

Agent Technology Center, Department of Cybernetics, Faculty of Electrical Engineering
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Education

- Dr. rer. nat. **PhD in computer science**, 2009 • *Clausthal University of Technology*, Germany
thesis: *Behavioural State Machines: Agent Programming and Engineering*
advisor: Prof. Dr. rer. nat. Jürgen Dix
reviewer: Prof. Michael Fisher, Ph.D. (*University of Liverpool*, UK)
chairperson of the board of examiners: Prof. Dr. rer. nat. Jörg P. Müller
- Mgr. **master's degree in computer science**, 2002 • *Comenius University in Bratislava*, Slovakia
artificial intelligence, distributed algorithms and parallel computing
thesis: *Approximative Logic Programming for Data Mining*
advisor: doc. PhDr. Ján Šefránek, CSc.

Career overview

- since 2009 **post-doctoral research fellow** • Department of Cybernetics, *Czech Technical University in Prague*, Czech Republic
- since 2004 **associated external collaborator** • Department of Applied Informatics, *Comenius University in Bratislava*, Slovakia
- 2004–2009 **research assistant** • Department of Informatics, *Clausthal University of Technology*, Germany
- 2004 **freelance software engineer** • *self employed*, Lausanne, Switzerland/Nitra, Slovakia
- 1999–2003 **team leader/programmer/analyst** • *Whitestein Technologies s.r.o.*, Bratislava, Slovakia
- 1998–1999 **programmer/analyst** • *Microstep s.r.o.*, Bratislava, Slovakia
- 1996–1997 **programmer/analyst** • *DIO s.r.o.*, Nitra, Slovakia

Research statement

I work to enable construction of *autonomous machines*. I focus on *knowledge-intensive embodied agents* and *multi-agent systems*, especially their individual and social *action selection* and *decision making*. The recurrent themes of my work are interactions of such systems with *dynamic environments* and *engineering pragmatics*. My work towards advancing *theoretical foundations* is driven by *applications* and *prototyping*.

- keywords artificial intelligence, multi-agent systems, cognitive robotics, agent architectures, agent-oriented programming and software engineering, multi-agent planning, plan repair, multi-robotics, coordination, teamwork, knowledge representation and reasoning, interaction with dynamic environments

Selected publications

Journal articles (2)

Tristan M. Behrens, Mehdi Dastani, Jürgen Dix, Michael Köster, and Peter Novák. The Multi-Agent Programming Contest from 2005-2010 - From gold collecting to herding cows. *Ann. Math. Artif. Intell.*, 59(3-4):277–311, 2010.

Jürgen Dix, Tristan M. Behrens, Michael Köster, and Peter Novák. Agenten als Goldgräber und Cowboys. *KI*, 23(2):50–53, 2009.

Collections and special issues (3)

Michael Köster, Tristan M. Behrens, Jürgen Dix, Jomi Fred Hübner, Mehdi Dastani, and Peter Novák, editors. *Special Issue: The Multi-Agent Programming Contest: History and Contestants in 2009*, *Ann. Math. Artif. Intell.* 59. 2010.

Jürgen Dix, Michael Fisher, and Peter Novák, editors. *Computational Logic in Multi-Agent Systems: 10th International Workshop, CLIMA X, Revised Selected and Invited Papers*, LNCS 6214. Springer, 2010.

Jürgen Dix, Rem Collier, and Peter Novák, editors. *Programming Multi-Agent Systems: 8th International Workshop, ProMAS 2010, Revised, Selected and Invited Papers*, LNCS 6599. Springer, 2011. Forthcoming.

Peer-reviewed conference & workshops papers (21)

Jiří Vokřínek, Peter Novák, and Antonín Komenda. Ground tactical mission support by multi-agent control of UAV operations. In *Proceedings of 5th International Conference on Industrial Applications of Holonic and Multi-Agent Systems, HoloMAS 2011*, 2011. Forthcoming.

Michal Pěchouček, Michal Jakob, and Peter Novák. Towards Simulation-Aided Design of Multi-Agent Systems. In *Post-proceedings of The Eighth International Workshop on Programming Multi-Agent Systems, ProMAS 2010*, LNAI 6599, Springer, 2011. Forthcoming.

Peter Novák and Wojciech Jamroga. Agents, Actions and Goals in Dynamic Environments. In *Proceedings of the Twenty-Second International Joint Conference on Artificial Intelligence, Barcelona, Spain; IJCAI 2011*, 2011. Forthcoming.

Antonín Komenda and Peter Novák. Multi-agent plan repairing. In *Proceedings of Decision Making in Partially Observable, Uncertain Worlds: Exploring Insights from Multiple Communities, DMPOUW 2011, IJCAI'11 collocated workshop*, 2011. Forthcoming.

Lukáš Chrupa and Peter Novák. Dynamic trajectory replanning for unmanned aircrafts supporting tactical missions in urban environments. In *Proceedings of 5th International Conference on Industrial Applications of Holonic and Multi-Agent Systems, HoloMAS 2011*, 2011. Forthcoming.

Radek Píbil, Peter Novák, Cyril Brom, and Jakub Gemrot. Notes on pragmatic agent-programming with Jason. In *Proceedings of 9th International Workshop on Programming Multi-Agent Systems, ProMAS 2011*, 2011.

Peter Novák and Wojciech Jamroga. Code patterns for agent-oriented programming. In *Proceedings of The Eighth International Conference on Autonomous Agents and Multi-Agent Systems, AAMAS, IFAAMAS, 2009*.

Peter Novák. Probabilistic Behavioural State Machines. In *Proceedings of The Seventh International Workshop on Programming Multi-Agent Systems ProMAS 2009*, LNAI 5919, Springer, 2009.

Michael Köster, Peter Novák, David Mainzer, and Bernd Fuhrmann. Two Case Studies for Jazzyk BSM. In *The First International Workshop on Agents for Games and Simulations: Trends in Techniques, Concepts and Design, AGS 2009*, LNCS 5920, Springer, 2009.

Peter Novák and Michael Köster. Designing goal-oriented reactive behaviours. In *Proceedings of the 6th International Cognitive Robotics Workshop, CogRob 2008, ECAI co-located workshop*, 2008.

Peter Novák. Jazzyk: A programming language for hybrid agents with heterogeneous knowledge representations. In *Proceedings of the Sixth International Workshop on Programming Multi-Agent Systems, ProMAS'08*, LNAI 5442, 2008.

Peter Novák. Cognitive agents with non-monotonic reasoning. In *7th International Joint Conference on Autonomous Agents and Multiagent Systems, AAMAS 2008, Doctoral Mentoring Program, IFAAMAS*, 2008.

Peter Novák. Behavioural State Machines: programming modular agents. In *AAAI 2008 Spring Symposium: Architectures for Intelligent Theory-Based Agents, AITA'08*, 2008.

Koen V. Hindriks and Peter Novák. Compiling GOAL agent programs into Jazzyk Behavioural State Machines. In *Proceedings of Multiagent System Technologies, 6th German Conference, MATES 2008, LNCS 5244*, Springer, 2008.

Mehdi Dastani, Koen V. Hindriks, Peter Novák, and Nick A. M. Tinnemeier. Combining multiple knowledge representation technologies into agent programming languages. In *Declarative Agent Languages and Technologies VI, 6th International Workshop, DALT 2008, Revised Selected and Invited Papers, LNCS 5397*, Springer, 2008.

Mehdi Dastani, Jürgen Dix, and Peter Novák. Agent Contest Competition - 4th edition. In *Proceedings of Sixth International Workshop on Programming Multi-Agent Systems, ProMAS'08, LNAI 5442*, Springer, 2008.

Mehdi Dastani, Jürgen Dix, and Peter Novák. Agent Contest Competition - 3rd edition. In *Proceedings of Fifth International Workshop on Programming Multi-Agent Systems, ProMAS'07, LNAI 4908*, Springer, 2008.

Peter Novák and Jürgen Dix. Adding structure to agent programming languages. In *Proceedings of Fifth International Workshop on Programming Multi-Agent Systems, ProMAS'07, LNAI 4908*, Springer, 2007.

Peter Novák and Jürgen Dix. Modular BDI architecture. In *5th International Joint Conference on Autonomous Agents and Multiagent Systems, AAMAS 2006, ACM*, 2006.

Mehdi Dastani, Jürgen Dix, and Peter Novák. The second contest on multi-agent systems based on computational logic. In *Computational Logic in Multi-Agent Systems, 7th International Workshop, CLIMA VII, LNCS 4371*, Springer, 2006.

Mehdi Dastani, Jürgen Dix, and Peter Novák. The first contest on multi-agent systems based on computational logic. In *Computational Logic in Multi-Agent Systems, 6th International Workshop, CLIMA VI, Revised Selected and Invited Papers, LNCS 3900*, Springer, 2005.

Invited workshop & seminar talks

Peter Novák. *Mission planning: Logic and game theory in multi-robot applications*, workshop talk at Dagstuhl Seminar #11101 on *Reasoning about Interaction : From Game Theory to Logic and Back*, 2011.

Peter Novák. *Control of teams of unmanned aerial/ground vehicles: ATG research overview*, seminar talk at Individual and Collective Reasoning Group, Uni. Luxembourg, 2010.

Peter Novák. *Behavioural State Machines: Framework for programming cognitive agents*, seminar talk at Agent Technology Group, CTU in Prague, 2009.

Peter Novák. *Programming of cognitive agents*, workshop talk at *Fac. of Math. Phys. and Inf., CU in Bratislava alumni workshop, TAM 2008*, 2008.

Peter Novák. *Towards pragmatics of rule-based agent programming language(s)*, workshop talk at Dagstuhl Seminar #08361 on *Programming Multi-Agent Systems*, 2008.

Peter Novák. *Agents and nonmonotonic reasoning*, colloquium talk at *Intelligence not only as a computation*, seminar in honour of Ján Šefránek, 2007.

Peter Novák. *Modular agent programming language*, workshop talk at Dagstuhl seminar #06261 on *Foundations and Practice of Programming Multi-Agent Systems*, 2006.

Peter Novák. *Programming languages for development of intelligent BDI agents*, seminar talk at Department of Applied Informatics, CU in Bratislava, 2006.

Research projects

3rd party funded

- principal investigator** **Multi-agent coordination and distributed continual planning**, 2010–2011, funded by *The Grant Agency of the Czech Technical University in Prague*, ~20.000 €, team of 4, 24 months, *CTU in Prague*
- leader & proposal co-author** **AgentFly-In-Air: information collection by teams of hardware UAVs**, 2011–2012, funded by U.S. Army/CERDEC and U.S. Navy/ONR, team of 6+, 18 months, *CTU in Prague*
- project leader** **Tactical AgentScout 2: Deliberative and reactive planning in adversarial environments**, 2010–2011, funded by U.S. Army/CERDEC, team of 8, 12 months, *CTU in Prague*
- project leader** **Tactical AgentFly 2: Intelligent Software Agent Control of Combined UAV Operations for Tactical Missions**, 2009–2010, funded by U.S. Army/CERDEC, team of 3, 12 months, *CTU in Prague*
- proposal co-author** **Representation of incomplete, evolving and distributed knowledge: interaction with a communication platform**, 2010–2011, funded by *Scientific Grant Agency of the Ministry of Education of Slovak Republic and Slovak Academy of Sciences*, 24 months *CU in Bratislava*
- team member** **Dynamic aspects of knowledge representation: from theory to applications**, 2006–2008, funded by *Scientific Grant Agency of the Ministry of Education of Slovak Republic and Slovak Academy of Sciences*, 24 months, *CU in Bratislava*
- team member** **Environment for multi-agent systems specification**, 2005–2007, funded by *Slovak Research and Development Agency*, 24 months, *CU in Bratislava*
- team member** **Logic theory of dynamic and modular knowledge bases**, 2003–2005, funded by *Scientific Grant Agency of the Ministry of Education of Slovak Republic and Slovak Academy of Sciences*, 24 months, *CU in Bratislava*

Other

- personal track** **Temporally extended mission planning for multi-agent systems**, on-going since 2011, team of 3, *CTU in Prague*, in collaboration with *TU Clausthal*
- personal track** **Theory and practice of agent-oriented programming**, on-going since 2004, team size varying between 1-4, *TU Clausthal/CTU in Prague*
- project leader** **Multi-Agent Programming Contest technical infrastructure**, 2006–2009, team size varying between 3-5, *TU Clausthal*
- team member** **W4: Well-founded semantics for the World Wide Web**, 2003–2004, *The New University of Lisbon*

Research software

- sole author** **Jazzyk**: an experimental agent-oriented programming language with a set of plug-ins, C++, 2008–2009 <http://jazzyk.sourceforge.net/>
- sole author** **JazzykJVM**: port of Jazzyk interpreter to JVM environment, Scala/Java, to be published, 2010–2011
- co-author** **Tactical AgentFly 2**: series of mid-scale simulations of urban warfare ISTAR missions for teams of UAVs, Java, 2010 <http://agents.felk.cvut.cz/projects/agentcoor>
- team leader** **MASSim**, *Multi-Agent Programming Contest* infrastructure, Java, 2006–2009 <http://www.multiagentcontest.org/>
- team leader** **Jazzyk KR modules**: a suite of plug-ins for the *Jazzyk* interpreter, C++/Smodels/Urbi/Nexuiz, 2009–2010 <http://jazzyk.sourceforge.net/>
- team leader** **Jazzbot, Urbibot, AgentContest team**: case studies in simulated robotics, C++, Prolog, Urbi, 2009–2010 <http://jazzyk.sourceforge.net/>
- team leader** **Tactical AgentScout 2**: series of mid-scale simulations of urban warfare ISTAR missions for teams of UAVs/UGVs, Java, 2011

Research mobility

- study stays **University of Luxembourg**, *Individual and Collective Reasoning Group*, Luxembourg, 1 week, 2010 (Wojciech Jamroga)
- Delft University of Technology**, *Man-Machine Interaction Group*, Netherlands, 1 week, 2007, (Koen Hindriks)
- Comenius University in Bratislava**, *Department of Applied Informatics*, Slovakia, 2 weeks, funded by *European Commission/ERASMUS staff mobility scheme*, 2006, (Ján Še-fránek)
- The New University of Lisbon**, *Centre for Artificial Intelligence*, Portugal, 3 months, funded by a mobility grant of *CologNet: EC FP5 Network of Excellence in Computational Logic*, 2003, (José Júlio Alferes and Carlos Viegas Damásio)
- Vienna University of Technology**, *Knowledge-Based Systems Group*, Austria, series of invited lectures by Chitta Baral, funded by a grant of *CU in Bratislava*, 2003
- student scholarships & travel grants **IJCAI'11 Google travel grant** (Barcelona, Spain), **AAMAS'09 student scholarship** (Budapest, Hungary), **AAAI SS-08/AITA'08 student scholarship** (Stanford, California), **AAMAS'06 student scholarship** (Hakodate, Japan), **AgentLink III/TF2'05 travel grant** (Ljubljana, Slovenia), **AgentLink III/TF3'05 travel grant** (Budapest, Hungary)

Teaching and supervision

- tutorials *Introduction to Programming Autonomous Agents and Multi-Agent Systems*, SS 2010, *Brno University of Technology*
- individual lectures *Building intelligent agents*, lecture in the course *Multi-Agent Systems* by Michal Pěchouček and Michal Jakob, WS 2010/2011, *CTU in Prague*
- Agent-Oriented Programming*, lecture in the course *Artificial Intelligence* by Vladimír Mařík, SS 2010, *CTU in Prague*
- Contests in Multi Agent Systems Research: CLIMA VII Agent Contest Report*, lecture in the course *Multi-agent Systems* by Jürgen Dix, WS 2006, *TU Clausthal*
- Multi-Agent Systems Tournament: CLIMA VII Contest*, lecture in the course *Artificial Intelligence* by Jürgen Dix, SS 2006, *TU Clausthal*
- Contests in Multi Agent Systems Research*, lecture in the course *Multi-Agent Systems* by Jürgen Dix, WS 2005, *TU Clausthal*
- teaching assistance *Multi-Agent systems*, WS 2010/2011, *CTU in Prague*
- Programming for Artificial Intelligence*, SS 2010, *CTU in Prague*
- Selected topics in Artificial Intelligence* (seminar), WS 2008/2009, *TU Clausthal*
- Selected topics in Artificial Intelligence* (seminar), WS 2008/2009, *TU Clausthal*
- Programming Modular Agent and Multi-Agent Systems* (project seminar), WS 2008/2009, *TU Clausthal*
- Selected topics in Artificial Intelligence* (seminar), SS 2007, *TU Clausthal*
- Programming in Java and Prolog* (practicum), WS 2006/2007, *TU Clausthal*
- Game Theory and Artificial Intelligence* (seminar), SS 2006, *TU Clausthal*
- Theoretical Computer Science III* (course), WS 2005/2006, *TU Clausthal*
- Theoretical Computer Science II* (course), SS 2005, *TU Clausthal*
- Planning* (seminar), SS 2005, *TU Clausthal*
- PhD. students Michal Čáp, thesis title to be determined, mentor/co-supervisor with Michal Pěchouček, since 2010, *CTU in Prague*
- Antonín Komenda, *Multi-agent re-planning and plan repair*, mentor/co-supervisor with Michal Pěchouček, since 2009, expected in 2012, *CTU in Prague*

- diploma theses Marek Juras, *Study of expressivity between agent-oriented programming languages Agent-Speak(L) and Behavioural State Machines*, since 2011, expected in 2012 CTU in Prague
- Sławomir Dereń, *Inter-agent communication module for Jazzyk*, co-supervision with Jürgen Dix, 2009, TU Clausthal
- Bernd Fuhrmann, *URBI robot programming language module for Jazzyk*, co-supervision with Jürgen Dix, 2009, TU Clausthal
- Michael Köster, *Implementierung eines autonomen Agenten in einer simulierten 3D-Umgebung: Wissensrepräsentation*, co-supervision with Jürgen Dix, 2008, TU Clausthal
- David Mainzer, *Implementierung eines autonomen Agenten in einer simulierten 3D-Umgebung: Interaktion mit der Umwelt*, co-supervision with Jürgen Dix, 2008, TU Clausthal
- master student projects Marek Juras, *Study of expressivity between agent-oriented programming languages Agent-Speak(L) and Behavioural State Machines: preliminaries*, WS 2010/2011, CTU in Prague
- Weiyu Yi, *Jazzyk KR module for interaction with the MASSim game server*, WS 2008/2009, TU Clausthal
- Jens Dehnert, *Agent contest scenario simulation and SW packages maintenance*, 2007/2008, TU Clausthal
- Sławomir Dereń, *Paralellization and maintenance of the MASSim tournament server*, 2007/2008, TU Clausthal
- Xavier Queralt Mateu, *Agent Contest scenario simulation and SW packages maintenance*, 2006/2007, TU Clausthal
- Sławomir Dereń, *Agent Contest scenario simulation and SW packages maintenance*, 2006/2007, TU Clausthal
- Michael Köster, *Agent Contest scenario simulation and SW packages maintenance*, 2005/2006, TU Clausthal
- David Mainzer, *SVG based visualization module for the MASSim server*, 2005/2006, TU Clausthal
- Dominik Steinborn, *Agent Contest web-interface and debugging tools*, 2005/2006, TU Clausthal
- Bernd Fuhrmann - *MASSim: the core server and communication infrastructure*, 2005/2006, TU Clausthal

Academic services

Department service

- 2006 member of the hiring committee for the Chair of Databases and Information Systems, Department of Informatics, TU Clausthal

Scientific community involvement

- steering committees *Multi-Agent Programming Contest*, since 2009, series of academic competitions held in collocation with premier workshops in agent-programming
- organisation/ PC chair *8th International Workshop on Programming Multi-Agent Systems*, ProMAS 2010, co-chair
- 10th International Workshop on Computational Logic in Multi-Agent Systems*, CLIMA-X 2009, co-chair
- Multi-Agent Programming Contest 2009*, AgentContest 2009, co-organiser
- Multi-Agent Programming Contest 2008*, AgentContest 2008, co-organiser
- Multi-Agent Programming Contest 2007*, AgentContest 2007, co-organiser
- CLIMA VII Contest*, co-organiser

- programme committees *10th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS 2012*
- Federated Conference on Computer Science and Information Systems 2011/Techniques and Applications for Mobile Commerce, FedCSIS/TAMoCo 2011*
- 2nd International Conference on Ambient Systems, Networks and Technologies, ANT 2011*
- 22nd International Joint Conferences on Artificial Intelligence, IJCAI 2011*
- 9th International Workshop on Declarative Agent Languages and Technologies, DALT 2011*
- 9th International Workshop on Programming Multi-Agent Systems, ProMAS 2011*
- 9th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS 2011*
- 8th International Workshop on Declarative Agent Languages and Technologies, DALT 2010*
- 12th Ibero-American Conference on Artificial Intelligence, IBERAMIA 2010*
- 8th German Conference on Multi-Agent System Technologies, MATES 2010*
- 8th International Joint Conference on Autonomous Agents and Multiagent Systems, AAMAS 2009*
- 7th international Workshop on Programming Multi-Agent Systems, ProMAS 2009*
- 7th International Workshop on Declarative Agent Languages and Technologies, DALT 2009*
- 11th edition of the Ibero-American Conference on Artificial Intelligence, IBERAMIA 2008*
- International Workshop on Multi-Agent Systems as Middleware and Architectures for Business Systems, MAS² 2008*
- The First CLIMA Contest, 2006*
- journal referee *Journal of Autonomous Agents and Multi-Agent Systems, in 2009, 2010 and 2011*
- IEEE Transactions on Systems, Man, and Cybernetics: Part A Systems and Humans, in 2011*
- IEEE Transactions on Knowledge and Data Engineering, in 2009*
- Multiagent and Grid Systems - An International Journal, Special issue on Agents, Web Services and Ontologies: Integrated Methodologies, in 2008*

Auxiliary reviewer

- journals *Journal of Autonomous Agents and Multi-Agent Systems, in 2008*
- edited books *Multi-Agent Programming: Languages, Platforms and Applications, vol. 2, (Bordini, Dastani, Dix and El Fallah Segrouchni, eds.), in 2009*
- Multi-Agent Programming: Languages, Platforms and Applications, (Bordini, Dastani, Dix and El Fallah Segrouchni, eds.) in 2005*
- conferences & workshops *CONTEXT'11, ICAART'09, MICAI'08, ICLP'08, JELIA'08, MATES'08, KR'08, CORE'08, SBIA'08, FoIKS'08, MICAI'07, LADS'07, CLIMA VIII, CLIMA VI, EUMAS'06, MICAI'06, LCMAS'05, MICAI'05, LPNMR'05, KI'05*

Professional and civil organisations involvement

- since 2011 **DMSIG: Distributed Mobile Sensors Interest Group** focusing on coordination issues in multi-robot teams of autonomous underwater and aerial vehicles, initiated by NATO Undersea Research Center and WDT 71 Bundeswehr Technical Center for Ships and Naval Weapons, Maritime Technology and Research
- 2008–2010 **Association for Advancement of Artificial Intelligence**, professional organisation
- since 2006 **Trojsten/Trihedron Foundation**, Slovakia, NGO supporting correspondence seminars in mathematics, physics and computer science for high school students
- 2000–2003 **AI-Lab: Laboratory of Artificial Intelligence**, founding member/head coordinator, Slovakia, NGO fostering cooperation projects between local IT industry and students of Artificial Intelligence at CU in Bratislava

Languages

(self assessment according to the Common European Framework of Reference for Languages)

Slovak **native**
English **fluent**
Czech **fluent**
German **advanced**
French **beginner**

proficient user (C1-C2)
proficient user (C1-C2)
independent-proficient user (B2-C1)
basic user (A1-A2)