLIR T440





LUIZA

Laboratory of AI at University of Zilina

LUIZA Laboratory of Artificial Intelligence University of Žilina

- 21x computer with nVIDIA GPU RTX 3060, MATLAB, Blender, Anaconda/Spyder IDE, ...
- 21x set of multimedia: HIKVISION DS-U18 8MP, head
- Teacher set: 1x WACOM CINTIQ 22 DTK, 2x JABRA, 2x Wifi audio system, WiFi USB, BLE USB
- Data storage QNAP TS 453D 8TB
- 2x Jetson Nano development KIT, 2x Jetson Xavier AGX development KIT, Latte Panda Alpha







LABORATORY OF DIGITAL
VIDEO PROCESSING



LABORATORY OF HEALTH
APPLICATIONS

SW-HW-COVER DESIGN

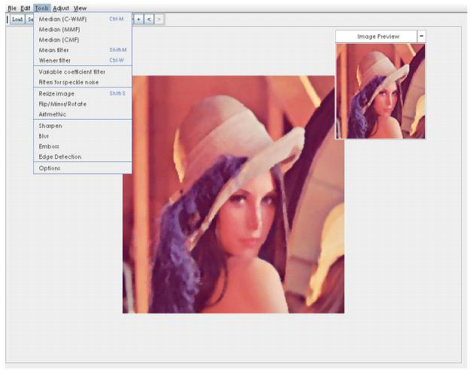


REALIZED SW AND HW SOLUTIONS – I.

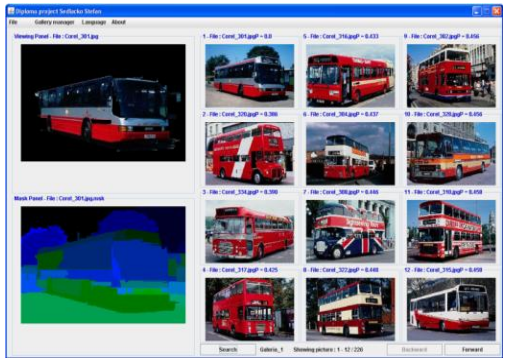
- **SYDMOS (2006),** SYSTEM FOR DISTANT MONITORING OF THE HEALTH STATE
- **TEBID (2006),** TERMINAL FOR COLLECTING AND TRANSMISSION OF BIODATA
- **SYDES (2006),** SYSTEM OF CONNECTIVITY TO THE DATA OF THE E-HEALTH STATE
- **ECG MONITORING (2006),** ECG MONITORING OF HEART ACTIVITY
- **IFM (2007),** Image Filtering Machine
- **INIRES (2008),** INteractive Image REtrieval System



TEBID homecare system



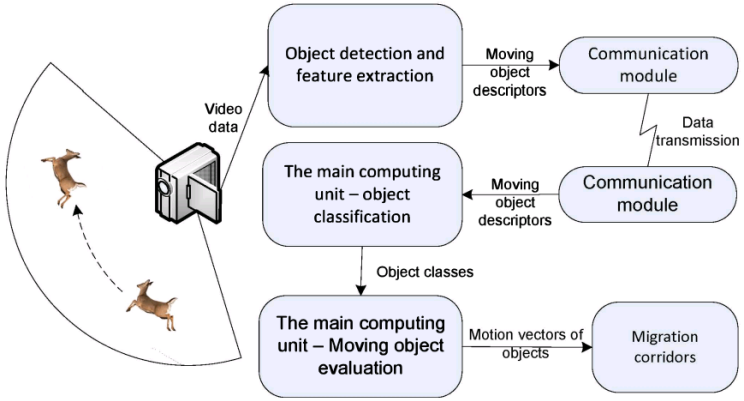
IFM



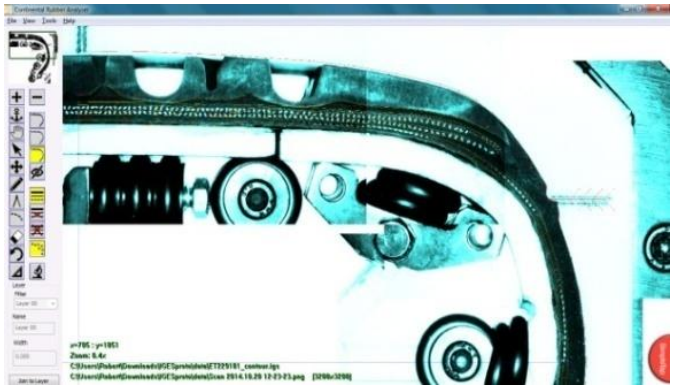
INIRES

REALIZED SW AND HW SOLUTIONS – II.

- **HECTOR (2011),** HELICOPTER FUSELAGE CRACK MONITORING AND PROGNOSIS THROUGH ON–BOARD SENSOR NETWORK
- **MRI T2MAPS (2012),** MRI T2 MAPS ANALYSER
- **IA (2012),** INTERSECTION ANALYSER
- **SIIT (2013),** SEMANTIC INCLUSION OF IMAGES AND TEXTUAL SEGMENTS
- **ASFAR (2014),** AUTOMATIC SYSTEM FOR ANIMAL RECOGNITION
- **CRA (2015),** CONTINENTAL RUBBER ANALYSER



ASFAR

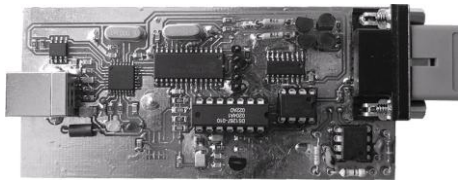


CRA

REALIZED SW AND HW SOLUTIONS – III.



SIIT



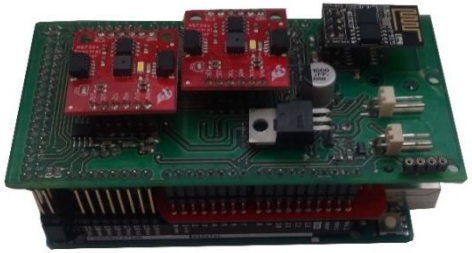
SpO_2 sensor



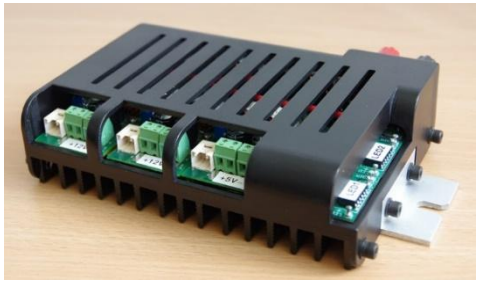
Smart chair



Stratospheric balloon satellite



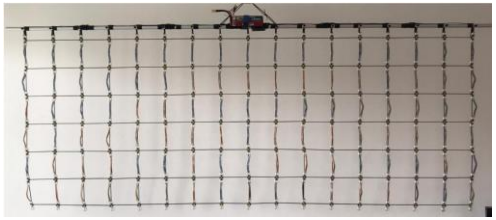
PREDICON main weather station



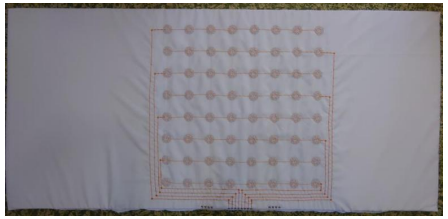
ASFAR power source module



PREDICON "CUBE" weather station



17x7pxl "flying" color display for drone



Smart topper for detecting the position of the lying patient by smart textile



LABORATORY OF DIGITAL VIDEO PROCESSING



LABORATORY OF HEALTH APPLICATIONS

TEACHING & STUDENTS



LECTURES – I.

Programming

Informatics (assoc. prof. Benco, assoc. prof. Matuska)
Object-oriented programming 1,2 (assoc. prof. Benco)
Scripting Languages (assoc. prof. Benco, Dr. Paralic, Dr. Sykora)
Higher Programming Languages (Dr. Paralic)

Signal processing

Introduction to signals and systems (assoc. prof. Kamencay, prof. Dado)

Graphics and Computer vision

Computer graphics 1 (prof. Hudec, Dr. Hlavata)
Computer graphics 3 (assoc. prof. Kamencay, Dr. Hlavata)
Creative computer graphics (assoc. prof. Kamencay, Dr. Hlavata)
Digital image proccessing (prof. Hudec, Dr. Hlavata)
3D virtualisation (assoc. prof. Kamencay, prof. Hudec)

LECTURES – II.

Systems

- **Sensing and display systems** (prof. Hudec)
- **Internet of Things** (assoc. prof. Matuska, prof. Brida)
- **Database systems in ICT** (Dr. Paralic)
- **Operating systems and virtualization** (Dr. Matuska)
- **Digital television and new services** (prof. Hudec)

WEB

- **Creation of static multimedia websites** (assoc. prof. Matuska, Dr. Radilova)
- **Creation of dynamic multimedia websites** (assoc. prof. Matuska, Dr. Radilova)
- **Web informatics system development** (assoc. prof. Matuska, Dr. Radilova)

Applications

- **Development of Interactive Applications** (Dr. Sykora)
- **Mobile application development** (Dr. Paralic)
- **Game Design** (Dr. Sykora)

SELECTED MASTER'S THESIS – I.

3D scanning platform, 2021

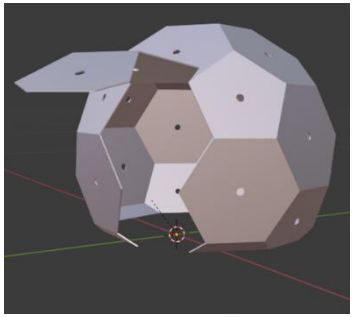
Student: Ing. Adam ŠTECH
Supervisor: prof. Robert HUDEC, PhD.

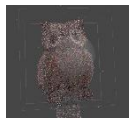





3D scanning dome, 2022

Student: Ing. Ján TEKEĽ
Supervisor: prof. Robert HUDEC, PhD.

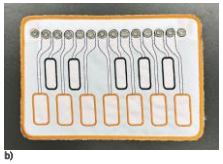






Textile piano, 2023

Student: Ing. Samuel KRŠKO
Supervisor: prof. Robert HUDEC, PhD.



SELECTED MASTER'S THESIS – II.

Recognition of dangerous objects from the image, 2023

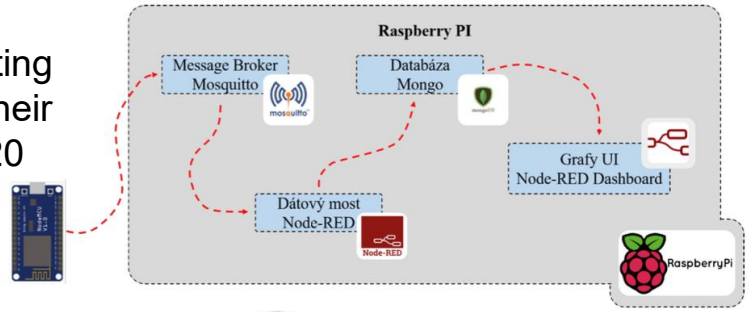
Student: Ing. Juraj Vaško
Supervisor: Ing. Róberta Hlavatá, PhD.

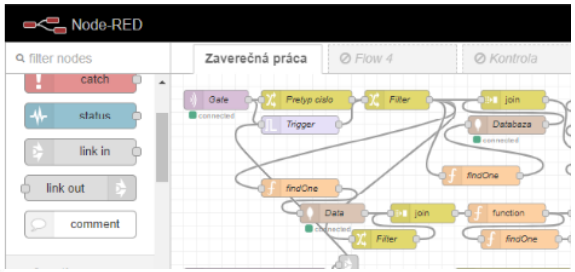


Model	Accuracy	Precision	F1-score	Recall	Loss
Seqential	88.75%	89.74%	88.61%	87.50%	0.604
ResNet50	90.83%	90.83%	90.83%	90.83%	0.3068
InceptionV1	95.42%	94.31%	95.47%	96.67%	0.2359

IoT based system for detecting the number of people and their distribution in classroom, 2020

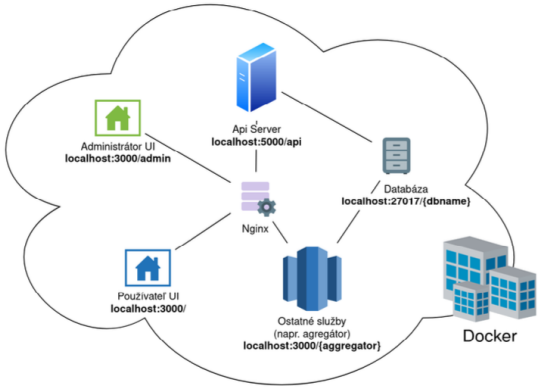
Student: Ing. Jakub Brozda
Supervisor: Ing. Slavomír Matúška, PhD.

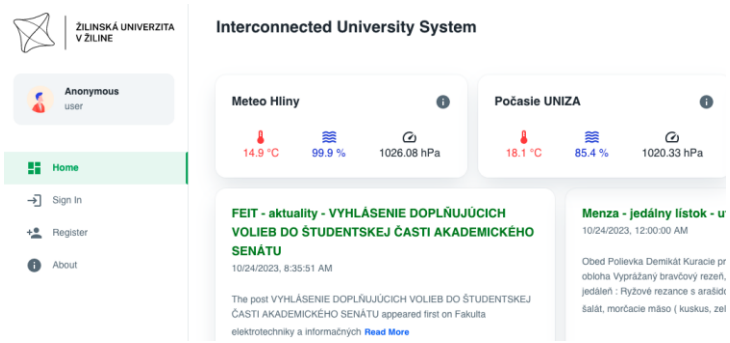




A functional IoT-based system design of the Connected University, 2021

Student: Ing. Miroslav Hutár
Supervisor: Ing. Slavomír Matúška, PhD.

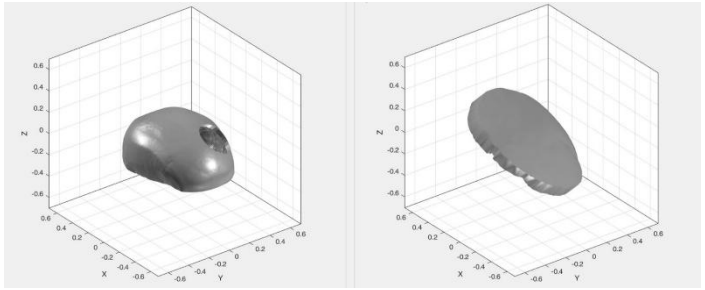




SELECTED MASTER'S THESIS – III.

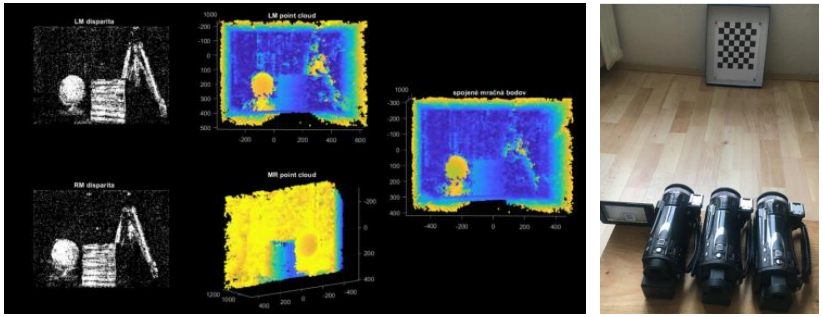
3D reconstruction of skull defects, 2018

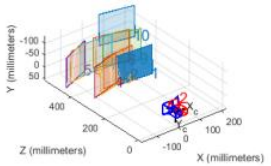
Student: Ing. Dominika JANČOVIČOVÁ
Supervisor: assoc. prof. Patrik KAMENCAY, PhD.



3D reconstruction of a real scene using a multi-camera system, 2021

Student: Ing. Michal GAJDOŠÍK
Supervisor: assoc. prof. Patrik KAMENCAY, PhD.



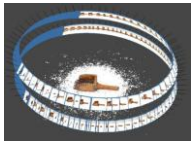


Virtual tour of the museum, 2023

Student: Ing. Anton BREZÁNI
Supervisor: assoc. prof. Patrik KAMENCAY, PhD.









SELECTED MASTER'S THESIS – IV.

Emotion detector, 2021

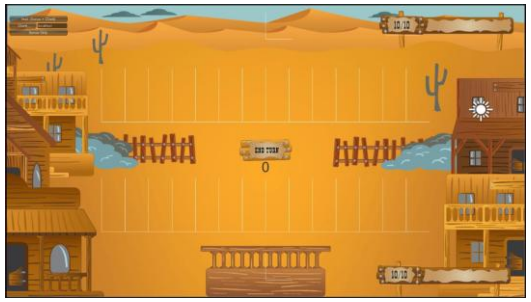
Student: Ing. Hana LEŠŤANOVÁ
Supervisor: Ing. Peter SÝKORA, PhD.



A - Angry B - Happy C - Sad		Predicted		
		A	B	C
True	A	315	45	131
	B	31	780	68
	C	95	63	436

Card game, 2022

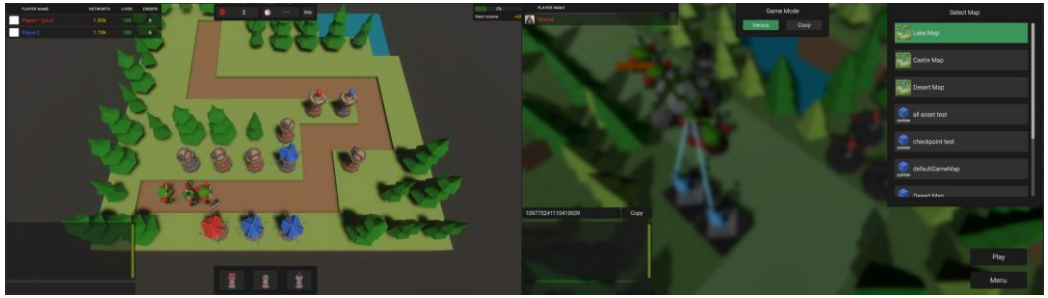
Student: Ing. Matej LIHAN
Supervisor: Ing. Peter SÝKORA, PhD.





Cooperative game with terrain adjustment, 2022

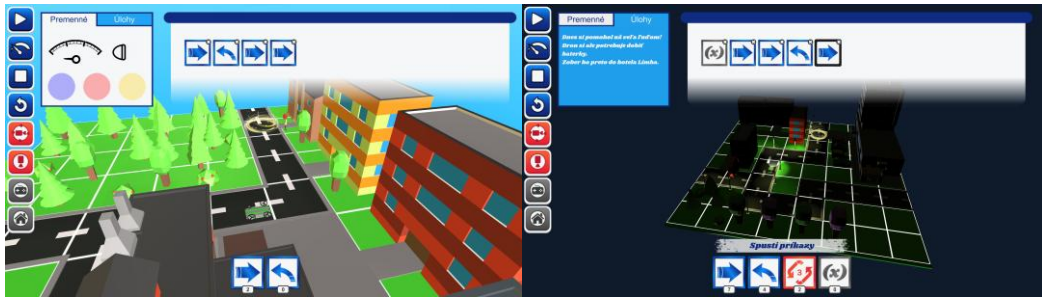
Student: Ing. Andrej VYŠINSKÝ
Supervisor: Ing. Peter SÝKORA, PhD.



SELECTED MASTER'S THESIS – V.

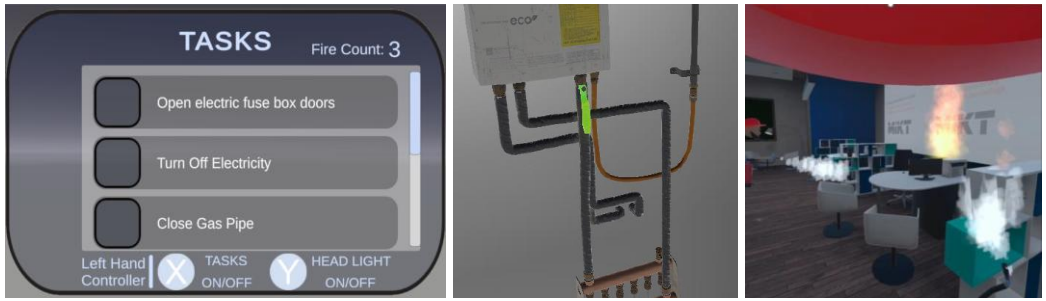
Mobilodron, 2022

Student: Ing. Matej MATEJČIK
Supervisor: Ing. Peter SÝKORA, PhD.



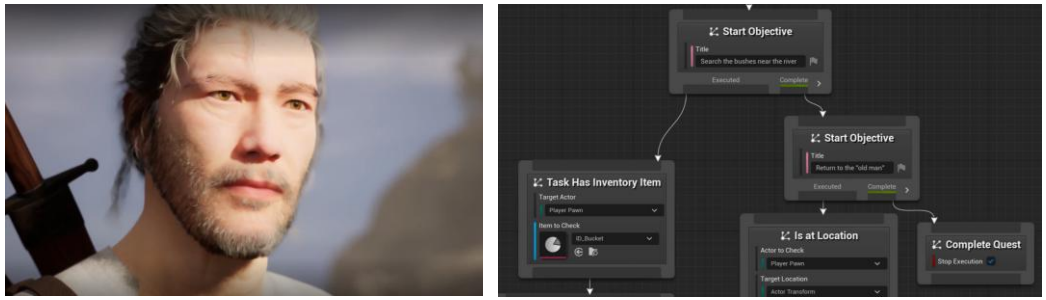
Simulator of a security situation in virtual reality, 2023

Student: Ing. Matúš LIZOŇ
Supervisor: Ing. Peter SÝKORA, PhD.



Modular quest system, 2023

Student: Ing. Michal SMOLEŇ
Supervisor: Ing. Peter SÝKORA, PhD.



SELECTED MASTER'S THESIS – VI.

UNIZA WARS, 2023

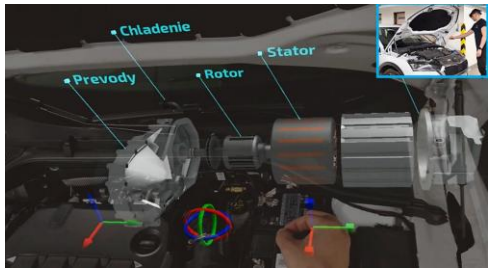
Student: Ing. Andrej Pisarčík
Supervisor: assoc. prof. Miroslav Benco, PhD.





Augmented reality and its use in industrial applications, 2021

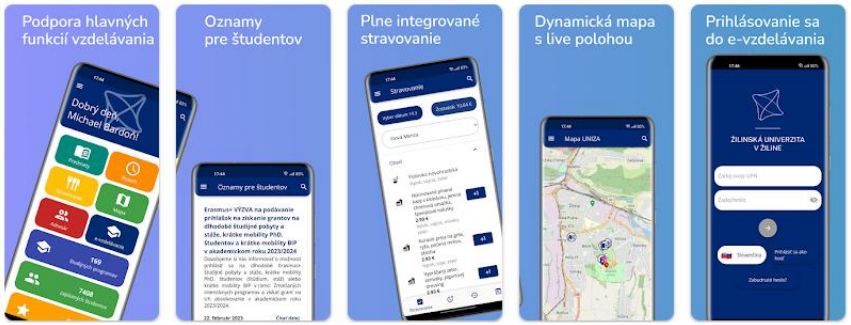
Student: Ing. Benjamin Kall
Supervisor: assoc. prof. Miroslav Benco, PhD.





Smart Uniza – mobile app, 2023

Student: Ing. Michael Bardoň
Supervisor: assoc. prof. Miroslav Benco, PhD.

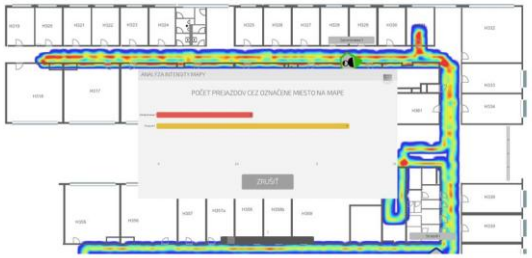


SELECTED MASTER'S THESIS – VII.

Design and implementation of a software module for monitoring and configuration of the Digital Twin system, 2021

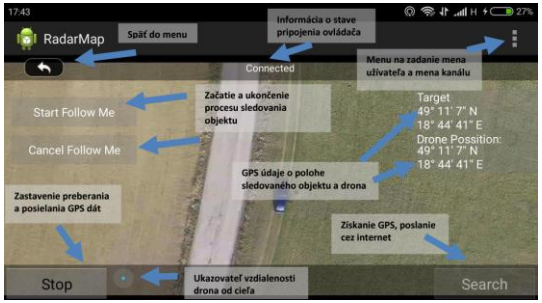
Student: Ing. Roman Kempa
Supervisor: assoc. prof. Miroslav Benco, PhD.





Drone control application, 2016

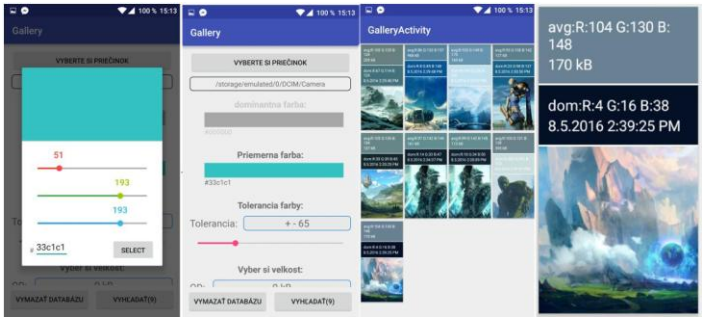
Student: Ing. Ľubomír Igonda
Supervisor: assoc. prof. Miroslav Benco, PhD.





Smart Gallery for Android, 2016

Student: Ing. Michal Mikolka
Supervisor: assoc. prof. Miroslav Benco, PhD.



GRADUATED PHD. STUDENTS – I.

[1] PARALIČ, M.: Methods of Audio Signals Recognition – Segmentation and Speakers Recognition; Supervisor: JARINA, R., University of Zilina, EF, Department of Telecommunications, 2007. (in Slovak)

[2] BENČO, M.: The automatic description and retrieval of images based on combined features extraction; pages: 123, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2008. (in Slovak)

[3] LUKÁČ, P.: Modified algorithm of automatic segmentation of color images based on graph theory; pages: 155, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2011. (in Slovak)

[4] JELŠOVKA, D.: Modified algorithm for 2D-3D faces recognition using Canonical Correlation analysis; pages: 130, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2012. (in Slovak)

[5] KAMENCAY, P.: Creating a 3D model from stereo images using segmentation; pages: 97, Supervisor: JARINA, R., University of Zilina, EF, Department of Telecommunications, 2012. (in Slovak)

[6] ZACHARIÁŠOVÁ, M.: Semantic inclusion of textual and visual imformation for semantic WEB; pages: 114, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2013. (in Slovak)

GRADUATED PHD. STUDENTS – II.

Graduated PhD. Students

[7] FRIČ, M.: Static image searching based on graphical input (pictogram); pages: 108, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2014. (in Slovak)

[8] MATÚŠKA, S.: Classification of animals in dynamic sequences for determination of migration potential of wildlife animals; pages: 132, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2014. (in Slovak)

[9] SÝKORA, P.: Dynamic Gesture Recognition based on Depth Map Video Sequence Analysis, pages: 78, Supervisor: HUDEC, R., University of Zilina, EF, Department of Telecommunications, 2015. (in English)

[10] TRNOVSZKÝ, T.: Dynamic video sequences' object recognition in infrared domain; pages: 145, Supervisor: HUDEC, R., University of Zilina, EF, Department of Multimedia and Information-Communication Technology, 2017. (in Slovak)

[11] VRŠKOVÁ, R.: Research on classification methods human behavior; pages: 128, Supervisor: HUDEC, R., University of Zilina, FEIT, Department of Multimedia and Information-Communication Technology, 2022. (in Slovak)

[12] ŠTECH, A.: Automatic image selection for a photogrammetric 3D object reconstruction system; pages: 95, Supervisor: HUDEC, R., University of Zilina, FEIT, Department of Multimedia and Information-Communication Technology, 2024. (in Slovak)



LABORATORY OF DIGITAL VIDEO PROCESSING



LABORATORY OF HEALTH APPLICATIONS

PROJECTS



INTERNATIONAL PROJECTS – I.

[1] **VTP AV/8/9/202: CONNECT - Co-ordination and stimulation of innovative ITS activities in Central and Eastern European countries** (2005 – 2007)

Coordinator: Milan Dado

Researchers: Róbert Hudec, Miroslav Benčo

[2] **FP7-SA-202855: Emergence of Research Driven Clusters in Central Europe** (06/2008-05/2010)

Sub-Coordinator: Milan Dado (UNIZA)

Co-operators: Peter Brída, Róbert Hudec

[3] **COST 292: Semantic multimodal analysis of digital media (05/2004-12/2008)**

Coordinator: Ebroul Izquierdo (Queen Mary University of London, UK)

Researchers: Roman Jarina, Róbert Hudec

[4] **IST EC2-6RP: SSA – 015829, Canada-Europe Collaboration in IST Research & Technology Development** (2005-2007)

Sub-coordinator: Milan Dado (UNIZA)

Researchers: Róbert Hudec

INTERNATIONAL PROJECTS – II.

[5] **A–0930–RT–GC: HECTOR – Helicopter fuselage Crack moniToring and prognosis through on–board sensOR network, European Defence Agency** (12/2009-12/2011)

Coordinator: Marco Giglio (Politecnico di Milano, IT)

Sub-coordinator: Róbert Hudec (UNIZA)

Researchers: Vladimír Wieser, Vladimír Hottmar, Miroslav Benčo, Michal Kuba, Martin Vestenický, Jozef Dubovan, Martina Zachariášová, Štefan Pollák

[6] **E! 6752: DETECTGAME R&D for Integrated Artificial Intelligent System for Detecting the Wildlife Migration** (06/2013 - 06/2016)

Coordinator: Jaromír Bogr (B&M InterNets, CR)

Sub-coordinator: Róbert Hudec (UNIZA)

Researchers: Miroslav Benčo, Ján Hlúbik, Martin Paralič, Martin Vaculík, Vladimír Wieser, Peter Brída, Juraj Machaj, Patrik Kamencay, Miroslav Uhrina, Martina Zachariášová, Slavomír Matúška, Martin Šimaliak, Andrej Tkáč, Peter Sýkora

[7] **PLSK.03.01.00-24-0181/18: GameJam** (10/2019 - 09/2021)

Coordinator: Justyna Stefańczyk (Uniwersytet Śląski w Katowicach, PL)

Sub-coordinator: Miroslav Benčo (UNIZA)

Researchers: Patrik Kamencay, Peter Sýkora

INTERNATIONAL PROJECTS – III.

[8] **COST CA16212: Impact of Nuclear Domains On Gene Expression and Plant Traits (INDEPTH)** (2017-2021)

Coordinator: Christophe Tatout (Université Clermont Auvergne, FR)

Sub-oordinator: Patrik Kamencay (UNIZA)

[9] **MSCA-RISE-2016: SENSors and Intelligence in BuiLt Environment: SENSIBLE** (2016-2022)

Coordinator: Vladimir Stankovic (University of Strathclyde, Glasgow, UK)

Sub-Coordinator: Juraj Machaj (UNIZA)

Researchers: Róbert Hudec, Patrik Kamencay, Miroslav Benčo, Peter Sýkora, Martina Radilová, Slavomír Matúška

[10] **DIGITAL-2022-CLOUD-AI-02-TEF-HEALTH - Testing and Experimentation Facility for Health** (2023-2027)

Coordinator: Petra Ritter (Charite Berlin, DE)

Sub-Coordinator: Róbert Hudec (UNIZA)

Researchers: Patrik Kamencay, Miroslav Benčo, Peter Sýkora, Martin Paralič

NATIONAL PROJECTS – I.

[1] **26220120028: Centre of excellence for Systems and Services of Intelligent Transport I** (09/2009 – 08/2013)

Coordinator: Milan Dado

Researchers: Martin Vaculík, Roman Jarina, Róbert Hudec, Peter Brída, Vladimír Wieser

[2] **26220220022: Design of New Diagnostic Algorithm for Selected Tumour Affections** (09/2009 – 05/2013)

Coordinator: Račay Peter, (JLF UK, Martin)

Sub-Coordinator: Róbert Hudec

[3] **26220220134: VY-INTECH-TEX: Research of Technologies and Products for Intelligent and Technical Fabrics** (01/2011 – 12/2014)

Coordinator: Hudec Róbert

Researchers: Vladimír Wieser, Martin Vaculík, Miroslav Benčo, Martin Vestenický

[4] **APVV–LPP–0216–09: The Science and Research Popularisation in ICT Technology Area at Secondary Technical Schools** (01/2009 – 12/2012)

Coordinator: Róbert Hudec

Researchers: Martin Vaculík, Peter Brída, Martin Paralič, Peter Počta, Miroslav Benčo, Jozef Dubovan, Ján Hlubík

NATIONAL PROJECTS – II.

[5] **APVV–0349–010: Towards Electromagnetic Induction Based Methods to Meet their True Potential in Non-destructive Monitoring of Conductive Structures** (05/2010 – 10/2014)

Coordinator: Ladislav Janoušek

Researchers: Róbert Hudec, Martina Zachariášová, Miroslav Benčo

[6] **26220220415: Broker Centre of Aviation Technology Transfer and Expertise in Transport and Transport infrastructure** (05/2010 – 10/2014)

Coordinator: Andrej Novák, (FPEDAS)

Sub-Coordinator: Peter Brída

Researchers: Milan Dado, Vladimír Wieser, Miroslav Benčo, Jozef Dubovan

[7] **26220120050: Centre of excellence for Systems and Services of Intelligent Transport II** (05/2010 – 10/2014)

Coordinator: Milan Dado

Researchers: Róbert Hudec, Martin Vaculík, Roman Jarina, Peter Brída, Vladimír Wieser, Miroslav Benčo, Peter Počta, Juraj Machaj

[8] **26220220021: Centre of Translation Medicine** (09/2009 – 06/2012)

Coordinator: Peter Račay, (JLF UK, Martin)

Researchers: Róbert Hudec (UNIZA)

NATIONAL PROJECTS – III.

[9] **VEGA-1/4066/07: New systems and principles of semantic description and retrieval of multimedia content** (01/2007-12/2009)

Coordinator: Róbert Hudec

Researchers: Roman Jarina, Miroslav Benčo, Michal Kuba, Martin Brezňan

[10] **VEGA-1/0570/10: Algorithms Research for Automatic Analysis of Multimedia Data** (01/2010-12/2011)

Coordinator: Róbert Hudec

Researchers: Miroslav Benčo, Roman Jarina, Zuzana Dubcová, Peter Lukáč, Michal Chmulík

[11] **VEGA-1/0655/10 Algorithms for Scanning and Transmission and Reconstruction of 3D Picture in 3D IP TV** (01/2010-12/2011)

Coordinator: Roman Jarina

Researchers: Martin Brezňan, Peter Počta, Dominik Jelšovka, Patrik Kamencay

[12] **26220220153: Competence Centre for Research and Development in Diagnosis and Therapy of Carcinoma** (08/2011-11/2014)

Coordinator: Dušan Mištuna, (JLF UK, Martin)

Sub-Coordinator: Róbert Hudec (UNIZA)

Researchers: Miroslav Benčo

NATIONAL PROJECTS – IV.

[13] **2003 SP 51/028 09 00/028 09 10, State program R&D, project Communication networks and services of next generation** (12/2003-12/2005)

Coordinator: Róbert Hudec

Researchers: Martin Vaculík, Peter Brída, Miroslav Benčo, Rastislav Pirník, Vladimír Wieser, ...

[14] **MDPT 721/250/2006, Broadband in Slovak Republic** (05/2006-12/2006)

Coordinator: Róbert Hudec

Researchers: Martin Vaculík, Vladimír Wieser, Rastislav Pirník

[15] **MDPT 722/250/2006, A main trend in electronic communications and their impact on universal service** (05/2006-12/2006)

Coordinator: Martin Vaculík

Researchers: Róbert Hudec, Vladimír Wieser, Rastislav Pirník

[16] **VEGA-1/0705/13:Image elements classification for semantic image description** (01/2013-12/2015)

Coordinator: Róbert Hudec

Researchers: Miroslav Benčo, Martina Zachariášová, Patrik Kamencay, Martin Vaculík, Martin Paralič, Slavomír Matúška, Peter Sýkora, ...

NATIONAL PROJECTS – V.

[17] **ŠP-341/2003, State program R&D „Budovanie informačnej spoločnosti“, project „Využitie IKT technológií a sieťových platforiem novej generácie vo vzdelávaní“**(in Slovak) (2003-2006)

Coordinator: Milan Dado

Researchers: Róbert Hudec, Vladimír Wieser, Martin Vaculík, ...

[18] **26220220184: University’s Research Park of University of Zilina** (05/2013 – 06/2015)

Coordinator: Michal Zábovský, (UVP UNIZA)

Researchers: Milan Dado, Róbert Hudec, Martin Vaculík, Miroslav Benčo, Jozef Dubovan, ...

[19] **APVV-14-0519: Smart textiles and clothing for mobile monitoring of human vital functions** (07/2015 – 06/2017)

Coordinator: Ladislav Janoušek (KTEBI)

Researchers: Róbert Hudec, Slavomír Matúška, Martin Vestenický, Martin Paralič

[20] **APVV-16-0190: Research of integration of textile functional system for biodata monitoring aimed at achievement synergy of human health, comfort and safety.** (07/2017 – 06/2020)

Coordinator: Dana Rástočná Illová (VÚTCH - CHEMITEX,spol. s r.o.)

Researchers: Róbert Hudec, Slavomír Matúška, Martin Paralič

NATIONAL PROJECTS – VI.

[21] **APVV-16-0505: The short-term PREDICtion of photovoltaic energy production for needs of pOwer supply of Intelligent BuildiNgs - PREDICON** (07/2017 – 06/2020)

Coordinator: Róbert Hudec

Researchers: Miroslav Benčo, Patrik Kamencay, Peter Sýkora, Slavomír Matúška, Martin Paralič,

[22] **APVV-18-0167: Smart clothing for E-health applications.** (07/2019 – 06/2021)

Coordinator: Ladislav Janousek (KTEBI FEIT UNIZA)

Researchers: Róbert Hudec, Martin Paralič, Miroslav Markovič

[23] **APVV-PP-COVID-20-0100: DOLORES.AI: System of pandemic defence.** (09/2020 – 12/2021)

Coordinator: Patrik Kamencay

Researchers: Róbert Hudec, Miroslav Benčo, Peter Sýkora, Slavomír Matúška, Martin Paralič, Martina Radilová

[24] **313011AFG5 – BIOFORD,** (09/2020 – 06/2023)

Coordinator: Martina Antošová (JLF UK, Martin)

Researchers: Robert Hudec, Patrik Kamencay, Miroslav Benčo, Peter Sýkora, Slavomír Matúška, Martin Paralič

NATIONAL PROJECTS – VII.

[25] **313011AFG4 – DIGIBIOBANKA,** (09/2020 – 06/2023)

Coordinator: Branislav Hadzima, (VC UNIZA)

Researchers: Róbert Hudec, Patrik Kamencay, Miroslav Benčo, Peter Sýkora, Slavomír Matúška, Martin Paralič,

[26] **Hybrid learning in AI, machine learning and kybernetics at UNIZA**. (12/2020 – 12/2022)

Coordinator: Robert Hudec

Researchers: Patrik Kamencay, Miroslav Benčo, Peter Sýkora, Slavomír Matúška, Martin Paralič

[27] **APVV-21-0502: BrainWatch: System for automatic detection of intracranial aneurysms.** (07/2022 –06/2025)

Coordinator: Robert Hudec

Researchers: Patrik Kamencay, Miroslav Benčo, Peter Sýkora, Slavomír Matúška, Martin Paralič

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PUBLICATIONS



SELECTED PUBLICATIONS, 2026

Suchalova S., Calcagno S., Hudec R., Spampinato C.,; Fine-grained fMRI Classification of Visual Stimuli Using CLIP Embedding Alignment, IEEE Access (Early Access), ISSN-2169-3536, 2026, (Q2)

Kryvoshei O., Kamencay P., Polak L.,; Neural Vessel Segmentation and Gaussian Splatting for 3D Reconstruction of Cerebral Angiography, AI 2026, 7(1), 22, 2026, (Q1)

SELECTED PUBLICATIONS, 2025

Pisarčík A., Hudec R., Hlavatá R.,; DERI1000: A New Benchmark for Dataset Explainability Readiness, AI, ISSN-2673-2688, 2025, (Q1)

Kamencay P., Hlavatá R., Paralič M., Hudec R.,; Review of aneurysms detection methods focusing on selected YOLO-based models, Journal of clinical medicine, ISSN-2077-0383, 2025, (Q1)

Štureková J., Kamencay P., Sýkora P., Hlavatá R.,; A comparison of convolutional neural network transfer learning regression models for remote photoplethysmography signal estimation, AI, ISSN-2673-2688, 2025, (Q1)

Štureková J., Kamencay P., Sýkora P., Šúchalová S., Matthes D., Fuchs M.,; DySpect-Net: neural network predicting spectrum from non-uniformly sampled data, IEEE Access, ISSN-2169-3536, 2025, (Q2)

Finocchiaro M., Calcagno S., Kavasidis I., Sorrenti A., Šúchalová S., Hudec R., Pennisi M., Salanitri F., Spampinato C.,; From questions to neural insights: towards query-based fMRI decoding, 2025 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), ISBN-979-8-3315-8618-8, 2025.

Hlavatá R., Kamencay P., Hudec R., Sýkora P., Benčo M.,; A new approach for classification intracranial aneurysm using GRU and 2D convolution layers, Radioelektronika 2025, ISBN-979-8-3315-4447-8, 2025.

Kryvoshei O., Kamencay P., Hlavatá R., Štech A., Benčo M.,; Comparative assessment of modern approaches for 3D reconstruction, Radioelektronika 2025, ISBN-979-8-3315-4447-8, 2025.

SELECTED PUBLICATIONS, 2024

Stech Adam, Kamencay Patrik, Hudec Robert: Enhancing 3D Models with Spectral Imaging for Surface Reflectivity, Sensors, 24(19), 6352, 2024.

Hlavata Roberta, Kamencay Patrik, Radilova Martina, Sykora Peter, Hudec Robert: Automated Method for Intracranial Aneurysm Classification Using Deep Learning, Sensors, 24(14), 4556, 2024.

Pisarcik Andrej, Hudec Robert, Hlavata Roberta, Kamencay Patrik: Comparison of Deep Learning Explainable Approaches for Medical Image Analysis, ELMAR - International Symposium Electronics in Marine, pp. 331–334, 2024, Zadar, Croatia.

Skrvan Adam, Hudec Robert, Sturekova Jana, Harabis V, Chmelik, J: Radon Transform-Based 3D Reconstruction of Brain Vasculature from 2D Angiography, 15th International Conference Elektro 2024, ELEKTRO 2024 – Proceedings, 2024, Zakopane, Poland.

Suchalova Silvia, Hudec Robert, Benco Miroslav, Pisarcik Andrej: EEG Signals Preprocessing for BCI Systems Using Visual Evoked Potentials, 15th International Conference Elektro 2024, ELEKTRO 2024 – Proceedings, 2024, Zakopane, Poland.

Sturekova Jana, Kamencay Patrik, Sykora Peter: Enhancing Heart Rate Monitoring Using Remote Photoplethysmography Based on Neural Network, Proceedings Elmar - International Symposium Electronics in Marine, pp. 41–44, 2024, Zadar, Croatia.

SELECTED PUBLICATIONS, 2023

Vrskova Roberta, Kamencay Patrik, Hudec Robert, Sýkora Peter: A new deep-learning method for human activity recognition, Sensors, ISSN-1424-3210, 23(5), 2816, 2023.

Paralič Martin, Zeleňák Kamil, Kamencay Patrik, Hudec Róbert: Automatic approach for brain aneurysm detection using convolutional neural networks, Applied Sciences (Switzerland), ISSN-2076-3417, 13(24), 13313, 2023.

Kamencay Patrik, Dubovan Jozef, Dado Milan, Benedikovic Daniel, et al.: Neural-network-optimized vehicle classification using clustered image and fiber-sensor datasets, IEEE Access: practical innovations, ISSN-2169-3536.

Kamencay Patrik, Hlavata Roberta, Hudec Robert, Sykora Peter, Benco Miroslav: A new method for detection of cerebral aneurysm using deep learning, Photonics North 2023, Montreal, Canada, ISBN-979-8-3503-2674-1.

Sykora Peter, Hlavata Roberta, Kamencay Patrik, Benco Miroslav, Hudec Robert: Body Part Classification from Medical Single Channel Images Using Deep Neural Networks, ELMAR - International Symposium Electronics in Marine, 2023-September, pp. 79–82, Zadar, Croatia.

Hlavata Roberta, Kamencay Patrik, Sykora Peter, Benco Miroslav, Hudec Robert: A New Approach for Aneurysm Detection Based on CNNs, ELMAR- International Symposium Electronics in Marine, 2023-September, pp. 71–74, Zadar, Croatia.

Stech Adam, Hudec Robert, Kamencay Patrik, et al.: A novel method for 3D photogrammetry modeling using different wavelengths Radioelektronika 2023, ISBN-979-8-3503-9834-2.

SELECTED PUBLICATIONS, 2022

Vrskova Roberta, Hudec Robert, Kamencay Patrik, Sykora Peter: Human activity classification using the 3DCNN architecture, Applied sciences, ISSN-2076-3417

Vrskova Róberta, Hudec Róbert, Kamencay Patrik, Sýkora Peter: A new approach for abnormal human activities recognition based on ConvLSTM architecture, Sensors, ISSN-1424-3210

Gleskova Helena, Hudec Robert, et al.: Optimization of all-textile capacitive sensor array for smart chair, IEEE Access: practical innovations, open solutions, ISSN-2169-3536

Matuska Slavomir, Machaj Juraj, Hudec Robert, Kamencay Patrik: An improved IoT-based system for detecting the number of people and their distribution in a classroom Sensors, ISSN-1424-3210

Radilova Martina, Kamencay Patrik, Hudec Robert, Benco Miroslav, Radil Roman: Tool for parsing important data from web pages, Applied sciences, ISSN-2076-3417

Matuska Slavomir, Hudec Robert: A functional IoT-based system design of the Connected University, ELEKTRO 2022: conference proceedings, ISBN-978-1-6654-6725-4

Stech Adam, Kamencay Patrik, Hudec Róbert: Digitalization and 3D reconstruction of object using photogrammetry, ELEKTRO 2022: conference proceedings, ISBN-978-1-6654-6725-4

SELECTED PUBLICATIONS, 2021

Hudec, Robert; Matuska, Slavomir; Kamencay, Patrik; et al.: A Smart IoT System for Detecting the Position of a Lying Person Using a Novel Textile Pressure Sensor, SENSORS, Volume: 21, Issue: 1, Article Number: 206, JAN 2021.

Kamencay Patrik, Hudec Robert, Benco Miroslav, Radil Roman, Radilová Martina: 3D reconstruction and localisation of biomedical data in 3D space, UNIZA 2021, book.

Vrskova Roberta, Sykora Peter, Kamencay Patrik, Hudec Robert, Radil Roman: Hyperparameter tuning of ConvLSTM network models TSP 2021: 44th international conference on Telecommunications and signal processing, ISBN-978-1-6654-2934-4

Vrskova Roberta, Hudec Robert, Sykora Peter, Kamencay Patrik, Radilova Martina: Education of video classification based by neural networks ICETA 2020: 18th IEEE International conference on emerging elearning technologies and applications: Information and communication technologies in learning : proceedings, ISBN-978-0-7381-2366-0.

Vrskova Roberta, Hudec Robert, Sykora Peter, Kamencay Patrik, Benco Miroslav: Violent behavioral activity classification using artificial neural network, 2020 New Trends in Signal Processing (NTSP): Proceedings of the International Conference on New Trends in Signal Processing, ISBN-978-1-7281-6154-9.

Machaj Juraj, Brida Peter, Matuska Slavomir: Proposal for a localization system for an IoT ecosystem, Electronics, ISSN-2079-9292.

SELECTED PUBLICATIONS, 2020

Matuska, Slavomir; Paralic, Martin; Hudec, Robert“ A Smart System for Sitting Posture Detection Based on Force Sensors and Mobile Application, MOBILE INFORMATION SYSTEMS, Volume: 2020 Published: NOV 19 2020.

Frniak, Michal; Markovic, Miroslav; Kamencay, Patrik; et al.: Vehicle Classification Based on FBG Sensor Arrays Using Neural Networks, SENSORS Volume: 20 Issue: 16 Article Number: 4472 Published: AUG 2020

Hudec, Robert; Matuska, Slavomir; Kamencay, Patrik; et al.: CONCEPT OF A WEARABLE TEMPERATURE SENSOR FOR INTELLIGENT TEXTILE, ADVANCES IN ELECTRICAL AND ELECTRONIC ENGINEERING Volume: 18 Issue: 2 Pages: 92-98 Published: JUN 2020

Benco, Miroslav; Kamencay, Patrik; Radilova, Martina; et al.: The Comparison of Color Texture Features Extraction based on 1D GLCM with Deep Learning Methods, Conference: 27th International Conference on Systems, Signals and Image Processing (IWSSIP) Location: ELECTR NETWORK Date: JUL 01-03, 2020, Sponsor(s): Fluminense Fed Univ, Inst Comp

Radilova, Martina; Kamencay, Patrik; Matuska, Slavomir; et al: Tool for Optimizing Webpages on a Mobile Phone, Conference: 43rd International Conference on Telecommunications and Signal Processing (TSP) Location: ELECTR NETWORK Date: JUL 07-09, 2020

Kamencay, Patrik; Radilova, Martina; Radil, Roman; et al.: Innovative 3D Reconstruction Method based on Patch Based Technique using Neural Network, Conference: 43rd International Conference on Telecommunications and Signal Processing (TSP) Location: ELECTR NETWORK Date: JUL 07-09, 2020

SELECTED PUBLICATIONS, 2019

Kamencay, Patrik; Sinko, Martin; Hudec, Robert; et al.: Improved Feature Point Algorithm for 3D Point Cloud Registration, Conference: 42nd International Conference on Telecommunications and Signal Processing (TSP) Location: Budapest, HUNGARY Date: JUL 01-03, 2019

Sykora, Peter; Kamencay, Patrik; Hudec, Robert; et al.: Comparison of Feature Extraction Methods and Deep Learning Framework for Depth Map Recognition, Conference: International Conference on New Trends in Signal Processing (NTSP) Location: Demanovska Dolina, SLOVAKIA Date: OCT 10-12, 2018

Matuska, Slavomir; Hudec, Robert; Vestenicky, Martin: Towards the Development of a Smart Wearable Device Based on Electrically Conductive Yarns, Conference: 13th International Scientific Conference on Sustainable, Modern and Safe Transport (TRANSCOM) Location: Novy Smokovec, SLOVAKIA Date: MAY 29-31, 2019

Sinko, Martin; Sykora, Peter; Kamencay, Patrik; et al.: Development of a system for collecting and processing sky images and meteorological data used for weather prediction, Conference: 13th International Scientific Conference on Sustainable, Modern and Safe Transport (TRANSCOM) Location: Novy Smokovec, SLOVAKIA Date: MAY 29-31, 2019

Vestenicky, Martin; Matuska, Slavomir; Hudec, Robert: Simple method of photovoltaic panel power characteristic measurement based on Arduino hardware platform, Conference: 13th International Scientific Conference on Sustainable, Modern and Safe Transport (TRANSCOM) Location: Novy Smokovec, SLOVAKIA Date: MAY 29-31, 2019

SELECTED PUBLICATIONS, 2018

Pedrozo Campos Antunes, T., Souza Bulle de Oliveira, A., Hudec, R., Brusque Crocetta, T., Ferreira de Lima Antão, J.Y., de Almeida Barbosa, R.T., Guarnieri, R., Massetti, T., Garner, D.M., de Abreu, L.C.: Assistive technology for communication of older adults: a systematic review, Aging and Mental Health, ISSN: 13607863, DOI: 10.1080/13607863.2018.1426718

HLUBIK, J. - KAMENCAY, P. - HUDEC, R. - BENCO, M. - SYKORA, P.: Advanced Point Cloud Estimation based on Multiple View Geometry, 28th International Conference Radioelektronika 2018, April 19-20, Prague, Czech Republic.

VESTENICKY, M. - MATUSKA, S. - HUDEC, R. - KAMENCAY, P.: Sensor network proposal based on IoT for a prediction system of the power output from photovoltaic panels, 28th International Conference Radioelektronika 2018, April 19-20, Prague, Czech Republic.

SINKO, M. - KAMENCAY, P. - HUDEC, R. - BENCO, M.: 3D Registration of the Point Cloud Data Using ICP Algorithm in Medical Image Analysis, 12th International conference ELEKTRO 2018, Mikulov, Czech Republic.

HANNAH S., MATUSKA S., GLESKOVA H., HUDEC R.: Towards the development of a wearable temperature sensor based on a ferroelectric capacitor, 12th International conference ELEKTRO 2018, Mikulov, Czech republic.

KAMENCAY, P. – HUDEC, R. – ORJESEK, R. – SYKORA, P.: Vehicles Recognition Based on Point Cloud Representation, Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST, Volume 222, 2018, p.79-84, 1st Int. Conference on Intelligent Transport Systems, INTSYS 2017; Hyvinkaa; Finland, OI: 10.1007/978-3-319-93710-6_9

SELECTED PUBLICATIONS, 2017

TRNOVSZKY, T. – KAMENCAY, P. – ORJESEK, R. – BENCO, M. – SYKORA, P.: Animal recognition system based on convolutional neural network, Advances in Electrical and Electronic Engineering, Volume 15, Issue 3, September 2017, Pages 517-525, DOI: 10.15598/aeee.v15i3.2202

KAMENCAY, P. – BENCO, M. – MIZDOS, T. – RADIL, R.: A new method for face recognition using convolutional neural network, Advances in Electrical and Electronic Engineering, Volume 15, Issue 4 Special Issue, 2017, Pages 663-672, DOI: 10.15598/aeee.v15i4.2389

TRNOVSZKY, T. – SYKORA, P. – HUDEC, R.: Comparison of Background Subtraction Methods on Near Infra-Red Spectrum Video Sequences, Vol. 192, 2017, Pages 887-892, 12th International Scientific Conference Of Young Scientists On Sustainable, Modern and Safe Transport, TRANSCOM 2017; High Tatras Grand Hotel Bellevue; Slovakia, DOI: 10.1016/j.proeng.2017.06.153

SELECTED PUBLICATIONS, 2016

MATUSKA, S. - HUDEC, R. KAMENCAY, P. - BENCO, M. - RADILOVA, M.: A Novel System for Non-Invasive Method of Animal Tracking and Classification in Designated Area Using Intelligent Camera System, Radioengineering Journal, Vol. 25, No. 1, pp. 161-168, 2016, ISSN 1210-2512. (WoS, SCOPUS)

SATNIK. A, - ORJESEK, R. - HUDEC, R. - KAMENCAY, P. - JARINA, - R. TALAPKA, J.: A novel approach for 3D model recognition based on SSCD, In 11th International Conference ELEKTRO 2016, (ELEKTRO 2016), Pages: 96-99, Strbske Pleso, Slovak Republic, Date: May 16-18, 2016, ISBN: 978-1-4673-8698-2. (WoS, SCOPUS)

KAMENCAY, P. - TRNOVSZKY, T - HUDEC, R. - BENCO, M. - SYKORA, P. - SATNIK, A.: Accurate Wild Animal Recognition using PCA, LDA and LBPH, In 11th International Conference ELEKTRO 2016, (ELEKTRO 2016), Pages: 62-67, Strbske Pleso, Slovak Republic, Date: May 16-18, 2016, ISBN: 978-1-4673-8698-2. (WoS, SCOPUS)

KAJAN, P. - KAMENCAY, P - HLUBIK, J. - HUDEC, R. - BENCO, M. - SYKORA, P.: Real-time Facial Motion Capture using a Webcam, Communications, 1/2016, pp.: 56-61, ISSN 1335-4205. (SCOPUS)

SYKORA, P. - KAMENCAY, P. - HUDEC, R. - BENCO, M.: A New Algorithm for Key Frame Extraction based on Depth Map using Kinect, Communications, 1/2016, pp.: 29-34, ISSN 1335-4205. (SCOPUS)

SATNIK, A, - HUDEC, R. - KAMENCAY, P. - BENCO, M. - HLUBIK, J. - MATUSKA, S.: A Comparison of Key-point Descriptors for the Stereo Matching Algorithm, 26th Conference Radioelektronika 2016, pp: 292-295, April 19-20, Košice, Slovak Republic, ISBN (USB): 978-1-5090-1673-0, ISBN: 978-1-5090-1673-7. (SCOPUS)

SELECTED PUBLICATIONS, 2015

MATUSKA, S. - HUDEC, R. - BENCO, M. - KAMENCAY, P.: Real-time Segmentation and Tracking Module of Target of Interest From Video Sequence in Object Recognition Systems, Advanced Computer and Communication Engineering Technology, Proceedings of ICOCOE 2015, Pages 557-565, ISBN 978-3-319-24582-9, DOI: 10.1007/978-3-319-24584-3_48.

KAMENCAY, P. - HUDEC, R - BENCO, M. - SYKORA, P. - RADIL, R.: An Efficient P-KCCA Algorithm for 2D-3D Face Recognition Using SVM, In Journal Advances in Electrical and Electronic Engineering (AEEE 2015), Volume: 13, Number 4, Pages: 399-406, 2015, DOI: 10.15598/aeee.v13i4.1473, ISSN 1336-1376. SJR: 0.249 (2014), SNIP: 0.797 (2014), IPP: 0.402 (2014) (SCOPUS)

RADIL, R. - BARABAS, J - KAMENCAY, P.: New Approach to Metal Biomarker Detection using Nonionizing Electromagnetic Field, In Scientific Letters of the University of Zilina, (Communications 2015), 1A/2015, Pages: 51-57, 2015, ISSN 1335-4205. (SCOPUS)

RADILOVA, M. - KAMENCAY, P. - HUDEC, R. - BENCO, M. - MATUSKA, S. - HLUBIK, J.: A new design of the detail description for objects recognition in the key frame using ontology, Proceedings of the 17th International Conference on Research in Telecommunication Technologies 2015, pp:15-18, 9th – 11th September 2015, Ostravice, Czech republic, ISBN: 978-80-248-3797-0.

SATNIK, A. - TALAPKA, J - HLUBIK, J. - KAMENCAY, P. - HUDEC, R. - RADILOVA, M. - BENCO, M.: Model for Detecting Wild Animals based on a Photogrammetry, Proceedings of the 17th International Conference on Research in Telecommunication Technologies 2015, pp: 19-24, Ostravice, Czech Republic, Date: September 9-11, 2015, ISBN 978-80-248-3797-0.

SELECTED PUBLICATIONS, 2014

KAMENCAY, P. – HUDEC, R. – BENCO, M. – ZACHARIASOVA, M.: 2D-3D Face Recognition Method based on Modified CCA-PCA Algorithm, International Journal of Advanced Robotic Systems: Vision Systems, ISSN 1729-8806, 2014, DOI: 10.5772/58251, (Current Content Connect, Thomson Reuters Master Journal List), IF= 0.497.

BENCO, M. – HUDEC, R. – KAMENCAY, P. – ZACHARIASOVA, M. – MATUSKA, S.: Advanced approach to color texture feature's extraction based on GLCM, International Journal of Advanced Robotic Systems, ISSN 1729-8806, Vol: 11, AN: 104, pp.1-8, 2014, DOI: 10.5772/58692, (Current Content Connect, Thomson Reuters Master Journal List), IF= 0.497.

MATUSKA, S. - HUDEC, R. - KAMENCAY, P. - BENCO, M. - ZACHARIASOVA M.: Classification of Wild Animals based on SVM and Local Descriptors, In AASRI Procedia, 2014 AASRI Conference on Circuit and Signal Processing (CSP 2014), ISSN 2212-6716. (SCOPUS)

HUDEC, R. - BENCO, R. - MATUSKA, M. - KAMENCAY, P. - ZACHARIASOVA, M.: Utilisation of electroconductive mixed Ag-yarns as data and power wires in an intelligent textile structures, 10th International conference ELEKTRO 2014, pp. 658-661, Rajecké Teplice, May 19-20, 2014, CFP1448S-CDR, ISBN: 978-1-4799-3720-2, DOI: 10.1109/ELEKTRO.2014.6848982. (SCOPUS)

SYKORA, P. - KAMENCAY, P. - HUDEC R.: Comparison of SIFT and SURF Methods for Use on Hand Gesture Recognition based on Depth Map, In AASRI Procedia, 2014 AASRI Conference on Circuit and Signal Processing (CSP 2014), ISSN 2212-6716. (SCOPUS)

SELECTED PUBLICATIONS, 2013

KAMENCAY, P. – ZACHARIASOVA, M. – HUDEC, R. – JARINA, R. – BENCO, M. – HLUBIK, J.: A Novel Approach to Face Recognition using Image Segmentation based on SPCA-KNN Method, V Radioengineering Journal, Vol. 22, No. 1, pp. 92-99, 2013, ISSN 1210-2512 (Thomson Reuters Master Journal List, SCOPUS, Elsevier, INSPEC, IET, ADS Harvard, Impact Factor 0.739).

BOJMIR, M., - HUDEC, R.: Modelling of 3D objects from videoflow for transportation application, In: Civil and Environmental Engineering, Scientific-Technical Journal, Vol: 9, Issue:1/2013, pp: 42-47, ISSN 1336-5835.

HUDEC, R., - JANOUŠEK, L., - BENČO, M., - MAKYŠ, P., - WIESER, V., - ZACHARIÁŠOVÁ, M., - PÁCHA, M., - VAVRÚŠ, V., - VESTENICKÝ, M.: Structural Health Monitoring of Helicopter Fuselage, Communications, Scientific letters of the University of Zilina, Vol. 15, No. 2 (2013), pp.: 95-101, ISSN 1335-4205. (SCOPUS)

BENCO, M. – HUDEC, R. – ZACHARIASOVA, M. – KAMENCAY, P. –MATUSKA, S: Novel approach to color texture retrieval based on GLCM, In: Communications : scientific letters of the University of Žilina. - ISSN 1335-4205. - Vol. 15, no. 2A (2013), s. 55-59. (SCOPUS)

ZACHARIASOVA, M. – KAMENCAY, P. – HUDEC, R. – BENCO, M. – MATUSKA, S: A new approach to short web document creation based on textual and visual information, In: TSP 2013 [elektronický zdroj] : 36th international conference on Telecommunication and signal processing : July 2-4, 2013 Rome, Italy. - [S.l.]: IEEE, 2013. - ISBN 978-1-4799-0403-7. - CD-ROM, s. 788-792. (SCOPUS)

SELECTED PUBLICATIONS, 2012

LUKAC, P. - HUDEC, R. - BENCO, M. - DUBCOVA, Z. - ZACHARIASOVA, M. - KAMENCAY, P.: The evaluation criterion for color image segmentation algorithms, Journal of Electrical Engineering, Vol. 63, No.1, pp. 13-20, 2012, ISSN 1335-3632, DOI: 10.2478/v10187-012-0002-1/, (Thomson Reuters Master Journal List, SCOPUS, Elsevier, INSPEC, IET, ADS Harvard),

KAMENCAY, P. - BREZŇAN, M. – JARINA, R.– LUKÁČ, P. – ZACHARIÁŠOVÁ, M.: Improved Depth Map Estimation from stereo Images basd on Hybrid Method, In Radioengineering, vol. 21, No. 1, April 2012, ISSN 1210-2512, (Thomson Reuters Master Journal List, INSPEC, SCOPUS)

JELSOVKA, D., - HUDEC, R., - BREZNAN, M., - KAMENCAY, P.: 2D-3D Face Recognition Using Shapes of Facial Curves Based on Modified CCA Method, In PROCEEDINGS of 22th International Conference Radioelektronika 2012, pp.: 285-288, Brno, Czech Republic, 17-18 April 2012, (IEEE Xplore, SCOPUS, ISI WoK).

KAMENCAY, P. - BREZŇAN, M. – JELSOVKA, D.– ZACHARIASOVA, M.: Improved Face Recognition Method based on Segmentation Algorithm using SIFT-PCA, In PROCEEDINGS of 35th International Conference on Telecommunications and Signal Processing, TSP 2012, Czech Republic, Prague, 3-4 July 2012 (IEEE, Thomson reuters).

ZACHARIASOVA, M. - HUDEC, R. - BENCO, M. - KAMENCAY, P.: Automatic extraction of non-textual information in web document and their classification, 35th International Conference on Telecommunications and Signal Processing (TSP), 2012, 2012/7/3, pp: 753-757, (IEEExplore, ISI WoK)

SELECTED PUBLICATIONS, 2011

GAVULOVA, A. – PIRNIK, R. - HUDEC, R.: Traffic Control System of Slovak agglomerations in NaTIS project, in: Modern Transport Telematics, 11th International Conference on Transport System Telematics, TST 2011, Springer-Verlag Berlin Heidelberg, pp. 382-391, October 2011, Germany, ISBN 978-3-642-24659-3, (Springer Verlag, SCOPUS, ISI WoK)

HUDEC, R.: Adaptive order-statistics L-filters (Adaptívne poriadkové–štatistické L-filtre, in Slovak), monography, EDIS, 2011, 155 pages, ISBN 9788055402482.

LUKAC, P. - HUDEC, R. - BENCO, M. - KAMENCAY, P. - DUBCOVA, Z. - ZACHARIASOVA, M.: Simple Comparison of Image Segmentation Algorithms Based on Evaluation Criterion, Proceedings of 21st International Conference Radioelektronika 2011, ISBN 978-1-61284-322-3 (IEEE Xplore, SCOPUS, ISI WoK).

KAMENCAY, P. - BREZŇAN, M. – JARINA, R.– LUKÁČ, P.: Depth Map Computation Using Hybrid Segmentation Algorithm, In PROCEEDINGS of 34th International Conference on Telecommunications and Signal Processing, TSP 2011, Budapest, Hungary, 18-20 August 2011 (IEEE, Thomson reuters, SCOPUS, DBLP)

HUDEC, R., - BOJMIR, M., - BENCO, M.: Damaged watermarks detection in frequency domain as a primary method for video concealment, Advances in Electrical and Electronic Engineering, Vol.9, No.5, pp.187-195, SPECIAL ISSUE, 2011, ISSN 1336-1376 (Print), ISSN 1804-3119 (Online); (SCOPUS, DOAJ, DRIVER, EBSCO)

SELECTED PUBLICATIONS, <2010

SBARUFATTI, C. - MANES, A. - GIGLIO, M. - MARIANI, U. - MOLINARO, R. - MATTA, W. - DI LUZIO, I. - TOSCANI, D. - ARCHETTI, F. - BJERKAN, L. - HUDEC, R. - WIESER, V. - MAKYS, P. - GOZDECKI, J. - KATSIKEROS, C.: Application of Structural Health Monitoring over a Critical Helicopter Fuselage Component, Proc. of 2nd Int. Conf. HELI World, 3-4 November 2010, Frankfurt, Germany.

HUDEC, R.: Image sensing, academic book, EDIS, August 2008, 150 pages, ISBN 978-80-8070-880-1 (in Slovak).

HUDEC, R., - VESTENICKY, M.: The m-health terminal for collecting and transmission of biodata. Proceedings of Fifth International Symposium „Communication systems, networks and digital signal processing, CSNDSP 2006“, 19-21 July 2006, pp. 228-231, University of Patra, Greece, ISBN 960-89282-0-6

BENCO, M., - HUDEC, R.: Novel Method for Color Texture Features Extraction Based on GLCM, Radioengineering, Vol.16, No.4, pp. 64-67, December 2007. ISSN 1210-2512, (Thomson Reuters Master Journal List, INSPEC, SCOPUS)

POCTA, P. - HUDEC, R. - BOJMIR, M.: Performance Evaluation of Video Transmission over IEEE 802.11b WLANs from the Video Quality Perspective, The Mediterranean Journal of Computers and Networks, Vol. 5, No. 2, pp. 53-58, 2009. ISSN 1744-2397, (SCOPUS, INSPEC)

HUDEC, R., - MARCHEVSKY, S.: Extension of impulse detectors to spatial dimension and their utilisation as switch in the LMS L-SD filter, Radioengineering, Vol. 10, No. 1, pp. 11-15, April 2001. ISSN 1210-2512



LABORATORY OF DIGITAL VIDEO PROCESSING



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THANKS FOR ATTENTION

? QUESTIONS ?

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