



Department of Cybernetics

EU Centre of Excellence



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Introduction



132 academicians:

- 18 faculty members
- 66 research fellows and 48 Ph.d. students
- 6 technical/administrative staff

Mission Objectives:

- Perform internationally recognized research, build teams of research excellence
- Support industrial take-up of research
- Demonstrate potential of industry-university cooperation
- Undergraduate and graduate education in the field of cybernetics

Research performed in:



Gerstner Laboratory for Intelligent Decision Making and Control



Center for Machine Perception



Research Areas



- **Biology Inspired Computing, Artificial Intelligence**
Problem solving, logic programming, machine learning, pattern recognition, knowledge ontologies, knowledge, bio- and medical decision making
- **Intelligent Data Analysis, Datamining**
Data mining, evolutionary computing, data warehousing, data and SW architectures, relational learning
- **Agent Technology and Distributed Decision Making**
Distributed Artificial Intelligence, agent architectures, multi-agent systems, communication & negotiation, coordination & cooperation, collective behavior, trust, agent platforms, production planning and scheduling
- **Mobile and Collective Robotics**
Sensor fusion, world model creation, navigation in an unknown environment, human/robot cooperation, collective robotics, 3D laser scanning and virtual reality
- **Computer Vision**
Reconstruction of 3D scenes from range images, object recognition, omnidirectional vision, surface reconstruction by stereovision, mathematical research related to uncertainty handling (quantum and fuzzy logic).
- **Diagnostics, Testing and Network Security**
complex software semi-automatic testing methodology, AI methods for diagnostics, distributed diagnostics, network intrusion detection and prevention



European Projects

- **EU Centre of Excellence (2000):** Machine Intelligence Research and Application Centre for Learning Excellence
- Participation in FP5: **15 projects** (1 coordination)
- **IST 2006 Prize** for the system **I4Control**
- Participation in FP6: **15 projects**
- Participation in FP7: **6 projects**
4 under negotiation



Selected Industrial Contracts and Grants



- **Rockwell Automation:** 10+ contracts in artificial intelligence
- **BAE Systems:** Multi-agent UAV collision avoidance on A-Globe platform
- **The Boeing Company:** Recognition of targets in images
- **Medtronic:** SW for pacemakers and other medical devices
- **Honeywell:** Observing people by video cameras
- **TOYOTA Motor Corporation:** Computer vision - blue sky research
- **Volkswagen:** Image processing from the car in motion
- **DENSO Automotive:** Agent-based on-board car diagnostics
- **CADENCE Design Systems:** Multi-agent modeling of IC design process
- **Samsung:** Reconstruction of images
- **Google:** Image-based search, security, 3 Google awards
- **Texas Instruments:** Control and interfacing of the digital camera
- **Hitachi:** Image processing and face recognition
- **Siemens, Transportation Systems:** Planning and scheduling for in-store logistics
- **TDE Durmersheim:** machine learning based gas consumption prediction
- **Automation of Railways, CZ:** SW testing for Auto-bloc



Collaboration with Defense Industry

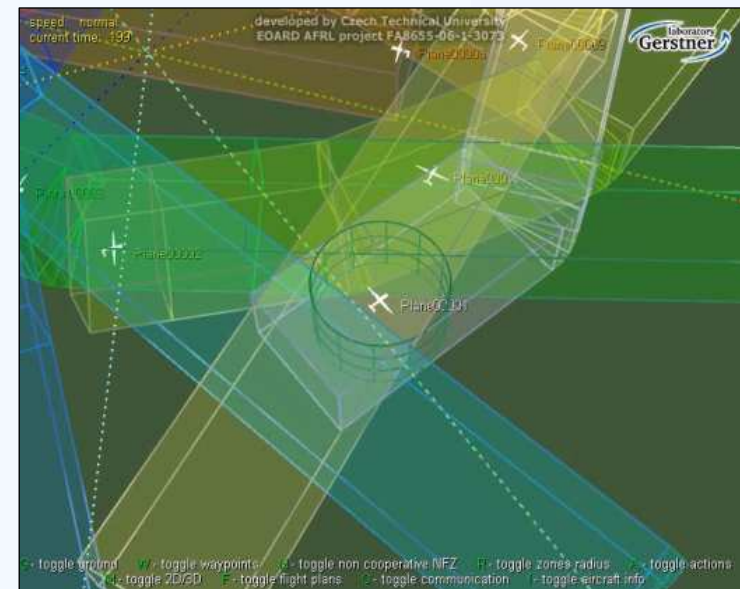


U.S. Air Force Research Laboratory, AFOSR/OSD/EOARD funding:

- Agent-based Computing in Distributed Adversarial Planning (2007-2008)
- Autonomous Agents for UAV Air-Traffic Control (2005-2007)
- Advanced Agent Methods in Adversarial Environment (2004-2005)
- Meta-reasoning and Monitoring in the Multi-Agent Systems (2002-2003)
- Agents Inaccessibility in Multi-agent Systems (2002-2004)
- Acquaintance Models in Operations Other Than War (2002-2003)
- Multi-Agent Systems in Communication (1999 - 2000)

Office for Naval Research (ONR):

- Adjustable Autonomy in MAS (2005-2008)
- Robot coordination using PIM, subcontract awarded by IHMC, (2007)
- Meta-reasoning for Modeling and Simulation in Agent Systems (2003-2005)



Department Collaboration with Defense Industry



CERDEC, U.S. Army:

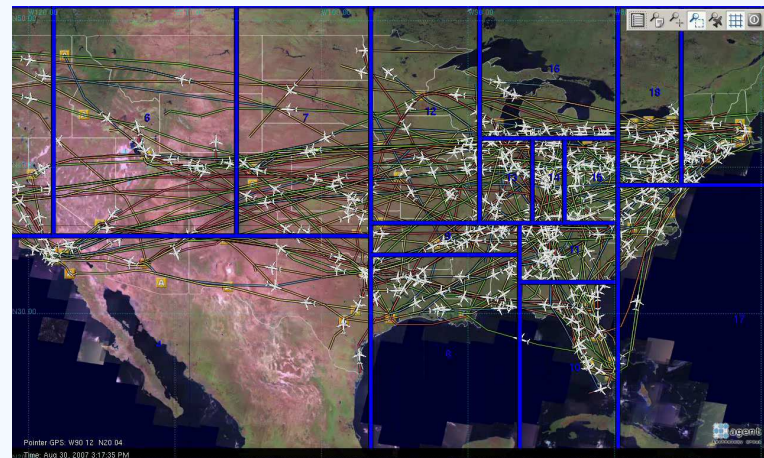
- Distributed Planning and Coordination of Team-oriented Activities in a Dynamic Environment, subcontract provided to University of Edinburgh (2006-2008)
- Cooperative Adaptive Mechanism for Network Protection N62558-07-C-0001, subcontract provided to Masaryk University (2007)
- Modeling Individual, Collaborative and Adversarial Reflection in MAS (2005-2007)
- Reflective/Cognitive Agent in Distributed Decision Making (2004-2005)
- Modeling in Multi-agent Systems: A Technology Primer, (2004)

IHMC/NASA, FL:

- Agent-based root cause detection in hydrogen production
- Transportation of hydrogen and oxygen - scheduling

FAA:

- Collision avoidance algorithms



Search

Fly To Find Businesses Directions

Fly to e.g., Reservoir Rd. Clayville, NY

Places

- My Places
 - Sightseeing
 - Untitled Polygon
 - AIS3
 - Temporary Places
 - My Places
 - ais3
 - Risk
 - Moje mista
 - Event Layer
 - Moje mista
 - Pirate Reports 2005-2009
 - Somal_Pirate_Coast.kmz
 - UNOSAT Overlays
 - gulfOfAdenSmall.kmz
 - Moje mista
 - Pirate Reports 2005, 2006, 2007
 - Pirate Reports 2008
 - Described Pirate Reports 2009
 - Pirate Reports 2005-2009
 - sal50k.kml
 - My Places

Layers

- Gallery
- Ocean
- Global Awareness
- Places of Interest
- More
- Terrain



Department Collaboration with Defense Industry



Missile Defense Agency - MDA, USA:

- Stereoscopic Imaging – precise detection of targets from multiple cameras (2008-2009)

Czech Ministry of Defense, CZ:

- Stabilized camera platform for UAVs

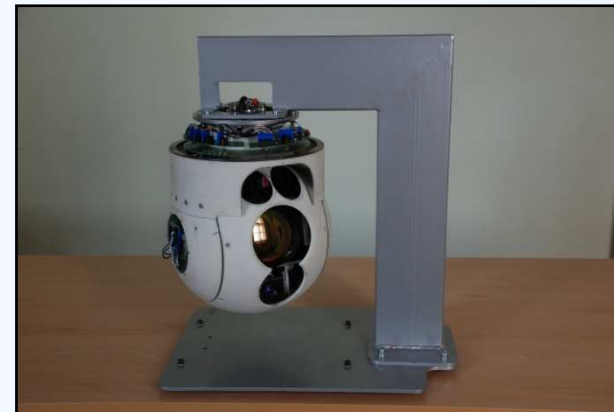


Image Processing – Center for Machine Perception





Startup and Spin-off Companies:

- **CERTICON**, a.s.: (100+ employees): Software development, Network integration services, Software testing, Predictive algorithms, Design planning and scheduling
- **ProTyS**, a.s.: (43 employees) Software development, Software testing, Intelligent control algorithms, fuzzy logics
- **Neovision** s.r.o.: (21 employees): Computer Vision
- **Eydea**, s.r.o. (4 employees): Image Processing
- **Cognitive Security**, s.r.o.: Network Security

National Center for Applied Cybernetics: CTU, TU Brno, WBU, Academy of Science, CertiCon, Neovision+ 7 other companies. The main goal: Technology Transfer, Spreading excellence within: TU Brno – **Robocup Rescue Winner in 2003** and WBU Pilsen – **project MALACH Spielberg's Foundation**, Museum of Holocaust, John Hopkins University



Different Models of Cooperation with Industry



- **R&D Consultancy**
- Standard short- or **long-term research** and prototype development contracts
- **Know-how transfer** to spin-off companies with the follow-up supervision
- **Targeted education** of future employees
- **Incubation** of (even highly interdisciplinary) research teams
- Incubation of **independent R&D bodies** (e.g. Rockwell Automation Research Center, Computer Associates Development Center etc.)

Visions

- **Concentration/growth of resources:**
 - Czech Institute of Informatics and Cybernetics

