



UNIVERSITÀ DI PISA
DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE
Dottorato di Ricerca in Ingegneria dell'Informazione

Corso di Dottorato

“Smart Spaces”

Dmitry G. Korzun,

Petrozavodsk State University - Russia

Short Abstract: Nowadays computing environments are occupied with a growing multitude of digital networked devices. Software agents running on such devices make them smart objects that visible in our daily lives as real objects. This technology progress follows the vision of Pervasive and Ubiquitous Computing, Ambient Intelligence, Semantic Web, and the more recent paradigms of Smart Spaces and Internet of Things (IoT). This course introduces the concept and methodology of Smart Spaces for creating smart services for IoT-aware computing environments. We consider the Smart-M3 platform, which provides testbed and tools for prototyping smart spaces. The students study several reference application designs, including such emerging domain areas as collaborative work, e-tourism, mobile healthcare, and Industrial Internet.

Course Contents in brief:

- Ubiquitous computing: Internet of Things, smart services, and multi-agent systems
- Agent interaction models: Blackboard and Publish/Subscribe
- Semantic Web: Knowledge representation and reasoning
- The Smart-M3 Platform: Multi-device, Multi-vendor, Multi-domain
- Smart-M3 space applications: Architecture, design, and case studies

Total # of hours: 20

References:

1. G. Kortuem, F. Kawsar, V. Sundramoorthy, and D. Fitton. Smart objects as building blocks for the internet of things. *IEEE Internet Computing*, 14(1):44-51, Jan. 2010.
2. J. Honkola, H. Laine, R. Brown, and O. Tyrkko. Smart-M3 information sharing platform. In *Proc. IEEE Symp. Computers and Communications (ISCC'10)*, pages 1041-1046. IEEE Computer Society, June 2010.
3. J. Kiljander, A. Ylisaukko-oja, J. Takalo-Mattila, M. Etelapera, and J.-P. Soininen. Enabling semantic technology empowered smart spaces. *Journal of Computer Networks and Communications*, 2012:1-14, 2012.

4. E. Ovaska, T. S. Cinotti, and A. Toninelli. The design principles and practices of interoperable smart spaces. In X. Liu and Y. Li, editors, *Advanced Design Approaches to Emerging Software Systems: Principles, Methodology and Tools*, pages 18-47. IGI Global, 2012.
5. D. Korzun, S. Balandin, and A. Gurtov. Deployment of Smart Spaces in Internet of Things: Overview of the design challenges. *Proc. 13th Int'l Conf. Next Generation Wired/Wireless Networking and 6th Conf. on Internet of Things and Smart Spaces (NEW2AN/ruSMART 2013)*, LNCS 8121, pages 48-59. Springer-Verlag, Aug. 2013.
6. J. Kiljander, A. D'Elia, F. Morandi, P. Hyttinen, J. Takalo-Mattila, A. Ylisaukko-Oja, J.-P. Soininen, T.S. Cinotti. *Semantic Interoperability Architecture for Pervasive Computing and Internet of Things*. *IEEE Access*, 2: 856-873, 2014.

CV of the Teacher

Institution	Petrozavodsk State University
From / To	1993 – 1997
Degree(s) or Diploma	B.Sc. in Applied Mathematics and Computer Science with distinction at 1997, Honours Diploma. Title of the thesis: <i>Language for Network Data Traffic Filtering and Processing</i>

Institution	Petrozavodsk State University
From / To	1997–1999
Degree(s) or Diploma	M.Sc. in Applied Mathematics and Computer Science with distinction at 1999, Honours Diploma. Title of the thesis: <i>TCPconan — a System with Flexible Management of TCP Connections Data Processing</i>

Institution	Petrozavodsk State University, Saint-Petersburg State University
From / To	1999-2002
Degree(s) or Diploma	Ph.D in Physics and Mathematics, specialization area: Mathematical Modelling, Numerical Methods and Software Systems with defence at 2002, Saint-Petersburg State University, Council D-212.232.50 on defences for Doctors of Science in Faculty of Applied Mathematics and Control Processes. Advisor: Dr. Y. A. Bogoyavlenskiy (PetrSU). Opponents: Prof. I. L Bratchikov (Saint-Petersburg State University), A. A. Makarov (Moscow State University). PhD Thesis: <i>Syntactic Algorithms for Solving Nonnegative Linear Diophantine Equations and their Application for Modelling of Internet Link Workload Structure</i> . Department of Computer Science, Petrozavodsk State University, 2002. 185p

Institution	Petrozavodsk State University
From / To	2002-2007
Degree(s) or Diploma	Scientific degree of Docent (Adjunct Professor) at Department of Computer Science and Mathematical Software by order no. 1818/898-д 18.06.2007 of Federal

Years within Organisations:

- Department of Computer Science, Petrozavodsk State University (PetrSU), Russia (Sep. 1993–ongoing), currently as Adjunct Professor
- Helsinki Institute for Information Technology (HIIT) and Department of Computer Science and Engineering (CSE), Aalto University, Finland (Jan. 2005–ongoing), currently as Senior Researcher
- Faculty of Mathematics, Petrozavodsk State University (PetrSU), Russia (Mar. 2013 - ongoing), Vice-Dean for Research
- Department of Computer Science, Petrozavodsk State University (PetrSU), Russia (Jan. 2014–ongoing), Principal Scientist

Key research topics:

- Modelling, algorithms, and experiments for
 - Routing in structured peer-to-peer systems
 - Ranking methods in peer-to-peer systems
 - Performance analysis and capacity planning of distributed systems
- Discrete methods in mathematical modeling and analysis of distributed systems and network traffic. Ontological modeling.
- Smart Spaces for future Internet applications, ubiquitous computing, Internet of Things.
- Algorithms for solving systems of linear Diophantine equations (nonnegative solutions), mainly novel syntactic methods.
- Applications of formal grammars and Diophantine analysis.
- Software Engineering (education, distributed development, mobile applications, multi-agent architectures, proactive services, Smart-M3 platform).

Technical Program Committee:

- Annual International Workshop on Advances in Methods of Information and Communication Technology (AMICT, former name is Finnish Data Processing Week at Petrozavodsk State University, FDPW; <http://www.cs.karelia.ru/fdpw/index.php.en>), 2001 - ongoing
- Conference of Open Innovations Association FRUCT (<http://fruct.org/>), 2010 - ongoing
- Conference on Internet of Things and Smart Spaces (ruSMART, <http://rusmart.e-verest.org>), 2011 - ongoing
- International Congress on Ultra Modern Telecommunications and Control Systems (ICUMT, <http://www.icumt.org/>), 2010 - ongoing
- International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM, <http://www.iaria.org/conferences/UBICOMM.html>) 2011-ongoing.
- IEEE International Conference on Communications (ICC'12). 2nd IEEE International Workshop on Smart Communication Protocols and Algorithms (SCPA), 2012, 2013

Advisory Board:

- Open Innovations Association FRUCT (<http://fruct.org/>), 2009-ongoing

Editorial board (reviewer):

- International Journal On Advances in Internet Technology (by IARIA, http://www.iariajournals.org/internet_technology/index.html), 2012 - ongoing
- Journal of Theoretical and Applied Computer Science (<http://www.jtacs.org/>), 2013 - ongoing
- Journal on Selected Topics in Nano Electronics and Computing (<http://jstnec.petrus.ru/>), 2013 - ongoing
- Journal “SPIIRAS Proceedings” (<http://www.proceedings.spiiras.nw.ru/>), 2014 - ongoing

Room and Schedule

Room: *Aula Riunioni del Dipartimento di Ingegneria dell'Informazione, Via G. Caruso 16, Pisa – Ground Floor*

Time:

Day1 (01.12.2014): 9.00-13.00

Day2 (02.12.2014): 9.00-13.00

Day3 (03.12.2014): 9.00-13.00

Day4 (04.12.2014): 9.00-13.00

Day5 (05.12.2014): 9.00-13.00