**RESEARCH INSTITUTE
FOR INTELLIGENT COMPUTER SYSTEMS**

**TERNOPIL NATIONAL ECONOMIC UNIVERSITY,
MINISTRY OF EDUCATION AND SCIENCE, UKRAINE**

**V.M. GLUSHKOV INSTITUTE FOR CYBERNETICS,
NATIONAL ACADEMY OF SCIENCES, UKRAINE**

ANNUAL REPORT

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Ternopil – 2018

CONTENTS

FOREWORD

It is my pleasure to present the 2017 Annual Report of Research Institute for Intelligent Computer Systems (ICS), Ternopil National Economic University (TNEU) and the Glushkov Institute for Cybernetics, National Academy for Science, Ukraine. This report is the XIV one since the ICS has established in 2004 based on the Branch Research Laboratory for Automated Systems and Networks (founded in 1984).

The ICS consists of the 14 research groups. During its history, the ICS staff has received more than 150 invention certificates of the former USSR and 58 Ukrainian patents; in particular, we got the 10 patents in 2017. There were published more than 1100 papers, in particular the 115 in 2017. There were defended the 38 DSc and PhD theses, in particular the six in 2017.

The high level of the ICS' research and development are confirmed by awarding the 21 international grants and followed projects within the INTAS, CRDF, NSF, NATO, STCU, FP7 and bilateral programs, in particular the three in 2017. In these projects, the ICS collaborated with a huge number of worldwide universities as well as governmental institutions and private companies. In addition, we are running a huge Erasmus+ project ALIOT entitled Internet of Things: Emerging Curriculum for Industry and Human Applications, see details inside of this report. Additional 14 projects have completed with the funding from the Ministry for Education and Science, Ukraine; in particular, the two projects are running 2017. Regarding research project activities in 2017, I would like to distinct the achievement of the Research Group on Wireless Systems Security leaded by DSc Vasyl Yatskiv.

The ICS is running the regular the IEEE International Conferences on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS), www.idaacs.net every two years since 2001. In particular, last one has completed in Bucharest, Romania, 21-23 September 2017. Now we are preparing the 10 IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems, which is planning in September 18–21, 2019, University of Lorraine, Metz, France.

The ICS is taking a part in organization of International Symposium on Wireless Systems within the IDAACS Conference since 2012. Now we are preparing the fourth IEEE International Symposium on Wireless Systems within the IEEE International Conferences on Intelligent Data Acquisition and Advanced Computing Systems, which is planning in September 20–21, 2018 in Lviv Polytechnic National University, Lviv, Ukraine.

The ICS staff continues to keep good links with IEEE within the IEEE Student Branch at TNEU and the Instrumentation and Measurement / Computational Intelligence Joint Societies Chapter of IEEE Ukraine Section. A Chapter has completed the eight Technical Meetings in 2017, see details inside of this report.

The International Journal of Computing is issuing quarterly, and it is indexing by Scopus Elsevier. In addition, the Journal is indexing by Finnish publication forum, Norwegian Social Science Data Services, Google Scholar, and Index Copernicus International. The four regular issues have published in 2017

Finally, I would like to thank Dr. Taras Lendyuk and Dr Oleksandr Osolinsky for their help in preparing and editing and designing this report.

Enjoy,
ICS Advisor   Prof. Anatoliy Sachenko

March 24, 2018

1. GENERAL INFORMATION

ICS History

Research Institute for Intelligent Computer Systems (ICS)'s mission is to push a preparation of the international research projects by inter-universities teams in the area of Computing.

The ICS counts the 14 Research Groups, in particular: Intelligent Distributed Systems, Intelligent Sensor Data Acquisition, Intelligent Robotic Systems, Neural Networks and Parallel Computing, Knowledge Bases and Ontologies, Information Technology and Specialized Computer Systems, Image Processing and Pattern Recognition, Wireless Systems Security, Project and Program Management on the base of IT and Knowledge, Cybernetics of Complex Systems, Information Security, and Intelligent Cyber Security and Defense, Metrology of Information Measuring Systems, Simulation and Algoritmization of Complex Technological Processes.

The ICS was established in 2004 on the basis of Branch Research Laboratory of Automated Systems and Networks, which in turn inherited rights and experience of the Branch Research Laboratory of Automated Data Acquisition and Processing Systems, founded in 1984 by the Ministry of Electronic Industry of the USSR and the Ministry of Higher and Specialized Secondary Education of Ukrainian SSR. According to strengthening links between the Ministry of Education and Science and National Academy of Sciences, the ICS has been under joint supervision of the TNEU and the Glushkov Institute of Cybernetics, National Academy of Sciences of Ukraine since 2007.

A high level of the ICS' research and development has proved since 1997 by winning a number of international grants within the INTAS, CRDF, NSF, NATO, STCU, FP7 and bilateral programs. In these projects the ICS partners were the Universities of Thessaloniki (Greece), Calabria (Italy), Coruna (Spain), Mons (Belgium), Maine and New Jersey (USA), Kaunas (Lithuania), Minsk and Brest (Belarus) and othersas well as the governmental reseas. Additional 11 projects were executed during this period with funding from the Ministry of Education and Science of Ukraine. This active work of ICS staff enabled to push the research facilities and infrastructure of the Institute, in particular the Ternopil Information-Communication Center was created using NATO funds.

ICS researchers are founders of the IDAACS Charity Foundation, which supports organization of regular International Intelligent Data Acquisition and Advanced Computing Systems (IDAACS) Workshop since 2001 every two years under IEEE's support. In particular, the previous IDAACS Workshops were held in Foros, Crimea (2001), in Lviv (2003), in Sofia, Bulgaria (2005), Dortmund, Germany (2007), Rende (Cosenza), Italy (2009), Prague, Czech Republic (2011), Berlin, Germany (2013), Warsaw, Poland (2015), and Bucharest (2017).

Two IEEE International Symposiums on Wireless Systems within the Conference on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS-SWS) were held in Offenburg, Germany, in 2012, 2014 and 2016 correspondingly.

The ICS researchers established the IEEE Student Branch at TNEU in 1998. The Instrumentation and Measurement / Computational Intelligence Joint Societies Chapter of IEEE Ukraine Section were created in 2005, and its activities were awarded with IEEE Outstanding Chapter Award for activities in 2007 and 2014 correspondingly. In 2002 the International Journal of Computing was founded, www.computingonline.net, which has a professional status in Ukraine, and it's distributed worldwide. The Journal is issued quarterly in English language. Since November 2016 the IJC Journal is indexed by Scopus Elsevier. Also, the Journal is indexed by Finnish publication forum, Norwegian Social Science Data Services, Google Scholar, and Index Copernicus International.

ICS Management

Director – Dr. Volodymyr Kochan
Scientific Advisor – Prof. Anatoliy Sachenko
Scientific Secretary – Dr. Myroslav Komar

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ICS Frame
Intelligent Distributed Systems Group (IDS)

Principal researcher – Prof. Anatoliy Sachenko
Group members:
- Pavlo Bykovyy
- Volodymyr Kochan
- Myroslav Komar
- Olexandr Osolinskyy
- Vasyl Yatskiv

Intelligent Sensor Data Acquisition Group (ISDA)

Principal researcher – Prof. Volodymyr Kochan
Group members:
- Zbyshek Dombrovsky
- Orest Kochan
- Ihor Maykiv
- Olexandr Osolinskyy
- Oleksiy Roshchupkin
- Radislav Smid
- Iryna Turchenko
- Nadia Vasylkiv

Intelligent Robotic Systems Group (IRS)

Co-Researchers, Principal researchers – Prof. Robert Hiromoto, Dr. Vasyl Koval
Group members:
- Oleh Adamiv
- Vladimir Golovko
- Alex Nykorak
- Anatoliy Sachenko

Neural Networks and Parallel Computing Group (NNPC)

Principal researcher – Dr. Volodymyr Turchenko
Group members:
- Vitaliy Dorosh
- Volodymyr Kochan
- Anatoliy Sachenko

Knowledge Bases and Ontologies Group (KBO)

Principal researcher – Prof. Sergey Rippa
Group members:
- Anatoliy Sachenko
- Taras Lendyuk
- Andriy Melnyk
- Serhiy Voznyak

Information Technology and Specialized Computer Systems Group (ITSCS)

Principal researcher – Prof. Yaroslav Nykolaychuk
Group members:
- Orest Volynskyy
- Arthur Voronych
- Natalia Vozna
- Oleg Zastavnyy

Image Processing and Pattern Recognition Group (IPPR)

Principal researchers – Prof. Viktor Krylov, Dr. Ihor Paliy
Group members:
- Anatoliy Sachenko
- Diana Zagorodnya

Wireless Systems Security Group (WSS)

Principal researcher – DSc Vasyl Yatskiv
Group members:
- Robert Hiromoto
- Anatoliy Sachenko
- Jürgen Sieck
- Taras Tsavolyk
- Orest Volynskyy
- Natalia Yatskiv

Project and Program Management on the base of Information Technologies and Knowledge Group (PPMITK)

Principal researcher – Prof. Sergey Bushuyev
Group members:
- Mykhailo Dombrovsky
- Zbyshek Dombrovsky
- Oksana Dunets
- Grygoriy Gladiy
- Yuriy Ivanyshak
- Taras Lendyuk
- Oksana Lyashenko
- Volodymyr Neizzhalyi
- Sergey Rippa
- Anatoliy Sachenko
- Oleg Sachenko
- Iryna Turchenko
- Nadiia Vasylkiv

Cybernetics of Complex Systems Group (CCS)

Principal researcher – Dr. Roman Pasichnyk

Group members:
- Grygoriy Gladiy
- Andriy Melnyk
- Yuriy Pigovskyy

Information Security Group (IS)

Principal researcher – Prof. Mykola Karpinsky

Group members:
- Pavlo Bykovyy
- Lesya Dubchak
- Myroslav Komar

Intelligent Cyber Security and Defense Group (ICSD)

Principal researchers – Prof. Vladimir Golovko, Prof. Anatoliy Sachenko

Group members:
- Pavlo Bykovyy
- Myroslav Komar
- Volodymyr Karpinskyy

Metrology of Information Measuring Systems Group (MIMS)

Principal researchers – Prof. Volodymyr Kochan, DSc Roman Kochan,

Group members:
- Orest Kochan
- Olexandr Osolinsky
- Nadiia Vasylkiv

Simulation and Algoritmization of Complex Technological Processes Control Group (SACTPC)

Principal researcher – Dr Igor Dobrotvor

Group members:
- Dmytro Bodnar
- Anatoliy Sachenko
- Grygoriy Gladiy
- Diana Zagorodnya

2. ICS RESEARCH STAFF

Senior Staff

Oleh Adamiv

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Research interests: robotics, artificial intelligence, navigation methods for mobile robots.

Dmytro Bodnar

Specialist (1971), Mathematics, Ivan Franko Lviv State University, Doctor of Physics and Mathematics Sciences, Professor, Mathematical Analysis, Professor at Department of Economic Cybernetics and Informatics, Ternopil National Economic University, SACTPC Group Member (2014).

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Research interests: analytical foundations of the theory of branched continued fractions and their usage.

Pavlo Bykovyy

Bachelor (2004), Computer Engineering, Ternopil Academy of National Economy, Specialist (2005), Computer Systems and Networks, Engineer (2005), Basics PC Construction Laboratory of Department for Information Computer Systems and Control, IEEE Member (2004), IEEE Student Branch Chairman in Ternopil State Economical University (2005), Ph.D. Student (2007), Ph. D. in Computer Systems and Components (2011), IDAACS 2003-2013 Organizing Committee Member, IDS Group Member (2004), IS Group Member (2012), ICSD Group Member.

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Research interests: security systems, databases, software development.

Sergey Bushuyev

Founder and president of the Ukrainian Project Management Association, Head of Project Management Department at Kyiv National University of Construction and Architecture. Member of the Board of Directors, a member of the Certification Department, First Assessor in seven countries, International Validator of Certification Programs at International Project Management Association (IPMA), Head of PPMITK Group (2014).

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Research interests: project management.

Igor Dobrotvor

Specialist (1979), Mathematics and Physics, PhD Student (1979), PhD in Phys.-Math. Sciences (1984), Associated Professor at Department of Intelligent Information Technologies (then International Information, then Economic Cybernetics and Iformatics) (2003), Doctor of Technical Sciences (2014), Head of SACTPC Group (2014)

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Research interests: methods and means of digital signal processing: digital filters; decision support systems; mathematical conflictology and pattern recognition

Zbyshek Dombrovskyy

Specialist (1969), Radiotechnics, Kyiv Polytechnic Institute, Master in Organization Management (2000), Senior Researcher at Research Department of Ternopil Finance-Economic Institute, TFEI (1974), Inventor of USSR (1977), Head of Research Laboratory "Informatics" at TFEI (1988), Senior Lecturer (1996), Management Department, PMS group (2007), Ph. D. in Computer Systems and Components (2008), ISDA Group Member (2012), PPMITK Group Member (2012).

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Research interests: methods and means of digital signals processing, digital filters, decision support systems, arithmetic units and real time special processors, distributed objects automated control systems.

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Research interests: fuzzy logic systems, VHDL language.

Robert Hiromoto

Ph.D., University of Texas, Dallas, USA, Professor of Computer Science, University of Idaho, Idafo-Falls, USA, Fulbright Programm Fellow (2013-2014), TNEU, Co-Head of IRS Group (2013), WSS Group Member (2013).

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Reaearch interests: parallel computing, wireless sensors security, wireless networks

Grygoriy Gladiy

Specialist (1979), Applied Mathematics, Chernivtsi State University, Ph.D. (1990), Mathematical Methods, Models and Information Technologies in Economics, Associated Professor (2013), Department for Information Computer Systems and Control, CCS Group Member (2013), PPMITK Group Member (2014), SACTPC Group Member (2014).

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Research interests: flow methods of imitation simulation of economy systems and processes.

Vladimir Golovko

Master (1979), Computer Engineering, Moscow Bauman State Technical University, PhD (1990), in Computer Science (1990), Doctor of Technical Sciences (2003), Head of Intelligence Information Technologies Department and Laboratory of Artificial Neural Networks of the Brest State Technical University, IRS Group Member (2014), Co-head of ICSD Group.

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Research interests: artificial intelligence; neural networks; information security, mobile robots

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Research interests: specialized computer systems, wireless information technologies and systems of their security.

Volodymyr Karpinskyy

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Research interests: mathematical modelling, metrology, computational methods, Computer Systems and Networks, Computer Science.

Orest Kochan

Specialist (2006), Physics of Metals, Lviv National University named after I. Franko, IDSCS group member (2007), training researcher (2008), Research Institute for Intelligent Computer Systems, Ph. D. Student (2008), Ph. D. in Devices and Methods of Heat Value Meausring (2011), Senior Lecturer, Department for Information Computer Systems and Control (2011), ISDA Group Member (2008), MIMS Group Member (2014).

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Research interests: intellectual temperature measurement systems.

Roman Kochan

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Research interests: distributed measurement systems, microprocessor systems, analog-digital converters.

Volodymyr Kochan

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Research interests: intelligent measurement devices, informational-measurement systems and complexes.

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Research interests: artificial intelligence, systems of information security.

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Research interests: mobile robots, signal and image processing, technical vision systems, artificial intelligence, distributed systems.

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Research interests: digital images processing, images recognizing.

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Specialist in mathematics, informatics and computers, Ternopil State Pedagogical Institute (1994), Specialist in Finance and Credit, Ternopil Academy of National Economy (1998), Ph.D. in Economic Simulation (2001), D.Sc. in Mathematical Methods, Models and Information Technologies in Economy (2010), Head of Department of Economical Cybernetics and Informatics (2011), PPMITK Group Member (2014).

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Research interests: economic simulation, project management

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Research interests: ontology, knowledge discovery.

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Research interests: face detection and recognition, image processing, artificial neural networks, parallel computing.

13

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Research interests: ontologies, knowledge discovery.

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Research interests: mathematical modeling, algorithms.

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Research interests: knowledge bases, ontology, knowledge discovering.

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Specialist (2004), Computer Systems and Networks, Yuriy Fedkovych Chernivtsi National University, Assistant at Department of Computer Systems and Networks, Faculty of Computer Science, Yuriy Fedkovych Chernivtsi National University (2005), PhD Student at Ternopil National Economic University (2010), Computer Systems and Components, Head of IEEE student branch at TNEU, ISDA Group Member (2004).

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Research interests: information-measuring systems, microcontrollers, ultisensory systems, neural networks, sensors.

Anatoliy Sachenko

Specialist in Information Measurement Technology (1968), Ph.D. in Electrical Engineerings (1978), Scientific Advisor of Branch Research Laboratory for Automated Systems and Networks (1984), D. Sc. In Computer Engineering (1988), Prof. of Department for Information Computer Systems and Control (1991), Honored Inventor of Ukraine (1992), Full Member of Ukrainian Academy of Economics Cybernetics (1998) and New- York Academy of Sciences (1998), Member of Specialized Scientific Council in State University "Lviv Polytechnic" (1994), Chairman of Specialized Scientific Counsil K58.082.02 at TNEU (2002), Editor-in-Chief of International Journal of Computing, Doctoral Dissertations Chapter Editor in "IEEE I&M Magazine", Head of Department for Information Computer Systems and Control, Dean of Institute for Computer Information Technologies (1994-2005), Scientific Advisor of the ICS (2004), IDAACS 2001-2013 Co-Chairman, Head of IDS Group (2004), Co-Head of ICSD (2014), NNPC Group Member (2004), KBO, WSS Groups Member (2008), IPPR, PPMITK and SACTPC Groups Member (2014).

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Research interests: Artificial intelligent systems, distributed sensor networks, computational, intelligence, intelligent robotics systems, parallel computation systems, cybersecurity and safety systems, project management, wireless sensor networks.

Oleg Sachenko
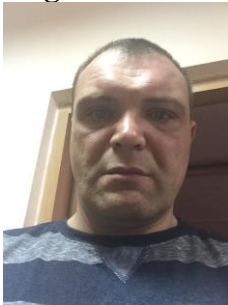
Specialist (1992), International Economy, Ternopil Institute of National Economy, Lecturer, Department for Information Computer Systems and Control, TNEU (2013), Ph. D. in Projects and Programs Management (2016), PPMITK Group Member (2014).

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Research interests: project management

Jürgen Sieck

Master in mathematics (1981), Humboldt University Berlin, Germany, PhD in Computer Science (1989), Humboldt University Berlin, Germany. Senior researcher at the research group "Informations- und Kommunikationsan-wendungen" (INKA), professor for computer sciences with a   ultisensory n on algorithms, multimedia and mobile application for the degree programme Applied Computer Science at the University of Applied Sciences HTW Berlin. WSS Group member.

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Research Interests: multimedia, computer graphics, virtual reality and wireless communication.

Radislav Smid

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Research Interests: signal processing, measuring, testing, autonomous sensors embedded computer systems.

Iryna Turchenko

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Research interests: neural networks, intelligent and distributed sensor networks, multi-parameter sensors.

Volodymyr Turchenko

Specialist (1995), Computing Machines, Systems, Complexes and Networks, Brest Polytechnic Institute (rep. Belarus), Ph. D. in Computer Engineering (2001), Assistant Professor (2002), Associate Professor (2004), Department for Information Computer Systems and Control, IEEE member (1999), IDAACS 2001-2011 OrgCom Vice-Chair and member, member of Specialized Academic Council K58.082.02 at TNEU (2002-2009), FP7 Marie Curie Postdoctoral Research Fellow at the Center of Excellence of High Performance Computing, Department of Electronics, Informatics and Systems, University of Calabria, Italy (2009-2011), Deputy editor-in-chief of International Journal "Computing" (2009), ACM member (2009-2011), Member of Marie-Curie Association, Head of NNPC Group (2004).

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Research interests: Neural networks, parallel programming, parallel and distributed computations.

Nadia Vasylkiv

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Research interests: metrological support for information measurement systems.

Artur Voronych

Master (2008), Automation Control of Technological Processes, Ph.D. student (2010), Department of Computer Systems and Network, Ivano-Frankivsk National Technical University of Oil and Gas, ITSCS group (2012).

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Research interests: signal processing, theory of information and data encryption.

Natalia Vozna

Specialist (1998), Management Information Systems, Ternopil Academy of National Economy, PhD student (2005), Computers, Systems and Networks, lecturer (2009), Department of Specialized Computer Systems, PhD (2009), Computer Systems and Components, ITSCS group (2013).

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Research interests: computer systems design, information theory and data decoding, lower computer networks.

Orest Volynskyy

Master (2009), Specialized Computer Systems, Ternopil National Economic University, Training-Researcher RIICS (2009), Ph. D. (2013), ITSCS group member (2009), WSS group member (2014).

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Reasearch interests: special processors in bounded systems of resiadual classes.

Natalia Yatskiv

Specialist (1997), Physics-Engineer, Ivano-Frankivsk Oil and Gas State Technical University, Ph. D. in Technical Sciences, Computational Machines, Systems and Networks (2003), Associate Professor (2007), Department for Information Computer Systems and Control, WSS Group Member (2012).

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Reasearch interests: human-computer   ultisensor; wireless communication technologies**.**

17

Vasyl Yatskiv

Specialist (1996), Automation Technological Processes and Manufacturing, Ivano-Frankivsk Oil and Gas State Technical University, Ph. D. in Technical Sciences, Computational Machines, Systems and Networks (2001), Senior Lecturer (2001), Associate Professor (2002), Department of Specialized Computer Systems, DsC. In Computer Systems and Components (2016), Secretary of the Specialized Academic Council K58.082.02 at TNEU (2002), IDS Group Member (2004), Head of WSS Group (2012),.

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Research interests: cordless optical connection channels, modular arithmetic based special processors development.

Oleh Zastavny

Specialist (2002), Information Security in Computer Systems, Ternopil Academy of National Economy, Ph. D. student (2002), Elements and Devices of Computer Engineering and Control Systems, Assistant (2002), Department of Specialized Computer Systems, Ph. D. (2007), Elements and Devices of Computer Engineering and Control Systems, ITSCS group (2007).

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Research interests: embedded computer systems, signal processing, information theory and data encoding, autonomous sensors, low-level sensor networks.

Junior Staff

Mykhailo Dombrovsky

Specialist (1998), Finances and Credits, Ternopil Academy of National Economy, training management and information systems Consortium for improving business and management education in Ukraine (2000-2002), research fellow (part-time work) Scientific Research Department of Ternopil National Economic University (TNEU) (2009-2013), engineer of the first category university educational computer cybernetic laboratory TNEU (2015), part-time lecturer (2000-2012), Department of International Economics, PPMITK Group Member (2013).

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Research interests: project management.

Vitaliy Dorosh

Bachelor (2009), Software of Automated Systems, Ternopil National Economic University, Engineer (2009), ISDA Group Member (2009), Laboratory of Personal Computers at Department for Information Computer Systems and Control, NNPC Group Member (2013).

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Research interests: neural networks

Oksana Dunets

Bachelor (2015), Information Technologies, Computer Science, Ternopil National Economic University, is pursuing Master degree in Project Management (2017), technician at Department for Information Computer Systems and Control (2015), PPMITK Group Memeber (2015).

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Research interests: neural networks, web development, project management, artificial intelligence, modeling, web technologies.

Yuriy Ivanyshak

Bachelor (2014), International Information, Master (2015), Project Management, Ternopil National Economic University, Engineer (2015), PhD Student (2015), Department for Information Computer Systems and Control, PPMITK Group Memeber (2015).

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Research interests: cybernetics in management, system approach in management, TRIZ.

19

Taras Lendyuk

Specialist (1985), Industry Planning, Ternopil Finance Economic Institute, Engineer-Programmer (1986), Ph. D. student (1999), Economic-Mathematical Modelling, Department for Information Computer Systems and Control, IDAACS 2001-2011 organizing committee member, KBO Group Member (2009), PPMITK Group Member (2014).

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Research interests: economic-mathematical   ultisen, project management.

Volodymyr Neizzhalyi

Bachelor (2015), Information Technologies, Computer Science, Ternopil National Economic University, is puruing Master degree in Project Management (2017), technician at PC Lab, Department for Information Computer Systems and Control (2015), PPMITK Group Memeber (2015).

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Research interests: management of investment projects.

Alex Nykorak

Technician (2010), Chernivtsi industrial college, bachelor (2012), computer engineering, master (2013), computer systems and networks, Chernivtsi Yury Fedkovych National University, Junior Researcher (2013), Department for Information Computer Systems and Control, IRS Group Member (2013).

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Research interests: systems and tools of artificial intelligence, control systems and processes, computer systems and components, information technologies, automation of control processes

Taras Tsavolyk

Bachelor (2013), Computer Engineering, Master (2014), Specialized Computer Systems, Ternopil National Economic University, PhD Student (2014), Lecturer (2016), Department for Information Computer Systems and Control.

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Research interests: wireless sensor networks, the system of residual classes.

Serhiy Voznyak

Engineer-Economist (1996), Information Systems in Management, Ternopil National Economic University Director Deputy of Exploitation and Security (1997), Lecturer, Department of Computer Engineering (1997), KBO Group Member (2012).

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Research interests: computer networks and infrastructure, web-technologies

Diana Zagorodnya

Bachelor (2008), Pedagogic Education, Teacher of Mathematics and Basics of Informatics, V. Hnatiuk Ternopil National Pedagogic University, Master (2009), Pedagogic Education, Teacher of Mathematics and Basics of Informatics, V. Hnatiuk Ternopil National Pedagogic University, Head of Training Cources (2009), Ternopil Municipal "Station of Junior Technics", Administrative Assistant, Ph.D. student (2012), Department for Information Computer Systems and Control, Ternopil National Economic University (2012), IPPR Group Member (2012), SACTPC Group Member (2014).

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Reasearch interests: images identification, images analysis algorithms for computer recognition systems.

3. RESEARCH PROJECTS

Current

[Project 1] Erasmus+ALIOT

Grantholder – Prof. Chris Phillips, Newcastle University, Newcastle, UK
National coordinator – Prof. Vyacheslav Kharchenko, National Aerospace University KhAI, Kharkiv
Leader of ICS TNEU team – Prof. Anatoliy Sachenko, ICS, Ternopil National Economic University

Duration: 2016 – 2018

Objectives: development and modernization of curricula for masters, graduate students and staff of industrial companies in the field of development, research and application of a new branch of Internet of Things (IoT) in accordance with the needs of modern society.

Main project results:

- An outing meeting in Stockholm for all project participants was held to resolve the project structure and direction of its development.
- The responsibilities are divided and teams organized for the development of courses, modules, lectures, laboratory works.
- Managers and co-managers of working groups have been appointed.
- A liability matrix has been developed according to the development courses and modules.
- The structure of courses and modules has been developed, their fullness has been discussed
- The structure of the work programs is determined
- Curricula developed
- Monitoring by the Erasmus + Commission from Kyiv is underway
- Stages for the completion and development of curricula were determined

Team:
- Anatoliy Sachenko;
- Myroslav Komar;
- Volodymyr Kochan;
- Vasyl Yatskiv;
- Vasyl Koval;
- Grygoriy Gladiy;
- Iryna Strubytska;
- Zbyshek Dombrovskiy;
- Oksana Dunets.

[Project 2]   **Theoretical Foundations and Hardware for Improving the Productivity of Wireless Sensor Networks**

Principal investigator of project – Dr. Vasyl Yatskiv

Duration: 01.2017 – 12.2018

Objectives: The project is aimed at solving the scientific and applied problem of improving the productivity of Wireless Sensor Networks (BCM) by developing effective methods of noise immunity encoding and adaptive data transmission schemes on their basis, developing error-proof and asymmetric computing complexity of data compression methods. At the same time, important criteria for evaluating the developed methods will be: hardware complexity, computational complexity and energy costs for the implementation of algorithms.

Main project results:

- development of methods for correction of multiple errors based on modular correction codes with low computational complexity of algorithms of decoding;
- research of computational complexity of correction codes of system of residual classes with a special system of modules;
- development of the method of data transmission in BSM on the basis of adaptive error control scheme and modular correction codes;
- investigation of the influence of noise on algorithms of data compression in BSM;
- development of new data compression methods resistant to noise and error propagation during decoding with asymmetric computational complexity of coding algorithms (the complexity of coding algorithms is less than the complexity of decoding algorithms);
- conducting experimental studies of the transmission of compressed data under the influence of various types of noise;
- development and realization on the FPGA of reconfigurable special processor of noise-proof data encoding on the basis of modular correction codes;
- escription of data compression algorithms in Verilog language and implementation of FPGA data processing devices in BSM.

Team:
- Vasyl Yatskiv;
- Anatoliy Sachenko;
- Volodymyr Kochan;
- Mykhailo Kasyanchuk;
- Natalia Yatskiv;
- Ihor Yakymenko;
- Stepan Ivasiev;
- Orest Volynskyy;
- Taras Tsavolyk.

[Project 3]   DAAD programme "Eastern Partnerships"

Project Co-investigator: Prof. Anatoliy Sachenko

Duration: 2017 – 2019

Objectives:
- Strengthening partnerships and cooperation between German HEI and HEI in middle Eastern/ South Eastern and Eastern Europe as well as Caucasus and Central Asia
- Fostering of cooperations which foster the alignment of academic degrees (Bologna process)

Main project results:
- Strengthening of existing and initiating new sustainable partnerships
- Exchange of researchers, graduates and students
- Sustainable structural improvements of conditions of research and teaching in partner countries
- Contribution to internationalisation of German and foreign HEI

Team:
- Anatoliy Sachenko;
- Pavlo Bykovyy;
- Iryna Turchenko.

[Project 4]   **Methods of Protection against Computer Attacks based on Neural Networks and Artificial Immune Systems**

Principal investigator of project – Prof. Anatoliy Sachenko;
Co-investigator – Dr Myroslav Komar.

Duration: 2016 – 2017

Objectives: The development of a new intelligent information technology based on the theory of artificial neural networks, fuzzy logic and artificial immune systems to increase the reliability of computer attacks detection and classification.

Main project results:

- An analysis of known methods of protection against computer attacks has been carried out.
- A modified method for constructing a detection detector for computer attacks based on neural networks and artificial immune systems was developed.
- A method for reducing the amount of information based on neural networks of high trust with the use of multichannel neural network detectors for constructing a hierarchical classifier of computer attacks has been developed.
- A generalized architecture of intelligent computer-based protection system has been developed.
- Experimental studies of developed methods and algorithms have been carried out, which confirmed the reliability of detection and classification of computer attacks and improvement of the safety level.
- An approach is proposed to increase the security of the system against computer attacks by implementing neural network detectors on the FPGA and introducing a subsystem of decision-making based on the rules of the fuzzy output of Mamdani.

Team:
- Anatoliy Sachenko;
- Myrolav Komar;
- Volodymyr Kochan;
- Vladimir Golovko;
- Vasyl Yatskiv;
- Lesia Dubchak;
- Pavlo Bykovyy;
- Diana Zahorodnia;
- Vitaliy Dorosh;
- Taras Tsavolyk;
- Stepan Ivasiev;
- Grygoriy Sapozhnyk;
- Andriy Karachka.

Completed

[Project 5]   Distributed Sensor Networks with Computing Nodes Reconfiguration

Principal investigator: Prof. Anatoliy Sachenko
Co-investigator: Dr. Igor Maykiv

Foreign partner: Technical University of Moldova, Moldova

Duration: 2014 – 2015

Objectives: Development of methods for structural synthesis of universal modules with the reconfiguration possibility.

Main project results:
- Based on morphological analysis and synthesis technique of structural synthesis of universal modules comprising functional analysis, the structural synthesis was carried out. The technique combines lexicographical criterion advantages (L-criterion) for the selection of electronic components during functional analysis and absolute criterion of preference (optimality Pareto, π-criterion) during the search of the set of optimal solutions that are considered in the literature as alternative methods to find optimal solutions. The combination of L- and π-criteria to reduce the number of alternatives synthesized during structural synthesis. A formalized discrete optimization solution is versatile for a wide range of problems of optimal structural synthesis of computing systems.
- A new universal module structure with improved functional properties through a separate process execution processing and data sharing capabilities as well as reconfiguration of hardware and software through the use of programmable logic integrated circuits (FPGAs) was designed.
- A 4-level model, that graphically displays, was developed. Between different processes of receiving and transmitting messages to the controller serial interfaces and it is an effective tool in their implementation both at the functional analysis and structural synthesis.
- An experimental model of network application processor with the possibility of reconfiguring the methodology and its testing was created.

Team:
- Anatoliy Sachenko;
- Igor Maykiv;
- Volodymyr Kochan;
- Nadia Vasylkiv;
- Oleksiy Roshchupkin;
- Diana Zahorodnia;
- Yuriy Ivanyshak;
- Olexandr Osolinsky;
- Taras Lendyuk;
- Oksana Dunets.

[Project 6]   Wireless Multimedia Sensor Networks on the Base of Modular Arithmetics and Galois Codes for Videomonitoring Systems

Principal investigator: Prof. Anatoliy Sachenko

Co-investigator: Dr. Vasyl Yatskiv

Foreign partner: Pedagogical University Huazhong, China.

Duration: 2013 – 2014

Objectives: developing of improved methods for training of artificial neural networks on heterogeneous parallel computing systems consisting of grid, providing high efficiency of parallelization and development of grid-based library functions for paralel training of artificial neural networks.

Main project results:
- New methods of data coding and transmitting based on modular arithmetic were developed, which enable increased efficiency of wireless multimedia sensor networks (WMSN). Methods have designed for devices with limited hardware resources and autonomous power supply.
- Method of network coding is based on data system of residual classes. The overall bandwidth of wireless sensor networks was investigated as well as the scope of data distribution schemes for different residues.
- Method of coding and redundancy reducing of multimedia data without loss in system of residual classes, which provides 2-3 times reducing of image processing time by division of the image on the modules of residual classes system and parallel encoding of obtained residues was developed. Application of Huffman codes for residues compressing provides lossless compression ratio depending on the class of images: 1,6 – 4 – for photo-realistic images; 4 – 8 – for images with large areas of the same color.
- Method of improving of data reliability based on modified correcting code system of residual classes, which is characterized by a lower computational complexity and allows about 5 times increasing of encoding speed versus R – source code RNS and Reed – Solomon RS (127, 87) was developed.

Team:
- Anatoliy Sachenko
- Yaroslav Nykolaychuk
- Natalia Yatskiv
- Vasyl Yatskiv
- Orest Volynskyy
- Petro Humenyy

[Project 7]   Neural network method for improving the accuracy of information-measurement systems of ultraviolet radiation

Principal investigator: Prof. Anatoliy Sachenko

Project has completed within inter-university network Erasmus Mundus together with partners from Alaxender Ioan Kuza University, Iassi, Romania.

Duration: 01.01.2013-31.12.2014

Goal: development of new neural network method for improving the accuracy of information measuring systems for measurement of ultraviolet radiation.

Research purpose: neural network methods and means of accuracy improving of the information-measuring systems for measurement of ultraviolet radiation.

Research methods: structural and functional analysis (error analysis of measuring systems for measuring of UV radiation level and UV sensors); methods of neural networks theory, the method of gradient ascent in the space of weight coefficients and neurons thresholds of (for NN training); simulation methods (for experimental research of developed methods); technique of primary transformer investigation.

Current project results:
- The methods of signal processing of multiparameter sensors were proposed. Simulations were conducted in MathLab.
- The software for modeling of the real multiparameter sensors behavior was developed. The software allows to buid the model random and systematic errors, and identify the limits of the proposed methods.
- Application for Ukrainian patent and for useful model was made.

Team:
- Anatoliy Sachenko
- Oleksiy Roshchupkin
- Volodymyr Kochan

[Project 8]   Methods and Tools of Wireless Multimedia Sensor Networks Based on Modular Arithmetic.

Principal investigator – Prof. Yaroslav Nykolaychuk

Duration: 01.01.2013 – 31.12.2014

Goal: development of methods and tools for data encoding and transmitting in wireless multimedia sensor networks aimed at improving the reliability of their operation and functionality.

Abstract: The project developed new methods and algorithms for data encoding and transmitting using mathematical tools of modular arithmetic, aimed at improving the performance of wireless multimedia sensor networks (WMSM). A Verilog – encoder model for noise-immune data encryption using modified correcting codes is designed.

Main results:
- The method of adaptive coding and transmission of multimedia data based on modular arithmetic and multipath routing using adaptive distribution packages and their transfer from multipath routing, providing efficient use of the total bandwidth of wireless sensor networks.
- The method of network data coding based on a system of residual classes (SRC), which would reduce the data volume by 50%, including the retransmission of packets that needs to restore messages. The proposed method of packages selecting of relatively simple modules, where modules are selected a bit different, because remnants of the bit transmitted by the common route is approximately equal to the bit residues on specific routes. The method of network coding improves overall network capacity by about 60%.
- A modified correcting code system of residual classes, characterized by the formation of the simplified procedure of check symbols, providing increased performance encoding is about 5 times as compared with other correcting codes. Using modified correcting codes RNS in wireless sensor networks will improve the reliability and overall network capacity by reducing the number of retransmissions.

Team:
- Yaroslav Nykolaychuk
- Anatoliy Sachenko
- Vasyl Yatskiv
- Natalia Yatskiv
- Natalia Vozna
- Petro Humenny
- Orest Volynsky

[Project 9]   Neural Network Methods for Evaluation of Microprocessors in Power Consumtion of Instructions

Principal investigator: Dr. Zbyshek Dombrovsky

Duration: 2010 – 2012

Objectives: development of hardware-software complex, which will allow to built mathematical models of processor cores power consumption.

Main tasks:
- development of appropriate specialized hardware, which allows to evaluate power consumption of instruction in normal microprocessor operation mode;
- development of testing methods (calibration) of created hardware;
- using of artificial neural networks for prediction of power consumption of those instruction modes (addressing, conditions and etc.) which was not completely tested experimentally;
- using of experiment planning methods for the additional decreasing of experiments volume.

Team:
- Anatoliy Sachenko
- Volodymyr Kochan
- Andrii Borovyi
- Oleh Havryshok
- Ihor Maykiv
- Orest Volynskyy

Published results:

1. A. Borovyi, V. Kochan, Th. Laopoulos, Sachenko A. Improved Sorting Methodology of Data-processing Instructions, International Journal of Computing, vol. 10, issue 1, 2011, pp. 50-55.
2. A. Borovyi, I. Maykiv, R. Kochan, Z. Dombrovskyy, V. Kochan. The Unit of Measurement of Consumers Pulse Energy, Patent of Ukraine 90922 UA, MPK (2009) G05F 5/00 G01K 17/00, no. A2008 06325 ; applied 13. 05. 2008; published 10. 06. 2010, Bulletin no. 11.
3. Time-domain analysis of ARM7TDMI core instructions [Text] / A. Borovyi, V. Kochan, Th. Laopoulos, A. Sachenko // Proceedings of the 6th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS'2011). – Vol. 2. – [S. L. : s. N.], 2011. – September 15-17. – P. 785 –790.

[Project 10] Parallel Grid-aware Library for Neural Networks Training – PaGaLiNNeT

Principal investigator: Dr. Volodymyr Turchenko
Scientific advisor: Prof. Anatoliy Sachenko

Partners: Prof. Lucio Grandinetti, Center of Excellence on High Performance Computing, Department of Electronics, Computer Science and Systems, University of Calabria, Italy.

Grant No FP7 MC IIF 221524 – 908524 according to the 7th EU Frame Programme, Grant of Marie Curie for researches from the third countries (International Incoming Fellowships – IIF), return phase

Duration: 2011 – 2012

Objectives:
Development of enhanced training methods for artificial neural networks in heterogeneous parallel computing systems within the Grid; providing the high efficiency of parallelization and development of the Grid-based library for parallel neural networks training.

Main results:
- As a part of the project design three levels of grid-based library are created: (i) at the level of a single supercomputer / cluster homogeneous computing nodes, (ii) at the heterogeneous computing nodes within a cluster, (iii) at the grid of computing system with heterogeneous hosts and heterogeneous communication channels between them. A parallel version of the library for the level (i) was installed on parallel machines with ccNuma architecture. A strategy for resource brokering based on Pareto optimization [1] is implemented in C programming language and included in the library. The developed library for the level (i) which includes the routines for parallel training of multilayer perceptron [2] and recurrent neural network was used for the prediction of the stock price for financial markets. The results are published in [6]. A parallel version of the library for the level (ii) was developed and installed on the computing cluster of heterogeneous architectures. The resource brokering sub-routine based on Pareto optimization [1] is called from the code of resource broker separately before executing the main task. The performance analysis of computing nodes of the cluster is based on a modified BSP-based model with improved computational complexity of parallel training algorithm for multilayer perceptron [2]. The results are published in [5];
- Within the application of parallel algorithms for neural network training to speed up the execution of practical tasks, an application task of convolution neural network for the detection of the number of micronucleus in the human lymphocytes is considered. The accurate detection of the number of micronucleus in the human lymphocytes can be used as biological dosimeter in order to relive the presence and the action of carcinogenic factors and could enhance the correctness of the final medical response. It was proven the application of convolution NN for the development of this task because this NN model provides good detection properties and showed good detection results of the more complicated task of human face detection. The human lymphocyte images were acquired by the image flow cytometer which causes the different types of noise that influence on the acquired image. We have tested the CNN for the images altered by a zoom factor. The CNN provides no false alarms for each zoom factor. The number of false negative detections is much lower in comparison with the pattern matching method, implemented as a LABVIEW routine (IMAQ Match Pattern method) inside the flow cytometer. The detection rate of 87.5% provided by the CNN is much higher than 25% of detection rate by the IMAQ Match Pattern method on the considered example images. The results are published in [3, 4].

Published results:

1. Turchenko V.O. Brokering methodology of Grid-resources using Pareto-optimality // Measuring and Computing Technologies Equipment in Technological Processes. – 2011. # 1. – pp. 312-318.
2. Turchenko V.O. Efficiency Comparison of Multilayer Perceptron Group Training on Parallel Computer and Computation Cluster // Transactions KPI. Informatics, management and computing technology: Proceedings – Kyyiv: Vek+. – 2011. – No. 54. – pp. 130-138.
3. Paliy I., Lamonaca F., Turchenko V., Grimaldi D., Sachenko A. Detection of Micro Nucleus in Human Lymphocytes Altered by Gaussian Noise Using Convolution Neural Network, Proceedings of 2011 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2011), 2011, Binjiang, Hangzhou, China, pp. 1097-1102.
4. Lamonaca F., Turchenko V., Grimaldi D. Aspetti innovativi della progettazione hardware e software di citofluorimetro ad immagini, Atti del XXVIII Congresso Nazionale Gruppo Misure Elettriche ed Elettroniche, 2011, Genova, Italy, pp. 289-290.
5. Turchenko V., Puhol T., Sachenko A., Grandinetti L. Cluster-Based Implementation of Resource Brokering Strategy for Parallel Training of Neural Networks, Proceedings of the 6th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems IDAACS2011, Sep 15-17, 2011, Prague, Czech Republic, pp. 212-217.
6. Turchenko V., Beraldi P., De Simone F., Grandinetti L. Short-term Stock Price Prediction Using MLP in Moving Simulation Mode, Proceedings of the 6th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems IDAACS2011, Sep 15-17, 2011, Prague, Czech Republic, pp. 666-671.
7. Turchenko V. Efficiency Comparison of Batch Pattern Training Algorithm of Multilayer Perceptron on Parallel Computer and Computational Cluster, Scientific Journal of National Technical University of Ukraine "Kyiv Polytechnic Institute", Kyiv, 2011, No 54, pp. 130-138 (in Ukrainian).
8. Sachenko A., Kulakov Yu., Kochan V., Turchenko V., Bykovvy P., Borovyy A. Computer Networks: A Tutorial, Ternopil, Ekonomichna dumka, 2012, 476 p. // Chapter 15. Grid-computations based on network technologies, pp. 416-439 (in Ukrainian).
9. Turchenko V., Grandinetti L., Sachenko A. Parallel Batch Pattern Training of Neural Networks on Computational Clusters, Proceedings of the 2012 International Conference on High Performance Computing & Simulation (HPCS 2012), July 2 – 6, 2012, Madrid, Spain, pp. 202-208.
10. Turchenko V., Golovko V., Sachenko A. Parallel Batch Pattern Training of Recirculation Neural Network, Proceedings of the 9th International Conference on Informatics in Control, Automation and Robotics (ICINCO 2012), July 28 – 31, 2012, Rome, Italy, pp. 644-650.
11. Turchenko V., Golovko V., Sachenko A. Parallel Training Algorithm for Radial Basis Function Neural Network, 7th International Conference on Neural Networks and Artificial Intelligence (ICNNAI'2012), October 10-12, 2012, Minsk, Belarus, pp. 47-51.

[Project 11] Efficient Parallel Batch and Single Pattern Neural Network Training Algorithms Using Open MPI and GPU-computing

Principal investigator: Dr. Volodymyr Turchenko
Partners: Prof. Jack Dongarra, Innovative Computing Lab, University of Tennessee, Knoxville, TN, USA.
Grant: Fulbright Scholar Program 2012/13

Duration: 09/2012 – 06/2013

Objectives:
1. test enhanced batch pattern parallel algorithm for NN training by changing the parameters of the internal algorithms of MPI collective functions on different parallel architectures;
2. develop GPU-based versions of the parallel batch and single pattern algorithms for NN training;
3. test experimentally the efficiency of improvement of the GPU-based version of the algorithms in comparison with their Open MPI implementations.

Main results:
1. The parallelization efficiency of the neural network training algorithm on the example of the recirculation neural network model has been researched. The Open MPI, OpenMP and CUDA-based versions of the parallel batch pattern training algorithm for recirculation neural network were implemented using C language. The parallelization efficiency of the developed algorithms has been researched on many-core parallel machine with 48 AMD Opteron 6180 SE processors, on computational cluster with 48 Intel Xeon E5520 processors, on 60-core Intel GPU Xeon Phi Coprocessor 5110P card and Nvidia Tesla C2050 GPU card using its 64 cores only (total is 1024). The experimental research of the developed algorithm using Open MPI technology showed the parallelization efficiency of 75% on 48 processors of the many-core system, 60% on 48 processors of the cluster, 70% on 60 processors of the Intel GPU Xeon Phi card. The experimental research of the developed algorithm using OpenMP technology showed lower figures, 40% of parallelization efficiency on 48 processors of the many-core system. The experimental research of the developed algorithm using CUDA technology showed 14-times speedup on one Nvidia Tesla GPU card. The developed algorithms are included to the developing library PaGaLiNNeT capable to speed-up scientific computations based on neural networks on general-purpose and hybrid (CPU+GPU) high performance computing systems.
2. The research project entitled "An Adaptive End-to-End Approach for Terabit Data Movement Optimization" was investigated. The goal of this project is to develop a novel architecture and related approaches to the end-to-end optimization of terabyte size data movement on next-generation networking and storage system technologies. The moving scientific data sets at terabits per second transfer rates over wide-area networks between geographically dispersed data centers were modeled. The set of events which describe a drop of the bandwidth in the communication network was obtained. A predictive model based on artificial neural networks to predict the duration of the event and the value of the maximum bandwidth drop was developed. I have used the developed library for parallel neural network training PaGaLiNNeT (developed by me within my previous project) and the model of a multi-layer perceptron. The experimental researches showed that the modeled events have stochastic nature and therefore it is necessary to tune the neural network model to provide desirable prediction results. This scientific collaboration with the host institution will be continued in the future.

Published results:
4. Turchenko V., Bosilca G., Bouteiller A. and Dongarra J. "Efficient Parallelization of Batch Pattern Training Algorithm on Many-core and Cluster Architectures", Proceedings of the 7th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems, Sep 12-14, 2013, Berlin, Germany, pp. 692-698.

[Project 12]   Human Biometric Identification in Video Surveillance Systems

Foreign partner: Technical University of Sofia, Bulgaria

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Bulgaria: Dr. Ognian Bumbarov

Duration: 2009 – 2010

Objectives: design of intelligent biometrical sub-system for detection and recognition of humen faces in the video surveillance systems for monitoring of public places, database support of staff or factory's visitors etc.

Main tasks:
- development of methods and algorithms for movement detection on the captured videoframes;
- development of methods and algorithms of videoframes preliminary processing by skin color;
- improvement of methods and algorithms of detection and tracing of humen face;
- development of methods and algorithms of face recognition.

Team:
- Anatoliy Sachenko
- Ihor Paliy
- Yuriy Kurylyak
- Taras Leshko

Published results:
1. Ihor Paliy, Anatoliy Sachenko, Yuriy Kurylyak, Ognian Boumbarov, Strahil Sokolov. Combined Approach to Face Detection for Biometric Identification Systems // Proceedings of 5th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, 21-23 September 2009, Rende (Cosenza), Italy, pp. 425-429.
2. Ognian Boumbarov, Strahil Sokolov, Plamen Petrov, Anatoliy Sachenko, Yuriy Kurylyak. Kernel-based Face Detection and Tracking with Adaptive Control by Kalman Filtering // Proceedings of 5th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, 21-23 September 2009, Rende (Cosenza), Italy, pp.434-439.
3. Y. Kurylyak, I. Paliy, A. Sachenko, A. Chohra, K. Madani. Face Detection on Grayscale and Color Images using Combined Cascade of Classifiers // International Journal of Computing. – Ternopil (Ukraine). – 2009. – Vol. 8, Issue 1. – pp. 61-71.
4. Y. Kurylyak A Real-Time Motion Detection for Video Surveillance System // Proceedings of 5th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS2009). – Rende (Cosenza), Italy, 2009. – pp.386-389.
5. Paliy I.O. Methods of Face Detection in Systems of Computer Recognizing on the Base of Combined Cascade of Neural Network Classifiers. – PhD Thesis, Ternopil National Economic University. – Ternopil. – 2009.

[Project 13]   Development of Intelligent Video Surveillance Systems

Principal investigator: Dr. Volodymyr Kochan

Project executed together with V.M. Glushkov Institute for Cybernetics, Prof. Vitaliy Boyun.

Duration: 2009 – 2010

Objectives: development of highspeed and relevant video surveillance system on the base of intelligent videocamera, which allows to decrease information streams between camera and worksatation central processor, as well as to read and process large images with high frame rate.

Main tasks:
- increasing of efficiency for communication channels between intelligent videocamera and personal computer;
- development of methods and algorithms of videoframes preliminary processing by skin color and movement;
- development of methods and algorithms of human face recognition on the base of combined cascades classifiers, classifiers training paralleling, and improvement of neural network training method in frame of combined cascade;
- development of algorithms of faces tracing;
- development of software and highlevel programe interface for interaction with intelligent camera; coding of developed algorithms in processor computer code for digital processing of intelligent videocamera images.

Team:
- Anatoliy Sachenko
- Ihor Paliy
- Yuriy Kurylyak

Published results:
1. Kurylyak Y.O., Sachenko A.O. Method of background image renewal for movement segmentation // Proceedings of 10-th International Conference "Modern Information and Electronic Technologies" (SIET'2009). – Odessa (Ukraine), 2009. – Vol. 1. – pp. 44.
2. Paliy I.O. Training of neural network classifiers with combined cascade for face detection // Proceedings of 10-th International Conference "Modern Information and Electronic Technologies" (SIET'2009). – Odessa (Ukraine), 2009. – Vol. 1. – pp. 42.
3. Paliy I. Face detection on grayscale and color images using combined cascade of classifiers // International Journal of Computing. – 2009. – Vol. 8. – Issue 1. – pp.61-71.

[Project 14]   Development of 3D Localization Methods for Navigation of Mobile robot

Foreign partner: Kaunas Technical University, Lithuania

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Lithuania: Prof. Rimvydas Simutis

Duration: 2009 – 2010

Objectifes: the main aim of project is development of the unified structure for autonomous mobile robot control and providing of 3D localization and navigation in non-structured environment with dynamical objects by using of new methods and means, which allow to get the possibility to give for mobile robots improved navigation characteristics and get new application of known methods.

Main tasks:
1) Analysis of known methods for design of control structure system for mobile robots (MR) and development of unified structure for autonomous MR control.
2) Development of Dataflow Diagram (DFD) for robot control system and analysis of time characteristics of DFD main modules. Setting of requirements for main MR modules.
3) Development of improved methods and means of MR control system:
   a) Development of new method of acquisition and processing of sensor data;
   b) Development of MR 3D localization methods.
4) Development of hardware and software for autonomous MR.
5) MR composing according to the requirements set in point 2, taking into account applied needs and MR hardware/software means developed in points 3-4.
6) Verification and testing of MR prototype functioning.

Team:
- Anatoliy Sachenko
- Vasyl Koval
- Oleh Adamiv
- Viktor Kapura

Published results:
1. Roth H., Sachenko A., Koval V., Chanim J., Adamiv O., Kapura V. The 3D Mapping Preparation using 2D/3D Cameras for Mobile Robot Control // Artificial Intelligence journal, Donetsk, Ukraine. – 2008. – Vol. 4. – pp. 512-521.
2. Adamiv O., Sachenko A., Kapura V. Gradient Method for Autonomous Robot Navigation // Proceedings of the Ninth International Conference "Modern Problems of Radio Engineering, Telecommunications and Computer Science" (TCSET'2008). – Lviv-Slavsko (Ukraine), 2008. – pp. 640-642.
3. O. Adamiv, V. Koval, V. Dorosh, G. Sapozhnyk, V. Kapura Mobile Robot Navigation Method for Environment with Dynamical Obstacles // Proceedings of the 5-th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS'2009). – Rende (Cosenza), Italy, 2009. – pp.515-518.
4. O. Adamiv, A. Lipnickas, A. Knyš. A stereovision system for autonomous robot navigation in 3-D // Proceedings of 10-th International Conference "Modern Information and Electronic Technologies" (SIET'2009). – Odessa (Ukraine), 2009. – Vol. 1. – pp. 28.

[Project 15]   Development of Stereovision Methods and Devices for Autonomous Navigation of Mobile Robots

Foreign partner: University of Sigen, Germany

Principal investigator from Ukraine: Prof. Anatoliy Sachenko

Principal investigator from Germany: Prof. Hubert Roth

Duration: 2008 – 2009

Objectives: Development of stereovision methods for autonomous navigation of mobile robots.

Main tasks:
- Development of stereo camera preliminary data processing methods for future integration with a mobile robot:
- Methods of generation of stereo images;
- Image filtering and analysis methods.
- Development of stereo image fusion and mobile robot environment 3D map generation methods:
- Image description methods;
- Stereo image corresponding points search and 3D map of environment generation methods.
- Development and implementation of sensor data fusion algorithms.
- Verification and testing of the developed methods using a mobile robot.

Team:
- Anatoliy Sachenko
- Vasyl Koval
- Oleh Adamiv
- Viktor Kapura

Published results:
1. Roth H., Sachenko A., Koval V., Chanim J., Adamiv O., Kapura V. The 3D Mapping Preparation using 2D/3D Cameras for Mobile Robot Control // Artificial Intelligence journal, Donetsk, Ukraine. – 2008. – Vol. 4. – pp. 512-521.
2. Adamiv O., Sachenko A., Kapura V. Gradient Method for Autonomous Robot Navigation // Proceedings of the Ninth International Conference "Modern Problems of Radio Engineering, Telecommunications and Computer Science" (TCSET'2008). – Lviv-Slavsko (Ukraine), 2008. – pp. 640-642.
3. H. Roth, A. Sachenko, V. Koval, O. Adamiv, V. Kapura Evaluation of Camera Calibration Methods for Computer Vision System of Autonomous Mobile Robot // Proceedings of 10-th International Conference "Modern Information and Electronic Technologies" (SIET'2009). – Odessa (Ukraine), 2009. – Vol. 1. – pp. 29.

[Project 16]   Development of Design and Optimization Methods of Early Intrusion Detection Systems

Foreign partner: Institute of Technology, Gebze, Turkey

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Turkey: Dr Serkan Aksoy

Duration: 2008 – 2009

Objectives: development of a Computer Aided Design (CAD) system for development of perimeter security systems optimized for quality-price, reliability-price criteria and further testing of the CAD system on real security systems.

Main tasks:
- Analysis of existing solutions and creation of a set of criteria and limitations for functional and cost analysis of security systems. Development of improved components and database for security systems.
- Development of methods and algorithms for structural synthesis and multi-criteria optimization of security systems. Development of a CAD system for security systems design based on the developed methods and algorithms.
- Development of a pilot security system with the use of the developed CAD. Testing of the pilot system.
- Carrying out a comparative analysis of the developed pilot system against existing systems. Introduction of necessary changes to the CAD system based on the conducted analysis.
- Carrying out the pilot security system testing to measure risks of undetected intrusions and risks of false alarms. Introduction of necessary changes to the pilot security system based on the conducted tests.
- Testing of the CAD system.

Team:
- Anatoliy Sachenko
- Volodymyr Kochan
- Volodymyr Turchenko
- Pavlo Bykovyy

Published results:
1. Bykovyy P. Design optimization of distributed technical security systems using a genetic algorithm // Visnyk of Vinnitsa Polytechnic Institute. – 2008, Issue #6, pp 28-34.
2. Bykovyy P., Pigovsky Yu., Kochan V., Sachenko A., Markowsky G., Aksoy S. Genetic Algorithm Implementation for Distributed Security Systems Optimization // Proceedings of the IEEE International Conference on Computational Intelligence for Measurement Systems and Applications (CIMSA 2008), 14-16 July 2008. – Istanbul, Turkey. – pp. 120-124.
3. Bykovyy P.Ye., Kochan V.V. Cryptographically secure protocol for networks of security sensors // Proceedings of 10-th International Conference "Modern Information and Electronic Technologies" (SIET'2009). – Odessa (Ukraine), 2009. – Vol. 1. – pp. 189.
4. Bykovyy P.Ye. Distributed sensor network for security systems // International journal of Computing. – Ternopil (Ukraine). – 2009. Vol. 8, Issue 2. – pp. 157-164.
5. P. Bykovyy, V. Kochan, Y. Kinakh, A. Sachenko, O. Roshchupkin, S. Aksoy, G. Markowsky. Data Communication Crypto Protocol for Security Systems Sensor Networks // Proceedings of 5th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems(IDAACS'2009). – Rende (Cosenza), Italy, 2009. – pp. 375-379.
6. P. Bykovyy, Y. Pigovsky, A. Sachenko, A. Banasik. Fuzzy Inference System for Vulnerability Risk Estimation of Perimeter Security // Proceedings of 5th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS'2009). – Rende (Cosenza), Italy, 2009. – pp. 380-384.

[Project 17] Computer Telecommunication System Based on Noise Signals

Principal investigator: Prof. Yaroslav Nikolaychuk

Project is executed together with JSC Ternopil Radio Plant 'Orion', chief designer Volodymyr Kordyak.

Duration: 2007 – 2009

Objectives: to increase noise-immunity and active range of radio stations, produced by the Orion plant; introduction of a mode of code based on division of transmission channels; development of computerized system of data acquisition based on autonomous sensors.

Project tasks:
- Design of a noise-signal based radio station with low range of operation for construction companies;
- Analysis of possible application areas for 2D noise signals;
- Analysis of possible application areas and prospective customers of computer systems based on autonomous sensors.
- Preparation of project solutions related to radio system serving and construction areas.

Team:
- Yaroslav Nykolaychuk
- Oleh Zastavnyy
- Nazar Krutskevych

Published results:
1. Nykolaychuk Y., Krutskevych N., Zastavniy O. Multibases Processors of Two-dimensional Correlation for Noise Immunity of Transfer Information // Proc. Of the IEEE International Workshop on Intelligent Data Acquisition and Advancing Computing Systems (IDAACS'2007). – 2007. – Dortmund (Germany). – pp. 315-317.

[Project 18] Dynamically Reprogrammable Network Capable Application Processor with Internet Capability

Foreign partner: Esensors Inc., USA

Principal investigator from Ukraine: Prof. Anatoliy Sachenko

Principal investigator from USA: Dr Darold Wobschall, PhD

Grant #UE2-2534-TE-07.

Duration: 2007 – 2009

Objectives: to enter the US smart sensors market with the Network Capable Application Processor (NCAP) developed within the project CRDF #UE2-2534-TE-03 – device oriented on software data processing in smart distributed measurement and control systems which uses adaptive software reconfiguration for intelligent functions execution (self-adapting and self-training). The developed NCAP will have the following features:
- ability to work in distributed measurement control systems utilizing the Internet;
- online remote reprogramming of user application software;
- support of a wide set of network interfaces;

Main tasks:
- the minimal set of the design documentation sufficient for production of a prototype NCAP has been developed;
- two prototype NCAP devices have been developed and undergo testing;
- testing of certain NCAP modules is performed, the NCAP software is being developed as well.

Team:
- Anatoliy Sachenko
- Volodymyr Kochan
- Roman Kochan
- Andrew Stepanenko
- Ihor Maykiv
- Iryna Turchenko
- Natalia Vozna

Published results:
1. Maykiv I., Stepanenko A., Wobschall D., Kochan R., Kochan V., Sachenko A., Vasylkiv N. Remote Reprogrammable NCAPs: Issues and Approaches // Proc. Of the IEEE International Workshop on Intelligent Data Acquisition and Advancing Computing Systems (IDAACS'2007). – 2007. – Dortmund (Germany). – pp. 109-113.
2. Maykiv I.M., Kochan V.V., Bilousov I.A. Project analysis of methods of serial interfaces controllers realization // Transactions of Ternopil State technical University. – 2009. – No. 1. – pp. 110-115.
3. Maykiv I.M. Investigation of I2C interface controllers realizations method on the programmed logical matrix // Proceedings of 5-th International Youth Conference "Modern Problems of Radiotechnics and Telecommunication". – Sevastopol (Ukraine), 2009. – pp. 284.
4. Maykiv I.M., Kochan V.V. Software-hardware controller of consecutive interfaces in network nodes of data acquisition // Proceedings of 10-th International Conference "Modern Information and Electronic Technologies" (SIET'2009). – Odessa (Ukraine), 2009. – Vol. 1. – pp. 138.

5. Maykiv I.M. Methodology of structural synthesis of netwok capable application processors // Proceedings of National Conference in Ternopil Ivan Pul'uj State Technical University. – Ternopil (Ukraine), 2009. – pp. 176.

6. Maykiv I.M. Software-hardware method of secuential interfaces controllers realization // Proceedings of 11-th International Conference "System Analysis and Information Technologies" (SAIT-2009). – Kyyiv (Ukraine), 2009. – pp. 437.

7. Maykiv I.M. Netwok capable application processor for distributer measuring-control systems // Transaction "Problems of Informatization and Control", Kyyiv (Ukraine). – 2009. – No. 2 (28). – pp. 187-191.

8. Maykiv I.M. Universal controlle of serial interfaces // Transactions of Chernivstsi University. Series: Physics. Electronics, Chernnivtsi (Ukraine). – 2009. – No. 3 (186). – pp. 130-135.

9. Maykiv I.M., Stepanenko A.V., Wobschall D. A method for structural synthesis of network capable application processors. // International Journal of Computing – Ternopil (Ukraine). – 2009. – Vol. 8. – Issue 2. – pp.126-138.

10. I. Maykiv, D. Wobschall, A. Stepanenko, R. Kochan, A. Sachenko, V. Kochan. Multi-port Serial NCAP using IEEE1451 Smart Transducer Standard // Proceedings of IEEE Sensor Application Symposium (SAS-2009). – New Orleans, LA, (USA), 2009. – pp. 293-297.

11. I. Maykiv, A. Stepanenko, D. Wobschall, R. Kochan, V. Kochan, A. Sachenko. Universal Controller of Serial Interfaces // Proceedings of the 5-th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS'2009). – Rende (Cosenza), Italy, 2009. – pp. 121-125.

12. Iryna Turchenko. Methods for Improving Efficiency of Data Processing Obtained from Multi-parameter Sensors in Distributed Computer Systems. Ph. D. Thesis on speciality 05.13.05 – Computer Systems and Components.- Ternopil National Economic University.- Ternopil.- 2008.- 200 p. (in Ukrainian)

13. Natalia Vozna. Forming and Organizing of Structured Data Movement in Multilevel Distributed Computer Systems. Ph. D. Thesis on speciality 05.13.05 – Computer Systems and Components.- Ternopil National Economic University. – Ternopil. – 2009. (in Ukrainian)

[Project 19]   Ternopil Education Communication Center

Foreign partner: University of Maine, USA

Principal investigator from Ukraine: Prof. Anatoliy Sachenko

Principal investigator from USA: Prof. George Markowsky

Project is granted by NATO Program of Security through Science Network Infrastructure Grant, and performed together with the University of Maine, USA.

Duration: 2006 – 2009

Objectives: Make common communication center for universities of Ternopil, agree and integrate educational networks of Ternopil Universities, introduce high-speed network for educational and research exchange.

Main tasks:
- Connect educative institutions of Ternopil to Internet through Ternopil Education Communication Center;
- Make basis for cooperation of all universities of Ternopil;
- Make basis for educative and research cooperation between universities of Ternopil and University of Maine and other researchers;
- Provide high-speed access to UARNET and GEANT networks;
- Provide abilities for holing video-conferences between Ternopil and other cities;
- Develop prototype of system, that can be implemented in other areas of Ukraine;
- Implement 16 processor cluster for GRID-processing that will be used in universities – project members;
- Create on-line library;
- Create Wi-Fi service for universities of Ternopil.

Team:
- Anatoliy Sachenko
- Serhiy Voznyak
- Ihor Romanets'
- Roman Romanyak

Published results:
1. Sachenko A. Ternopil Education Communication Center // Innovation and Communication Security (ICS) Panel Meeting. – 2006. – Kyiv (Ukraine).
2. G. Markowsky, A. Sachenko, S. Voznyak, V. Spilchuk, R. Romanyak, V. Turchenko, I. Romanets. The Ternopil Educational Communication Center – A NATO Project to Integrate Regional Information Technology Resources. Computing, 2008, Vol. 7, Issue 1.
3. Palagin O., Alishov N., Markowsky G., Sachenko A., Turchenko V. Security Tools for GRID-systems // Proceedings of the 2007 International Conference on Security ans Management. - 2007. Las Vegas, NV (USA).

[Project 20] Instruction Parameters Analysis for Power Modeling of Embedded Microprocessors

Foreign partner: Aristotle University of Thessaloniki, Thessaloniki, Greece

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Greece: Prof. Theodore Laopoulos

Project is granted by Ministry of Education and Science of Ukraine and Greek Government (agreement #M/85-2006), and performed together with the Aristotle University of Thessaloniki, Greece.

Duration: 2006 – 03.2008

Principal investigator from Ukraine: Main aim of the project is determining power consumption of each parameter of instruction: determining number and value of registers, immediate values, values and addresses of operands, address of command call, pipeline panel and substitution, examination and analysis of correlation of instructions' parameters in power consumption of instructions; examination and analysis of each parameter in power consumption of instructions; developing of accurate power models for execution level of ARM7TDMI core's instructions.

Main tasks:
Additional investigating of instructions' parameters power consumptions and developing of measurement methodology using existing measurement setup; developing new approach in measurement methodology that can determine processor's configuration. Due to this approach it is possible to measure and analyze correlation of instructions' power consumptions according to instruction's parameters; determine power consumptions; analyze and process power consumption values; develop power models for instructions; experimentally prove achieved theoretical results.

Team:
- Anatoliy Sachenko
- Volodymyr Kochan
- Volodymyr Turchenko
- Andrii Borovyi

Published results:
1. Borovyi A., Kostandakos V., Kochan V., Sachenko A., Yaskilka V. Analysis of CPU's Instructions Energy Consumption Device Circuits // Proceedings of Fourth IEEE International Workshop on Intelligent Data Acquisition and Advancing Computing Systems (IDAACS'2007). – 2007. – Dortmund (Germany). – pp. 42-46.
2. Borovyi A., Kochan V. Analysis of Microcontroller Instructions Power Consumption Measurement Circuits. Visnyk of Khmelnytskyy National University. – 2007. – Vol. 1. – #2. – pp. 105-109.
3. Borovyi A.M., Kochan V.V., Turchenko V.O. Stand for investigation of current moment value consumed by microprocessor // Transaction of Ternopil State Technical University. – 2009. – No. 1. – pp. 131-137.
4. Borovyi A.M. Analysis of power consumption by ARM7TDMI processor kernel // Proceedings of National Conference in Ternopil Ivan Pul'uj State Technical University. – Ternopil (Ukraine), 2009. – pp. 101.
5. A. Borovyi, V. Kochan, Z. Dombrovskyy, V. Turchenko, A. Sachenko Device for Measuring Instant Current Values of CPU's Energy Consumption // Proceedings of the 5-th IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS'2009). – Rende (Cosenza), Italy, 2009. – pp.126-130.

[Project 21]   Financial Analytics Method with Applications of Knowledge Bases

Principal   ultisensory from ICS: Prof. Anatoliy Sachenko

This is a joint project between National University of the State Taxation Department of Ukraine, Irpin, Ukraine and Research Institute for Intelligent Computer Systems, Ternopil, Ukraine.

Duration: 09.2008 – 11.2008

Objectives: evaluation of the present state and selection of priority directions for implementation of intelligent information technologies of financial analytics and knowledge bases in governmental resource management processes.

Main tasks:
- evaluation of the present state and investigation of theoretical research in information technologies for financial analytics with application of knowledge bases in management of governmental institutions;
- investigation of possible intelligent computer technologies application in the domain of financial analytics ontologies in governmental management;
- evaluation of the state and perspectives of ontology intelligent tools using in methods of financial analytics;
- development of technologies in area of intelectulazation of information-analytical processes and creation of financial analytics knowledge bases in governmental management;
- the conducted activity enabled to provide functional completeness of solutions to the defined research tasks and creation of documentation as per the Requirements Specification;
- research and creation of the output documentation were performed on the basis of a systematic approach, conceptual completeness of results and consistency;
- the conducted work follows the principal of minimal implementation costs for the proposed solutions.

Team:
- Anatoliy Sachenko
- Taras Lendyuk

Published results:
1. Palagin A., Rippa S. and Sachenko A. Conceptualization and problems of ontologies // Journal of Artificial Intelligence, 2008 Vol. 3, pp 374-379.

[Project 22]   Development of Effective GRID-technologies for Ecology Monitoring Using Satellite Data

Principal investigator from ICS: Prof. Anatoliy Sachenko
Principal investigator NSAU: Prof. Nataliya Kussul

Collaborative project of Scientific-Technologic Centre in Ukraine and National Sciences Academy of Ukraine has been performed together with the Space Research Institute of National Sciences Academy of Ukraine and National Aerospace Agency of Ukraine, Kyiv.

Grant STCU #3872

Duration: 12.2005 – 12.2007

Objectives: Development of an effective distributed computations techniques that provide simple and transparent solutions to the computationally-complicated tasks in different areas, especially associated with space data processing.

Main tasks:
- developing methodology for constructing temporal interpolation earth atmosphere photographs;
- developing methodology for predicting solar activity and corresponding algorithms for holding parallel computations;
- developing parallel implementation modeling methods algorithms for dynamics of main processes in multi-component ground environments with the corresponding cluster.
- developing GRID-service for monitoring and control tasks' solutions process in system;
- developing GRID-service for balancing system loading;
- developing GRID-service for visualization of computational results;
- developing GRID-service for granting users' access to system;
- developing service for system security purposes;
- uniting some clusters or computational networks into one complex for working under solution for the same task.

Team:
- Anatoliy Sachenko
- Volodymyr Turchenko
- Viktor Demchuk

Published results:
1. Turchenko V., Demchuk V., Sachenko A. Interplanetary Shock Arrival Time Prediction Using Multi-Layer Perceptron // Proceedings of the 4th IEEE Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications IDAACS'2007. – 2007. – Dortmund (Germany). – pp. 185-190.
2. Turchenko V. An Approach to IP Shock Arrival Time Prediction Using Approximating Neural Network // International Journal of Information Technology and Intelligent Computing. – 2007. – No. 4. – Vol. 1.
3. V. Turchenko, V. Demchuk, A. Sachenko, Y. Veremeyenko. An Approach to Interplanetary Shocks Prediction Using Single ACE/EPAM Channel Data // Proceedings of the Fourth International Conference on Neural Networks and Artificial Intelligence ICNNAI'2006. – 2006. – Brest (Belarus). – pp. 140-144.

[Project 23] Development of Web Ontologies as Data Exchange and Decision Support Tools to Facilitate Economic Cooperation between Ukraine and USA

Foreign partner: New Jersey Institute of Technology, USA

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from USA: Dr. Yefim Kats

Project had been performed according to Research program of the US National Science Foundation.

Grant # NSF-04-12

Duration: 2004 – 2007

Objectives: develop Web-ontologies as data exchange and decision making instrument for promotion of economic partnership between Ukraine and USA.

Main tasks:
- Standard ontology dictionary used in economical interchange, including dictionaries for typical e-commerce models, identification.
- Identifying objects as classes or relations with adequate limiting interpretation.
- Identifying specific ontology relations for (intelligence) agents based on automated processing.
- Developing Windows object library compatible apparatus for measuring possible ontology errors.

Team:
- Anatoliy Sachenko
- Roman Pasichnyk
- Yuriy Pihovsky
- Andrii Melnyk

Published results:
1. Pasichnyk R., Sachenko A. Semantic WEB-Search Developing by Problem-Oriented Ontology Means // Proceedings of the IEEE International Workshop IDAACS'2007. – 2007. – Dortmund (Germany). – pp. 445-448.
2. Hrusha V. Specifics of Ontologies Design and Application in proceedings of the 11th scientific conference of Ternopil State Technical University. – 2007. – Ternopil: TSTU. – pp. 78.
3. R. Pasichnyk, A. Sachenko, A. Melnyk "Formalization of ontology creation process using base classes" in proceedings of the 13th national conference "Modern problems of applied mathematics and informatics", Lviv, October 3-5 2006, P.162-163.
4. Master thesis by Andrii Melnyk was defended in 2006.
5. Course thesis by Andrii Melnyk was defended in 2005.
6. Master thesis by Vitaliy Kharchuk was defended in 2004.

[Project 24] Dynamically Reprogrammable Network Capable Application Processor with Internet Capability

Principal investigator: Prof. Anatoliy Sachenko

The project is funded under the Ministry of Education and Science of Ukraine

Grant #0107U005985.

Duration: 08.2007 – 12.2007

Objectives: to enter the US smart sensors market with the Network Capable Application Processor (NCAP) developed within the project CRDF #UE2-2534-TE-03 – device oriented on software data processing in smart distributed measurement and control systems which uses adaptive software reconfiguration for intelligent functions execution (self-adapting and self-training). The developed NCAP will have the following features:
-   ability to work in distributed measurement control systems utilizing the Internet;
-   online remote reprogramming of user application software;
-   support of a wide set of network interfaces.

Main tasks:
-   a minimal set of the design documentation sufficient for production of a prototype NCAP had been developed, which allowed to choose its elemental basis and embodiment;
-   there was developed a package of structural documentation;
-   there was developed software for interface microcontroller, which provides software support of hardware drivers for supported interfaces – data link layer, IP protocol (Internet Protocol) – network layer, TCP protocol (Transport Control Protocol) – transport layer, HTTP protocol (Hypertext Transfer Protocol) – session layer, dynamical HTML-page, where the data is presented and gets on all supported interfaces and can be read – presentation layer;
-   two prototype NCAP devices had been developed and underwent testing that allows to debug application software of its microcontrollers and their interaction between each other, as well as with the server and measuring-control modules in real time.

Team:
-   Anatoliy Sachenko
-   Volodymyr Kochan
-   Roman Kochan
-   Andrew Stepanenko
-   Ihor Maykiv
-   Pavlo Bykovyy

Published results:
1. Maykiv I., Stepanenko A., Wobschall D., Kochan R., Kochan V., Sachenko A., Vasylkiv N. Remote Reprogrammable NCAPs: Issues and Approaches // Proc. Of the IEEE International Workshop on Intelligent Data Acquisition and Advancing Computing Systems (IDAACS'2007). – 2007. – Dortmund (Germany). – pp. 109-113.
2. Stepanenko A., Maykiv I., Wobschall D., Kochan R., Kochan V., Sachenko A, Multi-port Serial NCAP Using IEEE1451 Smart Transducer Standard // Proceedings of the IEEE Sensor Application Simposium SAS'2009, 17-19 February, 2009, New Orleans, USA, pp. 293-297.

[Project 25] Investigation of the Intelligent Properties of Re-Configurable Network Capable Application Processor in Adaptive Distributed Instrumentation and Control Systems

Foreign partner: Sensors Development and Applications Group, National Institute Standards and Technologies, USA

Principal investigator from Ukraine: Dr. Volodymyr Kochan
Principal investigator from USA: Kang Lee
This project has been performed within US Civilian Research and Development Foundation (Cooperative Grant Program).

Grant # CRDF.CGP. UE2-2534-TE-03

Duration: 2005 – 2006

Objectives: Development of the IEEE-1451 standard compatible Network Capable Application Processor (NCAP) with dynamic software and hardware reconfiguration and investigation of its self-adaptive and intelligent properties in information-measurement systems.

Main tasks:
- Investigation of the NCAP's intelligent properties to be used with smart sensors, deployed in distributed information measurement systems with different architectures and functional requirements.
- Extension of the NCAP's functional features compatible with the IEEE1451 standard to support dynamic online reprogramming of software and a set of network interfaces.
- Development and investigation of the prototype NCAP and its programming methodology.

Team:
- Volodymyr Kochan
- Anatoliy Sachenko
- Roman Kochan
- Oleh Adamiv
- Iryna Turchenko
- Andriy Stepanenko

Published results:
1. Kochan V., Lee K., Kochan R., Sachenko A. Approach to Improving Network Capable Application Processor Based on IEEE 1451 Standard // Computer Standards & Interfaces. – 2005. – Vol. 28. – Issue2. – pp. 141-149.
2. Stepanenko A., Lee K., Kochan R., Kochan V., Sachenko A. Development of a Minimal IEEE1451.1 Model for 8051-Compatible Microcontrollers // Proc. Of the 2006 IEEE Sensors Applications Symposium. – 2006. – Houston, Texas (USA). – pp. 88-93.
3. Kochan R., Kochan V., Sachenko A., Maykiv I., Turchenko V, Markowsky G. Interface and Reprogramming Controller for Dynamically Reprogrammable Network Capable Application Processor (NCAP). // Proc. Of 3-th IEEE International workshop on Intelligent Data Acquisition and Advancing Computing Systems (IDAACS'2005). – 2005. – Sofia (Bulgaria). – pp. 639-642.
4. Kochan R., Kochan V., Sachenko A., Maykiv I. NCAP Based on FPGA // Proc. Of the IEEE Instrumentation and Measurement Technology Conference IMTC/2005. – 2005. – Ottawa, Ontario (Canada). – pp. 813-817.
5. Kochan R., Lee K., Kochan V., Sachenko A. Development of a Dynamically Reprogrammable NCAP // Proc. Of the IEEE Instrumentation and Measurement Technology Conference IMTC/2004. – 2004. – Como (Italy). – pp. 1188-1193.
6. Roman Kochan. Improvement of components of precision distributed information control systems: Ph.D. Theses on speciality 05.11.16 / Ternopil Academy of National economy. – Ternopil, 2005. – 193 p.

[Project 26]   Methods and Algorithms for Face Detection and Recognition for Real Time Video Surveillance Systems

Foreign partner: Belarus State University of Informatics and Radio Electronics, Belarus

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Belarus: Prof. Rauf Sadykov

This project has been performed in frames of State fund of fundamental research programs,

Ministry of Education and Science of Ukraine order #356 dated to 14.06.05.

Duration: 2005 – 2006

Objectives: Development of algorithms for preliminary processing of images based on segmentations and development of algorithms and software for face detection in static vision conditions.

Main tasks:
- Development of effective algorithms and software for capturing face images in video stream;
- Development of approximate 3-dimension face models;
- Development of algorithms for selection of informative features and classification of images according to modified syntactical discriminator functions;
- conducting experimental diagnosis and configuration of proposed algorithms for achieving maximum results of program model;
- development of a software system which implements the designed recognition schema.

Team:
- Anatoliy Sachenko
- Vasyl Koval
- Ihor Paliy
- Yuriy Kurylyak
- Victor Kapura

Published results:
1. Y. Kurylyak. System of Face Detection at Static Images. – 2006. – 83p.
2. Y. Kurylyak, Ihor Paliy, Vasyl Koval, Anatoliy Sachenko. Improved Method of ace Detection Using Color Images // Proceedings of the International Conference "Modern Problems of Radio Engineering, Telecommunications and Computer Science" TCSET'2006. – Feb'28 – Mar'4, 2006. – Lviv-Slavske, Ukraine. – pp. 186-188.
3. A. Sachenko, V. Koval, I. Paliy, Y. Kurylyak. Approach to Face Recognition Using Neural Networks // Proceedings of the IEEE Second International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications IDAACS'2005, Sofia, Bulgaria, September 5-7, 2005, pp. 112-115.

[Project 27]   Development of Methods and Tools for Improvement of Robot Navigation in a non-Structured Environment

Foreign partner: Kaunas Technical University, Lithuania

Principal investigator from Ukraine: Prof. Anatoliy Sachenko

Principal investigator from Lithuania: Dr Arunas Raudis

This project has been performed in frames of State Fund for Fundamental Research Programs, Ministry of Education and Science of Ukraine order #174 dated by 23.03.05.

Duration: 2005 – 2006

Objectives: Development of methods and tools for improvement of mobile robot navigation in non-structured environment.

Main tasks:
- Development of methodology for creation of a mobile robot management system, which reflects schemes for conforming mobile robot subsystems for ensuring unobstructed navigation in non-structured environment.
- Development and implementation of main concepts for processing sensor data and creating environmental local map to improve robot navigation in non-structured environment with the help of artificial neural networks.
- Development and implementation of effective and self-adaptive methods for robot navigation and pathway planning.
- Research of experimental methods (with the use of imitation modeling and neural network resources).

Team:
- Anatoliy Sachenko
- Vasyl Koval
- Oleh Adamiv
- Yuriy Kurylyak
- Maxym Lunochkin
- Serhiy Maystrenko

Published results:
1. Koval V., Adamiv O. The Software Structure Development for Mobile Robot Control // Proceedings of the IEEE Second International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications IDAACS'2005. – 2005. – Sofia (Bulgaria). – pp. 120-124.
2. Oleh Adamiv. Models and Intelligent Means of Autonomous Mobile Robot Adaptive Control: Ph.D. Theses on speciality: 05.13.23 / Ternopil National Economic University. – Ternopil, 2007. – 166 p.

[Project 28]   Development of Parallel Neural Networks Training Algorithms on Advanced High Performance Systems

Foreign partner: Parallel Computing Laboratory, Department of Electronics, Computer Science and Systems, University of Calabria, Italy

Principal investigator from Ukraine: Dr. Volodymyr Turchenko
Principal investigator from Italy: Prof. Lucio Grandinetti

Grant # INTAS YSF 03-55-2493

Duration: 2004 – 2006

Main tasks:
- Develop a parallel algorithm of enhanced data integration method using C programming language and MPI parallelization technology.
- Design and implement in C programming language and MPI parallelization technology two new methods of coarse-grain neural network parallelization which provides high efficiency of parallelization at the certain training parameters of neural networks and dynamic mapping method, which is more universal than static and shows better efficiency at different initial parameters of neural networks and provides parallelization. A series of on-line computational experiments of the above mentioned algorithms of the parallel machines SGI Origin 300, NEC TX-7 is performed and the computational grid consists of the cluster of double-processor Compaq personal computers under Linux operation system and Globus middleware package.
- Develop and implement in C programming language using MPI and MPE libraries the fine-grain parallel training algorithm of multilayer perceptron with parallelization of the outputs of hidden layer neurons at the initial stage of information processing inside neural network module.
- Compare the advantages and disadvantages of middleware technologies, in particular Globus, in a case of coarse-grain parallelization algorithm of Integration Historical Data Neural Networks with dynamic mapping on the parallel computer Origin 300 without using middleware package and on the computational grid operated by Globus middleware package.

Published results:
1. V. Turchenko. Parallel Algorithm of Dynamic Mapping of Integrating Historical Data Neural Networks, Information Technologies and Systems, 2004, Vol. 7, No. 1, pp. 45-52, ISSN: 0135-5465, http://www.tanet.edu.te.ua/iics/vtu/B7.pdf.
2. V. Turchenko, V. Demchuk. Efficiency Analysis of Parallel Routine Using Processor Time Visualization, International Scientific Journal of Computing, 2005, Vol. 4, Issue 1, pp. 12-18, ISSN: 1727-6209, http://www.tanet.edu.te.ua/computing/Computing2005Vol4Issue1-12-18.pdf.
3. V. Turchenko. Computational Grid vs. Parallel Computer for Coarse-Grain Parallelization of Neural Networks Training, Lecture Notes in Computing Science LNCS 3762, Edited by Robert Meersman, Zahir Tari, Pilar Herrero, Berlin, Heidelberg, New York, Springer-Verlag, 2005, pp. 357-366, ISSN: 0302-9743, http://dx.doi.org/10.1007/11575863_55.
4. V. Turchenko, C. Triki, L. Grandinetti, A. Sachenko. Efficiency Estimation of Parallel Algorithm of Enhanced Historical Data Integration on Computational Grid, International Scientific Journal of Computing, 2005, Vol. 4, Issue 3, pp. 9-19, ISSN: 1727-6209, http://www.tanet.edu.te.ua/computing/Computing2005Vol4Issue3-9-19.pdf.
5. V. Turchenko. Fine-Grain Approach to Development of Parallel Training Algorithm of Multi-Layer Perceptron, Artificial Intelligence, 2006, Vol. 1, pp. 94-102, ISSN 1561-5359, http://www.tanet.edu.te.ua/iics/vtu/B1.pdf.

[Project 29] Development of a Web-based Measurement System with Distributed Intelligence

Foreign partner: Laboratory of Signal Processing and Information Measurement University of Sannio, Benevento, Italy

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Italy: Prof. Pasquale Daponte

Project was performed under the Ministry of Education and Science of Ukraine order #M/79-2004, state registration #0104U006975.

Duration: 2004 – 2006

Objectives: to create a distributed measurement system (based on Intranet and Internet technologies), that can provide high accuracy sensor data processing by the use of artificial neural networks. The system's feature is remote units working in real time mode during long delays in data link layer, and costs decrease is achieved by shifting of some intelligent functions to a main server.

Main tasks:
- Development of distributed measurement system architecture with either Internet- or Intranet-technologies.
- Research and design of networked software structures. Development of software for distributed system using Web-technologies.
- Testing and verification of the developed software for distributed measurement system.

Team:
- Anatoliy Sachenko
- Volodymyr Turchenko
- Volodymyr Kochan
- Roman Kochan
- Iryna Turchenko
- Volodymyr Hrusha
- Olexandr Osolinskiy

Published results:
1. V. Hrusha, O. Osolinskiy, P. Daponte, D. Grimaldi, R. Kochan, A. Sachenko, I. Turchenko. Distributed Web-based Measurement System // IEEE Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications. 5-7 September 2005, Sofia, Bulgaria – pp. 355 -358.
2. V. Hrusha, O. Osolinskiy, R. Kochan, G. Sapojnyk Development of Web-based instrumentation, Proc. Of the International Conference "Modern Problems of Radio-Engineering, Telecommunications and Computer Science" TCSET'2006, February 28 – March 4, 2006, Lviv-Slavsko, Ukraine – pp. 199-201.
3. V. Hrusha, O. Osolinskiy, P. Daponte, D. Grimaldi, R. Kochan, A. Sachenko, I. Turchenko. Distributed Web-based Measurement System // IEEE Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications. 5-7 September 2005, Sofia, Bulgaria – pp. 355 -358.
4. I. Turchenko, V. Kochan, A. Sachenko, R. Kochan, A. Stepanenko, P.Daponte D. Grimaldi "Simulation Modeling of Neural-Based Method of Multi-Sensor Output Signal Recognition" in Proceedings of 2006 IEEE Instrumentation and Measurement Technology Conference IMTC/06. – April 24-27, 2006. – Sorrento (Italy). – pp. 1530-1535.

[Project 30]   Design of Distributed Sensor Network for Ayers Island Security Using Value Analysis Technology

Foreign partner: Department of Computer Science, University of Maine, USA

Projects investigator from Ukraine: Prof. Anatoliy Sachenko
Projects investigator from USA: Prof. George Markowsky

Project had been performed within the frames of the First Steps to Market program of the US Civilian Research and Development Foundation.

Grant # CRDF FSTM UM2-5012-TE-03

Duration: 2003 – 2005

Objectives: investigating possibilities for developing distributed sensor network with defined features for providing security Ayers Island, Orono, ME, USA.

Main tasks:
-   Analyze component and perimeter security systems vendors, examine well-known perimeter security systems.
-   Propose algorithm for defining key functional indicators for perimeter security distributed systems components that can optimize preparing procedure for CAD, appointed for design and optimization according to functional-price characteristics security system. This algorithm usage filled DB with functional-price characteristics for perimeter area security systems components that are unified and eligible for creating CAD.
-   Morphological matrix method was proposed for optimization according to functional-price characteristics of designed security systems and selecting variants of DSN that create Paret boundaries for all alternative variants according to two key functional characteristics.
-   CAD software module was developed, functions for all modules were described, and major requirements to perimeter area security systems CAD were established. Proposed CAD allows to design projects perimeter area security systems, using perimeter area security systems components database.
-   Demonstrate CAD version that was used for developing perimeter area security systems for Ayers island in Orono, ME according to quality, reliability and price characteristics.

Team:
-   Anatoliy Sachenko
-   Volodymyr Turchenko
-   Volodymyr Kochan
-   Pavlo Bykovyy

Published results:
1. Bykovyy P. Choosing of Technical & Economic Indices for Knowledge Base of Perimeter Security Systems // Proceedings of the 2004 IEEE International Conference on Intelligent Systems 3. – 2004. Bulgaria. – pp. 54-57.
2. I. Turchenko, V. Turchenko, V. Kochan, P. Bykovyy, A. Sachenko and G. Markowsky. "Database Design for CAD System Optimizing Distributed Sensor Networks for Perimeter Security." Proceedings of the 8th IASTED International Conference on Software Engineering and Applications SEA'2004 (2004): 59-64. (USA)
3. R. Kochan, V. Kochan, A. Sachenko, I. Maykiv, I. Turchenko and G. Markowsky. "Network Capable Application Processor based on FPGA." Proceedings of the 22nd IEEE Instrumentation and Measurement Technology Conference IMTC 2005 II (2005): 813-817. (Canada)
4. P. Bykovyy, I. Maykiv, I. Turchenko, O. Kochan, V. Yatskiv and G. Markowsky. "A Low-Cost Network Controller for Security Systems." Proceedings of the 3rd IEEE International Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications IDAACS'05 (2005): 388-391. (Bulgaria)

[Project 31]   Development of Intelligent Precision System for Thermal Objects Control

Foreign partner: Department of Automatics, the University of Mons, Belgium

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Belgium: Prof. Marcel Remy

The project had been performed under the NATO (Cooperative Science & Technology Sub-Program).

Grant NATO PST.CLG.977647

Duration: 2002 – 2004

Objectives: development precision and self-adaptive temperature control system for temperature objects with multi-zone linked control.

Main tasks:
-   Analysis of precision thermal objects and their control systems;
-   Analysis of error control system components and ways for reducing their influence on general system error.
-   Development of constructive-technological and structural-algorithmic methods for improving accuracy of measuring channels and control channels for multi-zone thermal objects.
-   Development of result processing methods for defining thermal objects parameters.
-   Adaptation of random small perturbation method for thermal objects with multi-zone linked control.

Team:
-   Anatoliy Sachenko
-   Roman Pasichnyk
-   Volodymyr Kochan
-   Volodymyr Turchenko
-   Roman Kochan
-   Nadia Vasylkiv
-   Yuriy Pihovsky
-   Mykola Derlytsya

Published results:
1. Derlytsya M., Pigovsky Y., Pasichnyk R., Kochan V. Improved Control System of Multi-Zone Thermal Object // Scientific Journal of Khmelnytsky Podillya Technical University. – 2004. – No. 2. – Vol. 1. – pp. 30-33.
2. Kochan V., Vasylkiv N., Chyrka M. The Error Evaluation of Temperature Measurement in Diffusion Furnace // Proceedings of the VIII International Conference Temperature. – 2003. – Lviv (Ukraine). – pp. 33.
3. Sachenko A., Kochan V., Pasichnyk R. Development of the Simulation Model of Thermocouples // Proceedings of the IEEE Instrumentation and Measurement Technology Conference IMTC/2003. – 2003. – Vail, CO. – pp. 1673-1677.
4. Derlytsya M. Improvement of the PC Based System of Optimal Control of Multi-Zone Thermal Object // Master Thesis, Ternopil Academy of National Economy. – 2004.
5. Pigovsky Y. Simulation Model for Effectivity Control of the Chip Manufacturing Process // Master Thesis, Ternopil Academy of National Economy. – 2004.

[Project 32]   Using Multisensor Fusion and Neural Networks Techniques for Robot Control
Foreign partner: Laboratory of Robotics Systems, Unevirsity of La Coruña, Spain

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Ukraine: Prof. Richard Duro

The project had been performed under the NATO (Cooperative Science & Technology Sub-Program).

Grant NATO PST.CLG.978744

Duration: 2002 – 2004

Objectives: development and implementation of main concepts of merging sensor data, using neural networks for controlling mobile robot. It is assumed that robot's movement is performed in unknown (dangerous for human) environment. Main purpose is the endpoint reached through obstructions.

Main tasks:
- Development of new methods for merging sensor data, using neural networks.
- Development of algorithms and software for merging sensor data subsystem.
- Hardware implementation of merging methods for sensor data on mobile robot.
- Verification and testing procedures of developed engines for merging sensor data on mobile robot.
-

Team:
- Anatoliy Sachenko
- Volodymyr Turchenko
- Vasyl Koval
- Oleh Adamiv

Published results:
2. Koval V. The Fusion of Structured Light and Video Image for Mobile Robot Control // Scientific and Technical Journal Artificial Intelligence. – 2004. – Donetsk (Ukraine). – No1.
3. Koval V. The Method of Obstacle Detection Using Fusion Technique of Heterogeneous Sensors // ASU and Automatic Devices. – 2004. – Kharkiv (Ukraine). – pp. 128-135.
4. Koval V., Turchenko V., Kochan V., Sachenko A., Markowsky G. Smart License Plate Recognition System Based on Image Processing Using Neural Network // Computing. – 2003. – Vol. 2. – Issue 2. – pp. 40-46.
5. Adamiv O., Koval V., Turchenko I. Predetermined Movement of Mobile Robot Using Neural Networks // International Scientific Journal Computing. – 2003. – Ternopil (Ukraine). – Vol. 2. – Issue 2. – pp. 64-68.
6. Koval V., Turchenko V., Sachenko A., Becerra J., Duro R., Golovko V. Infrared Sensor Data Correction for Local Area Map Construction by a Mobile Robot // The Lecture Notes in Artificial Intelligence, LNAI2718. – 2003. – pp. 306-315.
7. Koval V. The Method of Local Area Map Construction for Mobile Robot // Scientific Journal of Ternopil State Technical University I.Pulyuj. – 2002. – Ternopil (Ukraine). – Vol. 8. – No2. – pp. 80-88.
8. V. Koval, "Adversary merging sensor data algorithm on   ultisensory systems", // Sensors and systems, #7 (38) Sep. 2002. Pp.39-41.
9. Vasyl Koval. Methods and Algorithms of Map Development of Mobile Robot Environment Using Sensor Data Fusion: Ph.D. Theses on speciality 05.13.23 / Ternopil Academy of National Economy; NAS of Ukraine; State Research Institute of Information Infrastructure. – Ternopil, 2004. – 208 p.

[Project 33] Development of an Intelligent Sensing Instrumentation Structure

Foreign partners: Electronic Laboratory, Aristotle University, Thessaloniki, Greece, Parallel Computations Laboratory, University of Calabria, Italy, Department of Electronics at Brest Polytechnic Institute, Belarus.

Principal investigator from Ukraine: Prof. Anatoliy Sachenko
Principal investigator from Greece: Prof. Theodore Laopoulos
Principal investigator from Italy: Prof. Lucio Grandinetti
Principal investigator from Belarus: Prof. Volodymyr Golovko

The project had been performed under the "INTAS Open Call" program, grant # INTAS OPEN 97-0606.

Duration: 1999 – 2001

Objective: development of information measurement system for increase of measurement accuracy using automated correction of instrumental compound measurement error.

Research tasks:
- Target area analysis and requirements definition for intelligent sensor measurement system;
- Development of distributed structure for intelligent sensor measurement system;
- Development of methods for result processing with the target objective to increase the system's operational characteristics;
- Development and testing of the prototype intelligent sensor measurement system.

Team:
- Anatoliy Sachenko
- Volodymyr Kochan
- Volodymyr Turchenko
- Roman Kochan

Published results:
1. Sachenko A., Kochan V., Turchenko V., Tymchyshyn V., Vasylkiv N. Intelligent Nodes for Distributed Sensor Network // Proceedings of the 16th IEEE Instrumentation and Measurement Technology Conference IMTC/99. – 1999. – Venice (Italy). – Vol. 3. – pp. 1479-1484.
2. Golovko V., Grandinetti L., Kochan V., Laopoulos T., Sachenko A., Turchenko V. Tymchyshyn V. Approach of an Intelligent sensing Instrumentation Structure Development // Proceedings of the IEEE Intenational Workshop on Intelligent Signal Processing WISP'99? Budapest, Hungary, 4-6 September, 1999. – pp. 336-341.
3. Sachenko A., Kochan V., Turchenko V., Laopoulos T., Golovko V., Grandinetti L. Features of Intelligent Distributed Sensor Network Higher Level Development // Proceedings of the 17th IEEE Instrumentation and Measurement Technology Conference IMTC/2000. – 2000. – Baltimore (USA). – pp. 335-340.
4. Sachenko A., Kochan V., Turchenko V., Golovko V., Savitsky Y., Dunets A., Laopoulos T. Sensor Errors Prediction Using Neural Networks // Proceedings of the IEEE-INNS-ENNS International Joint Conference on Neural Networks IJCNN'2000. – 2000. – Como (Italy). – Vol. IV. – pp. 441-446.
5. Sachenko A., Kochan V., Kochan R., Turchenko V., Tsahouridis K., Laopoulos Th. Error Compensation in an Intelligent Sensing Instrumentation System, 18th IEEE Instrumentation and Measurement Technology Conference IMTC/2001. – 2001. – Budapest (Hungary). – pp. 869-874.
6. Turchenko V., Kochan V., Sachenko A., Laopoulos Th. The New Method of Historical Data Integration Using Neural Networks // Proceedings of the International Workshop on Intelligent

Data Acquisition and Advanced Computing Systems IDAACS'2001. – 2001. – Foros (Ukraine). – pp. 21-24.

7. Turchenko V., Kochan V., Sachenko A. Estimation of Computational Complexity of Sensor Accuracy Improvement Algorithm Based on Neural Networks // Lecture Notes in Computing Science, No 2130, Ed. By G.Gooss, J.Hartmanis and J. van Leeuwen, Springer-Verlag, Berlin, Heidelberg, New York. – 2001. – pp. 743-748.

8. Volodymyr Turchenko. Neural Network Methods and Means of Efficiency Improvement of Distributive Networks of Sensor Data Acquisition and Processing: Ph.D. Theses on speciality 05.13.13 / Lviv National Polytechnical University. – Lviv, 2001. – 188 p.

9. Volodymyr Tymchychyn. Efficiency Increasing of Specialized Computer System Design on the Base of Typical Microprocessor Platforms: Ph.D. Theses on speciality 05.13.13 / Lviv National Polytechnical University. – Lviv, 1999. – 200 p.

10. Patent of Ukraine 25609A, MKI G06F 15/00. Two-Wired Local Area Network, Signal Repeater and Invertor for Using in it / V. Kochan, V. Tymchyshyn (Ukraine); Applied 30.10.97 # 97105295; Issued 30.10.98.

11. Patent of Ukraine 25498A, MKI G06F 11/00. Method of Communication Channel Bandwith Increasing on the Base of Serial Interface and Device for it Realisation / V. Kochan, V. Tymchyshyn (Ukraine); Applied 27.01.98 # 98010432; Issued 30.10.98.

4. RESEARCH ACTIVITIES

IDAACS Conferences and Symposia

A – IDAACS Conferences

Prof. Lucio Grandinetti (Italy), Prof. Theodore Laopoulos (Greece) and Prof. Anatoliy Sachenko (Ukraine) proposed the idea of IDAACS Workshop during the working meeting in Cetraro, Italy, in June 2000. One of the main strategic goals of IDAACS is a promotion of the close scientific cooperation between the research teams and scientists from the countries of Western and Eastern Europe. Therefore, the Workshop's motto is "IDAACS – the crossing point of Intelligent Data Acquisition & Advanced Computing Systems and East & West Scientists". In 2011 the name 'IDAACS Workshop' has transformed in 'IDAACS Conference'. Since 2001 the following IDAACS Workshops and Conferences have organized:

- IDAACS'2001. July1-4 2001, Foros, Crimea, Ukraine.
- Workshop Chairman: Anatoly Sachenko
- Co-Chairmen of International Program Committee (IPC): Theodore Laopoulos, Greece, Robert E. Hiromoto, USA
- Statistics: 70 participants, 18 countries, 112 papers, 30 oral and 35 poster presentations, 280 P., 1 Vol .
- Special Issues: International Journal of Computing
- Sponsors: INTAS, NEC, HP invent, Science & Technology Center in Ukraine(STCU), Aval bank, Institute of Computer Information Technologies, IEEE Instrumentation & Measurement Society, IEEE Region 8.

- IDAACS'2003. August 8-10 2003, National University "Lviv's Polytechnic ", Lviv, Ukraine.
- Workshop Co-Chairmen: Anatoly Sachenko, Bohdan Stadnyk, Ukraine
- IPC Co-Chairmen: Lucio Grandinetti, Italy, Fernando Lopes Pena, Spain
- Statistics: 85 participants, 21 countries, 112 papers, 60 oral and 52 poster presentations, 529 P., 1 Vol.
- Special Issues: International Journal of Computer Standards & Interfaces, IEEE Transactions on Instrumentation and Measurement, International Journal of Computing, Sensors & Systems
- Sponsors: Ternopil Academy of National Economy (TANE) of IEEE Instrumentation & Measurement Society, STCU at MES of Ukraine, Aval bank.

- IDAACS'2005. September 5-7 2005, Technical University of Sophia, Sophia, Bulgaria.
- Workshop Co-Chairmen: Anatoliy Sachenko, Ukraine, Plamenka Borovska, Bulgaria
- IPC Co-Chairmen: Domenico Grimaldi, Italy, Peter A. J. Reusch, Germany
- Statistics: 99 participants, 27 countries, 147 papers, 96 oral and 51 poster presentations, 738 P., 1 Vol.
- Special Issues: International Journal of Computer Standards & Interfaces, IEEE Transactions on Instrumentation and Measurement, Journal of Computing, Sensors & Systems
- Sponsors: TANE, Technical University of Sophia, STCU, IEEE Bulgaria Section, IEEE Computer Chapter of Bulgaria Section.

- IDAACS'2007. September 6-8 2007, University of Applied Sciences Fachhochschule Dortmund, Dortmund, Germany.
- Workshop Co-Chairmen: Anatoliy Sachenko, Ukraine, Peter J. A. Reusch, Germany

- IPC Co-Chairmen: Richard Duro, Spain,Wieslaw Winiecki, Poland
- Statistics: 105 participants, 35 countries,180 papers, 95 oral and 52 poster presentations, 720 P., 1 Vol.
- Special Issues: IEEE Transactions on Instrumentation and Measurement, Journal of Computing, Sensors & Systems
- Sponsors: TNEU, University of Applied Sciences Fachhochschule Dortmund, IEEE Instrumentation & Measurement Society, RWE Systems AG, DSW21, Anna and Hermann Reusch Foundation, the Deutsche Forschungsgemeinschaft (German Research Foundation).

- IDAACS'2009. September 21-23 2009, Department of Electronics, Informatics and Systems, University of Calabria, Rende, Italy.
- Workshop Co-Chairmen: Anatoliy Sachenko, Ukraine, Domenico Grimaldi, Italy
- IPC Co-Chairmen: Vladimir Oleschuk, Norway, Dominique Dallet, France
- Statistics: 122 participants, 25 countries,142 papers, 86 oral and 56 poster presentations, 722 P., 1 Vol.
- Special Issues: River Publishers, International Journal of Computing
- Sponsors: Ukraine I&M / CI Joint Societies Chapter, University of the Calabria, Department of Electronics at University of the Calabria, IEEE Ukraine Section, IEEE Instrumentation & Measurement Society, IEEE Italy Section, IEEE Region 8. Workshop participant approved the IPS proposal to change the status from "Workshop" to "Conference"

- IDAACS'2011. September 15-17 2011, Czech Technical University in Prague, Prague, Czech Republic.
- Conference Co-Chairmen: Anatoliy Sachenko, Ukraine, Domenico Grimaldi, Italy
- IPC Co-Chairmen: Dana Petcu, Romania, Axel Sikora, Germany
- Statistics: 197 participants, 32 countries,197 papers, 96 oral and 51 poster presentations, 738 P., 1 Vol.
- Special Issues: International Journal of Computing, Sensors & Transducers Journal, Computer Standards & Interfaces.
- Sponsors: IEEE Ukraine I&M / CI Joint Societies Chapter, TNEU, Czech Technical University in Prague, Faculty of Electrical Engineering atCzech Technical University, Office of Naval Research, Honeywell spol. S r.o., H TEST a.s., authorized distributor of Agilent Technologies Agilent TechnologiesH TEST a.s., IEEE Ukraine Section, IEEE Czechoslovakia Section, IEEE Instrumentation & Measurement Society, IEEE Region 8, River Publishers.

- IDAACS'2013. September 12-14, 2013, Hochschule für Technik und Wirtschaft, University of Applied Sciences Berlin (HTW Berlin), Berlin, Germany.
- Conference Co-Chairmen: Anatoliy Sachenko, Ukraine, Jürgen Sieck, Germany
- IPC Co-Chairmen: Vladimir Haasz, Czech Republic, Kurosh Madani, France
- Statistics: 185 participants, 28 countries,185 papers, 120 oral and 60 poster presentations, 940 pages, 2 volumes.
- Special Issues: River Publishers, Journal of Cyber Security and Mobility, International Journal of Computing, Elsevier Engineering Applications of Artificial Intelligence,Sensors & Transducers Journal.
- Sponsors: IEEE Ukraine I&M / CI Joint Societies Chapter, THEY, University of Applied Sciences in Berlin, IEEE Instrumentation & Measurement Society, Office of Naval Research, The University of Maine, IEEE Region 8, River Publishers, IEEE Ukraine Section.

- IDAACS'2015. September 24-26, 2015, Faculty of Electronics and Information Technology and Faculty of Mathematics and Information Science, Warsaw University of Technology, Warsaw, Poland.

- Conference Co-Chairmen: Anatoliy Sachenko, Ukraine, Wiesław Winiecki, Poland
- IPC Co-Chairmen: Robert Hiromoto, USA, Linas Svilainis, Lithuania
- Statistic: 180 participants, 29 countries, 185 papers, 24 oral and 3 poster sessions, 991 pages, 2 volumes.
- Special Issues: River Publishers, Journal of Cyber Security and Mobility, International Journal of Computing, Elsevier Engineering Applications of Artificial Intelligence.
- Sponsors: IEEE Ukraine I&M / CI Joint Societies Chapter, TNEU, University of Applied Sciences in Berlin, IEEE Instrumentation & Measurement Society, Office of Naval Research, The University of Maine, IEEE Region 8, River Publishers, IEEE Ukraine Section.

- IDAACS'2017. September 21-23, 2017, Faculty of Automatic Control and Computer Science, University "Politehnica" of Bucharest (UPB), Romania.
- Conference Co-Chairmen: Anatoly Sachenko, Ukraine, Grigore Stamatescu, Romania.
- IPC Co-Chairmen: Dora Blanco Heras, Spain, John Kalomiros, Greece.
- Statistic: 194 participants, 35 countries, 213 papers, 24 oral and 3 poster sessions, 1143 pages, 2 volumes.
- Special Issues: River Publishers, International Journal of Computing.
- Sponsors: IEEE Ukraine I&M / CI Joint Societies Chapter, TNEU, Faculty of Automatic Control and Computers, University "Politehnica" of Bucharest (UPB), Asti Automation, IEEE Ukraine Section, IEEE Romania Section, Romanian Society of Automation and Technical Informatics (SRAIT), TÜV AUSTRIA ROMANIA, Festo, River Publishers.

B – IDAACS Symposia

The first IEEE International Symposium on Wireless Systems within the Conferences on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS-SWS'2012) has held in 2012.

- IDAACS-SWS'2012. September 20-21'2012, University of Applied Sciences in Offenburg, Offenburg, Germany.
- Symposium Hononary Chairman: Anatoliy Sachenko, Ukraine;
- Workshop Co-Chairmen: Evren Eren, Uwe Grossmann, Juergen Sieck, Axel Sikora, Germany
- Statistics: participants from 12 countries, 39 papers, 27 oral presentations, 127 P., 1 Vol.
- Special Issues: International Journal of Computing, Sensors & Transducers Journal, Computer Standards & Interfaces.
- Sponsors: Faculty of Electrical Engineering and Information Technology at Offenburg University of Applied Sciences, IEEE Ukraine Section IM/CIS Joint Chapter, IEEE Instrumentation & Measurement Society.

The second IEEE International Symposium on Wireless Systems within the Conferences on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS-SWS'2014) has held in 2014.

- IDAACS-SWS'2014. September 11-12'2012, University of Applied Sciences in Offenburg, Offenburg, Germany.
- Symposium Hononary Chairman: Anatoliy Sachenko, Ukraine;
- Symposium Co-Chairmen: Svitlana Antoshchuk, Volodymyr Brovkov, Ukraine, Evren Eren, Uwe Grossmann, Juergen Sieck, Axel Sikora, Germany
- Statistics: participants from 7 countries, 15 papers, 15 oral presentations, 127 P., 1 Vol.
- Sponsors: Faculty of Electrical Engineering and Information Technology at Offenburg University of Applied Sciences, IEEE Ukraine Section IM/CIS Joint Chapter, IEEE Instrumentation & Measurement Society.

The third IEEE International Symposium on Wireless Systems within the Conferences on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS-SWS'2016) was held in 2016.

- IDAACS-SWS'2016. September 26-27'2016, University of Applied Sciences in Offenburg, Offenburg, Germany.
- Symposium Hononary Chairman: Anatoliy Sachenko, Ukraine;
- Symposium Co-Chairmen: Volodymyr Brovkov, Ukraine, Evren Eren, Uwe Grossmann, Axel Sikora, Germany
- Statistics: participants from 9 countries, 24 papers, 24 oral presentations, 146 pages, 1 Volume
- Sponsors: Faculty of Electrical Engineering and Information Technology at Offenburg University of Applied Sciences, IEEE Ukraine Section IM/CIS Joint Chapter, IEEE Instrumentation & Measurement Society.

International Journal of Computing

The International journal of Computing has established based on Branch Research Laboratory of Automated Systems and Networks in 2002. Its main goal is to present results in the areas of Computer Science, Computer Engineering and Information Technology. The official language of the Journal is English. Journal is issueing the 4 times per year.

Since November 2016, the IJC Journal is indexing by Scopus Elsevier. In addition, the Journal is indexing by Finnish publication forum, Norwegian Social Science Data Services, Google Scholar, and Index Copernicus International.

The Journal's Editor-in-Chief is Prof. Anatoliy Sachenko, the Executive Editor is PhD, Dr Volodymyr Turchenko, and Associated Editors are Prof. Robert E. Hiromoto, University of Idaho, USA and Prof. Volodymyr Kochan. The Journal staff includes Mr. Taras Lendyuk, the Technical Editor, Dr Inna Shylinska, the Language Editor and Mrs. Halyna Kryva, the Economist.
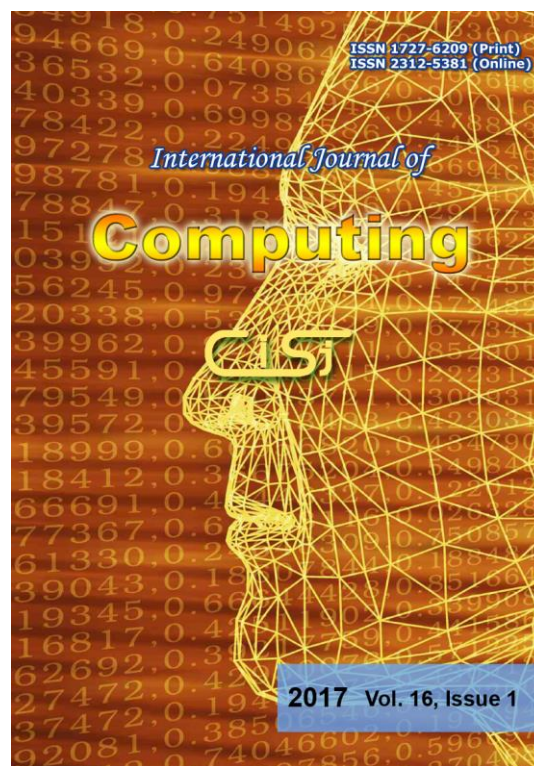
The Editorial Board consists of more than 40 recognised scientists from 17 countries: Australia, Belarus, Bulgaria, Czech Republic, France, Germany, Greece, Italy, Japan, Lithuania, Norway, Poland, Portugal, Romania, Russia, Spain, Ukraine and USA.

Journal Topics are: Algorithms and Data Structure, Software Tools and Environments; Bio-Informatics; Computational Intelligence; Computer Modeling and Simulation; Cyber and Homeland Security; Data Communications and Networking; Data Mining, Knowledge Bases and Ontology; Digital Signal Processing; Distributed Systems and Remote Control; Education in Computing; Embedded Systems; High Performance Computing and GRIDS; Image Processing and Pattern Recognition; Intelligent Robotics Systems; Internet of Things; IT Project Management; Wireless Systems.

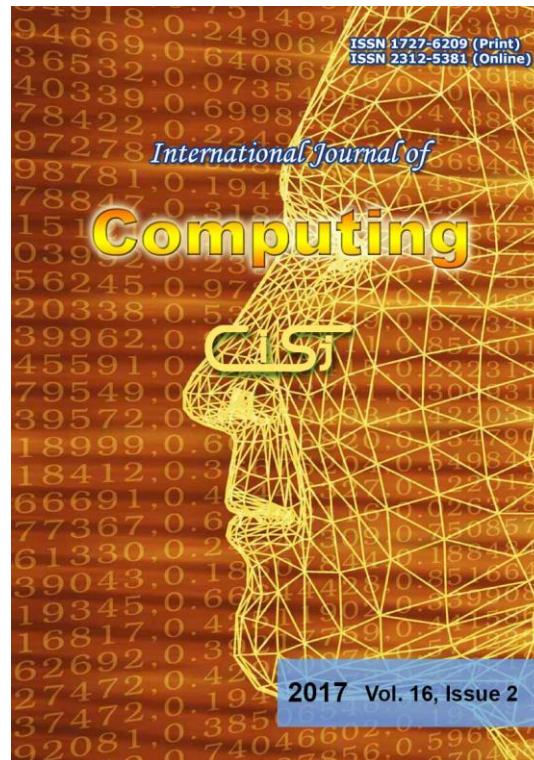| Issues	
• 2017, Vol. 16, Issue 4 • 2017, Vol. 16, Issue 3 • 2017, Vol. 16, Issue 2 • 2016, Vol. 16, Issue 1 • 2016, Vol. 15, Issue 4 • 2016, Vol. 15, Issue 3 • 2016, Vol. 15, Issue 2 • 2016, Vol. 15, Issue 1 • 2015, Vol. 14, Issue 4 • 2015, Vol. 14, Issue 3 • 2015, Vol. 14, Issue 2 • 2015, Vol. 14, Issue 1 • 2014, Vol. 13, Issue 4 – thematic issue "ICT in Project Management" • 2014, Vol. 13, Issue 3 • 2014, Vol. 13, Issue 2 • 2014, Vol. 13, Issue 1 • 2013, Vol. 12, Issue 4 • 2013, Vol. 12, Issue 3 • 2013, Vol. 12, Issue 2 • 2013, Vol. 12, Issue 1 • 2012, Vol. 11, Issue 4 – Special Issue on Advanced Computing Systems • 2012, Vol. 11, Issue 3 • 2012, Vol. 11, Issue 2 • 2012, Vol. 11, Issue 1– Special Issue on Pattern Recognition and Intelligent Processing • 2011, Vol. 10, Issue 4 – Special Issue on Wireless Systems • 2011, Vol. 10, Issue 3	• 2011, Vol. 10, Issue 2 • 2011, Vol. 10, Issue 1 – Special Issue on Neural Networks and Artificial Intelligence • 2010, Vol. 9, Issue 4 • 2010, Vol. 9, Issue 3 – Special Issue on Wireless Systems • 2010, Vol. 9, Issue 2 • 2010, Vol. 9, Issue 1 – Special Issue on Interactive Systems in Culture and Creative Industries • 2009, Vol. 8, Issue 32009, Vol. 8, Issue 2 • 2009, Vol. 8, Issue 22009, Vol. 8, Issue 1 – Special Issue on Artificial Neural Networks and Intelligent Information Processing • 2008, Vol. 7, Issue 3 • 2008, Vol. 7, Issue 2 – Special Issue on Intelligent Data Acquisition and Advanced Computing Systems • 2008, Vol. 7, Issue 1 • 2007, Vol. 6, Issue 3 • 2007, Vol. 6, Issue 2 – Special Issue on Virtual Instrumentation and Virtual Laboratories • 2007, Vol. 6, Issue 1 • 2006, Vol 5, Issue 3 – Special Issue on Neural Network and Artificial Intelligence • 2006, Vol5, Issue 2 • 2006, Vol 5, Issue 1

• 2005, Vol. 4, Issue 3 – Special Issue on Intelligent Data Acquisition and Advanced Computing Systems • 2005, Vol. 4, Issue 2 – Special Issue on Cyberspace Security • 2005, Vol. 4, Issue 1 • 2004, Vol. 3, Issue 3 • 2004, Vol. 3, Issue 2 • 2004, Vol. 3, Issue 1 – special issue ICNNAI'2003, Minsk, Belarus	• 2003, Vol. 2, Issue 3 • 2003, Vol. 2, Issue 2 – Special Issue on Intelligent Data Acquisition and Advanced Computing Systems • 2003, Vol. 2, Issue 1 • 2002, Vol. 1, Issue 2 – Special Issue on Intelligent Data Acquisition and Advanced Computing Systems 2002, Vol. 1, Issue 1 – Special Issue on Intelligent Data Acquisition and Advanced Computing Systems

Journal Contents, 2017, Vol. 16, Issue 1

1. P. Kossakowski, P. Bilski. Analysis of the Self-organizing Map-based Investment Strategy. – pp. 10-17.
2. L. Krejčí. Programming Autonomous Behavior of Reactive Metering Systems by Timed Automata. – pp. 18-26.
3. M. Pasieka, N. Grzesik, K. Kuźma. Simulation Modeling of Fuzzy Logic Controller for Aircraft Engines. – pp. 27-35.
4. I. Perova, Ye. Bodyanskiy. Fast Medical Diagnostics using Autoassociative Neuro-fuzzy Memory. – pp. 34-40.
5. S. Omatu. Classification of Mixed Odors using a Layered Neural Network. – pp. 41-48.
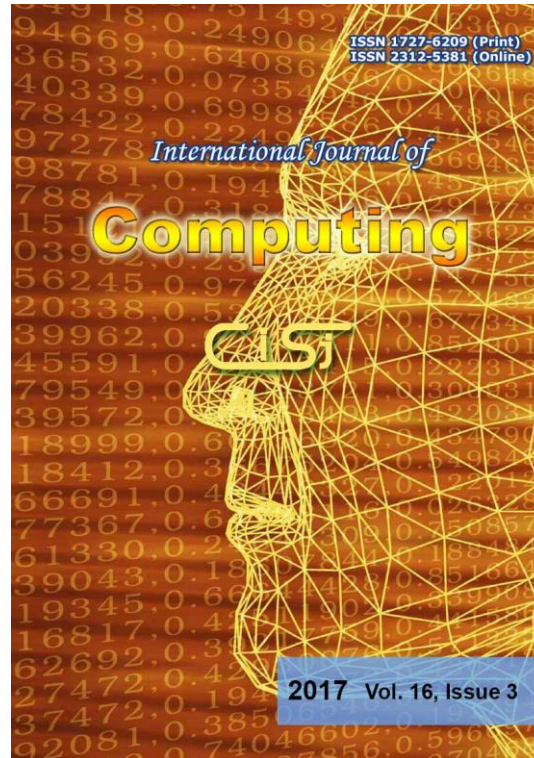
Journal Contents, 2017, Vol. 16, Issue 2

Journal Contents, 2017, Vol. 16, Issue 3

Journal Contents, 2017, Vol. 16, Issue 4

Specialized Scientific Council K58.082.02

Specialized scientific council in specialties:
- 05.13.05 – Computer Systems and Components;
- 05.13.06 – Information Technologies;

In 2017, such theses were defended:
- **D. I. Zahorodnia**, PhD thesis "Informational Technology for Structural and Statistic Identification of Hierarchical Objects from Characteristic Points of their Contours in Automated Video Surveillance Systems", speciality 05.13.06 – Information Tecnologies.
- **T. V. Lendyuk**, PhD thesis "Knowledge-Oriented Methods and Information Technology for Construction of Education Computerization Systems", speciality 05.13.06 – Information Technologies.

IEEE Instrumentation & Measurement/Computational Intelligence Joint Societies Chapter

The Instrumentation & Measurement / Computational Intelligence Joint Societies Chapter of IEEE Ukraine Section were established on June 7, 2005. The Chairman of the Chapter is Prof. Anatoliy Sachenko. The Chapter consists of 38 members from Lviv, Ternopil, Khmelnytskyy, Kyiv, Kharkiv, Ivano-Frankivsk, Zaporizhzhya, Chernivtsi and Odessa, in particular:

Prof. S. Antoshchuk, Odessa National Polytechnic University
Dr P. Bykovyy, Ternopil National Economic University
Dr O. Blazhko, Odessa National Polytechnic University
Prof. E. Volodarsky, National Technical University of Ukraine "Kyiv Polytechnic Institute"
Prof. M. Dorozhovets, Lviv National Technical University
Prof. A. Drozd, Odessa National Polytechnic University
Prof. O. Ivakhiv, Lviv National Technical University
Prof. R. Kochan, Lviv National Technical University
Dr O. Kochan, Ternopil National Economic University
Dr V. Kochan, Ternopil National Economic University
Prof. V. Krylov, Odessa National Polytechnic University
Dr S. Lysenko, Khmelnytsky National University
Dr V. Lyashkevych, Yury Fedkovych Chernivtsi State University
Dr I. Maykiv, Ternopil National Economic University
Dr V. Mukhin, National Technical University of Ukraine "Kyiv Polytechnic Institute"
Dr A. Piskozub, Lviv National Technical University
Prof. O. Pomorova, Khmelnytsky National University
Prof. M. Pryymak, Ternopil Ivan Pul'uj State Technical University
Prof. S. Rippa, National University of the State Taxation Department of Ukraine
Prof. A. Sachenko, Ternopil National Economic University
Dr V. Turchenko, Ternopil National Economic University
Prof. M. Cherkassky, Lviv National Technical University
Dr G. Shilo, Zaporizhzhya National Technical University
Dr V. Yatskiv, Ternopil National Economic University

List of technical meetings, which have completed by I&M/CI Chapter:

I. On March 7, 2017 a joint research seminar of the IEEE I & M / CI Chapter, the Information Computer Systems and Control Department, and the Research Institute for Intelligent Computer Systems was held at Ternopil National Economic University within the visit of delegation from Brest State Technical University, Belarus. There were two presenters: Prof. Volodymyr Golovko, Brest State Technical University (Belarus), title "Deep learning

neural networks: theory and applications" and Dr. Myroslav Komar, Ternopil National Economic University, "Resistance of computer systems towards virus attacks". There were the 31 people took a part in the the seminar including the 11 IEEE members.

II. On September 1, 2017 the Joint research Meeting of the IEEE IM/CIS Chapter within the visit of Prof. Jan Jürjens, from the Institute for Software Technology (IST), University of Koblenz-Landau, Germany to the Research Institute for Intelligent Computer Systems and Dept of Information Computer Systems and Control. There were two presenters: Prof. Jürjens, Institute for Software Technology (IST), University of Koblenz-Landau, Germany, title: "Industrial Data Space and Data Analysis" and Yurii Ivanyshak, Ternopil National Economic University, Ternopil, title "Wireless network for control of electrical substations with high resistance to interference and external interference". There were the 15 people took a part in the the seminar including the 10 IEEE members.

III. On September 22, 2017 the Joint research Meeting of the IEEE IM/CIS Chapter within the 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS 2017) was held in University "Politehnica" of Bucharest (UPB), Romania. There were two presenters: Prof. Anatoliy Sachenko, Ternopil National Economic University, Ternopil, title "Convolutional Neural Network Based Solar Photovoltaic Panel Detection in Satellite Photos" and Dr. Pavlo Bykovyy, Ternopil National Economic University, Ternopil, title "Criteria to Estimate Quality of Methods Selecting Contour Inflection Points". There were the 58 people took a part in the the seminar including the 27 IEEE members.

IV. In October 4, 2017 the Joint research Meeting of the IEEE IM/CIS Chapter within the Erasmus + ALIOT Project Meetings was held in University of Coimbra(UC), Portugal. There were two presenters: Prof. Alexander Drozd, Odessa National Polytechnic University, title "IoT Smart Technologies" and Prof. George Vorobets, Chernivtsi National University named by Yurii Fedkovych, title "Technologies of the Internet of things for cyber-physics systems". There were the 31 people took a part in the the seminar including the 17 IEEE members.

V. In October 12, 2017 the Joint research Meeting of the IEEE IM/CIS Chapter within the ICS-TNEU team meetings under the Erasmus + Aliot project was held. There were two presenters: Prof. Anatoliy Sachenko, Ternopil National Economic University, Ternopil, title "Data science for IoT and IoE" and Prof. Volodymyr Kochan, Ternopil National Economic University, Ternopil, title "IoT for intelligent transport systems". There were the 15 people took a part in the the seminar including the 10 IEEE members.

VI. On November 13, 2017 the Joint research Meeting of the IEEE IM/CIS Chapter and scientists from Hubei Technical University (China) at the Ternopil National Economic University was held. There were two presenters: Dr. Su Jun, Hubei Technical University (China), title "Attack Identification for Software-Defined Networking based on Attack Trees and Extension Innovation Methods" and Prof. Vasyl Yatskiv, Ternopil National Economic University, Ternopil "Specialized Computer Based Real Time Road Signs Recognition System for Vehicles". There were the 47 people took a part in the the seminar including the 10 IEEE members.

VII. On December 7, 2017 the Joint research Meeting of the IEEE IM/CIS Chapter within the Meetings of Scientific Council of TNEU and visit of Prof. Uwe Grosman to Ternopil National Economic University was held. There were two presenters: Prof. Uwe Grossman, University of Applied Sciences and Arts (Dortmund, Germany) "Collaborative Business Models for AAL-Services based on M2M-Communication" and Diana Zahorodnia, Ternopil National Economic University, title "Informational technology for structural and statistic identification of hierarchical objects from characteristic points of their contours in automated video surveillance systems". There were the 25 people took a part in the the seminar including the 10 IEEE members.

VIII. On December 8, 2017 a joint research Meeting of the IEEE IM/CIS Chapter, scientists from Ternopil, Lviv, Odessa, Irpin and Missouri (USA) was held at Ternopil National Economic University. There were four presenters: Prof. George Markovsky, Head of the Department of Computer Science at Missouri Science and Technology University, USA, presented topic: "Possible joint projects between scientists from Ukraine and the United States". Prof. Volodymyr Pasichnyk, from Information Systems and Networks Department of the National University "Lviv Polytechnic" presented a report "Informational and technological support for inclusive education in Ukraine". Prof. Svitlana Antoshchuk, Department of Applied Mathematics and Information Technologies, Odessa National Polytechnic University present topic "Scientific research directions at Odessa National Polytechnic University". Prof. Rippa Sergey, Director of the Educational-Scientific Institute of Information Technologies and Management of the University of the State Fiscal Service of Ukraine, presented topic „Directions of scientific research of the University of

the State Fiscal Service of Ukraine". There were the 28 people took a part in the the seminar including the 13 IEEE members.

IEEE Student Branch

The Institute of Electrotechnical and Electronics Engineers (IEEE) Student Branch at Ternopil National Economic University (TNEU) was founded in 1998.

Student Branch consists of students of the Faculty of Computer Information Technologies, PhD students and junior researchers of TNEU. In 2016 there were 3 active members in the Branch. The Branch Committee consists of the Chair – Yuriy Ivanyshak, a Counselor – Prof. Anatoliy Sachenko.

Members of the IEEE Student Branch at TNEU take part in international conferences and projects. Also, they assist in organization and preparation of the series of Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS) IEEE Workshops: 2001, 2003 – Ukraine, 2005 – Bulgaria, 2007 – Germany, 2009 – Italy, and the IEEE IDAACS Conference in 2011 – Czech Republic, 2013 – Germany, 2015 – Poland.

The main advantages of IEEE membership include: access to IEEE electronic resources, IEEE subscription in the scientific magazines and popular scientific literature "Spectrum", "Computer", "IEEE Transaction on Instrumentation and Measurement"; assistance and discounts for participation at international conferences, for example, as IEEE member scientist could win a travel grant to the conference in the country region (Ukraine, along with Europe, Middle East and Africa, belongs to region 8). Almost all conferences sponsored by IEEE give discount to students for registration fee, participation in competitions organized by IEEE in the region.

Overall, IEEE supports scientific activities of students and young scientists, supporting them in the development of their scientific career, increases collaboration between scientists from different universities and international scientific – educational organizations. For example, IEEE members have access to a digital library of articles Hplore IEEE conferences, are printed journals IEEE, have the opportunity to join the scientific communities in different scientific fields can win grants to visit academic conferences and receive a discount when registering them. Also, between branches and regions there is a contest for the best scientific article or website and mobile robots. Each of these competitions is accompanied by cash prizes.

Other Research Activities

[Org 1]   Sergey Bushuyev
 – Reviewing the 10 papers for international and national conferences.
 – Reviewing the 15 articles in international and national scientific journals.
 – Member of the organizing / program committee:
   • Bukovel, February 2017, Strategic Project Management;
   • Kyiv, May 2017, Project Management in the Development of Society;
   • Mykolaiv, September 2017, Practical Aspects of Project Management;
   • Odessa, December 2017, Project management: Innovations, Nonlinearity, Synergetics.

[Org 2]   Volodymyr Kochan
 – Member of the Editorial Board at International Journal of Computing.
 – Reviewing the papers for international and national conferences.
 – Member of the Specialized Scientific Council K58.082.02 at TNEU.
 – Preparation of 4 reviews for PhD Thesis autoreferats.
 – Member og organizing committee of IDAACS'2017, September 21-23, Bucharest, Romania.
 – Team member of Erasmus+ALIOT project "Internet of Things: Emerging Curriculum for Industry and Human Applications".

[Org 3]   Vasyl Koval
 – Expertise of one paper PhD thesis.
 – Member of the Specialized Scientific Council K58.082.02 at TNEU.
 – Member of Organization Committee of Workshop of Young Scientists and Students "Advanced Computer Information Technologies".
 – Team member of Erasmus+ALIOT project "Internet of Things: Emerging Curriculum for Industry and Human Applications".

[Org 4]   Yaroslav Nykolaychuk
 – Review of the dissertation of Nadiia Paseka "Models and Methods of Information Technology of Activation of Learning Processes" submitted for obtaining the scientific degree of the candidate of technical sciences in the specialty 05.13.06 – Information Technologies;
 – Member of the Program Committee of V Workshop of Young Scientists and Students "Advanced Computer Information Technologies", May 2017, Ternopil.
 – Member and a Vice-Chairman of the Specialized Scientific Council K.58.082.02 at TNEU.

[Org 5]   Roman Pasichnyk
 – Reviewing the 3 papers in international and national journals.
 – Member of the Program Committee of V Workshop of Young Scientists and Students "Advanced Computer Information Technologies", May 2017, Ternopil.

[Org 6]   Sergey Rippa
 – Reviewing the 12 papers for international and national conferences.
 – Reviewing the 5 articles in international and national scientific journals.
 – Reviewing the 2 PhD Thesis'.
 – Preparation of 3 reviews for PhD Thesis autoreferats.
 – A member of specialized academic council K 27.855.01 at NUSTA.

[Org 7] **Anatoliy Sachenko**
- Chairman of the Specialized Scientific Council K58.082.02 at TNEU;
- Member of Specialized Scientific Council D35.052.08 at National University "Lviv Polytechnics";
- Editor-in-Chief, International Journal of Computing;
- Editor-in-Chief, "International Journal for Information Engineering and Electronic Business";
- Reviewing the 26 papers for international and national conferences.
- Reviewing the four Doctor of Science Theses
- Reviewing the seven PhD Theses
- Co-Chairman of The 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, Bucharest, Romania, September 21-23, 2017
- Member of the Program Committee of International Conferences:
    1. International Research Conference -2017, Dortmund University of Applied Sciences and Arts, Dortmund, Germany;
    2. VI International Conference Міжнародна науково-технічна конференція "Information security and security of information systems",1 - 2 June 2017, Lviv, Ukraine;
    3. Federated Conference on Computer Science and Information Systems (FedCSIS 2017), Prague, Czech Republic, 4 - 7 September, 2017;
    4. First IEEE World Engineering Education Conference (EDUNINE2017), São Paulo, Brazil, March 19-22, 2017;
    5. ICCCS 2017_Windhoek_ Namibia;
    6. SETIT 2017_ Tunusia;
    7. 7th CrISS-DESSERT Workshop of the 12th Conference on Dependability and Complex Systems, DepCoS, July 2-6, 2017, Brunow, Poland;
    8. International Conference on Information and Digital Technologies IDT 2017, 5 - 7 July 2017, Zilina, Slovakia;
    9. The 2017 IEEE First Ukraine Conference on Electrical and Computer Engineering (UKRCON), May 29 – June 2, 2017 · Kyiv, Ukraine;
    10. Workshop Thermit of the 13th International Conference ICTERI 2017 ICT in Education, Research, and Industrial Applications: Integration, Harmonization, and Knowledge Transfer, May 15-18, 2017, Kiev – Ukraine;
    11. IX International Conference on Microelectronics and Computer Science, CHISINAU, MOLDOVA, October 19-21, 2017.

[Org 8] **Volodymyr Turchenko**
- Deputy Editor at International Journal of Computing, participated in preparing the four issues of the Journal, reviewed the one article
- Reviewer of abstracts for international conferences IDAACS'17, IJCNN'17, PDP'17, PCNN'17
- Reviewer of papers for journals Advances in Cyber-Physical Systems, Neurocomputing;
- A reviewer of the Fulbright Academic Exchange Program Applications in Ukraine.

[Org 9] **Vasyl Yatskiv**
- Reviewing the 2 PhD Theses;
- Member of the Organizing Committee: All-Ukrainian Seminar of Young Scientists and Students "Advanced Computer Information Technologies", Ternopil, May 2017.
- Member of the Organizing Committee of Conference on "Applied Scientific and Technical Researches".
- Scientific Secretary of the Specialized Scientific Council K58.082.02 at TNEU.
- Preparation of 3 reviews for PhD Thesis autoreferats and one review for Doctoral autoreferat.
- Team member of Erasmus+ALIOT project "Internet of Things: Emerging Curriculum for Industry and Human Applications".

5. ACADEMIC ACTIVITIES

Cooperation Agreements with Universities and Companies

[Agreement 1]Belarus State University of Informatics and Radioelectronics, Minsk, Belarus.
[Agreement 2]Brest State Technical University, Belarus.
[Agreement 3]Donetsk National Technical University, Ukraine.
[Agreement 4]Zaporizhya National Technical University, Ukraine.
[Agreement 5]Institute for Cybernetics, National Academy of Sciences of Ukraine, Kyyiv, Ukraine.
[Agreement 6]Institute of Space Research, National Academy of Sciences of Ukraine and NCAO, Kyiv, Ukraine.
[Agreement 7]Institute of Control, Russian Academy of Sciences, Moscow, Russia.
[Agreement 8]Institute of Artificial Intelligence, Donetsk.
[Agreement 9]Odessa National Polytechnic University, Ukraine.
[Agreement 10] Technical University of Sofia, Bulgaria.
[Agreement 11] University of Calabria, Italy.
[Agreement 12] Tsinghua University, China.
[Agreement 13] University of Maine, USA.
[Agreement 14] University of New Hampshire, USA
[Agreement 15] University of South Carolina, USA.
[Agreement 16] Physics-Mechanics Institute of G. Karpenko, National Academy of Sciences of Ukraine, Lviv, Ukraine.
[Agreement 17] University of Siegen, Germany
[Agreement 18] Chernivtsi National University by Yu.Fedkovich, Chernivtsi, Ukraine
[Agreement 19] Wuhan University of Technologies, Wuhan, Hubei, China
[Agreement 20] Kaunas University of Technology, Lithuania
[Agreement 21] Hochschule für Technik und Wirtschaft Berlin, University of Applied Sciences, Germany
[Agreement 22] Fachochschule Dortmunt, University of Applied Sciences, Germany
[Agreement 23] Pre-Carpathian National University by Vasyl Stefanyk, Ivano-Frankivsk, Ukraine
[Agreement 24] Silesian Technical University, Poland.
[Agreement 25] Warsaw University of Technology, Poland
[Agreement 26] National University of State Tax Service of Ukraine, Irpin, Kiev region.
[Agreement 27] National University of Water and Environmental Engineering, Rivne, Ukraine.
[Agreement 28] Kiev National University of Construction and Architecture, Ukraine.
[Agreement 29] Lviv State University of Life Safety, Lviv, Ukraine
[Agreement 30] Ivan Franko National University of Lviv, Lviv, Ukraine

Defended Theses and Awarded Degrees

[Def 1] Diana Zahorodnia defended PhD thesis titled "Informational Technology for Structural and Statistic Identification of Hierarchical Objects from Characteristic Points of their Contours in Automated Video Surveillance Systems", 05.13.06 – Information Technologies, supervisors: Prov. Viktor, Prof. Uwe Großmann.
[Def 2] Taras Lendyuk defended PhD thesis titled "Knowledge-Oriented Methods and Information Technology for Construction of Education Computerization Systems", 05.13.06 – Information Technologies, supervisor Prof. Sergey Rippa.

Defended Master Theses

[DefMas 1] Victor Derazhenko, Multiagent System for Computer Network Protection, Prof. A. O. Sachenko
[DefMas 2] Andriy Staranchuk, Software-Hardware Module of Information-Measuring System's

Amplifier Calibration, Assoc. Prof. V. V. Kochan

[DefMas 3] Nazar Veretyk, Quality Assurance Methods for Information Control Systems, Assoc. Prof. N. M. Vasylkiv

[DefMas 4] Roman Derkach, The Error Detection Method Based on Modular Correcting Codes, Assoc. Prof. N. G. Yatskiv

[DefMas 5] Victor Kysil, Halftone Image Segmentation Algorithms of the Computer Vision Systems, Prof. V. M. Krylov

[DefMas 6] Taras Polishchuk, Models and Algorithms for Searching and Booking of Hotel Rooms Based on Coloured Petri Nets, Assoc. Prof. M. P. Komar

[DefMas 7] Ostap Volytskyi, Project Management for Developing the Logistic Information System, Prof. S. P. Rippa

[DefMas 8] Roman Babyak, The Model for Evaluation of Project Team Competence, Assoc. Prof. I. O. Paliy

[DefMas 9] Yevhen Bodnar, Project Management of the Computer Game "Emergency Ball" Creation, Assoc. Prof. I. V. Turchenko

[DefMas 10] Volodymyr Voytovych, Improving the Selection Process of Innovative IT-Projects, Assoc. Prof. G. M. Hladiy

[DefMas 11] Vitaliy Havryliuk, Project Management of New Product Launch to the Market к.е.н., Assoc. Prof. G. M. Hladiy

[DefMas 12] Oksana Dunets, Creating the Intelligence Environment for Project Planning, Prof. A. O. Sachenko

[DefMas 13] Roman Zozulia, Project Management of Conducting of Enterprise Advertising Campaign, Assoc. Prof. N. M. Vasylkiv

[DefMas 14] Valentyn Kalashniuk, The Development of Project Management Methodology Based on the Value Approach, Prof. S. D. Bushuyev

[DefMas 15] Nikita Lubutsin, Endgame Strategy Application for Managing the IT Projects, Prof. A. O. Sachenko

[DefMas 16] Andriana Mahno, Fuzzy Model of Evaluation of Project Environment, Assoc. Prof. N. M. Vasylkiv

[DefMas 17] Volodymyr Neizhalyy, Management of Investment Project for Creation of Motor Service Center, Assoc. Prof. G. M. Hladiy

[DefMas 18] Oleg Parhomchuk, Project Management of Introducing the Automated System for Bar Code Identification, Prof. S. P. Rippa

[DefMas 19] Iryna Rordobudko, Planning and Organization of Exhibition Centre Creation, Assoc. Prof. Dombrovsky

[DefMas 20] Alina Sachenko, Project Management of Movie Theater Creation, Assoc. Prof. Dombrovsky

[DefMas 21] Andriy Khalimon, Project Management of Developing the Amplifiers Calibration Module, Assoc. Prof. V. V. Kochan

[DefMas 22] Zoriana Chak, Models of Project Management Office, Assoc. Prof. G. M. Hladiy

[DefMas 23] Ivan Shkorupa, Project Management of the Interactive Cafe Creation, Assoc. Prof. I. V. Turchenko

[DefMas 24] Oleg Turchyn, Managing the IT Projects Using the Decision Support System, Prof. A. O. Sachenko

[DefMas 25] Viktor Derazhenko, Introducing the Middlegame Strategy for Managing the IT Projects, Prof. A. O. Sachenko

[DefMas 26] Ivan Bereza, Project Management of Creation of the Information System for Medical Establishment, Assoc. Prof. N. M. Vasylkiv

[DefMas 27] Pavlo Danilov, Project Management of Developing the Executive Devise for Universal Multichannel Regulator, Assoc. Prof. V. V. Kochan

[DefMas 28] Volodymyr Zhovnirchyk, Project Management of the Condominium Creation, Assoc. Prof. I. V. Turchenko

[DefMas 29] Ivan Zvarych, Project Management of Enterprise Quality System, Assoc. Prof. Dombrovsky

[DefMas 30] Vitaliy Melnychenko, Management of Investment Project of Cost Reduction in Electrical Energy Transmission, Assoc. Prof. Dombrovsky

[DefMas 31] Nataliia Myhaskiv, The Model for Evaluation of Time and Cost of Software Projects, Assoc. Prof. I. O. Paliy

[DefMas 32] Vasyl Nadzhak, Management of Investment Project for Modernization of Poultry Farm Equipment, Assoc. Prof. G. M. Hladiy

[DefMas 33] Maria Nebelyak, Improving the Selection Process of Innovative Project for Opening the New Company, Assoc. Prof. G. M. Hladiy

[DefMas 34] Mykhailo Pitsan, Project Management of the Advertising Agency Creation, Assoc. Prof. I. V. Turchenko

[DefMas 35] Taras Polishchuk, Project Management of Developing the Website for Autocrane Repair Company, Assoc. Prof. N. M. Vasylkiv

[DefMas 36] Oleg Tarnavsky, Model of Project Resource Allocation under Uncertainty, Assoc. Prof. I. O. Paliy

[DefMas 37] Halyna Kozlovska, Designing the Business Architecture of the Project-Oriented Enterprise, Assoc. Prof. G. M. Hladiy

[DefMas 38] Taras Shmigelsky, Project Management for Creating the Virtual Office of IT Company, Prof. A. O. Sachenko

[DefMas 39] Myroslav Babak, Mathematical model of innovative development of brand brewing production, Assoc. Prof. I. G. Dobrotvor

[DefMas 40] Nazariy Mamlyuk, The dynamic model of globalization of intellectual capital in enterprises, Assoc. Prof. I. G. Dobrotvor

[DefMas 41] Andriy Pyrizhok, Tools assessing the quality of products, Assoc. Prof. R. M. Pasichnyk

[DefMas 42] Serhiy Stepaniuk, Tools management of the consulting company, Assoc. Prof. O. P. Adamiv

[DefMas 43] Roman Heleta, Tools predicting the reliability of suppliers, Assoc. Prof. R. M. Pasichnyk

[DefMas 44] Yulia Dutvko, Mathematical model of innovation management production company, Prof. D. I. Bodnar

[DefMas 45] Nadiia Kalika, Mathematical model of optimization of power generating company in the market, Prof. D. I. Bodnar

[DefMas 46] Andriy Kozlovsky, Tools assessment of production trends, Assoc. Prof. R. M. Pasichnyk

[DefMas 47] Ruslana Makarevych, Tools estimates of sales, Assoc. Prof. R. M. Pasichnyk

[DefMas 48] Roman Kuzbyt, The mathematical model of interaction of enterprise logistics providers, Prof. D. I. Bodnar

[DefMas 49] Khrystyna Pihotska, The mathematical model of the dealership network of the enterprise in the development of new sales markets, Assoc. Prof. R. M. Pasichnyk

[DefMas 50] Vitaliy Bilinskiy-Yaroshovych, Methods noise-immune data transmission in distributed computerized control systems, Assoc. Prof. O. M. Zastavny

[DefMas 51] Denys Korostil, Algorithms and special processors of definition of entropy based on different analytical expressions, Assoc. Prof. N. Ya. Vozna

[DefMas 52] Serhiy Slobodian, Design of the image-cluster models of quasi-stationary objects, Prof. Ya. M. Nykolaichuk

[DefMas 53] Roman Yakymiv, Cyber security of Ukraine's international relations, Prof. O. M. Lyashenko

[DefMas 54] Maria Sus, Model of TNC's interaction with countries in the technological sphere, Prof. O. M. Lyashenko

Intership of Staff, PhD Students and Students

Staff Intership

[Internship 1] Diana Zahorodnia, lecturer, Department for Information Computer Systems and Control, Design studio "Artes" (enterpriser O. M. Pilhun), 01.02 – 28.02.2017.

[Internship 2] Vasyl Yatskiv, Professor, Department for Information Computer Systems and Control, constructor buerau "Strila", 24.04 – 24.05.2017.

[Internship 3] Myroslav Komar, Assoc. Prof., Department for Information Computer Systems and Control, "Orange35" (enterpriser R. D. Hagaliuk), 16.05 – 16.06.2017.

[Internship 4] Iryna Turchenko, Assoc. Prof., Department for Information Computer Systems and Control, "Orange35" (enterpriser R. D. Hagaliuk), 16.05 – 16.06.2017.

[Internship 5] Grygoriy Sapozhnyk, Assoc. Prof., Department for Information Computer Systems and Control, "MagneticOne", 22.05 – 22.06.2017.

[Internship 6] Oleksandr Osoliskiy, lecturer, Department for Information Computer Systems and Control, "Svitlocenter" LtD, 09.10 – 10.11.2017.

Student Intership

[Internship 7] Vasyl Babiy, "Ukiart" LtD, Assoc. Prof. G. M. Hladiy

[Internship 8] Olga Bulbak, RIICS, TNEU, Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 9] Mykola Halushko, Dobromyl city council, Stasambir district, Lviv region., Assoc. Prof. G. M. Hladiy

[Internship 10] Oleg Hubchakevych, "MAGNIS" LtD, Assoc. Prof. G. M. Hladiy

[Internship 11] Olena Dzhygailo, RIICS, TNEU, Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 12] Ivan Dubas, "ECOTERPROM" LtD, Assoc. Prof. G. M. Hladiy

[Internship 13] Myroslava Diachuk, "MAGNIS" LtD, Assoc. Prof. G. M. Hladiy

[Internship 14] Maksym Zubrytsky, "Zahid Support" LtD, Assoc. Prof. G. M. Hladiy

[Internship 15] Rita Kasian, "WISE SOLUTIONS" (enterpriser A. Ye. Pyrih), Assoc. Prof. G. M. Hladiy

[Internship 16] Pavlo Kvasnytsia, "MAGNIS" LtD, Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 17] Vitaliy Kviatkovskiy, "MAGNETIC ONE", Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 18] Yevgeniy Kovalchuk, "MAGNIS" LtD, Assoc. Prof. G. M. Hladiy

[Internship 19] Vitaliy Kozlo, RIICS, TNEU, Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 20] Maria Lubarska, school, village Sadky, Zalishchyky district, Ternopil region, Assoc. Prof. G. M. Hladiy

[Internship 21] Romanna Semenyshyn, "SMILE Ukraine" LtD, Assoc. Prof. G. M. Hladiy

[Internship 22] Olga Tanasiv, kindergarden, Zaliztsi, Zboriv districs, Ternopil region, Assoc. Prof. G. M. Hladiy

[Internship 23] Petro Tanasiv, "Lilea", Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 24] Victor Fedorovych, "Crowdin" LtD, Ternopil, Assoc. Prof. G. M. Hladiy

[Internship 25] Bohdan Kharukh, Studio of Digital marketing "GOLDEN WEB" (enterpriser M.Ya. Hutsul), Assoc. Prof. G. M. Hladiy

[Internship 26] Mykola Hrytsiuk, Kovel industrial-economic college of Lutsk National Technical University, Assoc. Prof. G. M. Hladiy

[Internship 27] Maksym Kosiak, "Zahid Support" LtD, Assoc. Prof. G. M. Hladiy

[Internship 28] Vasyl Panchak, RIICS, TNEU, Ternopil, Assoc. Prof. N. G. Yatskiv

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[Internship 30] Liubomyr Horbatiuk, "Maras Digital" LtD, 35 Shuhevycha street, Bychach, Ternopil region, Assoc. Prof. N. G. Yatskiv

[Internship 31] Bohdan Hryhoryshyn, "Magnis" LtD, Kyyiv, Zoologichna street, 4F/169, Assoc. Prof. N. G. Yatskiv

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[Internship 33] Vsevolod Kropyva, RIICS, TNEU, Ternopil, Assoc. Prof. N. G. Yatskiv

[Internship 34] Volodymyr Krupetsky, RIICS, TNEU, Ternopil, Assoc. Prof. N. G. Yatskiv

[Internship 35] Maksym Mykhalchuk, RIICS, TNEU, Ternopil, Assoc. Prof. N. G. Yatskiv

[Internship 36] Andriy Ostapchuk, "Crowning" LtD, Ternopil, 3, Shashkevycha street, Assoc. Prof. N. G. Yatskiv

[Internship 37] Yuriy Sygin, enterpriser Andriy Pyrih, 12, Mazepy street, Ternopil, Assoc. Prof. N. G. Yatskiv

[Internship 38] Serhiy Yavorsky, "Magnis" LtD, Kyyiv, Zoologichna street, 4F/169, Assoc. Prof. N. G. Yatskiv

[Internship 39] Volodymyr Boychuk, Ternopil, TNEU, Publishing House, "Economichna Dumka", Assoc. Prof. V. V. Yatskiv

[Internship 40] Alina Kochenko, Vinnytsia region, Chechelnytsky district, Chechelnyk, 4, 70 years of October street, building 2, office 1, "Buduisvit", Assoc. Prof. V. V. Yatskiv

6. PUBLICATIONS

Monographs (Parts of Monographs), Books (Parts of Books)

[Publ 1]. S. Bezobrazov, A. Sachenko, M. Komar. Android's Applications Classification for Malware Detection. In press. 2017.

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[Publ 5]. T.V. Lendyuk. Knowledge-Oriented Methods and Information Technology for Construction of Education Computerization Systems. Autoreferat of PhD thesis, 05.13.06 – Information Technologies, Ternopil, 2017. – 20 p.

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[Publ 19]. O. Kochan, J. Su, R. Kochan. Designing an accurate system for temperature measurements. E3S Web of Conferences, Volume 19, 2017, pp. 03023.

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[Publ 28]. M.M. Zhydyk, A.M. Melnyk, V.B. Shpak, A.V. Kovbasisty. Computer Network for Model of "Smart House", Ternopil, TNEU, 2017.

[Publ 29]. M.P. Dyvak, N.P. Porplytsya, Yu.B. Maslyyak, A.V. Pukas, A.M. Melnyk. Method of Identification of Models of Objects with Distributed Parameters from Spatially Distributed Control Based on Analysis of Interval Data. Radioelectronics, Computer Science, Control. No. 2, 2017, pp. 150-159.

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[Publ 33]. Ya.M. Nykolaichuk, O.I. Volynsky, P.V. Humenny, T.I. Pastukh. Methods of Inter-basis Transformations of Multi-digit Codes of the Theoretic-Numerical Bases of Rademacher-Krestenson. Mathematical and computer simulation. Series: Technical Sciences. Kamyanets-Podilsky: I. Ogienko Kamyanets-Podilsky National University, 2017, issue 15, pp. 143-149.

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Conference Proceedings

[Publ 35]. A. Kovbasistyi, A. Melnyk, M. Dyvak, V. Brych, I. Spivak. Method for detection of non-relevant and wrong information based on content analysis of web resources. In Proceedings of the XIIIth International Conference on Perspective Technologies and Methods in MEMS Design (MEMSTECH), 2017, pp. 154-156.

[Publ 36]. A. Shaikhanova, A. Zolotov, L. Dubchak, M. Karpinski, V. Karpinskyi. Access Distribution Scheme to the Computer System Based on Fuzzy Logic. Graph-Based Modelling in Engineering, 2017, pp. 39-50.

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[Publ 41]. L. Pohreliuk, B. Rusyn, D. Kowalik. Virtual Library Architecture Using Cloud Computing, Proceedings of the 2017 4th International Conference on Education Reform and Modern Management (ERMM 2017), 2017, pp. 125-127.

[Publ 42]. R. E. Hiromoto, M Haney, A. Vakanski. A Secure Architecture for IoT with Supply Chain Risk Management. Proceedings of the 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications(IDAACS'2017). – Bucharest (Romania), September 21-23, 2017, pp. 431-435.

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Computing Systems: Technology and Applications (IDAACS'2017), Bucharest, Romania, 21-23 September, 2017, pp. 836-842.

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[Publ 47]. E. M. Ajose, Z. I. Dombrowski. Planning and Organizing the Road Building Project in Nigeria. Proceedings of the International Conference "Science and Innovations", vol. 1, Chernivtsi, 30-31 January 2017, pp. 13-15.

[Publ 48]. G. Shcherbakova, H.-S. Shi, V. Krylov, N. Bilous, S. Antoshchuk. Estimation of the Duration of RR-intervals of Electrocardiograms by Mean of Multistart Optimization Based on Wavelet Transformation. Proceedings of the 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS'2017). – Bucharest, Romania, September 21-23, 2017, pp. 752-755.

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[Publ 55]. M. Komar, V. Kochan, L. Dubchak, A. Sachenko, V. Golovko, S. Bezobrazov, I. Romanets. High performance adaptivesystem for cyber attacks detection. Proceedings of the 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS'2017). – Bucharest, Romania, September 21-23, 2017, pp. 853-858.

[Publ 56]. N. Vasylkiv, L. Dubchak, T. Lendyuk, I. Turchenko, I. Shylinska, M. Aleksander. Tasks Distribution for Students Testing Based on Fuzzy Logic. Proceedings of the 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, 21-23 September, 2017, Bucharest, Romania, pp. 26-29.

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Patents

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7. PARTICIPATION IN CONFERENCES, SYMPOSIUMS AND WORKSHOPS, AND RESEARCH VISITS

Conferences

[Visit 1]   **14 International Conference "The Experience of Designing and Application of CAD Systems in Microelectronics" (CADSM-2017), 21-25 February 2017, Polyana, Zakarpattya region, Ukraine**
- Vasyl Yatskiv
- Roman Kochan
- Andriy Melnyk
- Yaroslav Nykolaichuk

[Visit 2]   **37 International Conference "Electronics and Nano Technologies (ELNANO-2017)", 18 - 20 April, Kyyiv, Ukraine**
- Volodymyr Kochan
- Anatoliy Sachenko

[Visit 3]   **XIII International Conference "Perspective Technologies and Methods of MEMS Designing" (MEMSTECH 2017), 20 – 23 April 2017, Polyana, Zakarpattya region, Ukraine**
- Andriy Melnyk
- Yaroslav Nykolaichuk

[Visit 4]   **12th International Conference of ICT Using in Education, Research and Industry (ICTERI-2017), 15-18 May 2017, Institute of Postgraduate Education of T. Shevchenko Kyiv National University, Kyiv, Ukraine**
- Myroslav Komar

[Visit 5]   **International Conference "Information Technologies and Computer Simulation", 16-19 May 2017, Yaremche, Ukraine**
- Anatoliy Sachenko

[Visit 6]   **XIV International Conference "Project Management in the Development of Society", 18-20 May 2017, Kyiv, Ukraine**
- Sergey Bushuyev
- Anatoliy Sachenko
- Oksana Dunets
- Yuriy Ivanyshak

[Visit 7]   **International Conference "Advanced Computer Information Technologies" ACIT'2017, 19-20 May 2017, Ternopil, Ukraine**
- Nadiia Vasylkiv
- Vasyl Koval
- Orest Volynsky
- Nataliya Yatskiv
- Volodymyr Kochan
- Yaroslav Nykolaichuk
- Roman Pasichnyk

[Visit 8]   **1st IEEE International Conference "Electotechnica and Computer Engineering" (UKRCON 2017), 29 May – 2 June 2017, Igor Sikorsky KPI, Kyiv, Ukraine**
- Anatoliy Sachenko
- Volodymyr Kochan
- Vasyl Yatskiv

[Visit 9] **Conference "Microsoft Blockchain Intensive", 9-11 June 2017, Kyyiv, Ukraine**
- Vasyl Yatskiv

[Visit 10] **International Conference "International Research Conference at the University of Applied Sciences and Arts", University of Applied Sciences and Arts (Fachhochschule Dortmund), 30 June – 1 July 2017, Dortmund, Germany**
- Anatoliy Sachenko
- Oksana Dunets

[Visit 11] **XII International Scientific and Technical Conference "Computer Science and Information Technologies" (CSIT-2017), 5-8 September 2017, Lviv, Ukraine**
- Sergey Bushuyev

[Visit 12] **XIII International Conference "Project Management: State and Prospectives", 12-15 September 2017, Mykolaiv, Ukraine**
- Oksana Dunets
- Anatoliy Sachenko
- Mykhailo Dombrovsky
- Grygoriy Hladiy

[Visit 13] **9th IEEE International Conference on "Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS-2017)", 21-23 September 2017, Bucharest, Romania**
- Anatoliy Sachenko
- Volodymyr Kochan
- Victor Krylov
- Pavlo Bykovyy
- Oleksandr Osolinskiy
- Taras Lendyuk
- Diana Zahorodnia
- Yuriy Ivanyshak
- Oksana Dunets

[Visit 14] **VI International Conference of Young Scientists and Students "Actual Tasks of Modern Technologies", 16–17 Novenber 2017, I. Pulyui Ternopil National Technical University, Ternopil, Ukraine**
- Vitaliy Dorosh

Research Visits

ICS' staff visits

[Visit 15]   Anatoliy Sachenko visited the Warsaw University of Technology on April 18-28, 2017, where, together with the team of prof. Wieslaw Winiecki discussed the preparation of a joint Ukrainian-Polish project in the field of computer engineering "System of study of energy consumption of computer tools"; visited the University of applied sciences in Berlin, where the issue of signing an agreement between universities was discussed with Juergen Sieck, the preparation of a special issue of the international Computing magazine on complemented reality based on the results of the conference, which will be held by the University of Applied Sciences of Berlin, and also discussed transferring two computer classes for TNEU as sponsorship.

[Visit 16]   Anatoly Sachenko, Oksana Dunets, Vasyl Yatskiv, Zbyshek Dombrovsky from May 8 to 12, 2017 took part in the Spring Training School "Internet of Things: A New Course for Industry and Human Applications" within the framework of the Erasmus + Aliot project.

[Visit 17]   Oksana Dunets, Vitaliy Kviatkovsyi, Mykola Hrytsyuk and Maxim Kosyak took part in the summer school, organized annually by Dortmund University of Applied Sciences, Dortmund, Germany, from June 30 to July 7, 2017.

[Visit 18]   Anatoly Sachenko and Pavlo Bykovyy visited the Polytechnic University of Bucharest, Bucharest, Romania (University "Politehnica" of Bucharest, Bucharest, Romania) on July 18-27, 2017 to agree on the organization issues of the 9th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems IDAACS'2017.

[Visit 19]   Anatoly Sachenko from 2 to 6 October 2017 participated in the meeting of all Erasmus + ALIOT participants at the University of Coimbra (UC), Coimbra, Portugal.

[Visit 20]   Volodymyr Kochan participated in the round table "Artificial Intelligence: Multidisciplinary Aspects", which was organized by the Institute of Artificial Intelligence at the XVII International Scientific and Technical Conference "Artificial Intelligence and Intelligent Systems", October 17-18, 2017 in Kyiv. (AIIS'2017).

[Visit 21]   On October 27, 2017, in Kyiv, Oksana Dunets took part in a working meeting of the consortium participants (Germany, Belgium, Ukraine) to prepare MANDICS and UNIKIDS projects under the Erasmus + program.

International and National Collaborators Visits

[Visit 22]   Volodymyr Golovko, Olga Tarasyuk (Brest State Technical University), on March 5-8, 2017, a visit to the Ternopil National Economic University took place. During the visit, the re-signing of the cooperation agreement, as well as prof. V.Golovko delivered a lecture to students on the topic "Deep learning of neural networks: theory and application / Deep learning of neural networks: theory and application".

[Visit 23]   Jan Jurjens (Institute of Software Technology (IST), University of Koblenz-Landau University and director of research projects at the Fraunghofer Institute of Software and Systems Engineering, ISST Innovation Laboratory, Fraunhofer Logistics and Information Technology Center, West Germany), 31 August 2017 visited Ternopil National Economic University. During the visit, the sides discussed possible areas of cooperation in the areas of cybersecurity, protection of information and methods to avoid intrusions in wireless networks, industrial data space, the development of 3D printers as new printing technologies. The parties exchanged information and experience in implementing European and national projects.

[Visit 24]   Volodymyr Turchenko (researcher at the Ontatio Institute for Studies in Education, Toronto University, Canada) on October 25, 2017, was on a scientific visit to the

Institute of Intellectual Computer Systems, with the aim of discussing the development of joint research between the two institutions, joint activities within the framework of the preparation of the X IEEE International Conference IDAACS 2019 in Metz, France, September 2019, as well as the state of the publication and strategy for the development of the international Compute Magazine.

[Visit 25] Wang Chunzhi, Dean of the Computer Science School at Hubei Technical University and Ye Zhiwei School Scientists, Chen Hongwei, Zhang Zipang, Su Jun, Liu Weim (Liu Weim, on November 12-13, 2017, visited the framework of the signed Memorandum of Understanding between the Research Institute of Intellectual Computer Systems of the Ternopil National Economic University and the School of Computer Science at Hubei Technical University (Wuhan, China).

[Visit 26] George Markovsky (Head of the Department of Computer Science at the Science and Technology University of Missouri, USA) from December 6 to December 9, 2017. was on a working visit. George Markovsky met with students of the Ukrainian-American Computer Science Program, founder and first dean of which he was in 2004, took part in a joint scientific seminar, met with the current coordinator of the Ukrainian-American computer science program, adopted participated in the meeting of the specialized academic council K58.082.02, and also participated in working meetings for the international conference IDAACS-SWS 2018

[Visit 27] Uwe Grossmann (Professor at the University of Applied Sciences and Arts, Dortmund, Germany) from December 6 to December 8, 2017. was on a working visit during which he took part in the working meeting on the holding of the international conference IDAACS-SWS 2018 as a representative of the co-organizer of the conference of the University of Applied Sciences and Arts (Dortmund, Germany), which will be held in Lviv in September 2018. He also participated in the meeting of the specialized academic council K58.082.02, where the defense of the candidate's dissertation was held at the faculty of the Department of Country Diana, where he was the head of the department.

[Visit 28] Volodymyr Pasichnyk (Professor of the Department of Information Systems and Networks of the National University "Lviv Polytechnic"), Natalia Kunanets (Associate Professor of the Department of Information Systems and Networks of the Lviv Polytechnic National University), Svetlana Antoshchuk (Professor, Director of the Institute of Computer Systems of the Odessa National Polytechnic University) , Galina Scherbakova (Deputy Head of the Department of Electronic Funds and Information and Computer Technologies for the educational work of the Odessa National Polytechnic University within your institution) and Viktor Krylov (Professor, Department of Applied Mathematics and Information Technologies Odessa National Polytechnic University), Sergey Rippa (Director of Training and Research Institute of Information Technology and Management University of the State Fiscal Service of Ukraine) 8 December 2017. Participated in a joint scientific seminar on the basis of Research Institute of Intelligent Computer Systems.

8. AWARDS

[Award 1]. **Volodymyr Kochan** has awarded the honorable title "Honored Inventor of Ukraine" (Decree of the President of Ukraine No. 10/2017 "On Celebration of the State Awards of Ukraine on the occasion of the Day of Unity of Ukraine" dated January 21, 2017).

[Award 2]. **Gubchakevich Oleg** and **Yakobchuk Pavlo** were awarded with the diploma of the III degree for the third place in the All-Ukrainian competition of student's scientific works in the direction of "Information Technologies".

[Award 3]. **Anatoliy Sachenko** received a grant for a trip to the International Research Conference-2017), Dortmund University of Applied Sciences and Arts, June-July 2017, Dortmund, Germany.

[Award 4]. Four students **Oksana Dunets, Vitaliy Kvyatkovsky, Mykola Hrytsyuk and Maxim Kosyak** received a grant for a trip to the International Research Conference-2017) at Dortmund University of Applied Sciences and Arts with a Follow Summer School, June-July 2017, Dortmund, Germany.

[Award 5]. **Anatoly Sachenko** received a grant for the International Week at the Dortmund University of Applied Sciences and Arts, October; 2017, Dortmund, Germany.

9. STATISTICAL DATA

Data	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of Senior Researches	9	15	18	19	20	22	27	30	34	39	40	**39**
Number of Junior Researches	14	17	15	18	18	15	13	11	14	16	12	**10**
Number of Active Research Projects	9	7	7	8	4	2	2	3	2	3	3	**2**
Publications	26	58	57	72	77	104	109	126	127	113	131	**115**
Patents and applications for the invention	more than 150 invention certificates of the former USSR and 39 Ukrainian patents										9	**10**
Participation in Conferences, Symposia and Worshops	13	18	19	21	36	29	33	28	29	33	24	**32**
Number of Defended PhD and DrSc Theses	–	3	3	2	0	3	3	3	1	7	7	**6**
Number of Defended Master Theses	1	10	7	20	23	22	39	22	48	60	12	**54**
Number of Received Awards	1	2	5	7	5	3	2	3	2	5	6	**5**

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