Mendel University in Brno

RESEARCH TEAM PROFILES

FACULTY

Faculty of Business and Economics

RESEARCH AREA

Applied Computer Vision

RESEARCH TEAM

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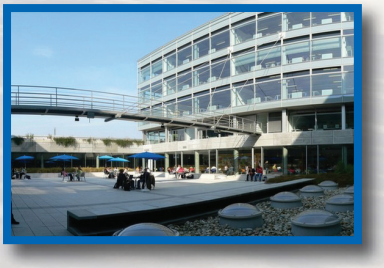
Jaromír Landa, PhD., Mendel University in Brno, Czech Republic

EXPERT/TECHNICAL PROFILE OF THE TEAM (SPECIFIC PART OF RESEARCH)

Our computer vision research is applied in three areas

- **Robotics:** autonomous robot navigation, object recognition, scene reconstruction. Team members are involved in development of autonomous robot *Advee* (http://www.advee.eu/) as well as in different robotic challenges.
- **Geographical Information Technologies:** point cloud (laser scanning data) processing and related object recognition (traffic signs etc.), aerial imagery processing. We cooperate with Faculty of Mechanical Engineering Brno University of Technology and Faculty of Forestry Mendel University in Brno on development of the object recognition algorithms.
- **User Experience:** user interface design, usability evaluation, state-of-the-art visualization techniques (augmented reality, 3D visualization, natural user interfaces etc.) Among other results, we developed portable augmented reality engine based on *Open Computer Vision* library that incorporates several object recognition algorithms.
- **Mobile application development:** mobile GIS, location based services, augmented reality etc. Our team currently develops a complex mobile mapping application for digital flood plans data acquisition in cooperation with ENVIPARTNER corporation.

Research group uses two specialized laboratories. The first one is *Virtual Reality Laboratory*. VRL is equipped with large stereoscopic projection, several common projections, 3D helmet Oculus Rift, over than 40 different mobile devices (mostly iOS and Android cellphones and tablets) and various input/output devices (cameras, goggles etc.). Computers range from small *MacMini* for embedded solutions to professional workstation based on *Apple MacPro* with two *Xeon* processors and 3 graphical cards. The other lab is *Intelligent Systems Laboratory* for robotics and industrial applications. ISL consists of 5 and 6 axis spherical manipulation units, *CompactRIO* and *DataLab* embedded solutions, systems for modelling and simulation (Ball & Plate Model, Magnetic Levitation Model, *PneuTrainer*, related Matlab toolboxes etc.), 3D printer *Dimension* and many educations setups (10x LEGO *Mindstorm*, 10x FMS 200 etc.)



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EXPERIENCE

Participation in national projects (programme and provider)

- Czech Economics in Integration and Globalization Processes and the Agrarian Sector Development within the Integrated European Market Conditions (Czech ministry of Education, 2005–2011)
- Extension of laboratory for manipulation, regulation and control technics by technological facilities (University Development Fund, Ministry of Education and Youth, 2012)
- Innovation of laboratory for manipulation, regulation and control technics (University Development Fund, Ministry of Education and Youth, 2011)
- Laboratory for manipulation, regulation and programmable (University Development Fund, Ministry of Education and Youth, 2010)
- Rising property maintenance effectiveness with point cloud processing (Internal Grant Agency, Mendel University in Brno, 2013)
- Augment reality applications for marketing (Internal Grant Agency, Mendel University in Brno, 2012)
- Augment reality applications for production process speed-up (Internal Grant Agency, Mendel University in Brno, 2011)

Conference organization etc. (national and international)

- GIS Hackathon Brno – public workshops about development of applications and services based on spatial data for companies, teachers and students.

Involvement in cross-border / regional and bilateral cooperation

- Development of advanced geographical information system for Android platform (ENVIPARTNER s.r.o. company, from 2013)
- Re-design of information system Qi for user experience enhancement (DC Concept a.s. company, from 2014)
- Object recognition algorithms (Faculty of Mechanical Engineering, Brno University of Technology)
- Environmental applications (Faculty of Forestry, Mendel University in Brno)
- Innovation of bottle sorting automat (Tomra, s. r. o. company, CZ, in 2010)

Other foreign activities and contacts (active participation in conferences, publications, membership in international bodies etc.)

- Framework for Augmented Reality applications based on OpenCV library, http://bit.ly/1xHka2A
- Landa, Jaromír - Procházka, David: Automatic Road Inventory Using LiDAR. Procedia Economics and Finance. 2014. č. 12, s. 363–370. ISSN 2212-5671.
- Popelka, O., Procházka, D., Kolomazník, J., Landa, J., Koubek, T. Adaptive Real-Time Object Recognition for Augmented Reality. In Mendel 2012: 18th International Conference on Soft Computing. Brno: Brno University of Technology, 2012, pp. 526–531. ISBN 978-80-214-4540-6.
- Procházka, D., Popelka, O., Koubek, T., Landa, J., Kolomazník, J. Hybrid SURF-Golay Marker Detection Method for Augmented Reality Applications. Journal of WSCG, vol. 20, no. 3, 2012, pp. 197–204. ISSN 1213-6972.
- Kolomazník, J., Ondroušek, V., Vytečka, M. Stereoscopic analysis of the technological scene. In MENDEL 2013: 19th International Conference on Soft Computing. 1. vyd. Brno: Brno: Vysoké učení technické v Brně, 2013, pp. 353–356. ISBN 978-80-214-4755-4.
- Ondroušek, V., Vytečka, M., Kolomazník, J., Hammerschmiedt, M. The Robust Remote Control of the Manipulator. In: Mechatronics 2013. Springer, 2013. pp. 725–731. ISBN 978-3-319-02293-2.
- Several group members are IEEE and/or ACM members.

Topics for cooperation in H2020/project proposal

- Development of advanced mobile solutions (location based services, data gathering and analysis from mobile sensors, ubiquous/aware computing, cloud based computer vision).
- Spatial analysis (and visualization) of economical of environmental problems (smart cities, environmental changes, flood prevention etc.)
- Computer vision in robotics and industrial applications (autonomous mobile mapping, product quality evaluation etc.)

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