ARCTUCN

Automotive Research Centre of
Technical University Cluj-Napoca

TECHNICAL UNIVERSITY
OF CLUJ-NAPOCA
ROMANIA

A doua
"Conferință a Cercetării din UTCN"

15.12.2014

TRANSPORTATION

Associate Prof. PhD. Eng. Bogdan Varga

Automotive Research Centre of Technical University Cluj-Napoca (**ARCTUCN**) is an interdisciplinary **research centre** established in **2013** in the research region of Transilvania as the leading location for automotive research.

The center was born by joining several research entities already involved in automotive research since 2000.

The aim of ARCTUCN is to increase the **cooperation** between **academia and industry** within the frameworks of research and education.

This aim is supported by the presence in the area of significant players in automotive industry such as: Autoliv, Bosch, Continental, Draexlmaier, Leoni, Takata, Compa, Yazaki, Softing, and a large number of related ITC Romanian companies: AROBS, EBS, FORTECH, IQUEST, etc.

Research topics:

ARCTUCN focuses on the following topics in automotive research:

- ✓ Energy efficiency for powertrains;

- ✓ Light hybrid materials;

- ✓ Intelligent vehicles and advanced driving assistance;

- ✓ Efficient embedded systems;

- ✓ Electrical drives and machines.

Our mission is to develop solutions for **modeling**, **simulation**, **design**, **manufacturing** and **testing** for automotive industry. The Center employs extensive experimental facilities of the joint research entities as well as of the industrial partners.

Research structures:

TESTECOCEL

Research Center on Powertrains

CERTETA

Research Center on Sheet Metal Forming

IPPRG

Research Center on Image Processing and Pattern Recognition

ITEC

Research Center on Information Technology in Electronics

CCAIEDD

Center of Applied Researches in Electrical Engineering for Sustainable Development

TESTECOCEL - Research Center on Powertrains

Team members:

Prof. PhD. Eng. Nicolae BURNETE
Assoc. Prof. PhD. Eng. Bogdan VARGA
Assoc. Prof. PhD. Eng. Florin MARIAȘIU
Lecturer PhD. Eng. Emilian BORZA
Assist. PhD. Eng. Dan MOLDOVANU
Assist. PhD. Eng. Doru BĂLDEAN
Assist. PhD. Eng. Levente KOCSIS
Researcher PhD. Eng. Călin ICLODEAN

TESTECOCEL - Research Center on Powertrains

Area of expertise

SIL (Software In the Loop) testing

      Model development of the **powertrain** in **AVL Cruise;**

      Testing the powertrain in a pre-existing road infrastructure emerged from Google Earth (altitude, longitude and gradient dependent);

      Energy consumption evaluation for specific road path (bus urban lines);

      Battery package power storage evaluation dependent on demanded range (bus designated line), road and number of passengers;

      Road dependent **energy recovery evaluation;**

HIL (Hardware In the Loop) testing

      Testing the powertrain with virtual/real battery mounted in the **Cold Chamber**;

      Testing the real powertrain on a **virtual road infrastructure**;

      Testing the powertrain in the process of developing the **hybrid control** unit for hybrid powertrain configuration;
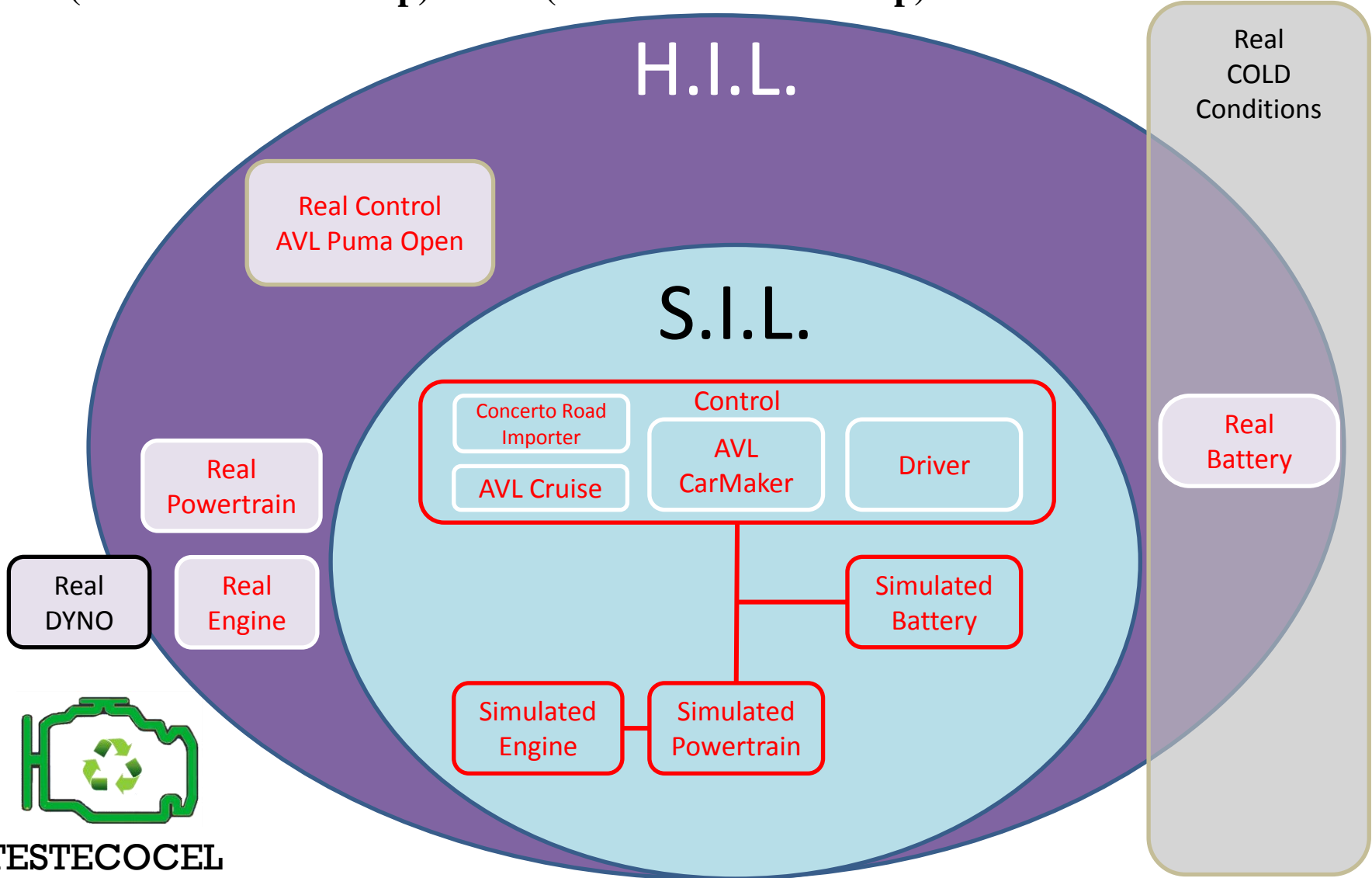
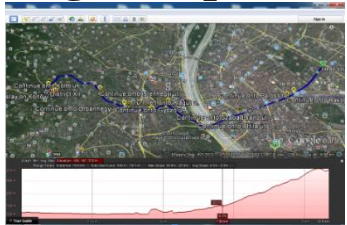   Road dependent energy recovery evaluation (**real battery** and **real powertrain**);

www.testecocel.utcluj.ro

The electrical bus under research
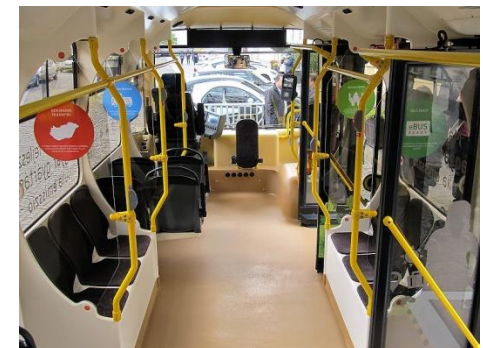
SIL (Software In the Loop) – HIL (Hardware In the Loop)

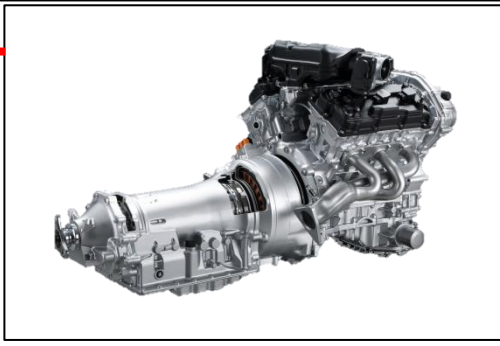# Investigation possibilities

Road path export

Cold Chamber

(on sight)   **0 °C … -30 °C**

AVL InMotion
AVL Car Maker

PUMA Open

electrical connection

Batteries

Dynamometer

Hybrid propulsion system to be tested

Continuous Emission Measurement of the specific implemented road path

TESTECOCEL

CERTETA - Research Center on Sheet Metal Forming

Team members:

Prof. PhD. Eng. Dorel BANABIC
Reader PhD. Eng. Dan-Sorin COMŞA
Lecturer PhD. Eng. Liana-Maria PĂRĂIANU
Lecturer PhD. Eng Lucian LĂZĂRESCU

CERTETA - Research Center on Sheet Metal Forming

The strategy of the CERTETA centre is to be the leading Romanian research centre that supports metal forming companies in developing advanced and efficient technologies. The main directions to achieve this goal are the following ones:

Effective and permanent dissemination of the research results and the technological transfer from the academic environment to industry in the domain of sheet metal forming

Training and human resource development in the field of sheet metal forming at all academic levels: graduate, master, researcher and PhD

Promoting scientific research results at national and international levels

Supporting the European and international integration of Romania in the terms of academic school and research in the areas mentioned above, as well as the assimilation of the EU directives and rules

Supporting the private companies in the technology and quick adaptation to the conditions of international competition and globalization of production

Disseminating the research results and regulations in field of interest previously mentioned through postgraduate training in accordance with the market demands.

www.certeta.utcluj.ro

CERTETA - Research Center on Sheet Metal Forming

Remarkable results achieved in the projects in the last 5 – **international patents**, **products** used by beneficiaries, **technologies** adopted by companies:

The members of the CERTETA Centre developed a **yield criterion** for **anisotropic metallic materials called BBC2005**. Its mathematical formulation has been implemented in the commercial finite element code **AutoForm** in order to simulate the sheet metal forming processes.

The AutoForm programme is used by 95% of the world's leading manufacturers of automobiles and airplanes, which assures a global scale application of the model BBC2005. The steps followed for implementing the model in the AutoForm programme
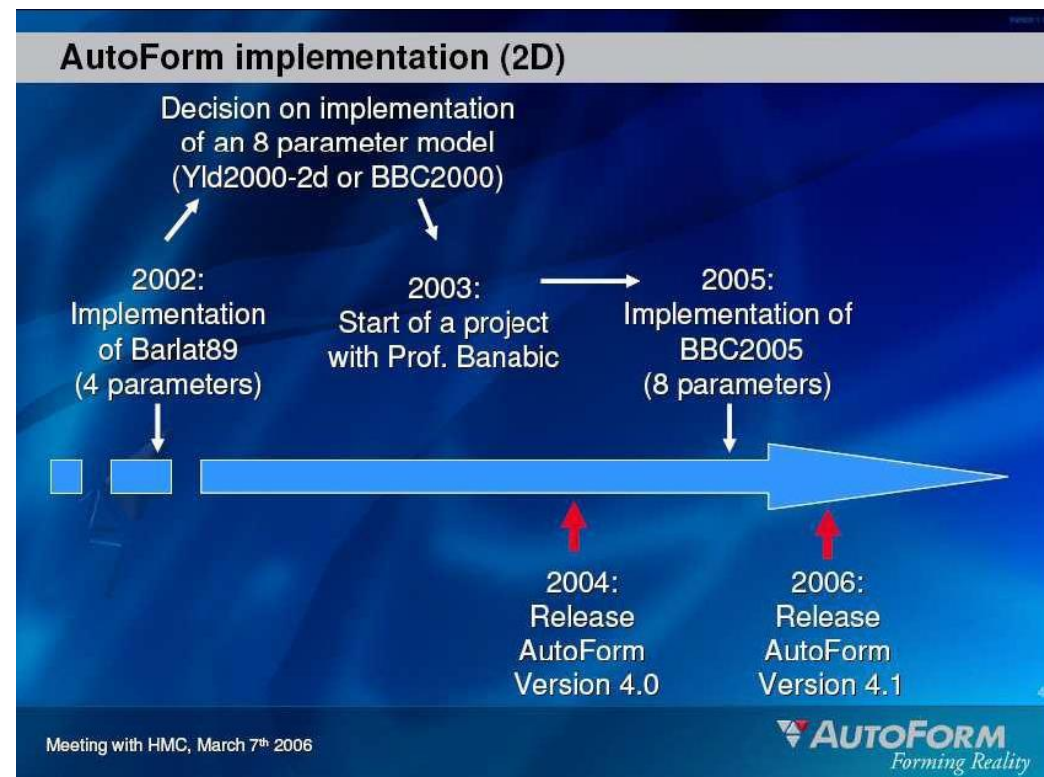
CERTETA - Research Center on Sheet Metal Forming

Graphical user interface of the AutoForm programme providing access to the BBC2005 yield criterion

CERTETA - Research Center on Sheet Metal Forming

CERTETA currently develops constitutive **models** for **anisotropic metallic materials**, with special emphasis on **cold-rolled sheet metals**. The **theoretical prediction** of the forming limits is also an important domain of research.

The models are developed with the aim of being implemented in the programmes used for the numerical simulation of the forming processes and computer-aided design of the forming tools. The members of the CERTETA team are also involved in the development of experimental methods for the determination of the mechanical parameters and limit strains of metallic sheets.

Panoramic view of the CERTETA Laboratory

IPPRG - Research Center on Image Processing and Pattern Recognition

Team members:

Prof. PhD. Eng. Sergiu NEDEVSCHI
Assoc. Prof. PhD. Eng. Tiberiu MARITA
Assoc. Prof. PhD. Eng. Radu DANESCU
Assist. Prof. PhD. Eng. Florin ONIGA
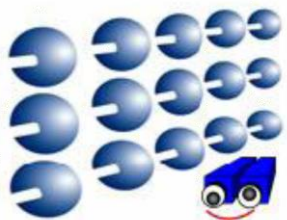Assist. Prof. PhD. Eng. Delia MITREA
Assist. Prof. PhD. Eng. Cristian VICAS
Assist. PhD. Eng. Anca CIURTE
Researcher PhD. Eng. Voichita POPESCU (BENEA)

PhD. Students:
Andrei VATAVU, Ion GIOSAN, Mihai NEGRU, Raluca BREHAR, Cristian VANCEA.

IPPRG - Research Center on Image Processing and Pattern Recognition

Areas of expertise

Image acquisition systems: setting up imaging solutions using digital and analogue cameras and frame grabbers,
multiple cameras synchronization, adaptation to lighting conditions.

Stereovision: 3D reconstruction by analysis of synchronized image pairs. This domain involves camera parameter computation through accurate calibration, image rectification, feature matching in multiple images, 3D computation using sub-pixel accuracy, post-processing.

Dense optical flow: use of variational methods for dense, accurate optical flow computation for real life scenarios.

Object detection, classification and tracking: use of probabilistic model-based techniques for extraction of relevant
objects" parameters from the 3D, grayscale and color information. Use of classifiers and probabilistic estimators for
object type identification and object parameter tracking.

Real-time computer vision: image processing algorithms optimization using parallelization techniques and exploiting modern computing architectures, such as GPUs and FPGAs.
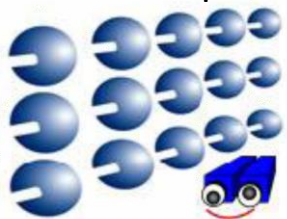
IPPRG - Research Center on Image Processing and Pattern Recognition

Development of original solutions for modeling dynamic 3D environments.

Development of original algorithms for feature extraction from monocular grayscale or color images, from stereo images, or from medical images (CT, ultrasonic, PET).

Development of original algorithms for 3D or 6D reconstruction, using classical stereovision, omnidirectional stereovision and optical flow.

Development of original algorithms for model matching, probabilistic tracking, and object classification.

Research & development in applied fields

Development of real-time perception systems for structured or unstructured 3D environments, applied to driving assistance systems, autonomous robots, space observation, or computer assisted medical diagnosis.

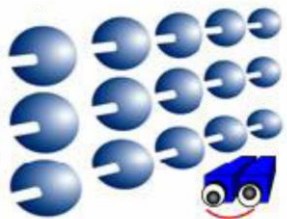Development of integrated hardware and software solutions for computer vision, with multiple applications.

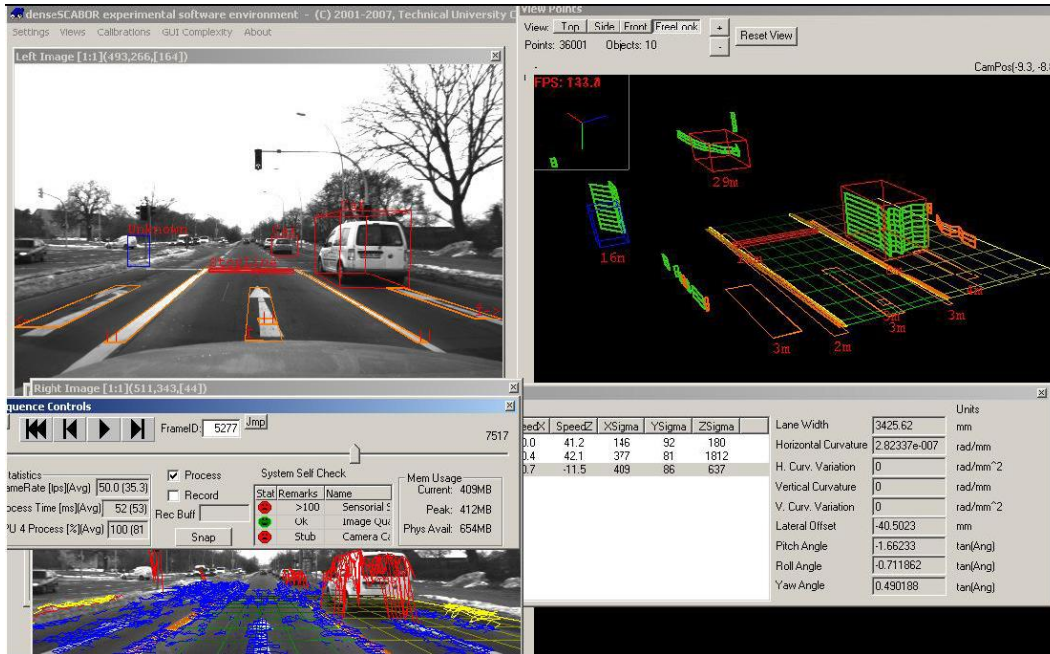Development of cooperative driving assistance systems.
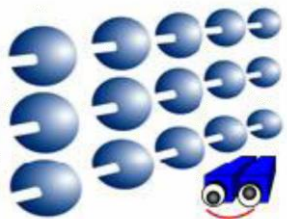
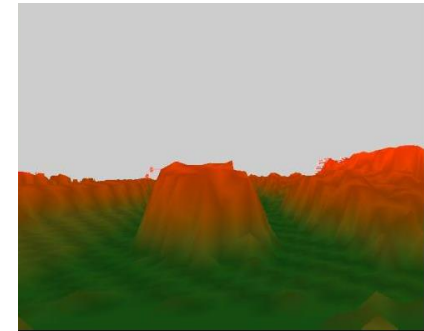**IPPRG** - Research Center on Image Processing and Pattern Recognition
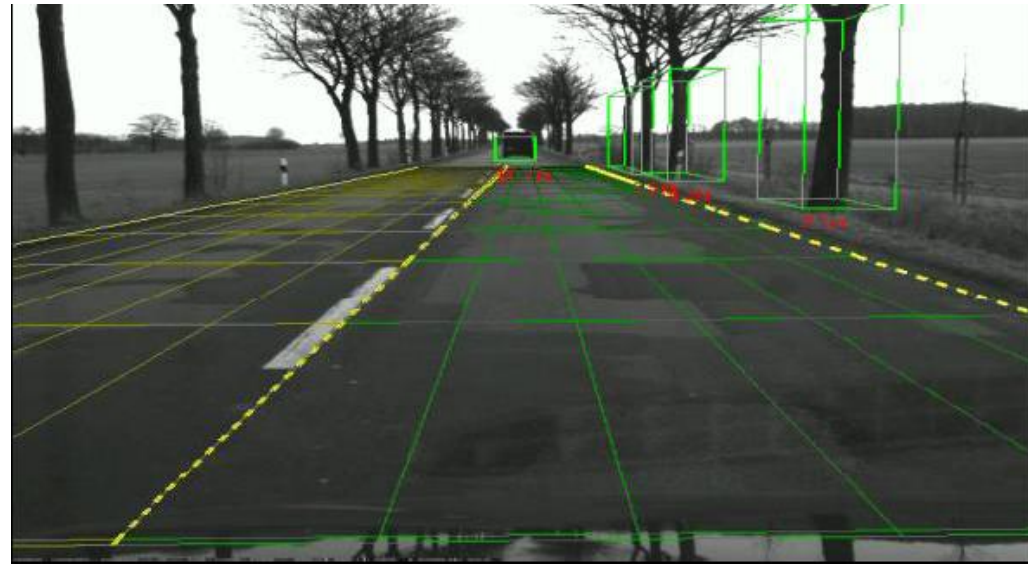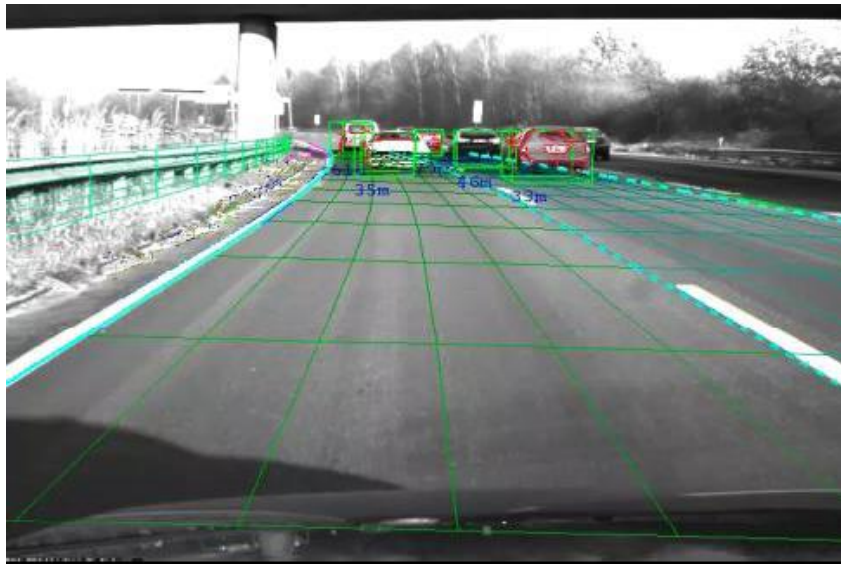
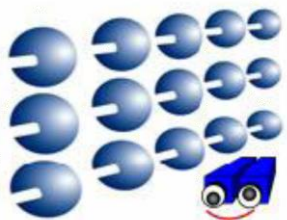Environment perception and representation

IPPRG - Research Center on Image Processing and Pattern Recognition

Environment perception and representation

SGM based stereo reconstruction and dynamic environment perception

ITEC - Research Center on Information
Technology in Electronics

Team members:

Prof. PhD. Eng. Dan PITICA
Prof. PhD. Eng. Ioan CIASCAI
Assoc. **Prof.** PhD. **Eng. Gabriel CHINDRIŞ**
Assoc. Prof. PhD. Eng. Ovidiu POP
Assoc. Prof. PhD. Eng. Liviu VIMAN
Assoc. Prof. PhD. Eng. Septimiu POP
Assist. Eng. PhD. Marius MUREȘAN
Assist. Eng. PhD. Vlad BANDE
Assist. Eng. PhD. Mihai DĂRĂBAN

Assist. PhD. Eng. Raul FIZEȘAN
Assist. PhD. Eng. Rajmond JÁNÓ
Assist. PhD. Eng. Adrian TĂUT
Assist. PhD. Eng. Monica ZOLOG
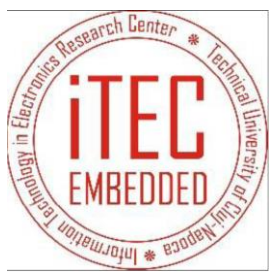PhD stud. Eng. Ionel BACIU
MsC stud. Eng. Alexandra FODOR
Mat. Mihail AVRAM
Mat. Delia GHIRAN
Eng. Aurelia HARAGUS
Eng. Ioan SĂPLĂCAN

http://emb.utcluj.ro/

ITEC - Research Center on Information Technology in Electronics

Areas of expertise

Embedded systems for Automotive

Circuit design: modeling, simulation and cross-simulation of electronic circuits (analog, digital, power, RF/EMI) using: Multisim, Pspice, Matlab, Pcad;

System design: modeling and simulation for electro-mechanical systems: power devices, actuators, mechatronics; using: Matlab, Simulink, LabVIEW;

HW Application design: fast-prototype design, PCB design for mass production, BOM/AVL design, DfT and testability for embedded applications, power supplies, interface/signal conditioning boards;

SW Application design: embedded control applications for OS and non-OS targets, broad range of targets (from small 8bit up to TriCore), V-modell development for SW, SW re-use;

TW Application design: testing and design of testing systems: SW and HW testing process, HiL and SiL, design of test-cases for SW;

Training services: LabVIEW trainings, Embedded Systems trainings, TW and HiL operation; Power systems; SCADA Systems;

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ITEC - Research Center on Information Technology in Electronics

Research & development in core areas

Calculus, design, simulation and analysis of power electronics circuits;

Numerical methods of analysis;

Control algorithms;

Transducers physics;

Electronic materials;

Research & development in applied fields

Software, hardware and testware for embedded systems;

Real-time measurements;

Power electronics;

Power dam SCADA systems;

Applied electronics for white-goods;

ITEC - Research Center on Information Technology in Electronics
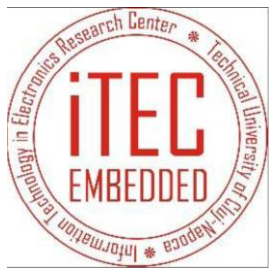
CCAIEDD - Center of Applied Researches in Electrical Engineering for Sustainable Development

Team members:

Prof. PhD. Eng. Loránd SZABÓ
Prof. PhD. Eng. Claudia MARŢIŞ
Prof. PhD. Eng. Horia HEDEŞIU
Lect. PhD. Eng. Csaba SZÁSZ
Lect. PhD. Eng. Daniel FODOREAN
Lect. PhD. Eng. Florin JURCA
Lect. PhD. Eng. Claudiu OPREA
Lect. PhD. Eng. Dan-Cristian POPA
Assist. PhD. Eng. Mircea RUBA

www.memm.utcluj.ro/ccaiedd

CCAIEDD - Center of Applied Researches in Electrical Engineering for Sustainable Development

Areas of expertise

Design, modeling, optimization and control of electrical machines & drives (EMDs) for automotive applications (EV/HEV propulsion and auxiliaries).

Condition monitoring, fault tolerance and diagnosis of EMDs.
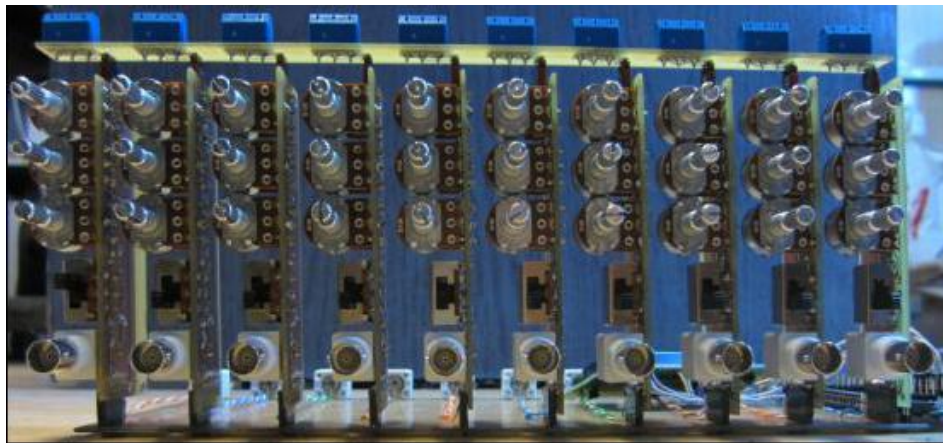
Embedded systems for automotive applications.

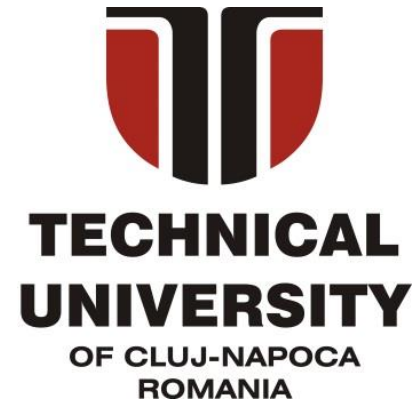Rapid-control prototyping (RCP) and Hardware-in-the-loop (HiL) testing in automotive applications.

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CCAIEDD - Center of Applied Researches in Electrical Engineering for Sustainable Development

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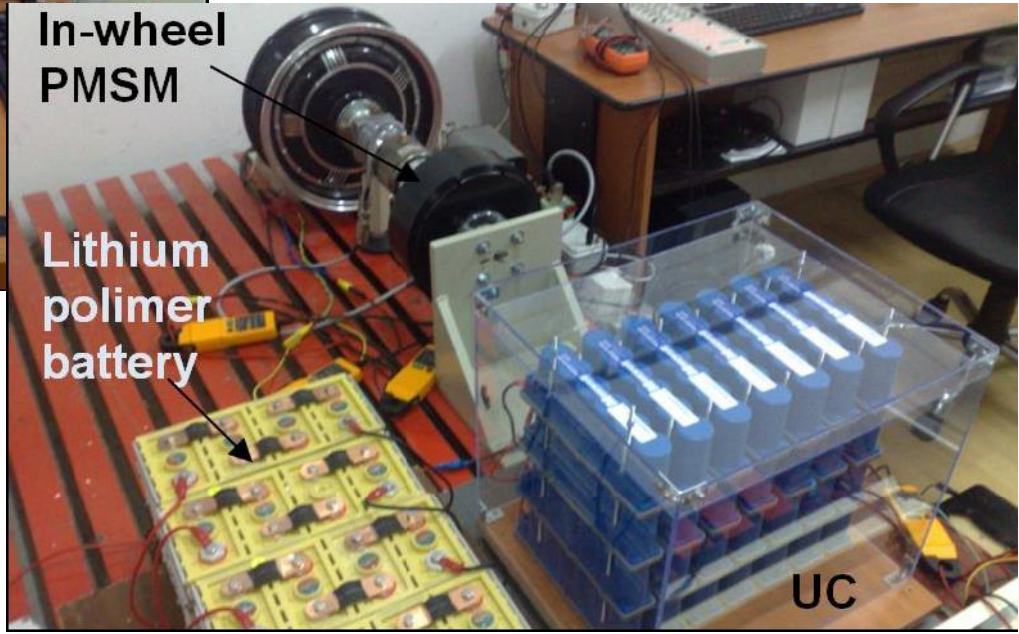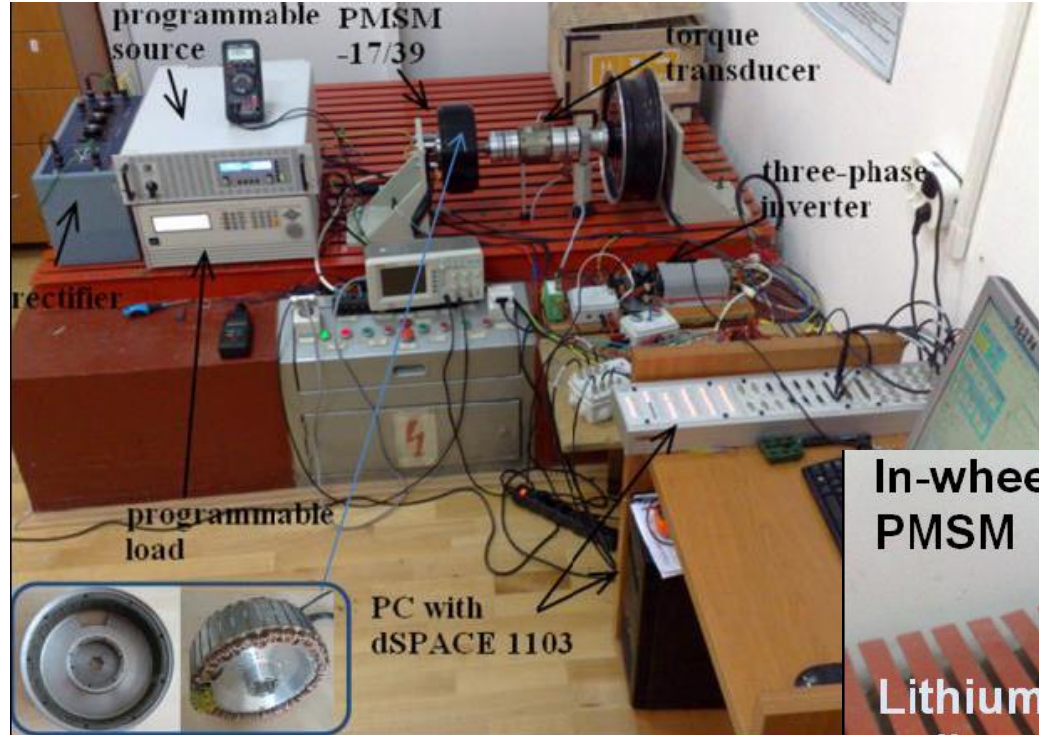
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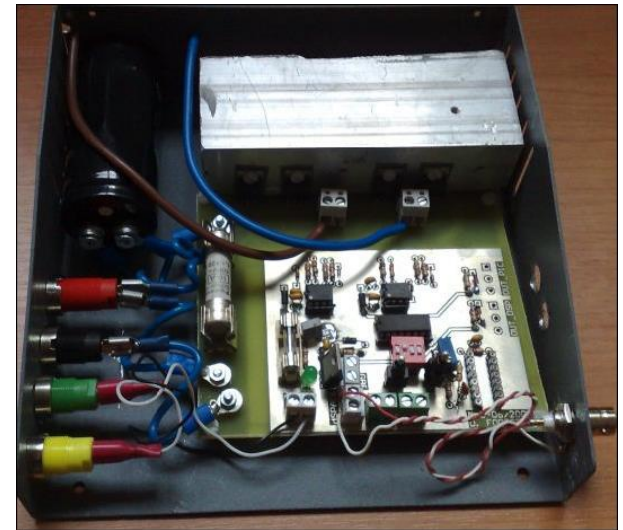
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