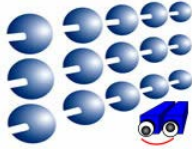
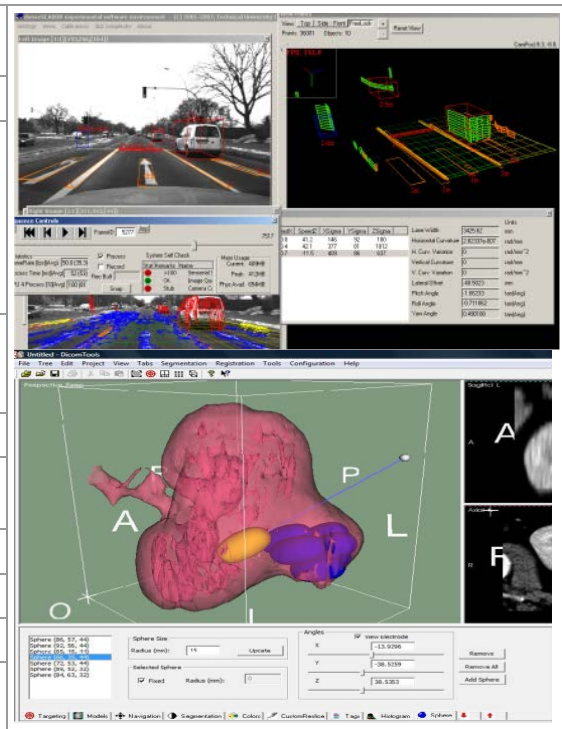


IMAGE PROCESSING AND PATTERN RECOGNITION RESEARCH CENTER

Contact details

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Acronym	IPPRRC
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Areas of expertise

Image processing and pattern recognition

-Color, grayscale and 3D image processing; Automatic image and media annotation

Stereovision based sensorial perception

-Stereovision; Dense optical flow; Object detection, classification and tracking; Real-time computer vision

Advanced driving assistance and Autonomous mobile systems

-Sensorial perception; Environment representation; Risk assessment

Medical image analysis

-Enhancement; Segmentation; Recognition; Prediction; Structured reporting; Ultrasonography, CT, MRI

Team

Prof. Dr. Eng. Sergiu Nedeveschi, Assoc. Prof. Dr. Eng. Tiberiu Marița, Assoc. Prof. Dr. Eng. Radu Danescu, Assoc. Prof. Dr. Eng. Florin Oniga, Assist. Prof. Dr. Eng. Delia Mitrea, Assist. Prof. Dr. Eng. Cristian Vicas, Assist. Prof. Dr. Eng. Anca Ciurte, Assist. Prof. Dr. Eng. Raluca Brehar, Assist. Prof. Dr. Eng. Mihai Negru, Assist. Prof. Dr. Eng. Ion Giosan, Assist. Prof. Dr. Eng. Andrei Vatavu.
Phd. students: Eng. Cristian Vancea, Eng. Marius Drulea, Eng. Arthur Costea, Eng. Robert Varga, Eng. Catalin Golban

Representative projects

UP Drive, “Automated Urban Parking and Driving”, H2020 project, (2016-2020)

MULTIFACE, “Multifocal System for Real Time Tracking of Dynamic Facial and Body Features”, PN-II-RU-TE-2014-4-1746 project, (2015-2017).

“Reconfigurable ROS-based Resilient Reasoning Robotic Cooperating Systems”, FP7 ARTEMIS (2014-2017).

Road surface measurement and modeling, funded by Rober Bosch GMBH, (2013-2016)

PAN-ROBOTS, “Plug and Navigate ROBOTS for smart factories”, FP7 project, (2012-2015)

CoMoSef, “Co-operative Mobility Services of the Future”, Eureka project, (2012-2015)

DRIVE C2X - Accelerate cooperative mobility, FP7 project, <http://www.drive-c2x.eu/> (2011-2014)

INSEMTIVES, “Incentives for Semantics”, FP7 project, www.insemtives.eu (2010-2012)

LarKC, “Large Knowledge Collider”, FP7 project, (2008-2011), <http://www.larkc.eu> (2010-2011)

INTERSAFE-2, “Cooperative Intersection Safety”, FP7 project, <http://cv.utcluj.ro/intersafe-2.html> (2008-2011)

SMARTCODRIVE, “Cooperative Advanced Driving Assistance System Based on Smart Mobile Platforms and Road Side Units”, PNII PT PCCA (Joint Applied Research Project), <http://cv.utcluj.ro/smartcodrive/> (2012-2016)

AMHEOS, “Automatic Medium and High Earth Orbit Observation System Based on Stereovision”, PNII PCCA (Joint Applied Research Project), <http://cv.utcluj.ro/amheos/> (2012-2016)

MULTISENS, “Multi-scale multi-modal perception of dynamic 3D environments based on the fusion of dense stereo, dense optical flow and visual odometry information”, PNII-Idei, <http://cv.utcluj.ro/multisens/> (2011-2016)

Significant results

The most representative publications of the past 5 years:

1. C. Vicas, S. Nedevschi, "Detecting Curvilinear Features Using Structure Tensors", *IEEE Transactions on Image Processing*, vol. 24, no. 11, pp. 3874 – 3887, NOV 2015.
2. M. Negru, S. Nedevschi, R. Peter, Exponential Contrast Restoration in Fog Conditions for Driving Assistance, *IEEE Transactions on Intelligent Transportation Systems*, vol. 16, no. 4, pp. 2257-2268, AUG 2015.
3. A. Ciurte, S. Nedevschi, I. Rasa, Systems of nonlinear algebraic equations with unique solution, *NUMERICAL ALGORITHMS*, Vol. 68, No. 2, pp. 367-376, FEB 2015.
4. A. Vatavu, R. Danescu, S. Nedevschi, "Stereo-vision-Based Multiple Object Tracking in Traffic Scenarios Using Free-Form Obstacle Delimiters and Particle Filters", *IEEE Transactions on Intelligent Transportation Systems*, Vol. 16, No. 1, pp. 498-511, FEB 2015.
5. V. Popescu, S. Nedevschi, R. Danescu, T. Marita, A Lane Assessment Method Using Visual Information Based on a Dynamic Bayesian Network, *JOURNAL OF INTELLIGENT TRANSPORTATION SYSTEMS*, vol. 19, no. 3, pp. 225-239, JUL 2015.
6. R. Danescu, S. Nedevschi, "A Particle-Based Solution for Modeling and Tracking Dynamic Digital Elevation Maps", *IEEE Transactions on Intelligent Transportation Systems*, vol. 15, no. 3, pp. 1002-1015, JUN 2014.
7. S. Nedevschi, V. Popescu, R. Danescu, T. Marita, F. Oniga, "Accurate Ego-Vehicle Global Localization at Intersections through Alignment of Visual Data with Digital Map", in *IEEE Transactions on Intelligent Transportation Systems*, vol. 14, no. 2, pp. 673-687, JUN 2013.
8. M. Drulea, S. Nedevschi, "Motion estimation using the correlation transform", in *IEEE Transactions on Image Processing*, vol. 22, no. 8, pp. 3260-3270, AUG 2013.
9. R. Varga, S. Nedevschi, "Label transfer by measuring compactness", in *IEEE Transactions on Image Processing*, vol. 22, no. 12, pp. 4711-4723, DEC 2013.
10. R. Danescu, F. Oniga, V. Turcu, O. Cristea, "Long Baseline Stereo-vision for Automatic Detection and Ranging of Moving Objects in the Night Sky", *Sensors*, vol. 12, no. 10, pp. 12940-12963, OCT 2012.
11. C. Pantilie, S. Nedevschi, "SORT-SGM: Sub-pixel Optimized Real-Time Semi-Global Matching for Intelligent Vehicles", *IEEE Transactions on Vehicular Technology*, vol. 61, no. 3, pp. 1032-1042, MAR 2012.
12. I. Haller, S. Nedevschi, "Design of Interpolation Functions for Subpixel-Accuracy Stereo-Vision Systems", *IEEE Transactions on Image Processing*, vol. 21, no. 2, pp. 889-898, FEB 2012.

Significant solutions:

High accuracy feature-based stereo-vision; High accuracy dense stereo-vision; High accuracy dense optical flow; - Vision based ego-motion estimation using a stereo system; Lane detection and tracking; Detection and classification of painted road objects; Obstacle detection and tracking; Obstacle classification; Perception & representation of unstructured environments; Forward collision detection; Dynamic environment perception; High level reasoning on perception and domain knowledge; Automatic image annotation; Medical image processing, interpretation and structured reporting

Products and technologies:

1. Real-time stereo-vision-based driving assistance sensorial system for highways
2. Real-time stereo-vision-based sensorial system for city driving assistance functions
3. Real-time stereo-vision-based advanced driving assistance for cooperative intersection safety.
4. Real-time GPU based solutions for accurate dense stereo-vision and accurate dense optical flow estimation.
5. Ground-base long baseline observation system for automatic detection and ranging of Low Earth Orbit objects.
6. Automatic visual annotation system
7. Medical diagnosis assistance system based on ultrasonic image texture analysis, for detection of diffuse diseases, malign and benign liver tumours, prostate cancer
8. Omnidirectional stereo-vision for surrounding perception used for robotic applications

The offer addressed to the economic environment

Research & development	<p>Development of original solutions for modelling dynamic 3D environments.</p> <p>Development of original algorithms for feature extraction from monocular grayscale or colour images, from stereo images, or from medical images (CT, ultrasonic, PET).</p> <p>Development of original algorithms for 3D or 6D reconstruction, using classical stereo-vision, omnidirectional stereo-vision and optical flow.</p> <p>Development of original algorithms for model matching, probabilistic tracking, and object classification.</p> <p>Development of real-time perception systems for structured or unstructured 3D environments, applied to driving assistance systems, autonomous robots, space observation, or computer assisted diagnosis.</p> <p>Development of integrated hardware and software solutions for computer vision,</p>
Consulting	<p>Consulting, design, research and prototyping towards development of image processing based solutions for multiple industrial and scientific fields.</p> <p>Custom integrated hardware and software solutions for specific problems related to driving assistance systems, surveillance, object and people recognition, automated medical diagnosis.</p>
Training	<p>Image processing basics: camera model, image formation, noise in the digital images, noise removal techniques, edge and corner detection, image segmentation, colour spaces, frequency space analysis.</p> <p>Pattern recognition techniques: extraction of features for classification, classification techniques, design and use of classifiers, object tracking techniques.</p> <p>Advanced techniques: accurate camera calibration, real-time stereo-vision, real-time optical flow, FPGA based image acquisition and processing.</p>