



AI Research & Know-How Transfer in the Czech Republic

Vladimír MAŘÍK

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CIIRC
Czech Institute of Informatics, Robotics, and Cybernetics
Czech Technical University in Prague

Academic AI (and Robotic) Research in the Czech Republic



Concentrated at 7 Universities and 2 institutes of Academy of Sciences

In total: staffing 1.000 researchers and 460 Ph.D. students organized in 25 research labs

Total Funding: \$ 45 M per year

Areas of strong expertise:

- **Machine Learning, Data mining**
- **Autonomous Robotics**
- **Machine Perception**
- **Industrial Applications of AI**
- **Natural Language Processing, Speech understanding**
- **Formal Methods and Reasoning**





Deep interest of the Czech government in the robotics and AI research!!

National Innovation Strategy (Feb. 2019)
AI plays the key role!

National AI Strategy (May 6, 2019):
To become a strong stakeholder in the European AI research
To build a European AI Center

Country of the Future - under preparation

The European Center will be build in cooperation with **the Czech Technical University** – two strong institutions there:

CIIRC & Faculty of Electrical Engineering



- Based on experience – a new Institute of CTU established in 2013
- CIIRC should play the role of the national – and later European - center of excellence in the subject fields
- **8 research programs - departments:**
 - Robotics (**Prof. Václav Hlaváč**)
 - Intelligent Systems (**Prof. Vladimír Mařík**)
 - Industrial Informatics (**Prof. Zdeněk Hanzálek**)
 - Industrial Production Control (**Prof. Michael Valášek**)
 - Cyber-Physical Systems (**Prof. Michael Šebek**)
 - Cognitive Science and Biomedical Eng. (**Dr. Lenka Lhotská**)
 - Assistive Technologies (**Prof. Olga Štěpánková**)
 - Research Platforms: Center of Applied Cybernetics (**Prof. Vladimír Kučera**)
- **The goal: State-of-the-art, competitive and self-sustainable institution**



New Building of CIIRC – was opened on May 2, 2017





- **Center of Research Excellence: Linking excellence with applicability and applications of results**
- **16.000 sqm, 350 researchers in 2020** (joint research teams with 5 faculties, teams with the Academy of Sciences, National Center for Applied Cybernetics, today 245 empl.)
- **National Center** – linkage to TU Brno, West-Bohemian University Pilsen, TU Ostrava, TU Liberec
- **Joint research Labs** with the **leading Universities** (RWTH Aachen, Vienna Univ. of Technology,), **CLAIRE & ELLIS**
- **DFKI Saarbruecken & INRIA Paris – key partners**
- Efficient **Technology Transfer Unit, Incubator of start-ups**
- Joint labs with **global companies** (Siemens, VW - Škoda Auto, Rockwell Automation, Eaton, Schneider, ABB, Kuka...)
- **National Research Hub for Society 4.0 (Triangle: Industry 4.0, Smart Cities, and Energy 4.0)**



AI4REason: ERC project aimed at automatic logic reasoning (**Dr. Josef Urban**)

ARUM (EU 7FW IP) and DigiCor (H2020): planning and scheduling system for **Airbus Industries** (**Prof. Vladimír Mařík**)

TRADR: Human-machine Cooperation in Robotics (**EU 7 FW project**) (**Prof. Václav Hlaváč**)

SAFELOG: Advanced Robotics – Human/Robot Interaction (EU Horizon 2020) (**Dr. Libor Přeučil**)

UPDRIVE: Cars without drivers (EU Horizon 2020)

RA-DIC: Big Data in Industrial Automation – **funded by Rockwell Automation**

Similar projects with **Škoda Auto, Porsche Engineering, Eaton, Ford, Seznam, Lego, RWE** etc.



3 Excellent Teams funded for 6 years

- **Artificial Intelligence and Reasoning – Josef Urban (ERC Grant Recipient) - 6 mil. EUR**
- **Intelligent Machine Perception – Josef Šivic (ERC Grant Recipient), 5.2 mil. EUR**
- **Robotics for Industry 4.0 – Robert Babuška, 7 mil. EUR**

Key researchers are highly respected personalities with excellent international track records.

Latest large projects



EU AIT Project “Manufacturing” – 50 partners, **330 mil. EUR** funding for 5 years

National Center of Competence „Cybernetics and AI” – **3 mil. EUR/year** – helps to network universities and SMEs – 15 subprojects approved for 2019

European Digital Innovation Hub for AI: the only one in the Czech Republic

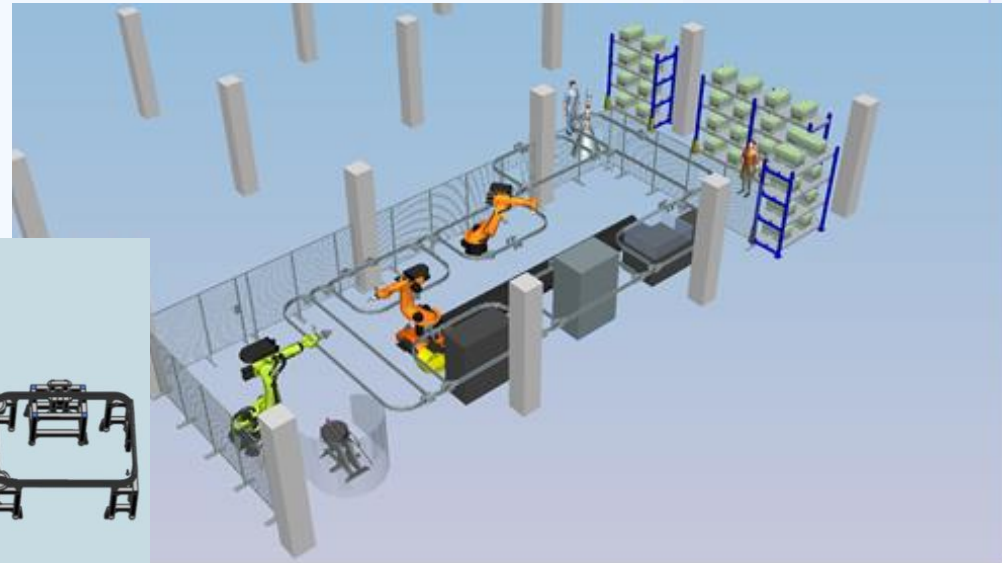
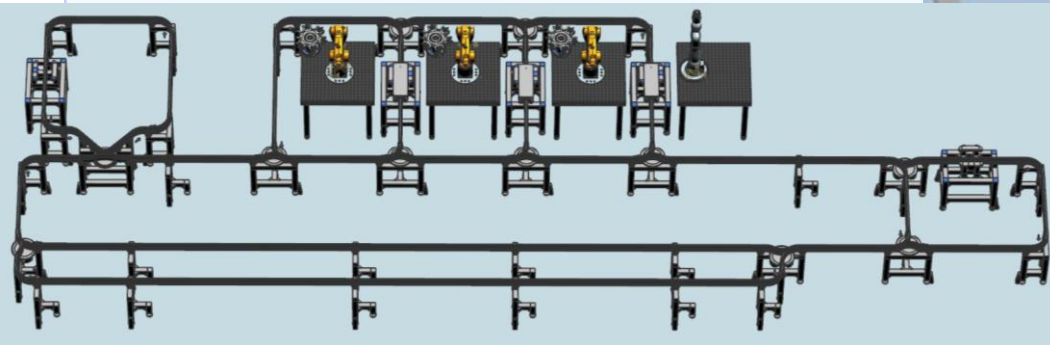
RICAIP EU Project (50 mil. EUR): approved – 4 partners: CIIRC, TU Brno, DFKI Saarbruecken, ZEMA Saarbruecken

CIIRC is building an **ECOSYSTEM of Academia-Industry cooperation** using combination of diverse forms of project funding

Testbed at CIIRC Czech Technical University



- ✓ **The very first testbed for Industry 4.0** in the country (support by **Siemens** and **Škoda Auto**, and some Czech SMEs) – under construction
- ✓ **Particular goals:**
 - ✓ **Industrie 4.0** compatible solutions for **SMEs**
 - ✓ **Interoperability** of Czech-made machine tools and SW solutions with Industrie 4.0 facilities
 - ✓ Creating community of companies, direct contacts of **SMEs with global players**



Testbed at CIIRC



Testbed at CIIRC

- The Testbed has been **linked to the testbed at DFKI Saarburecken** (the agreement signed during the visit of the Chancellor **Angela Merkel** to CIIRC in August 25, 2016)
- German government dedicated **1 mil. EUR to buy collaborative robots** for DFKI to share them with CIIRC –the **virtual reality technology is being** used
- A **large EU project RICAIP (50 mil. EUR) to virtually integrate testbeds** at CIIRC, DFKI and TU Brno **has been selected for funding**



Robots Shared with DFKI Saarbruecken



EU RICAIP: Research and Innovation Center for Advanced Industrial Production



- The main idea: RICAIP runs a **geografically distributed, but fully VIRTUALLY INTEGRATED TESTBED – Sept. 4, 2017**
- **A completely new concept of advanced manufacturing**
- The technologies of Virtualization, Virtual Reality, 3D printing, Semantic Knowledge Integration, will be used for this purpose The **integrated testbed – ambition to become the seed of the future European research infrastructure managed by independent EEIG**





National Center Industry 4.0 – on Sept. 4, 2017:
brings together universities, SMEs, global companies,
Chamber of Commerce, Confederation of Industry,
Innovation Centers etc.



Inspire & Make the Czech Industry 4.0



- **Implementation of the principles** of Industry 4.0
- **Increase awareness** about Industry 4.0 and Society 4.0
- **Cooperation** between academia and industry – sharing best practices and technological solutions
- **Promote education and interdisciplinary research** in Industry 4.0
- **New R & D strategies** and provide statements on Industry 4.0 topics
- Integration of the Czech research and industry **into the European infrastructure**
- **Testbed network** at CTU, Brno University of Technology, VŠB – Technical University of Ostrava, and other institutions in the Czech Republic – a quite a **new phenomenon**
- Promote **know-how transfer to the industrial sphere**, including start-ups and managed innovation



French governmental Initiative PRAIRIE

- To bring France among the top countries in AI Research
- **PRAIRIE Initiative** led by INRIA Paris
- 8 academic research bodies worldwide selected as partners:
 - The Turing Institute, UK,
 - AI Lab, U. of Berkeley,
 - Robotic Institute, Carnegie Mellon Univ.,
 - Max Planck Institute, Tuebingen, Germany
 - ...and **CIIRC !!**
- Announced by Macron on March 29th, 2018!
- In April 2019 got funding!
- Our Door **to ELLIS**



Center of the City of the Future - CCF

- Opened on May 23, 2018
- **Supported by Prague municipal authorities and Central-Bohemian Innovation Center**
- Virtual model of Prague 6
- Various technologies presented by 30+ companies
- Complemented by the Joint Master Programme “Smart Cities” with the **University of Texas in El Paso**



European and National Initiative



- **National initiative AICZECHIA** brings together **41 leading AI specialists** in the country
 - Strongly engaged in preparation of the National AI Strategy (NAIS)
- **CIIRC strongly participates in the European CLAIRE (Confederation of Laboratories for AI Research in Europe) network/initiative**, besides others hosting the Central European Office of this network
- **CIIRC** is instrumental in organizing the **ELLIS network (European Lab for Learning and Intelligent Systems)** aimed at **Machine Learning**



CURRENTLY: Preparing European CoE in AI



- **European Center of Excellence “AI in Manufacturing”**
- **Based on RICAIP: 4 core members**
 - **10 leading laboratories accross Europe (will be selected by CLAIRE)**
 - **Open access to the shared testbed facilities**
 - **Topics:**
 - **Geographically distributed production**
 - **Production as a service**
 - **Smart services of products**
 - **Retrofit of production lines, modularization of production**
 - **Long-term planning, scheduling & production optimization**
 - **5G shop-floors and edge computing**
 - **Developing the next generation of industrial robots**
 - **Advanced perception or interaction with humans (for human-centered AI) and environments**



CURRENTLY: Preparing European CoE in AI



- **Support by: VW, AIRBUS, Siemens, Bosch, ZF and Lego**
- **Direct linkage to DIH on AI - ecosystem**
- **Ready to cooperate across EU and worldwide!**

Please, feel invited!!!



CIIRC, ČVUT



Thanks for attention!



CIIRC, ČVUT