

ACoMIn Newsletter №4

Advanced Computing for Innovation

September 2014

ACoMIn Mission: to strengthen the research and innovation capacity of the Institute of Information and Communication Technologies – Bulgarian Academy of Sciences (IICT-BAS) by increasing the knowledge and skills of its researchers in emerging areas as well as by purchasing modern research infrastructure. ACoMIn should help the institute to successfully accomplish its strategic mission: by 2016, i.e. 5 years after its creation, IICT-BAS has to become a leading RTD Centre in Eastern Europe, providing facilities and working conditions comparable to the average standards of the EU Centres of Excellence in ICT. The institute will support the sustainable regional and national growth and employment by providing RTD results to advanced industrial organisations; it will be a focal point of high-quality research and training in advanced ICT topics.

Progress Report (April – September 2014)

WP1: Strengthening the IICT-BAS Human Potential

Employed Incoming Post-docs

Dr. Volodymyr Kudriashov was appointed to a post-doc position in August 2014. He came to IICT-BAS from the Department of Nonlinear Dynamics of Electronic Systems at the Usikov Institute for Radiophysics and Electronics, National Academy of Sciences of Ukraine, Kharkiv, where he defended his PhD thesis on image and signal processing in both bistatic radiometer and noise waveform radars based on antennas with beam synthesizing. While working at ACoMIn he will conduct research on improving image formation algorithms for noise sources classification, using the Brüel & Kjaer acoustic camera from the SmartLab equipment. His supervisor is Assoc. Prof. Kiril Alexiev.



Short Employments of Experienced Researchers

Prof. Darina Dicheva and **Prof. Christo Dichev** came to IICT-BAS from Winston Salem State University, USA. During their stay in the Institute (9 June – 9 July 2014) they continued the joint

research, initiated in 2013 with their local hosts Prof. Gennady Agre and Prof. Galia Angelova, on using semantic and game techniques for supporting educational systems. The emphasis was on *gamification* – a fairly new and growing field defined as the use of game design elements in non-game contexts. A meta-study of the published peer-reviewed case studies on using gamification in education was conducted. The results will be published in two papers: D. Dicheva, Ch. Dichev, G. Agre, G. Angelova. *Gamification in Education: A Systematic Mapping Study* – accepted for publication in the Journal of Educational Technology & Society (Impact Factor 1.34) and Ch. Dichev, D. Dicheva, G. Angelova, G. Agre. *From Gamification to Gameful Design and Gameful Experience in Learning* – accepted for publication in the Cybernetics and Information Technology Journal (SJR rank 0.216). Two lectures reviewing the state of the art and the trends in the use of gamification in education were delivered to experts coming from relevant academic, educational and IT communities within the frame of an ACoMIn Technology Transfer seminar held on 3 July 2014. Prof. Dicheva and Prof.

from the Visualization Lab of King's College London and assisted in the preparation of the program of the Technology Transfer seminar on 3D visualization of cultural heritage, which took place on 10 September 2014 as an associated event of the International Conference AIMSA 2014. Prof. Dobreva also took part in an ACoMIn Technology Transfer seminar held in Sofia on 9 July 2014, where she gave a lecture on new trends in the development of cultural heritage digital libraries.

Dichev also had two meetings with the RTD team of “Уча.се” – a popular Bulgarian online learning portal. Based on the careful portal evaluation, several recommendations were made. In this way the large community of “Уча.се” end-users, who would benefit from those innovative technologies, was actually reached.

Prof. Milena Dobreva came from the University of Malta with the main goal to continue the joint research with her local hosts Prof. Galia Angelova and Prof. Gennady Agre on digital repositories of cultural heritage artefacts and access to collections of digitized models. During her stay (10 June – 17 July 2014) Prof. Dobreva worked on the preparation of an overview of 3D modelling for archaeological objects, for the purpose of building a User Community in 3D modelling for cultural heritage within ACoMIn. Prof. Dobreva established connections to experts

from the Visualization Lab of King's College London and assisted in the preparation of the program of the Technology Transfer seminar on 3D visualization of cultural heritage, which took place on 10 September 2014 as an associated event of the International Conference AIMSA 2014. Prof. Dobreva also took part in an ACoMIn Technology Transfer seminar held in Sofia on 9 July 2014, where she gave a lecture on new trends in the development of cultural heritage digital libraries.

WP2: Purchasing Smart Lab Equipment and Building User Communities

During the reporting period ACoMIn's SmartLab was complemented with two new devices: an *Integrating Server Environment (ISE)* and a *3D printer*. The ISE is intended to ensure data concentration and acquisition between SmartLab device interfaces and the IICT's High Performance Computing (HPC) core. It also manages functionalities related to the control of transportation systems, modelling, simulation and optimization of traffic systems and their parameters. The ISE provides an environment for designing, testing and simulating various control strategies on a wide range of transportation systems: free



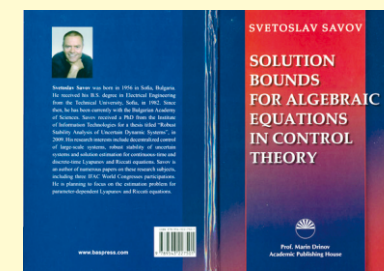
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Published Monographs Supported by ACoMIn

In June 2014 the monograph of **Dr. Svetoslav Savov** from IICT-BAS: ***Solution Bounds for Algebraic Equations in Control Theory*** (205 pages, ISBN 978-954-322-750-1) was published by Prof. Marin Drinov Academic Publishing House. The book is intended for a wide readership including engineers, applied mathematicians, graduate students, etc., seeking a comprehensive view of the main results on the estimation of the solutions of four algebraic equations, namely, the continuous-time and the discrete-time Lyapunov and Riccati equations.



Riccati equations.

In September 2014 the monograph of **Dr. Svetozar Ilchev** and **Assoc. Prof. Zlatolilya Ilcheva** from IICT-BAS: ***A New Approach for Data Handling for Web-based Applications*** (150 pages, ISBN 978-954-322-780-8) was published by Prof. Marin Drinov Academic Publishing House.

Among the potential readers of the book are developers of corporate Internet portals, news and advertising agencies, security footage producers, keepers and communicators of sensitive private data, government administrators etc.

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WP7: Project Management

In July 2014 the European Commission evaluated the work completed in the first reporting period of ACoMIn (project months 1-18, 1 October 2012 – 31 March 2014) as successful. The information about the research tasks, all performed activities and results achieved is presented in 7 public Deliverables available at the project site (www.iict.bas.bg/acomin/deliverables.html).

In order to increase the networking opportunities, in August 2014 the ACoMIn Consortium was extended by a **new partner** – **Prof. Johannes Kraus** from the Department of Mathematics, University of Duisburg-Essen, Germany. The University of Duisburg is among the largest research universities in Germany and Prof. Kraus is one of the leading European scientists in the area of Advanced Computing.

In July 2014 the Bulgarian Ministry of Education and Science provided to IICT-BAS substantial co-financing in order to complement and further strengthen the ACoMIn performance. The national support enables the integration of young Bulgarian researchers and PhD students into ACoMIn activities and provides the SmartLab equipment with additional functionality and modern accessories.

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tivity indices, etc. The scientific program of the event consisted of 5 invited talks and 69 regular papers. The 75 participants of the conference came from 21 countries, namely, Bulgaria, Germany, Austria, UK, China, USA, Belgium, Spain, Czech Republic, Switzerland, Norway, Greece, Turkey, Slovakia, Poland, Russia, Sweden, The Netherlands, Denmark, France, and Canada. The NMA'2014 proceedings will appear as a special Volume of the Springer series Lecture Notes in Computer Science (LNCS) in 2015 and will include 16 ACoMIn-related papers.

The International Workshop on Control in Transportation Systems (CTS'14) was held on 10-11 September 2014 in Sofia and was organised as an associated event of the COST Action TU1102 “Autonomic Road Transport Support Systems” Training School. The goal of this Workshop was to demonstrate advanced solutions and state of the art approaches to formal modelling, design issues and solutions, applied to transport and information systems. The event gathered 22 participants mainly from the Bulgarian academic community. The scientific program of the Workshop contained 2 invited talks and 12 regular presentations selected by the Program Committee after peer-reviewing. Selected papers will be published in a Special Issue of the Cybernetics and Information Technology Journal (SJR rank 0.216).

The 16th International Conference AIMSA 2014 “Artificial Intelligence: Methodology, Systems, and Applications” took place in Varna, Bulgaria on 10-13 September 2014. The AIMSA conferences, regularly organised in Bulgaria, have been providing a biennial forum for the presentation of Artificial Intelligence research and development since 1984. AIMSA is an established event for exchanging ideas between scientists developing and studying methods and algorithms for Artificial Intelligence as well as researchers, who apply them for solving real life problems. The conference was preceded by a one day seminar on 3D visualisation of Cultural Heritage intended to introduce the theory, process and practice of capturing and preparing digital models of cultural heritage artefacts, and how these digital objects can be used to enrich the understanding of our past. The scientific program of the conference consisted of 3 invited talks, 14 long papers and 17 short papers accepted for presentation after peer-reviewing by the conference Program Committee. The Proceedings is printed as Volume 8722 of the Springer Lecture Notes on Artificial Intelligence series and contains 2 ACoMIn-related papers. One of them: I. Nikolova, D. Tcharakchiev, S. Boytcheva, Z. Angelov, G. Angelova “*Applying Language Technologies on Healthcare Patient Records for Better Treatment of Bulgarian Diabetic Patients*” won the AIMSA 2014 Best Paper Award. The event was attended by 47 participants from 14 countries.

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The 8th International Conference on Numerical Methods and Applications (NMA'14) took place in Borovets on 20-24 August 2014. The conference topics included efficient methods and algorithms for advanced computing, modelling and understanding the nature of materials and how those materials could be applied for the advancement of ICT, application of advanced computing to the development of large-scale environmental models, novel results in CMOS modelling and applications of results, new methods and models for computing small sensi-

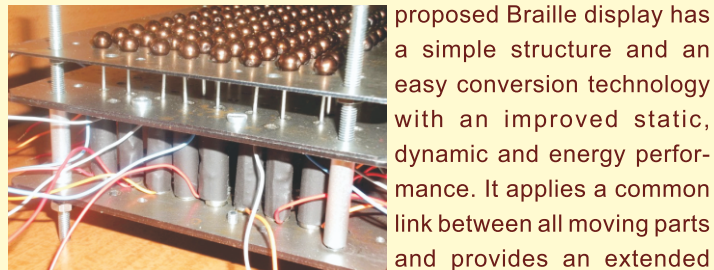
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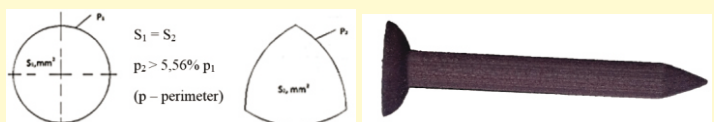
Manager. They presented the GU knowledge exchange strategy as well as the GU commercialisation strategy. The Bulgarian guests had meetings and talks in the James Watt Nanofabrication Centre and visited the clean room; they also held talks and exchanged experience with colleagues from Gold Standard Simulation Ltd. (www.goldstandardsimulations.com/) located in the GU premises. The visit to Glasgow was extraordinarily useful and enlightening, given that the created contacts and gained experiences were combined with concrete plans for activities in the next months.

In September 2014 a **Bulgarian patent application was submitted to WIPO**. The invention named “**Braille Display**” relates to a special tactile matrix, which can be used for creating an auxiliary computer interface for sightless people. The proposed Braille display has a simple structure and an easy conversion technology with an improved static, dynamic and energy performance. It applies a common link between all moving parts and provides an extended tactile feedback and a highly efficient start up with a low consumption of energy. The improved features of the matrix were designed using the Smart Lab equipment.



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In September 2014 a group of scientists from the Embedded Intelligent Technologies Department of IICT-BAS applied for a **Bulgarian patent for an invention named “Nail”**. The application concerns a nail with a special shape – it has three spherical surfaces and three edges. The nail cross-section forms the so called Reloe triangle, providing the nail with a greater resistance to collapse of the structure and ensuring a greater security of wooden buildings as well as a greater resistance to the transverse force actions. In 2015 the patent application of the nail is intended to be extended to WIPO.



From 29 September to 4 October 2014 ACoMIn has been presented at the **Annual International Technical Fair in Plovdiv**, which is the biggest fair in the country. More than fifty companies from the local and international market have shown interest in the topics proposed by the ACoMIn project, with a particular view on SmartLab. Companies from Israel, Austria, Romania, Russia, Serbia, Macedonia, Greece and Poland have expressed their interest in using novel technology such as three-dimensional printers, tomograph and infrared camera. On 30 September 2014, at a seminar entitled “**ICT innovations in Small and Medium Enterprises**” organised by the Bulgarian Association on Information Technologies (BAIT) within the fair, Prof. Galia Angelova introduced ACoMIn and described the main



objectives emphasizing on the development of scientific prototypes for innovative applications. She presented the SmartLab devices and their application to solving practical tasks. The event was attended by IT specialists mainly from the software industry, participants and guests of the fair.

WP5: Dissemination

Scientific Events Supported by ACoMIn

The International Workshop on Advanced Control and Optimisation: Step Ahead (ACOSA) was held on 8-10 May 2014 in Bankya. The workshop gathered 28 specialists working in the areas of control and optimisation, decision making techniques, process control systems, intelligent agents and systems, as well as other related topics. The event was structured in 5 sessions: three of them were devoted to presenting new research results (15 presentations), and two – to discussing the benefits of applying advanced control and optimisation, and on the implementation of advanced control concepts and technologies in small and medium-sized enterprises. The 15 ACoMIn-related papers will be published in the Workshop proceedings. Selected best papers will be proposed for publication in relevant research journals.

The International Workshop on Biometrics (BIOMET' 2014) was held on 23-24 June 2014 in Sofia with the main objective to disseminate recent advances in Biometrics among the research groups and companies in Bulgaria and the Balkan countries. The workshop was attended by 32 participants from Bulgaria, Italy, UK, Cyprus, Finland, Saudi Arabia, etc. The scientific program of the event included 4 invited talks and 17 presentations selected after peer-reviewing by the Workshop Program Committee. The Workshop Proceedings will be published as a special Volume in the Springer series Lecture Notes in Computer Science.

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way traffic, motorway control, macro and microscopic modelling. The ISE supports simulation tasks on *AIMSUN software suit*, an optimal control by *TRANSYT package* as well as real time communications with traffic lights controllers.

The ProJet 460Plus full-colour 3D printer is the world's most affordable colour 3D printer with the highest ease-of-use in its class. It incorporates advanced 3-channel CMY full-colour 3D



printing and operates with safe build materials, active dust control and zero liquid waste. Some of the ProJet 460Plus technical specifications are: resolution – 300 x 450 dpi, minimum feature size – 0.15 mm, layer thickness – 0.1 mm, input data file formats supported – STL, VRML, PLY, 3DS, FBX, ZPR. The ProJet 460Plus 3D printer

can rapidly design, create, communicate, plan, guide, prototype or produce functional parts, devices and assemblies.

Technology Transfer Seminars

The serial seminar of the **User Community “Intelligent Management of Digital Content”** devoted to new trends in e-learning was held in IICT-BAS on 3 July 2014 with three invited talks. Prof. Christo Dichev gave a lecture entitled “*Using game elements in educational systems: theoretical and technological perspectives*”, focused on the psychology of gamification in education and training. Prof. Darina Dicheva gave a lecture entitled “*Gamification in Education: What, Why, How?*” with an



emphasis on the results of the conducted meta-study. The lectures were followed by a lively discussion about the possibilities of using gamification in the Bulgarian educational institutions. The final presentation “*How learning can be a game*” was given by Mr. Darin Madzharov, the founder of the company “Уча.се”. He presented the popular Bulgarian online learning portal “Уча.се” (www.ucha.se) – a platform for learning and supporting online interactive sessions with pupils and teachers. The emphasis was on the comprehensive coverage of the learning material in form of appealing video lectures and on the

user interactivity. The discussion that followed was focused on enhancing the online platform to meet the growing students' needs and to increase its acceptance by the teachers. The seminar



was attended by 28 participants from academic institutions, secondary schools and Bulgarian IT companies.

The latest seminar of the “**Intelligent Management of Digital Content**” User Community was held on 9 July 2014. The seminar was aimed at presenting new trends in the development of digitized cultural heritage and digital libraries and discussing best practices and innovative approaches to their use in education and citizen science. It was organized with the active participation of Ontotext (www.ontotext.com) – a leading Bulgarian company in the area of semantic and content technologies. The program included four presentations: Prof. Milena Dobreva (from the University of Malta) gave a talk on best practices in using digital

resources in education and citizen science. Dr. Vladimir Alexiev (from Ontotext) spoke about using semantic technologies for cultural heritage. Mr. Petar Miladinov (from Sofia University) presented an example of integrated learning – the Virtual Museum. In his presentation Mr. Ilian Uzunov from Ontotext



discussed approaches to enhancing the educational resources with material from digital libraries as well as other actual tendencies in e-learning. The seminar ended up with an interesting discussion on the current challenges in using digital libraries' resources for education and research purposes. The event was attended by 23 participants from research institutions and IT companies.

The serial seminar of the **Industrial Mathematics User Group** was organised within the frame of the 8th International Conference on Numerical Methods and Applications (NMA'14) and was held in Borovets on 21 August 2014. It included the lecture “*Walk on equations and sequential Monte Carlo to solve linear systems*” presented by Dr. Sylvain Maire from Université du



Sud Toulon-Var, France, and the discussion “*Ultimate numerical methods for solving problems in modern physics and emerging technologies*” moderated by Prof. Ivan Dimov from IICT-BAS. The discussion paved the way towards more sophisticated studies involving devices such as MOSFETs (Metal On Silicon Field Effect Transistor), double-gates transistors, nano-wires, etc. The event was attended by 20 participants – scientists as well as practitioners from Austria, Belgium, Bulgaria, France, Germany, Switzerland, UK etc.

The seminar on **3D Visualization of Cultural Heritage** (www.aimsconference.org) was held in Varna on 10 September 2014. It was organised as an associated event to the 16th International Conference on Artificial Intelligence AIMS'14. The programme contained an introduction to the theory, process and practice of capturing and preparing digital models of cultural heritage artefacts. The seminar was implemented as a one-day



tutorial that combined several theoretical lectures with a number of practical sessions allowing attendees to get hands-on experience with technologies available with an emphasis on low cost, ease of use and sustainability. The morning session included

the following lectures: Drew Backer (Kings College, London, UK) “*Digitising Cultural Heritage – An overview of the state of digital cultural heritage, its importance, use and potential*” and “*Making Spaces – An entry level introduction to multi dimensional theory (space, time and probability), interaction design and dissemination*”; Martin Blazeby (Kings College, London, UK) “*Best Practice for 3D Digitisation – The London Chapter*” and “*3D Capture Techniques*”. The afternoon session consisted of two hands-on workshops - Depth Map Sensor scanning and Handyscan and Photogrammetry. The event was attended by 20

participants from Bulgarian research institutions, mostly young researchers from IICT.

The Seminar on Robotics and Innovations was held on 18-19 September 2014 at IICT-BAS. The program included four lectures of Prof. Kenichi Yano from the MIE University, Japan, dedicated to the computation framework in modelling and intelligent control of industrial and medical robotics and several presentations of young scientists from IICT-BAS. The first day was dedicated to the application of the computation fluid dynamics and finite element analysis in the optimisation and robot control for die casting process, mold shape design as well as an innovative liquid transferring robot. During the second day the problems of medical

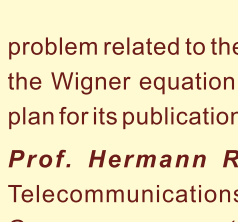


and assistive robotics were discussed. Prof. Yano presented his research on the development of robots for physical therapy that assist therapeutic exercises for shoulder joints in order to relieve the physical load on physiotherapists and demonstrated several life support systems and rehabilitation robots developed in his laboratory. The event ended with an interesting discussion on the possibilities for a future collaboration in the area of robotics, intelligent control, computational methods and mathematics based on the SmartLab equipment and the HPC infrastructure provided by IICT-BAS.

WP3: Networking with Leading EU Partners

Incoming Short Visits

Prof. Siegfried Selberherr from the Institute of Microelectronics at the Technical University of Vienna paid a working visit to IICT-BAS in the period 29 April – 2 May 2014. He had meetings with the AComIn coordinator, project work package leaders and collaborators, concerning the organisation of the activities, management of the collaboration and novel trends as well as open research problems raised by the progress of nanoelectronics. There were also several meetings, a seminar and discussions concerning the completion of joint papers and future research objectives.



In particular the discussions focused on a problem related to the existence and uniqueness of the solution of the Wigner equation. A research result has been derived and a plan for its publication was made.

Prof. Hermann Rohling, the Head of the Institute of Telecommunications at Hamburg University of Technology, Germany, was guest of AComIn in the period 18 – 24 May 2014.



During his stay he had meetings and discussions with leading scientists from the Department of Mathematical Methods for Sensor Data Processing. On 21 May Prof. Rohling gave a lecture entitled “*Automotive Radar Systems*”, which caused fruitful discussions and raised interest in further development of the research contacts.

Prof. Kenichi Yano, Head of the Mechatronics Laboratory and Dean of the Mechanical Engineering Department at MIE University, Japan, visited IICT-BAS in the period 18-20



September 2014. Prof. Yano took part in the AComIn Transfer Technology Seminar on Robotics and Innovations, which was held on 18-19 September 2014. He delivered four lectures on robotics and innovations; computation methods and simulations in industrial robotics; development of machining support robots as well as on the

development of medical and human support robots. During his stay Prof. Yano was familiarised with the SmartLab equipment and had several meetings and discussions with leading scientists from the Embedded Intelligent Technologies Department, where some possibilities for future cooperation with IICT-BAS were discussed.

Short Visits of Project Partners

Prof. Oleg Iliev from the Fraunhofer Institute of Industrial Mathematics (ITWM), Kaiserslautern, Germany, visited IICT-BAS in the period 17-22 May 2014. Some problems of common research interest were discussed during the visit, focusing on the experience of ITWM in the application and analysis of CT voxel



data and on some specific information concerning the functionalities of GeoDict software. Prof. Iliev took part in the International Conference on Numerical Methods for Scientific Computations and Advanced Applications, Bansko, 19-22 May 2014, organised by IICT-BAS, where he presented a plenary invited talk “*Upscaling Based Preconditioners for Composite Materials*”.

Prof. Asen Asenov and **Dr. Campbell Miller** from Glasgow University (UoG) were guests of AComIn in the period 11-17 June 2014. Prof. Asenov and Prof. Ivan Dimov (Head of the Parallel Processing Department of IICT-BAS) discussed the state of the collaboration between the two institutions and planned future



actions and interactions. Dr. Miller and Dr. Jean Michel Sellier (from IICT-BAS) discussed the preparation of a Horizon 2020 application on advanced quantum modelling of nanoelectronic devices and made plans for the submission of a joint project proposal to a suitable H2020 Call in 2015. Prof. Asenov and Dr. Miller visited the research groups of Prof. Ivan Dimov, Prof. Galia Angelova, Prof. Dimitar

Karastoyanov and Prof. Kostadin Kostadinov and were thoroughly informed about the research capabilities and the active research projects. This information will be disseminated in the School of Engineering of UoG in order to foster future collaboration within the frame of Horizon2020.

Secondments of/to Project Partners

Prof. Virginio Cantoni from the University of Pavia, Italy visited IICT in the periods 7-23 May and 22 June – 4 July 2014. During his stay Prof. Cantoni conducted collaborative research with Assoc. Prof. Dimo Dimov on the development of a database with 3D images of human ears for biometrics purposes. The images were created using the 3D Scanner of the AComIn Smart Lab. The results of this research were presented in two joint papers:

V. Cantoni, D. T. Dimov, A. Nikolov “*3D Ear Analysis by an EGI Representation*” and D. T. Dimov, V. Cantoni “*Appearance-Based 3D Object Approach to Human Ears Recognition*”, presented at the BIOMET'2014 International Workshop held in Sofia on 23-24



June 2014. The Workshop proceedings will be published as a Volume in the Springer series Lecture Notes in Computer Science. During his visit Prof. Cantoni, a Program Chair of the BIOMET'2014 Workshop together with Assoc. Prof. Dimo Dimov,

was also involved in tasks related to the successful preparation and running the event. Prof. V. Cantoni took part in the 15th International Conference CompSysTech in Russe, where on 27 June 2014 he gave the invited lecture “*Eye-tracking systems, research and applications*”.

During the period 15 May – 16 June 2014 **Assoc. Prof. Lyubka Doukovska**, **Assoc. Prof. Vladimir Monov** and **Dr. Vasia Atanassova** visited the School of Science and Technology and



the Centre for Applied and Autonomous Sensor Systems at the University of Örebro, Sweden. During their stay they conducted joint research with their Swedish colleagues on some optimisation and intelligent control topics. The results of

this research were published in the paper Atanassova V., L. Doukovska, D. Karastoyanov, František Čapkovič. “*InterCriteria Decision Making Approach to EU Member States Competitiveness Analysis: Trend Analysis*”, presented at the 7th IEEE International Conference Intelligent Systems (IS'14), 24-26 September 2014, Warsaw, Poland. They also discussed the possibilities to use the specialised software package EDEM, purchased within the frame of the AComIn project, for modelling the production, transportation and use of granular materials. At a seminar of the School of Science and Technology, Dr. Atanassova presented a lecture entitled “*InterCriteria Decision Making using Intuitionistic Fuzzy Sets*”.

From 30 June to 31 July 2014 **Assoc. Prof. Kiril Simov** and **Assoc. Prof. Petia Osenova** visited the Faculty of Arts at the Vrije University of Amsterdam. The visit had two main objectives: to complete and release the first public Bulgarian Core WordNet; and to adapt the Bulgarian NLP pipe for processing big amounts of texts in currently used standards, such as NAF, and to enrich it with modules for semantic annotation. The research tasks were performed in close cooperation with the group of Prof. Piek Vossen, the Head of the Computational Lexicology and Terminology Lab and with Prof. Francis Bond (from Singapore University), who was a visiting fellow in the Vrije University of Amsterdam in July. At the moment the Bulgarian Core Wordnet is freely available at



the site <http://compling.hss.ntu.edu.sg/omwl/>. The NLP pipe was adapted to process big data in NAF format and to incorporate the available WordNet senses. The pipe will be ready in December 2014 and its Bulgarian version will be included in the toolbox of the EC FP7 project “*NewsReader: Building structured event Indexes of large volumes of financial and economic Data for Decision Making*”.

Dr. Maria LyMBERG from IICT-BAS visited the University of Duisburg-Essen, Germany in the period 1-28 September 2014. The main objective of her secondment was to conduct joint research with Prof. Johannes Kraus. During this visit in Essen a



preconditioning technique known as incomplete factorisation by local exact factorisation (ILUE) was analytically and numerically studied. A technique for constructing ILUE preconditioner based on splitting of the domain into overlapping and/or non-overlapping subdomains was proposed and a condition number estimate was derived. The scientific results obtained are presented in a paper entitled “*Incomplete*

Factorization by Local Exact Factorization (ILUE)” submitted to a special issue of the Journal of Mathematics and Computers in Simulation (Impact Factor 0.856) devoted to the 80th Anniversary of the distinguished Professor Owe Axelsson.

WP4: Development of IP and KT Plan and Innovation Capacity Building

In the period 22-25 April 2014 **Prof. Galia Angelova**, **Prof. Ivan Dimov**, **Prof. Dimitar Karastoyanov** from IICT-BAS and **Prof. Kostadin Kostadinov** (AComIn innovation consultant) visited Glasgow University (GU – an AComIn partner) and Gold Standard Simulation Ltd. – a company associated to GU. The main objective of the visit was to gain an impression from the GU approach for working with external clients, making joint projects for industrial research, transferring technologies to industry and offering access to expensive high-tech equipment. Several important meetings were organised, among them were short meetings with Prof. Neal Juster, Senior Vice-Principal and Deputy Vice-Chancellor of GU, as well as with Prof. John Marsh, the Head of the GU School of Engineering; a meeting with Dr Brendan Casey, CEO of Kelvin Nanotechnology, a company owned by GU that implements projects with clients and enables access of industrial users to the James Watt Nanofabrication Centre; talks with Melville Anderson, Head of GU IP and Commercialisation Division; Prof. James Conroy, Vice Principal responsible for the internationalisation; Dr Neil Bowering, Head of Knowledge Exchange Unit in the GU Research Strategy and Innovation Office; and Joe Galloway, Research Support

