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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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# STAFF

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### BD 309

**VIDEOlab** – Laboratory of semantic analysis of still images and video

### BD 316

**PROTOTYPElab** – Laboratory of applied research and prototype solution of electronic systems

### BD 328

**GAMElab** – Laboratory of computer vision, virtual reality and gaming

### BD 333

**IOTlab** – Laboratory of IoT

### BD 334

**3D GRAPHIClab** – Laboratory of 3D graphic, 3D scanning and 3D printing

### Atelier

**HEALTHlab** – Laboratory of cognitive sciences

### UVP A1.11

**TEXTILElab** – Laboratory of design and production of prototype electronics

### UVP A0.07

**LUIZA** – Laboratory of AI at University of Zilina

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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 tuning

## **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 – III.

## **HEALTH/lab** – Laboratory of cognitive sciences

- EEG sensing
- Explainability of AI models in EEG
- 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 – II.

## **GAMElab** – Laboratory of computer vision, virtual reality and gaming

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

## **IOTlab** – Laboratory of IoT

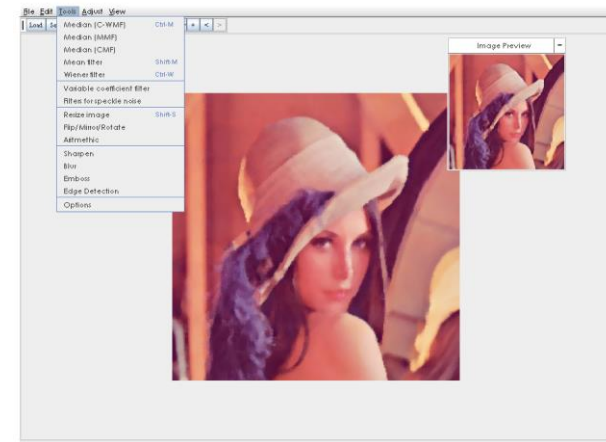
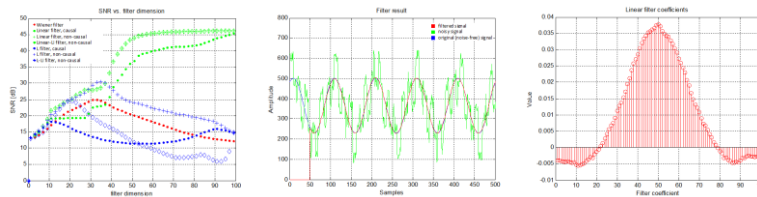
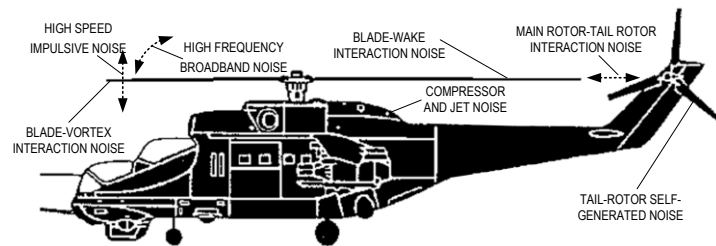
- IoT system design and IoT notes prototyping
- Mobile application design and development

## **3D GRAPHIClab** – 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

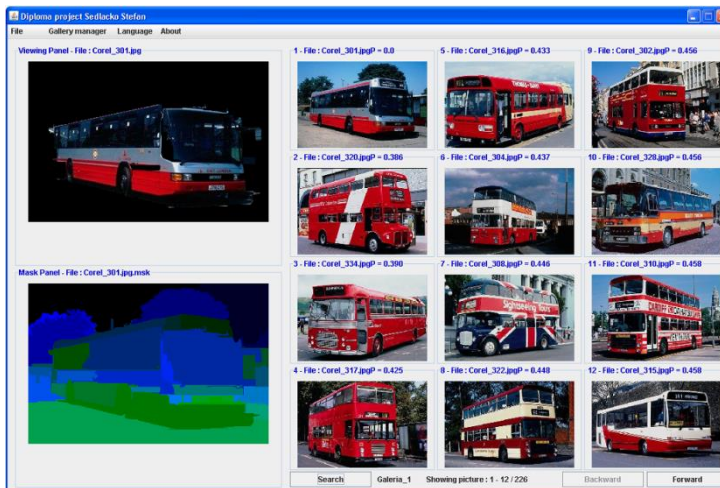
# DIGITAL IMAGE AND VIDEO FILTRATION

- 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-dependent L-filtration
- Order-statistics and texture spatial impulse detectors

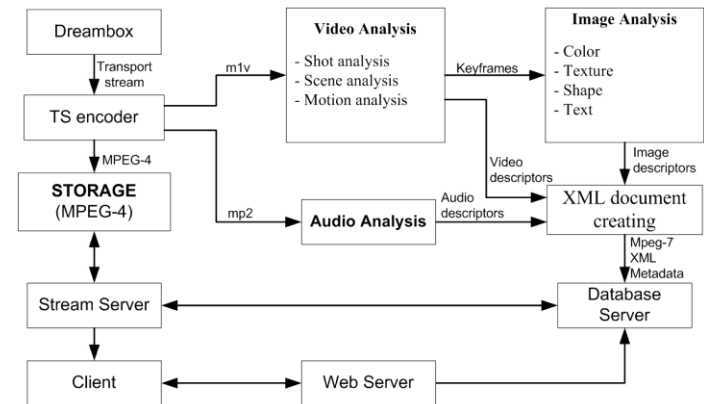
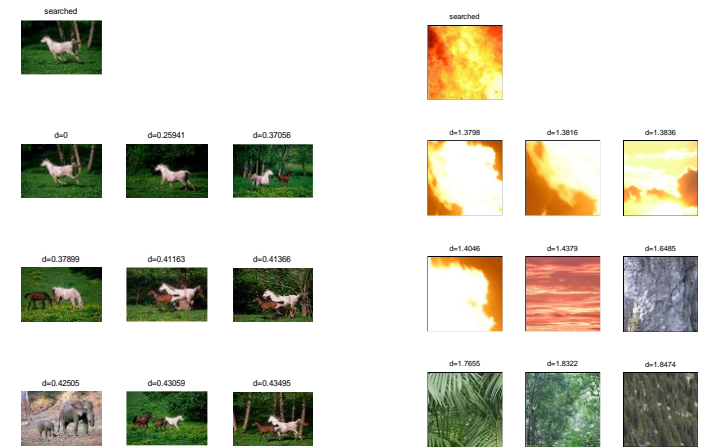


# IMAGE CONTENT ANALYSIS

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



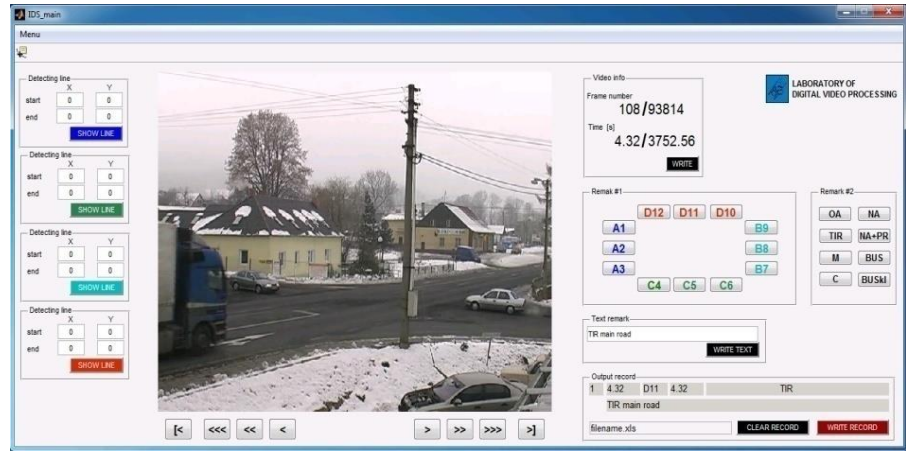
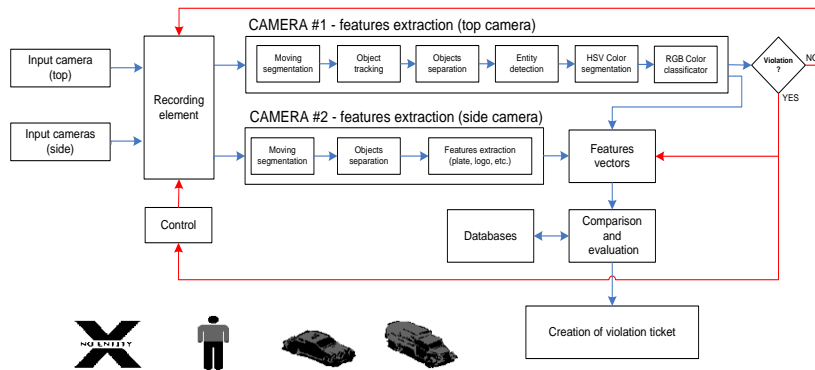
- DVB-S downloading and streaming system





# TRAFFIC VIDEO SYSTEMS

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

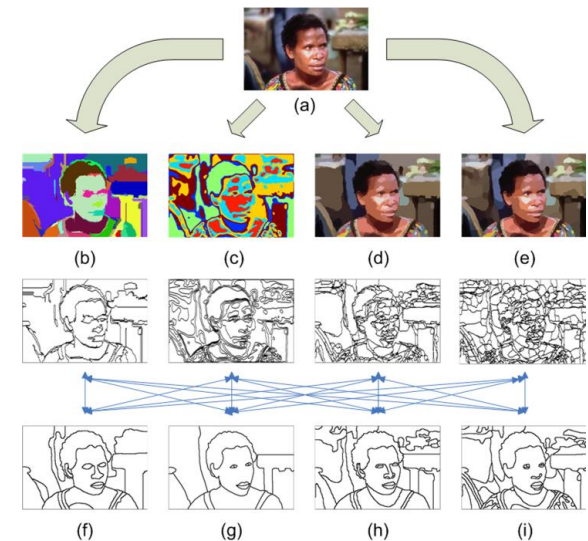
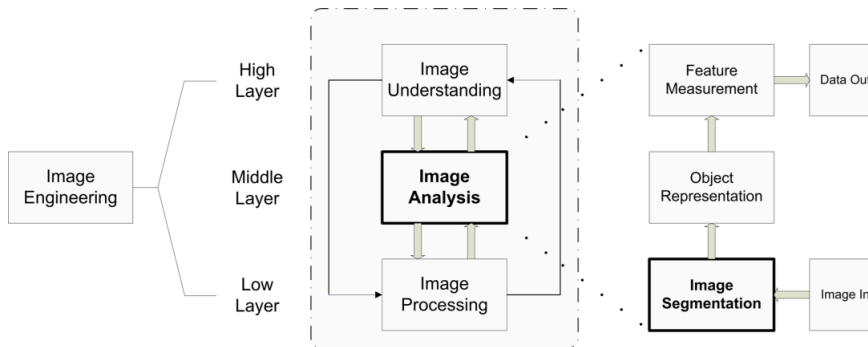




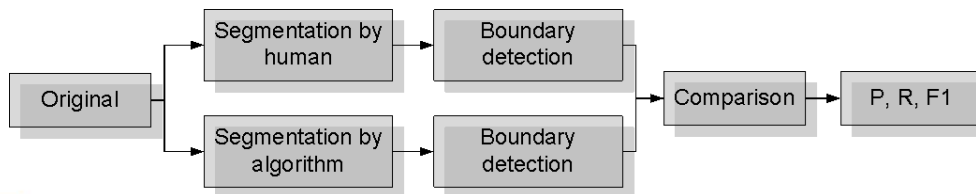
# ADVANCED IMAGE SEGMENTATION

## Algorithms

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

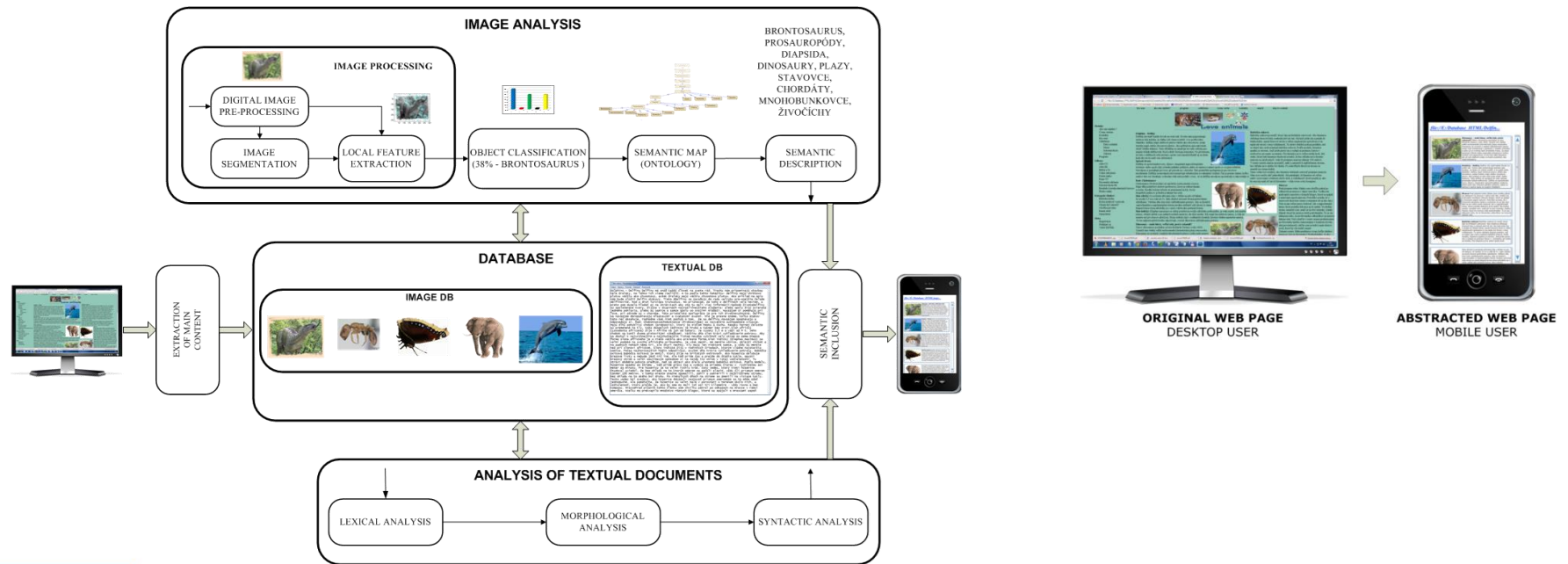


## Evaluation



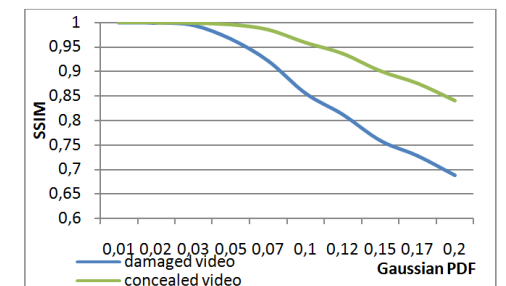
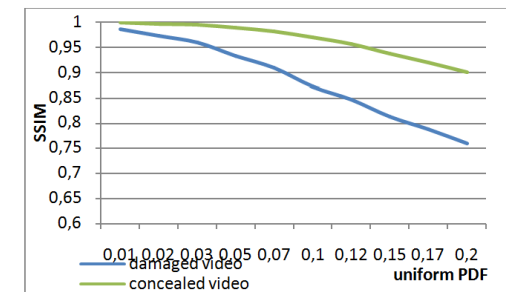
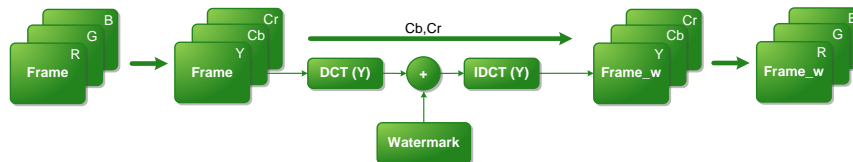
# SEMANTIC WEB BASED ON ONTOLOGY

- 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



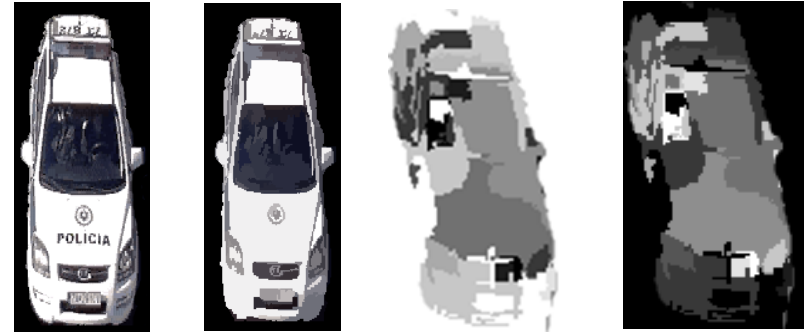
# VIDEOCONCEALMENT

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



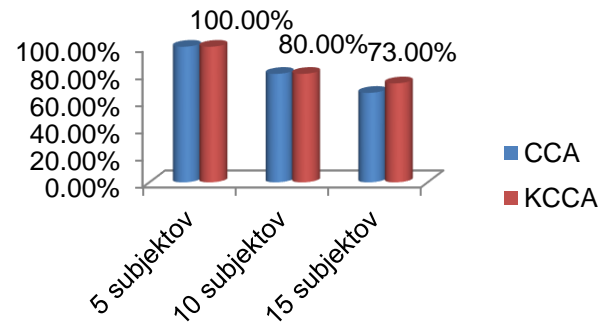
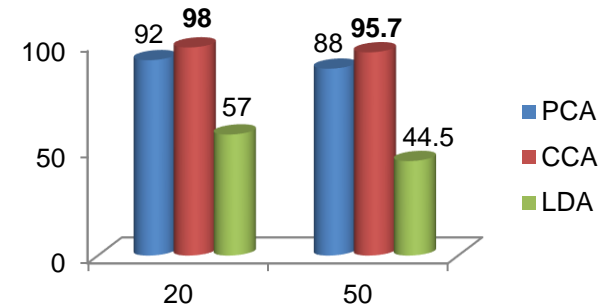
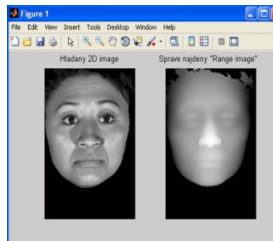
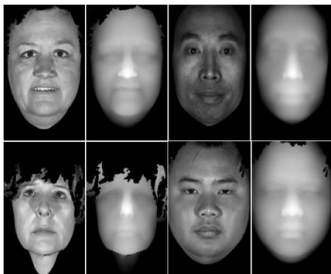
# 3D MODEL OBJECT RECOGNITION

- 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

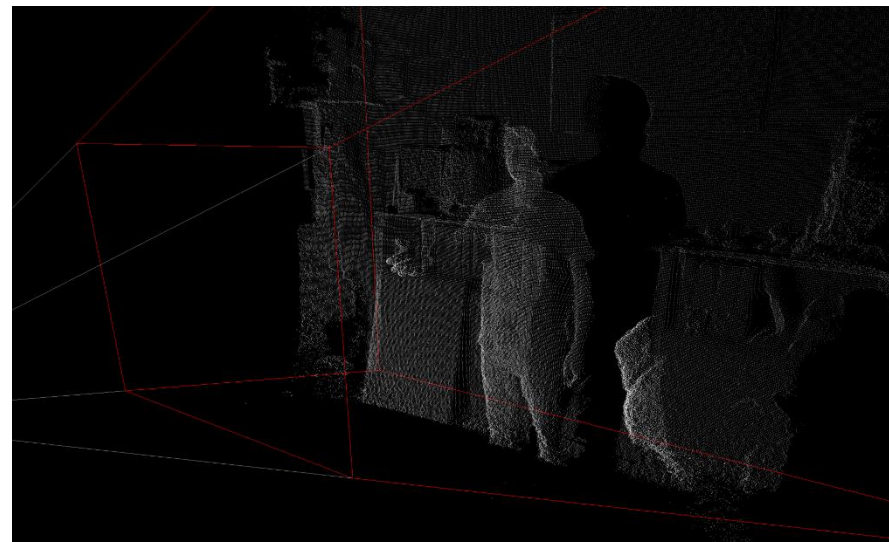
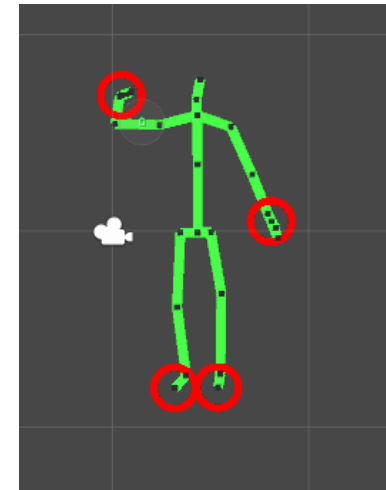
- 2D Face Recognition based on Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) and Canonical Correlation Analysis (CCA) methods.
- Proposing a modified method for 2D-3D Face Recognition using Canonical Correlation Analysis (CCA)





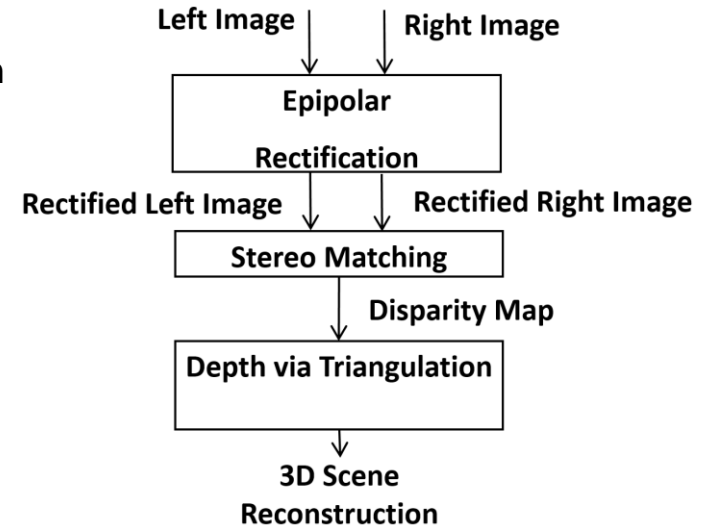
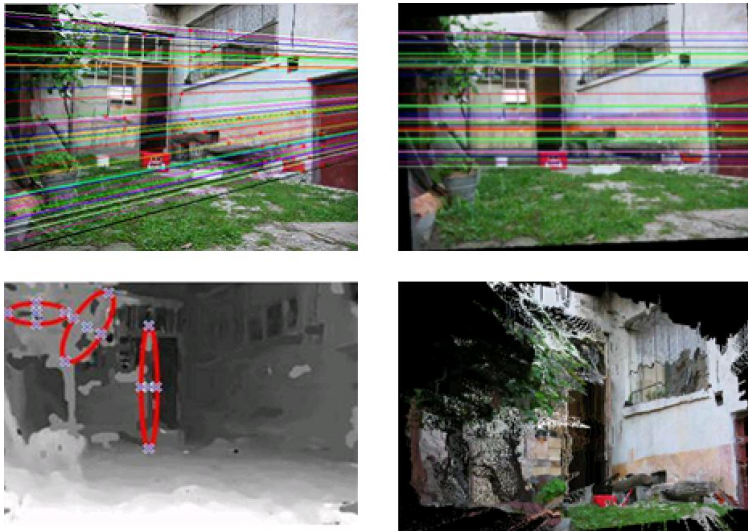
# ADVANCED IMAGE SENSORS

- 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

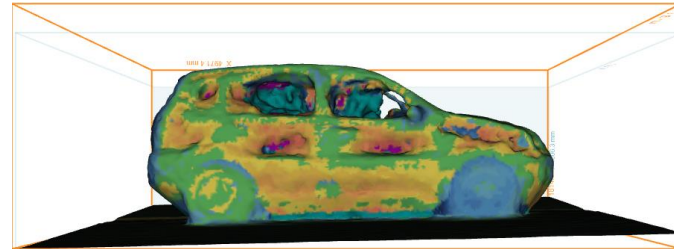




# 3D RECONSTRUCTION, VIRTUAL REALITY

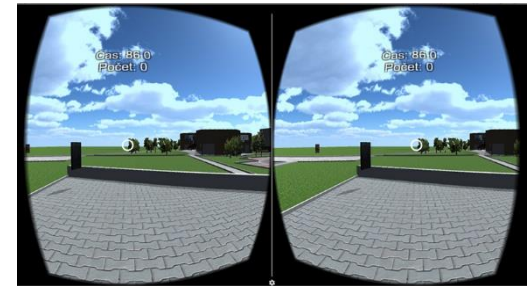
## 3D Reconstruction and Measurement

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



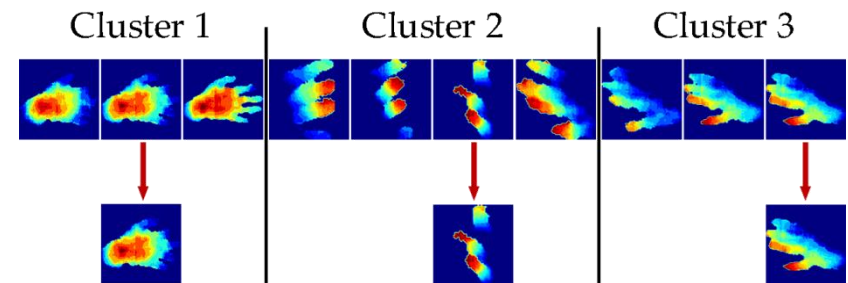
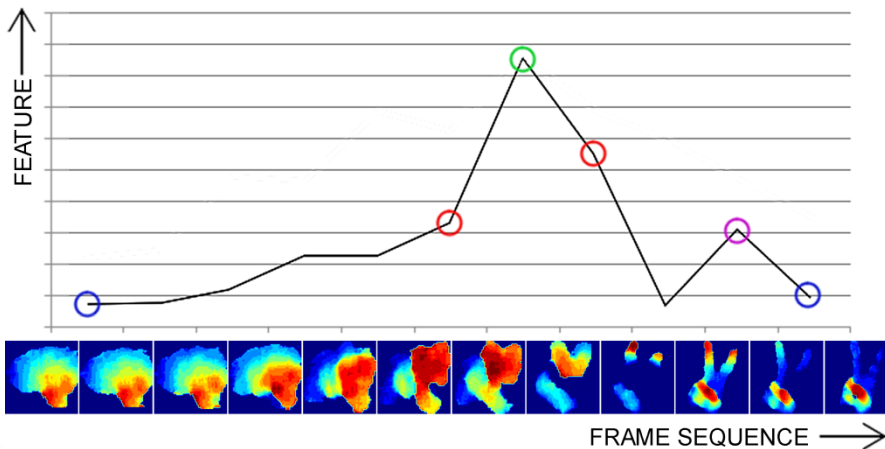
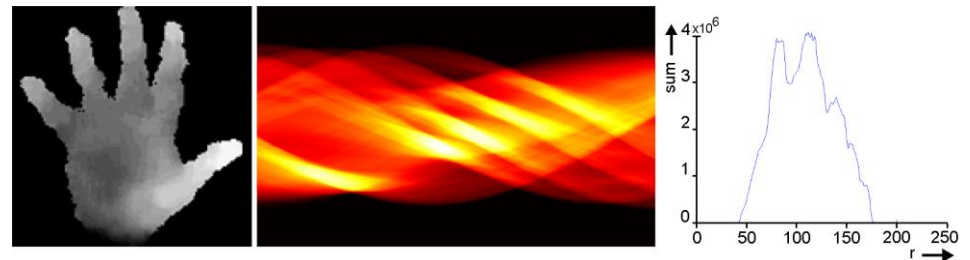
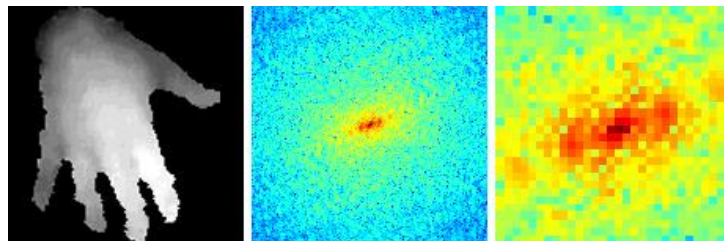
## Applications of Virtual Reality

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



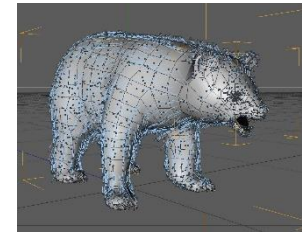
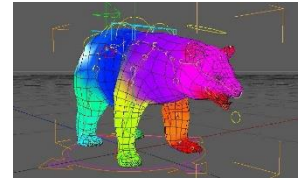
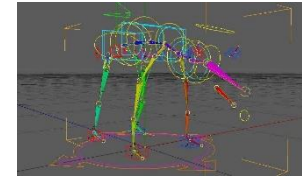
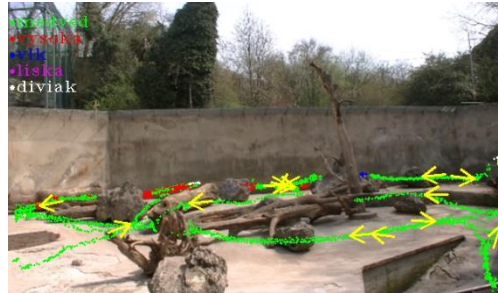
# HYBRID SHAPE-MOTION DESCRIPTION

- 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

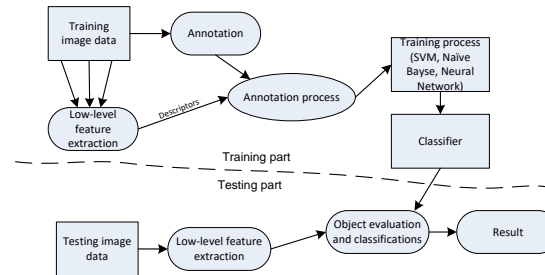


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		1	2	3	4
TARGETED	1	21	0	0	0
	2	0	25	1	0
	3	1	0	25	2
	4	0	2	0	23

MobileNet

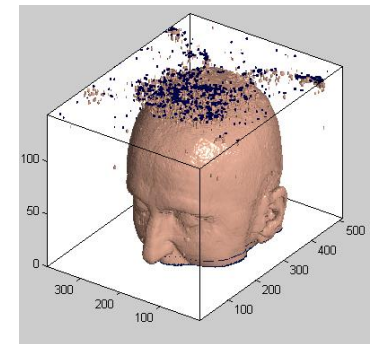
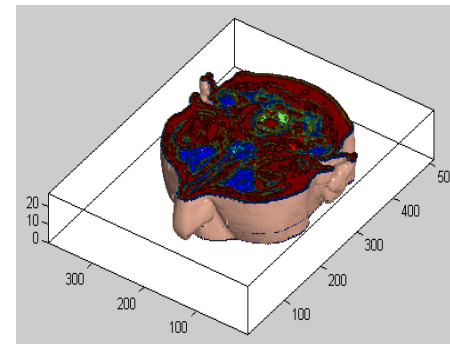
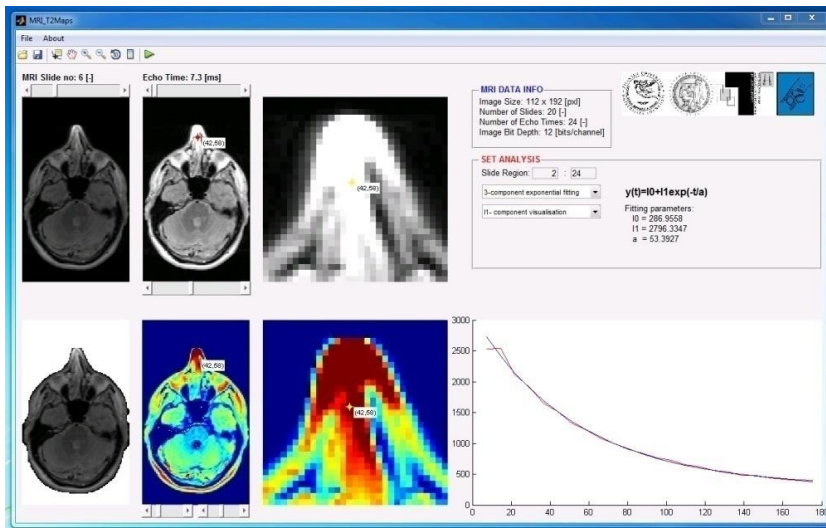
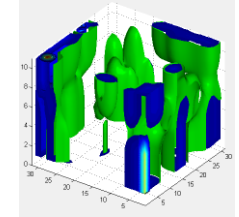
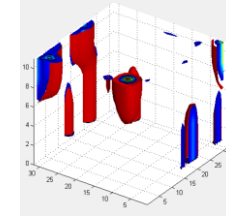
		PREDICTED			
		1	2	3	4
TARGETED	1	20	1	0	0
	2	1	24	0	1
	3	0	1	26	1
	4	2	0	1	22

ResNet



# CANCER DETECTION AND VISUALISATION

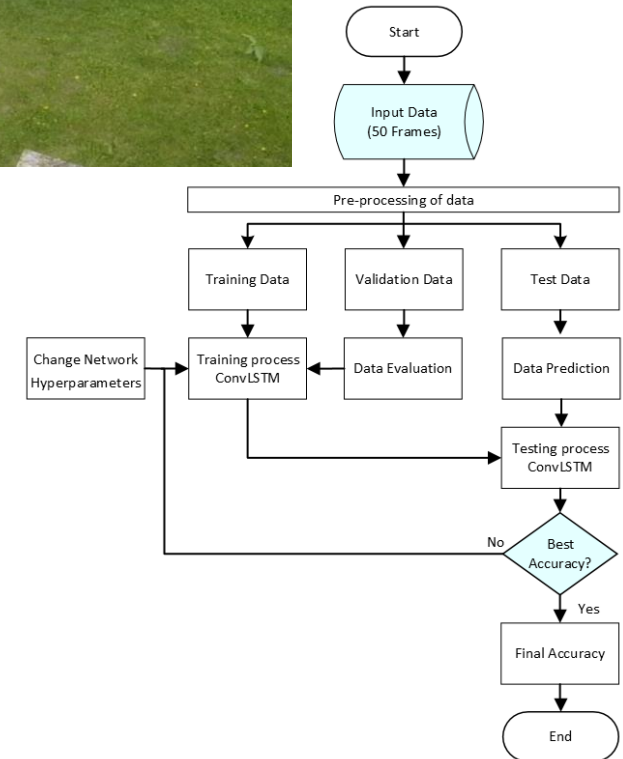
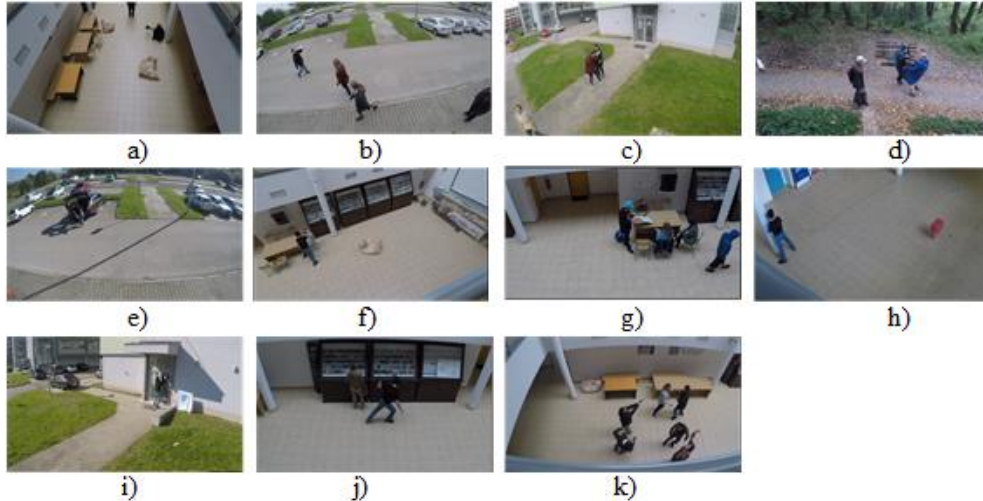
- DICOM v3.0 image data visualisation (Siemens MRI)
- MRI slice's data filtration and segmentation
- 3D Head/Brain surface reconstruction,
- 3D voxel interpolation
- 3D metabolite processing and visualisation (Cholin, Alanin, etc.)
- Brain cancer localisation, T2 relaxation maps (MRI) fitting





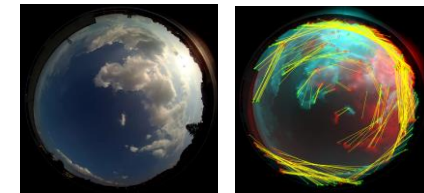
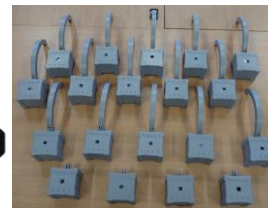
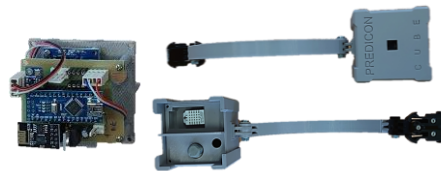
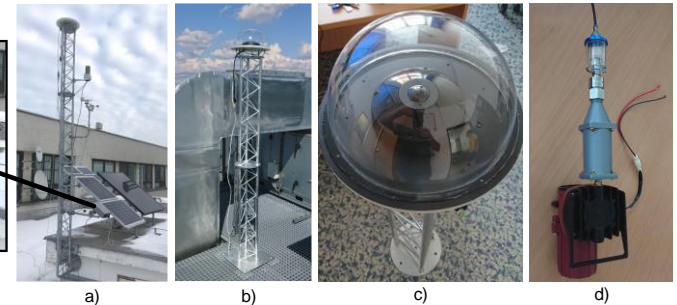
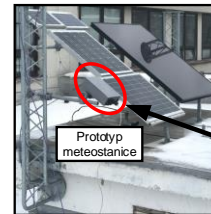
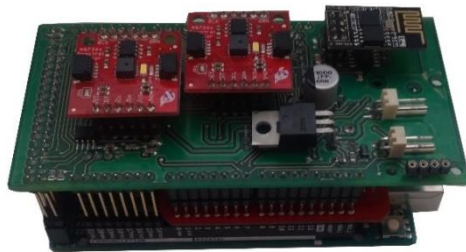
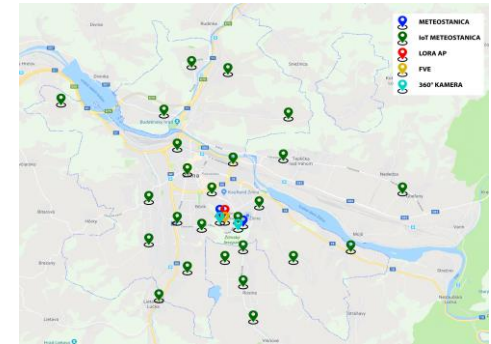
# ABNORMAL HUMAN ACTIVITIES RECOGNITION

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



# SHORT-TERM PREDICTION OF PVE

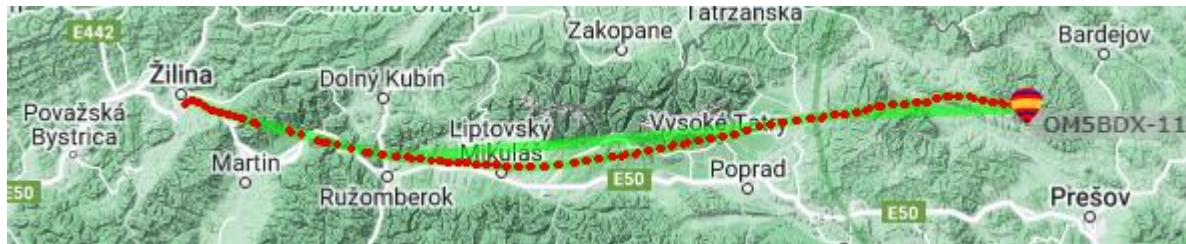
- Cloud classification (cirrus, altocumulus, nimbostratus, etc.)
- Short-term prediction of PV power plant (5 to 30 minutes)
- Intensity of solar irradiance forecasting by DL NN
- 3D cloud relief by stereoscopic 360° cameras' system
- METEO data sensing by IoT architecture from wide area
- LORA/WiFi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

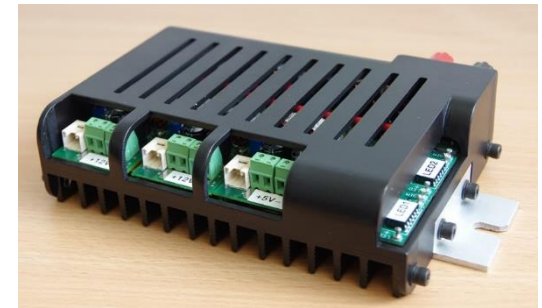
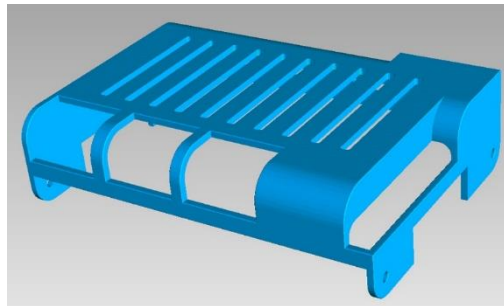
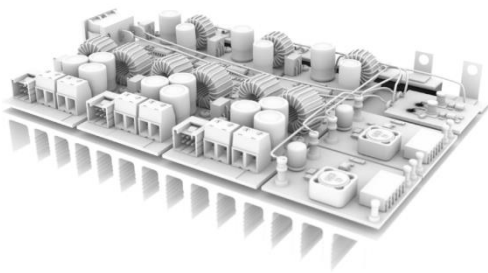
## 3D Modeling and Animation

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



## Rapid Prototyping and 3D Printing

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





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LABORATORY OF HEALTH  
APPLICATIONS

# LABORATORY OF HEALTH APPLICATIONS (LoHA)

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# LABORATORY OF HEALTH APPLICATIONS

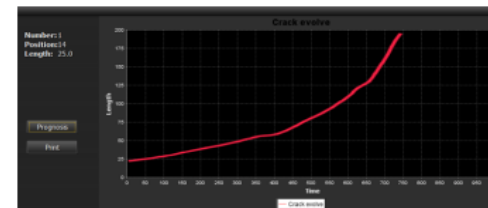
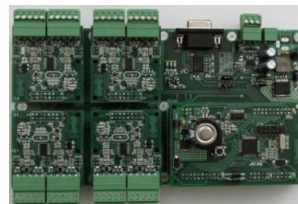
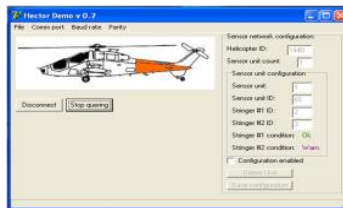
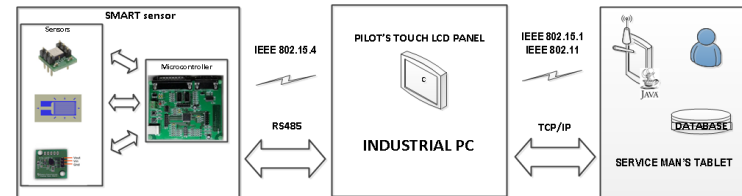
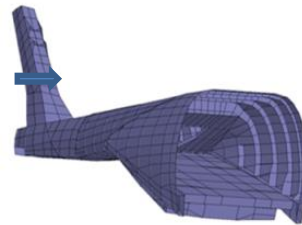
- **Structural health monitoring (nonliving)**
  - Non-destructive monitoring of electro-conductive materials
  - Digital signal filtration and preprocessing
  - Crack classification via SVM+PSO and GMM
  - On-board unit design HW and SW (C++, DELPHI, JAVA, PHP, MATLAB, etc)
  - DB design and mining
- **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 intelligent 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

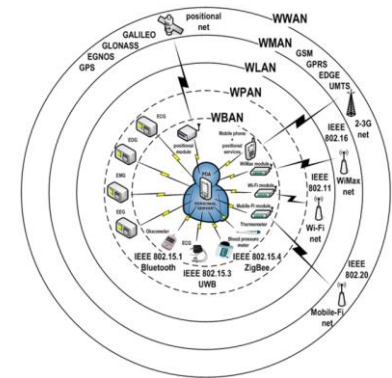
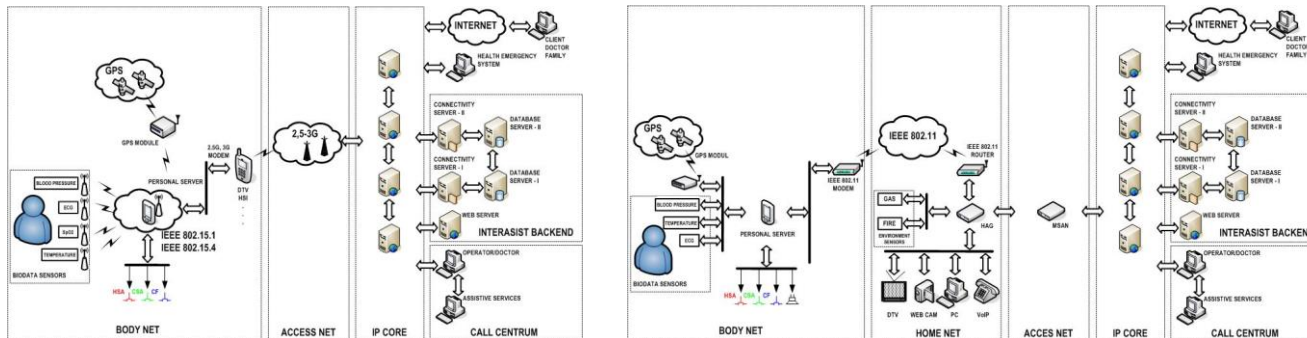
HECTOR-HELICOPTER fuselage Crack moniTORing and prognOSis through on-board sensOR network (European Defense Agency)

- Wireless and/or wired sensor net architecture development.
- Smart sensor development based on strain gauges.
- On Board Unit for Helicopter (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 BloData).
  - SYDES (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<sub>2</sub> monitoring, ...)



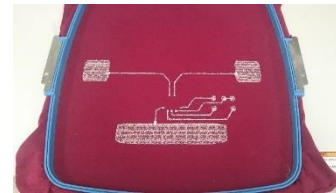
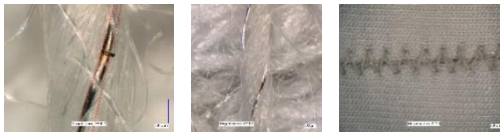
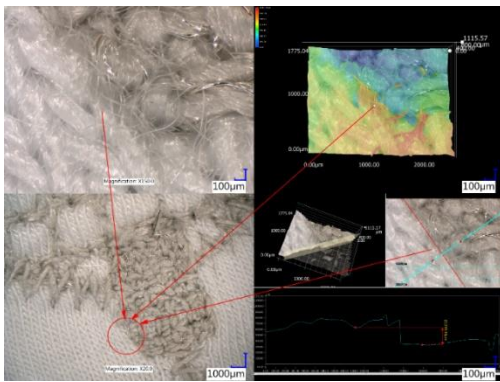
SYDMOS



# INTELLIGENT TEXTILE - I.

- Design of wearable clothing based on Ag coated yarn, Cu-microwire (power&data transmission, 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),



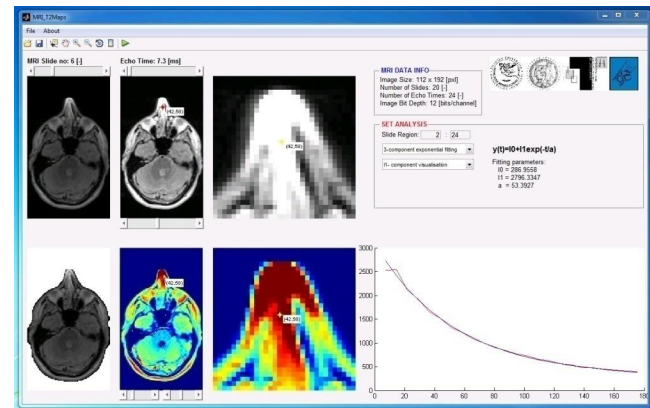
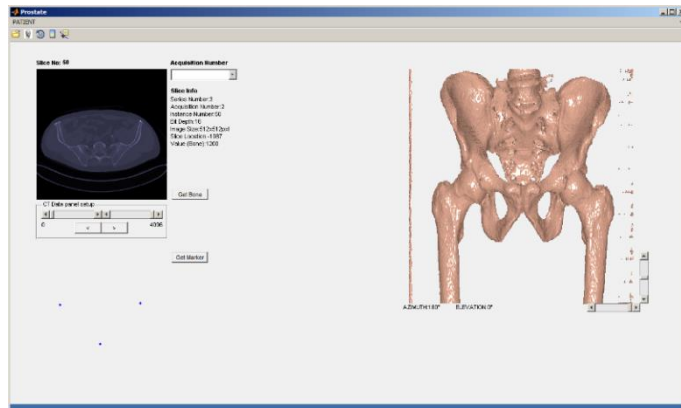
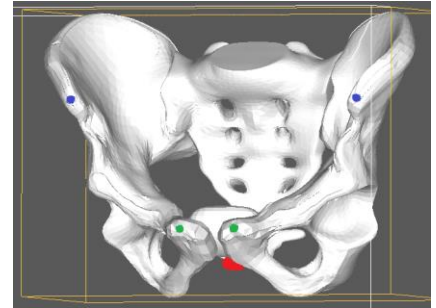




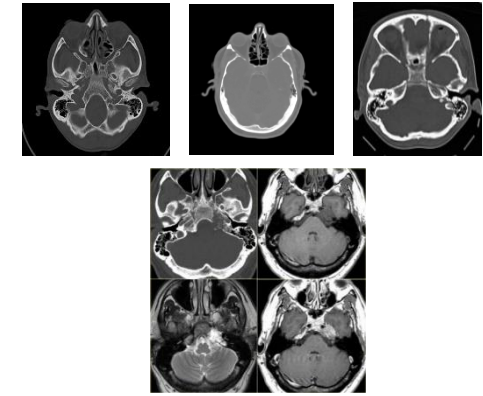
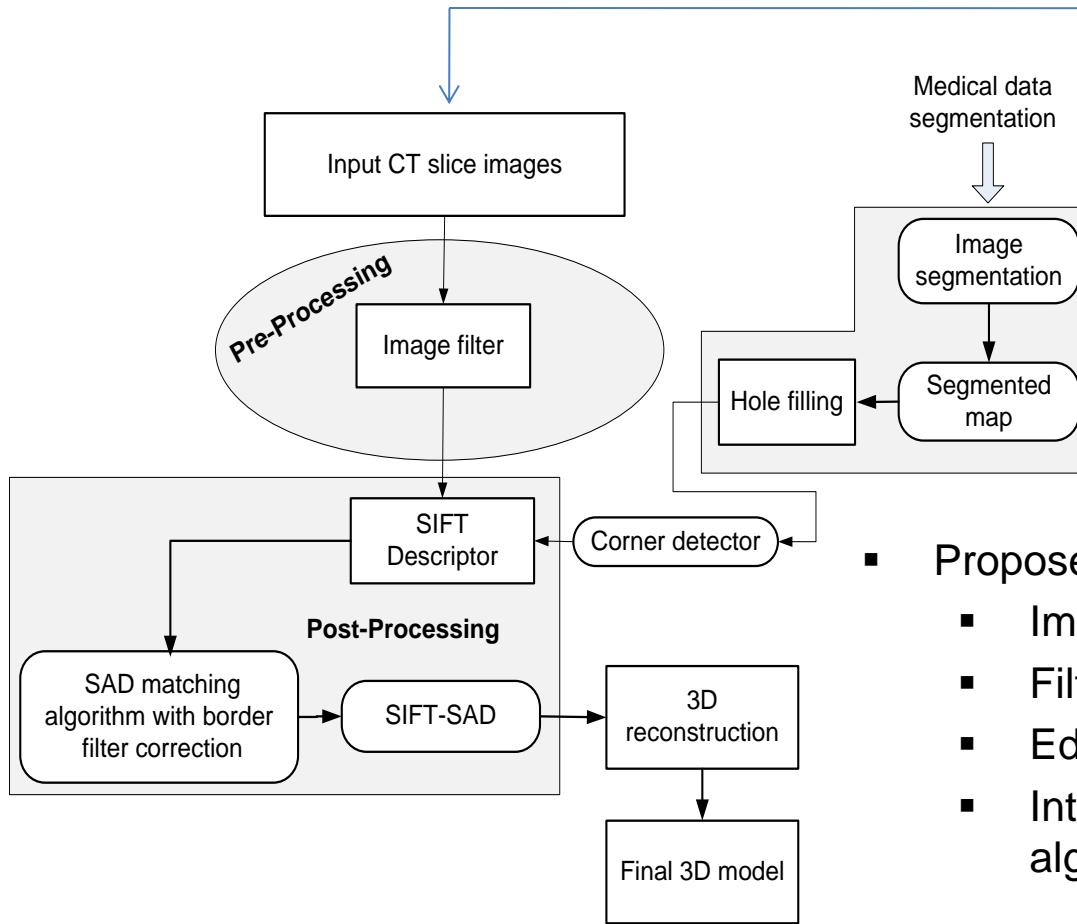
# DIAGNOSTIC OF CANCER DISEASES

Research of advanced methods for biomedical data processing

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



# 3D RECONSTRUCTION OF BIOMEDICAL DATA – I.

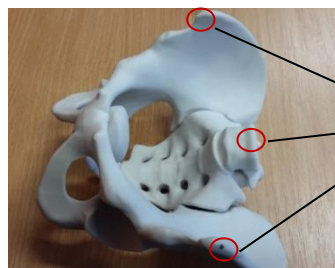
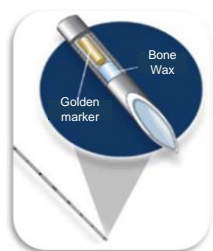
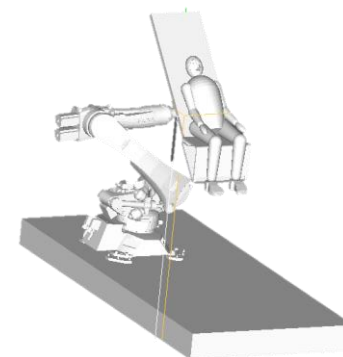
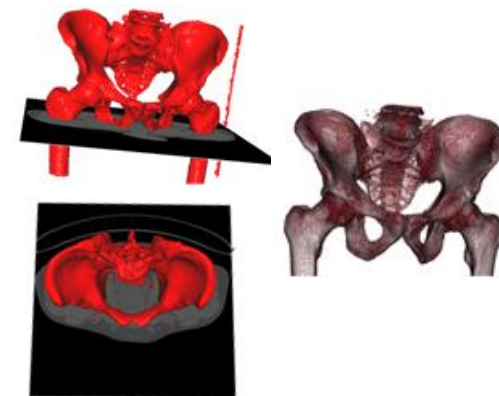


## Proposed method:

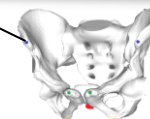
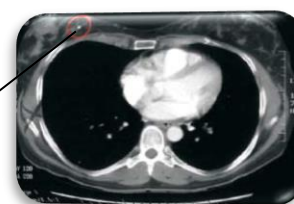
- Image filtering by Mean Shift filter
- Filtered image is split into segments
- Edge extraction using Canny edge detector
- Integrated the Mean-Shift segmentation algorithm with the SIFT-SAD method

## 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.

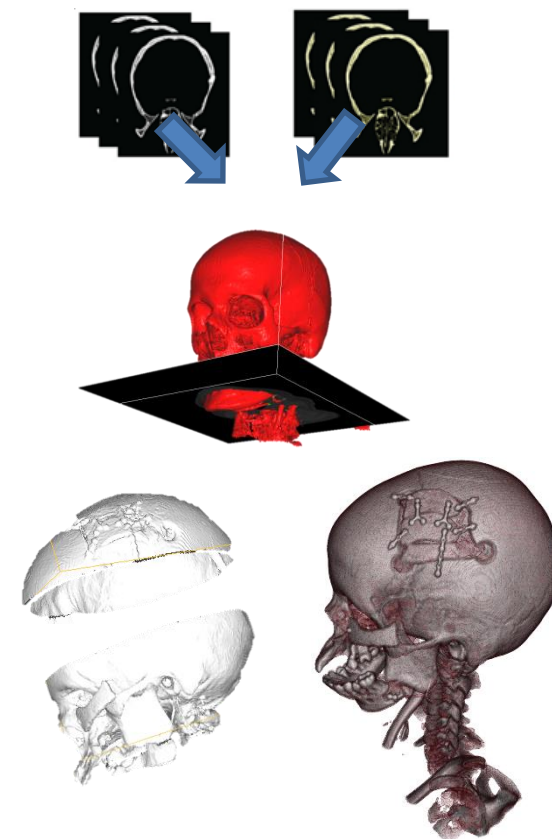


Location of  
biomarkers



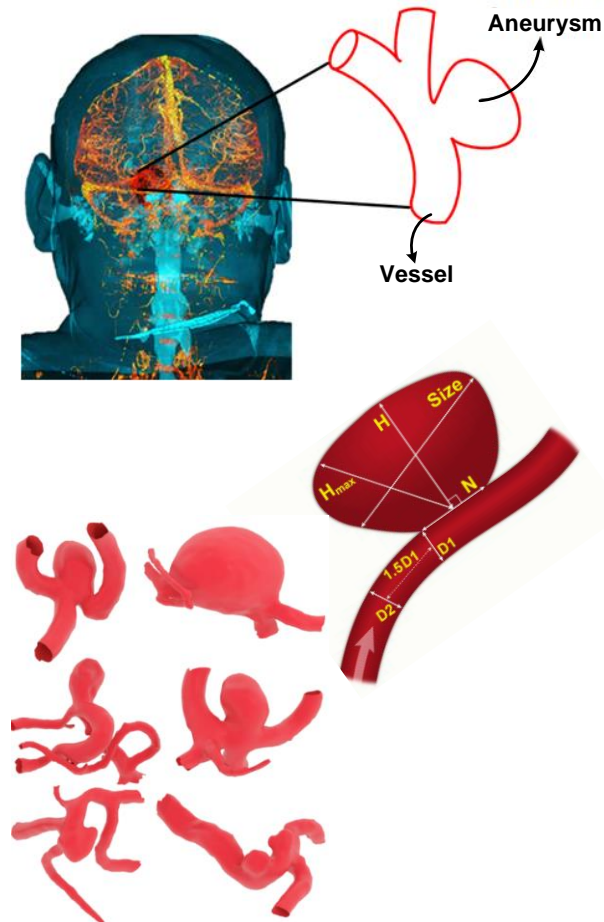
# 3D RECONSTRUCTION OF BIOMEDICAL DATA – III.

- 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 ANEURYSMS 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.





LABORATORY OF DIGITAL  
VIDEO PROCESSING



LABORATORY OF HEALTH  
APPLICATIONS

# SUB-LABS



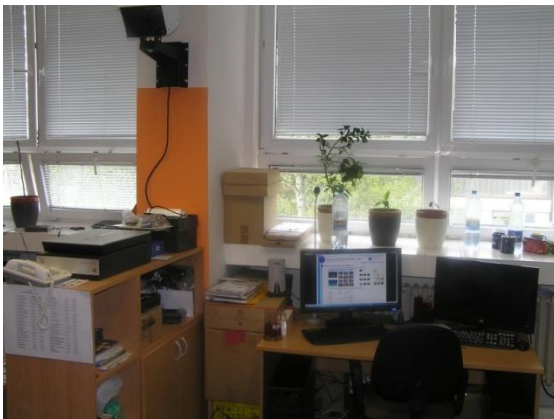




# VIDEOLAB

## 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.)



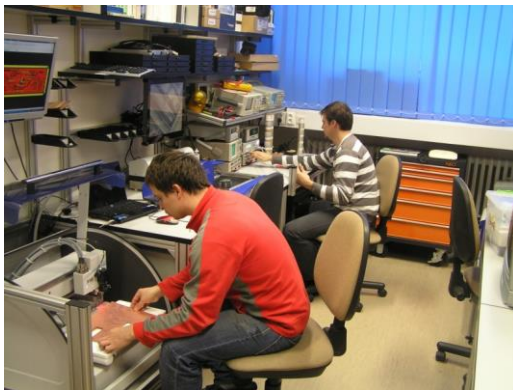
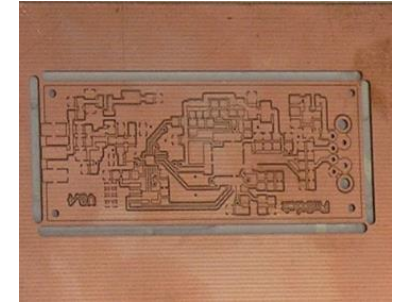




# PROTOTYPELAB

## 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 oven) – 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.)





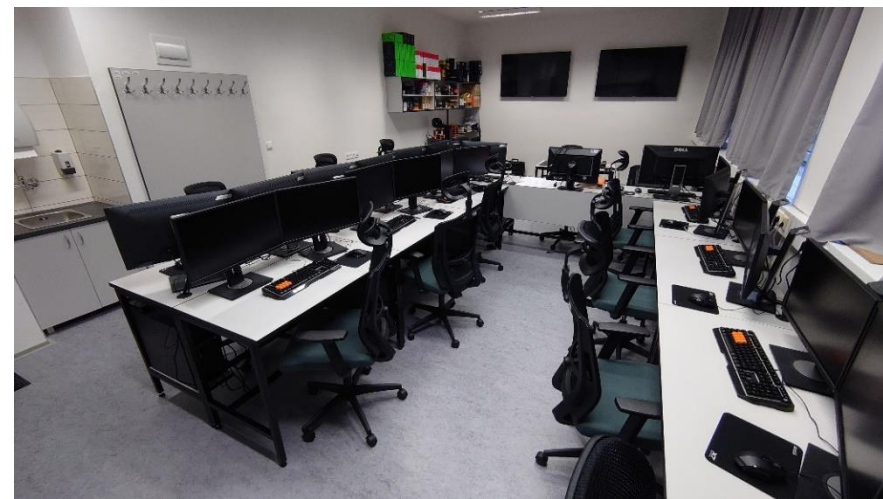
# GAMELAB

## 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

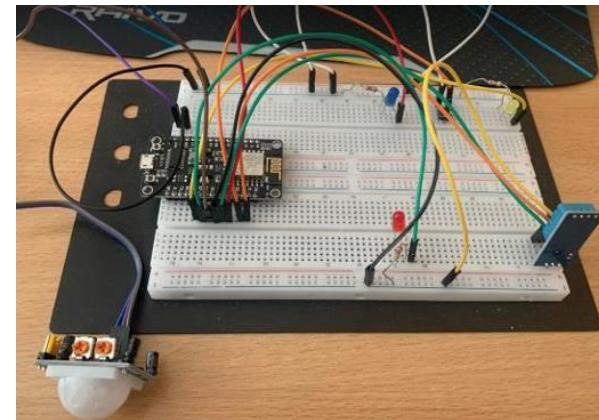




# IOTLAB

## 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 GRAPHICLAB

## 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 glasses)

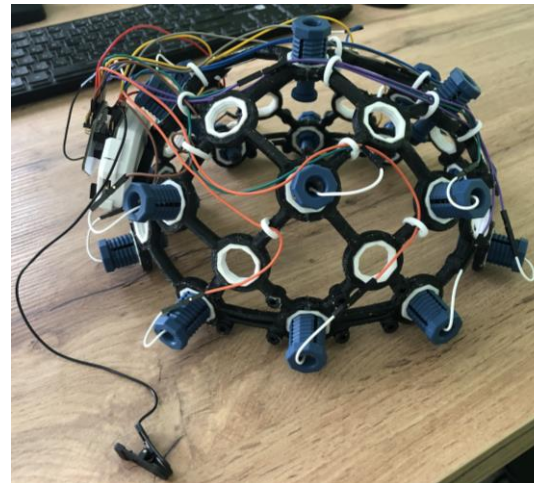
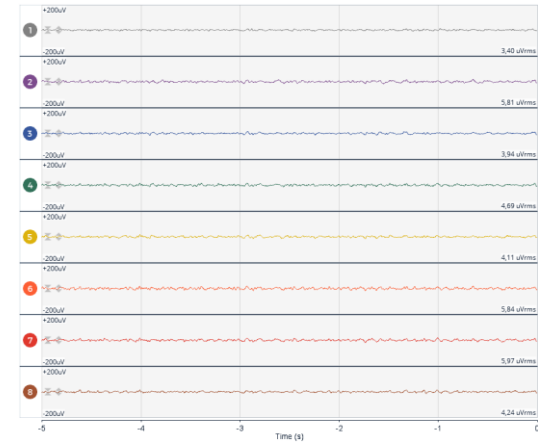




# HEALTHlab

Laboratory of cognitive sciences

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







# TEXTILElab

## 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 Žilina



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





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# SW-HW-COVER DESIGN

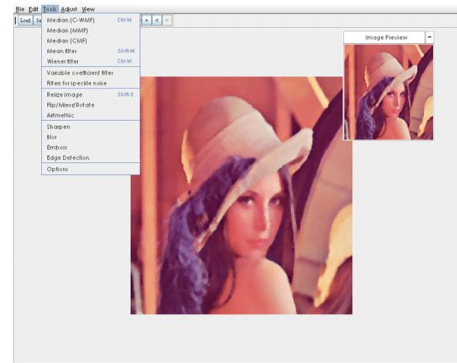


# REALIZED SW AND HW SOLUTIONS – I.

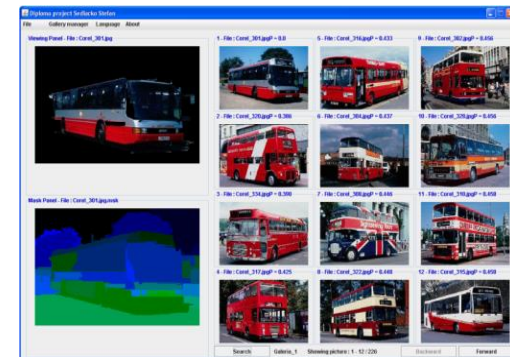
- **SYDMOS (2006)**, SYSTEM FOR DISTANT MONITORING OF THE HEALTH STATE
- **TEBID (2006)**, TERMINAL FOR COLLECTING AND TRANSMISSION OF BIODATA
- **SYDES (2006)**, SYSTEM OF CONNECTIVITY TO THE DATA OF THE E-HEALTH STATE
- **ECG MONITORING (2006)**, ECG MONITORING OF HEART ACTIVITY
- **IFM (2007)**, Image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



TEBID homecare system



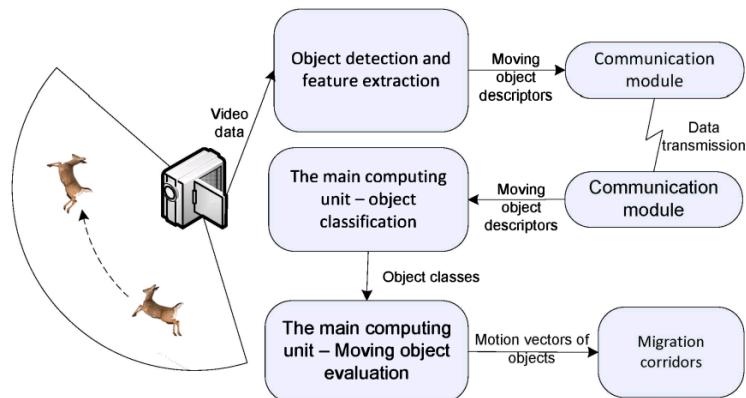
IFM



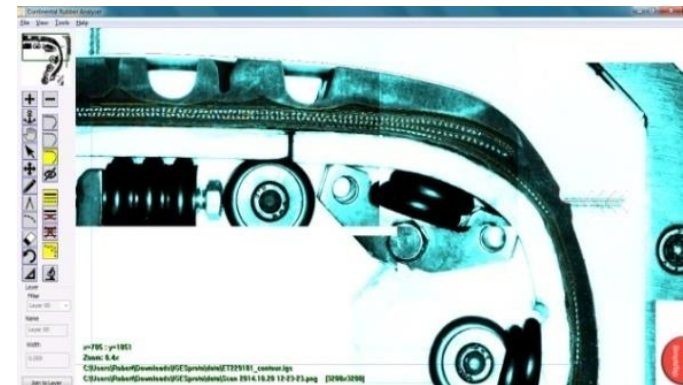
INIRES

# 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



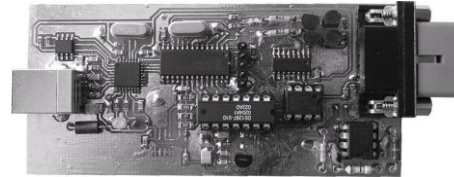
CRA



# REALIZED SW AND HW SOLUTIONS – III.



SIIT



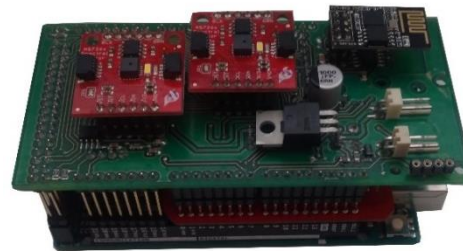
SpO<sub>2</sub> sensor



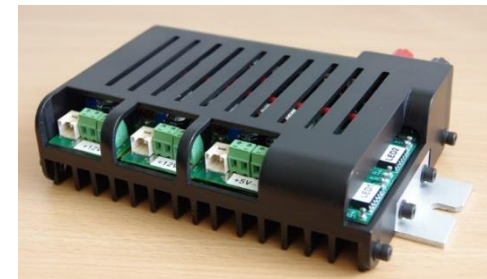
Smart chair



Stratospheric balloon satellite



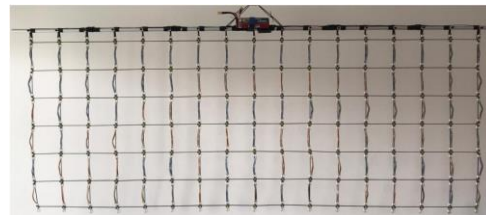
PREDICON main weather station



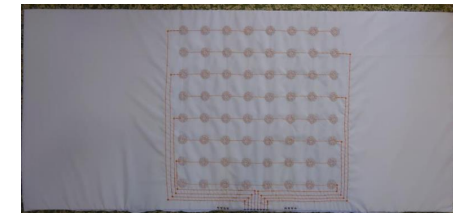
ASFAR power source module



PREDICON "CUBE" weather station



17x7pxl "flying" color display for drone



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



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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 processing** (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)

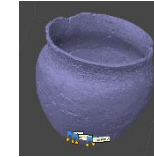




# SELECTED MASTER'S THESIS – I.

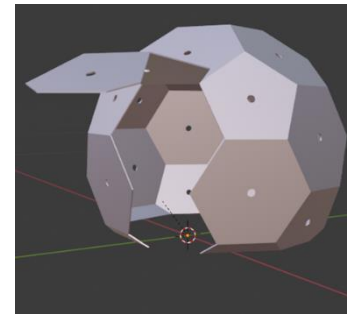
## 3D scanning platform, 2021

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



## 3D scanning dome, 2022

Student: Ing. Ján TEKEL'  
Supervisor: prof. Robert HUDEC, PhD.

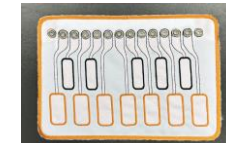


## Textile piano, 2023

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



a)



b)





# SELECTED MASTER'S THESIS – II.

## Recognition of dangerous objects from the image, 2023

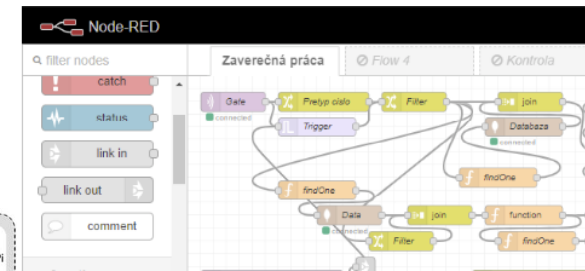
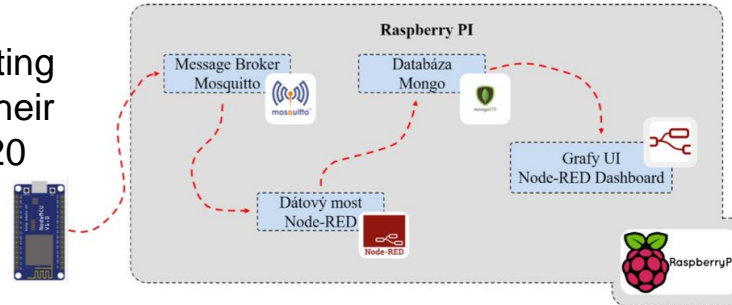
Student: Ing. Juraj Vaško  
Supervisor: Ing. Róberta Hlavatá, PhD.



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

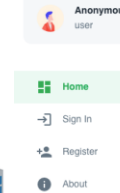
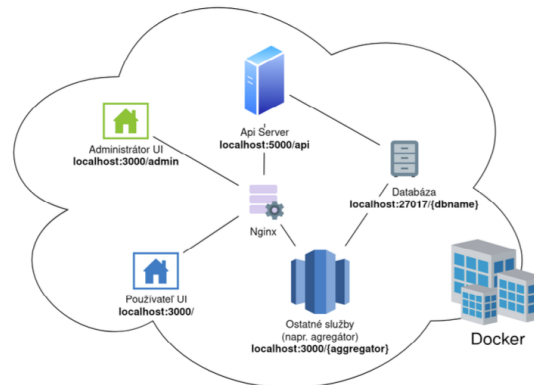
## IoT based system for detecting the number of people and their distribution in classroom, 2020

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.



### Interconnected University System



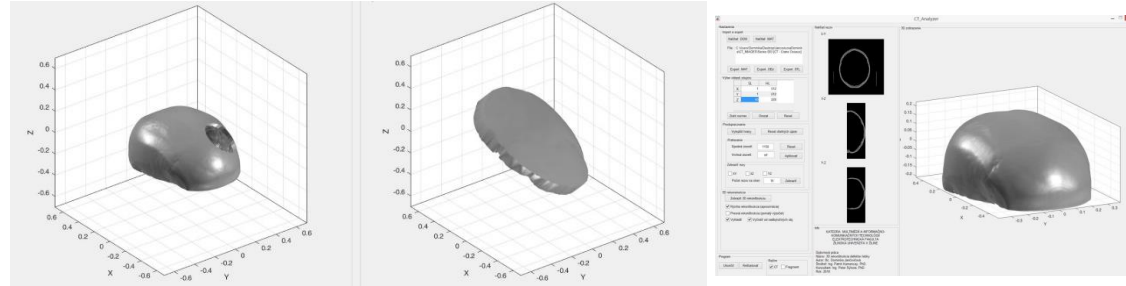


# SELECTED MASTER'S THESIS – III.

## 3D reconstruction of skull defects, 2018

Student: Ing. Dominika JANČOVIČOVÁ

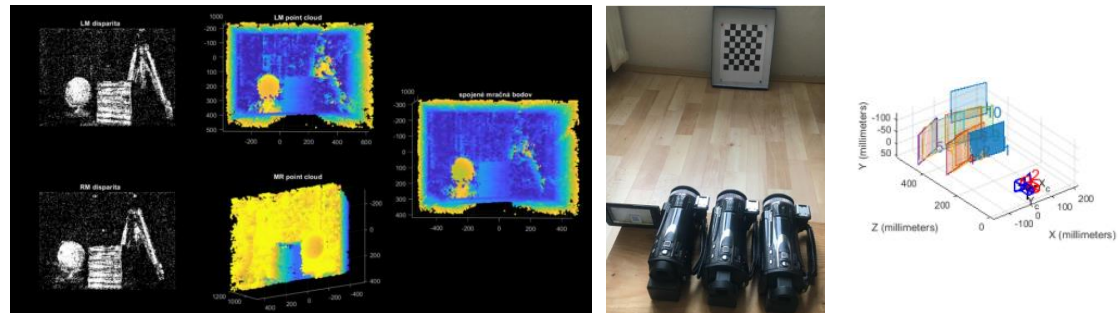
Supervisor: assoc. prof. Patrik KAMENCAY, PhD.



## 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.



		Predicted		
		A	B	C
True	A	315	45	131
	B	31	780	68
	C	95	63	436

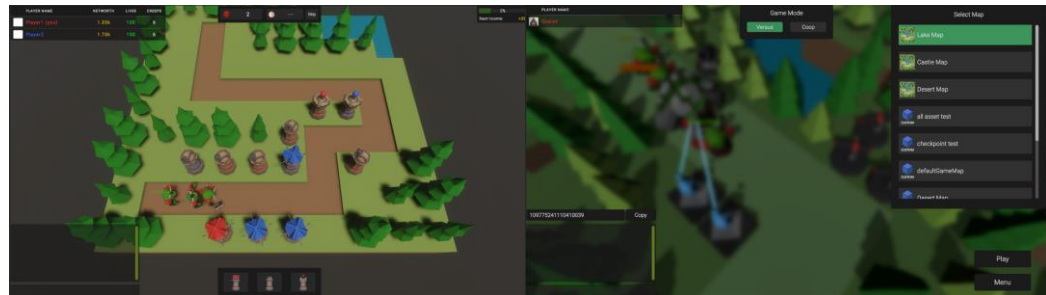
## Card game, 2022

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

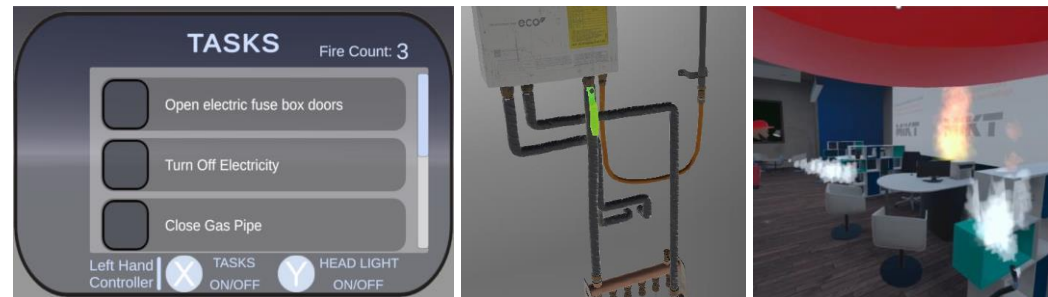
Supervisor: Ing. Peter SÝKORA, PhD.



## Simulator of a security situation in virtual reality, 2023

Student: Ing. Matúš LIZOŇ

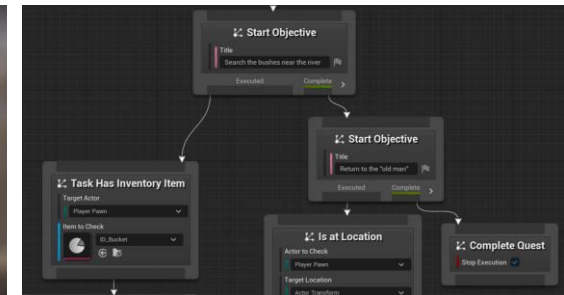
Supervisor: Ing. Peter SÝKORA, PhD.



## 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

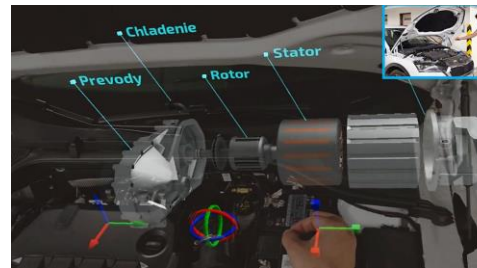
Supervisor: assoc. prof. Miroslav Benčo, PhD.



## Augmented reality and its use in industrial applications, 2021

Student: Ing. Benjamin Kall

Supervisor: assoc. prof. Miroslav Benčo, PhD.



## Smart Uniza – mobile app, 2023

Student: Ing. Michael Bardoň

Supervisor: assoc. prof. Miroslav Benčo, PhD.



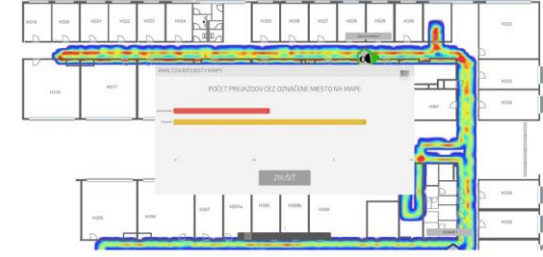
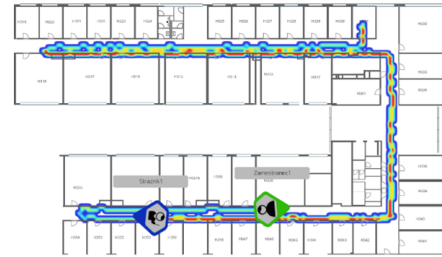


# SELECTED MASTER'S THESIS – VII.

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

Student: Ing. Roman Kempa

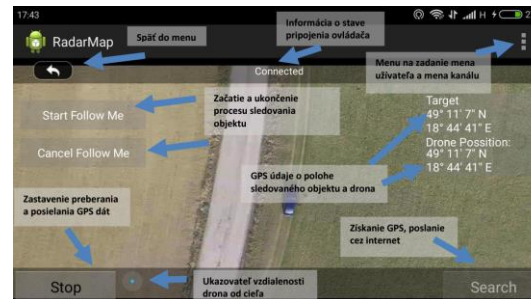
Supervisor: assoc. prof. Miroslav Benčo, PhD.



Drone control application, 2016

Student: Ing. Ľubomír Igonda

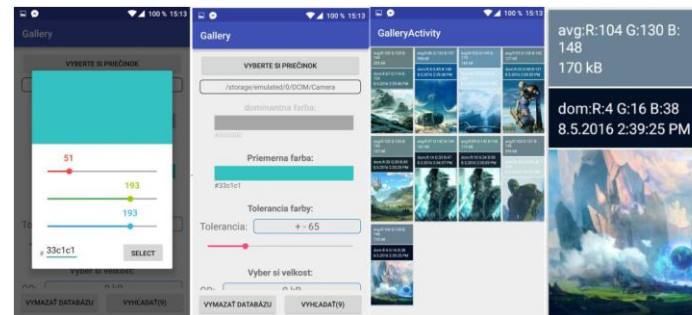
Supervisor: assoc. prof. Miroslav Benčo, PhD.



Smart Gallery for Android, 2016

Student: Ing. Michal Mikolka

Supervisor: assoc. prof. Miroslav Benčo, 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 information 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)





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# 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-coordinator: 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 00/28 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, 2023

Vrskova Roberta, Kamencay Patrik, Hudec Robert, Sýkora Peter: A new deep-learning method for human activity recognition, *Sensors*, ISSN-1424-3210.

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.

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

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, open solutions*, ISSN-2169-3536.





# 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/aeer.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/aeer.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

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LABORATORY OF DIGITAL  
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# THANKS FOR ATTENTION

## ? QUESTIONS ?

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