	EUROPEAN COMMISSION RESEARCH AND INNOVATION DG	Final Report

Project No: 316087

Project Acronym: AComIn

Project Full Name: Advanced Computing for Innovation

Final Report

Period covered: from 01/10/2012 **to** 31/03/2016

Start date of project: 01/10/2012

Project coordinator name:
Prof. Galia Angelova

Version: 1

Date of preparation: 05/05/2016

Date of submission (SESAM): 29/05/2016

Project coordinator organisation name:
INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Final Report

PROJECT FINAL REPORT

Grant Agreement number:	316087
Project acronym:	AComIn
Project title:	Advanced Computing for Innovation
Funding Scheme:	FP7-CSA-SA
Project starting date:	01/10/2012
Project end date:	31/03/2016
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Final Report

Please note that the contents of the Final Report can be found in the attachment.

4.1 Final publishable summary report

Executive Summary

The general objective of AComIn is to strengthen the research and innovation capacity of the Institute of Information and Communication Technologies (IICT), Bulgarian Academy of Sciences (BAS) by increasing the knowledge and skills of IICT researchers in advanced areas, by purchasing modern research infrastructure as well as by development of innovation capacity. AComIn should help the institute to successfully accomplish its strategic mission: by 2016, i.e. 5 years after its creation, IICT 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 and users from the public sector.

In terms of human capacity, IICT managed to improve its human resources. AComIn project attracted 16 incoming post-doctoral researchers, who worked in IICT with long term contracts, and eight visiting professors who were recruited in IICT with short term employments. Four of the post-doctoral researchers remained in the institute after AComIn end. As for the staff of the institute with permanent contracts, comparing the figures before and after AComIn (2011 vs. 2016), overall the number of permanent staff remains the same but the average age is now between 40 and 50 compared to 50-60 in 2011. Many female researchers obtained scientific degrees and habilitations; new young researchers and doctoral students were attracted. Moreover, IICT offers continued research education to obtain a PhD with independent preparation or paid PhD study to young experts coming from the industry. This illustrates the capacity building and multiplicator role of IICT.

In terms of publication activity, all research teams in AComIn produced internationally acknowledged results. Several research directions (not envisioned in the original proposal) emerged as result of new ideas brought by the new postdocs. In the category “papers with IF and SJR with DOI” AComIn scientists published 161 papers. The project actually implied for 3 years more than doubled indicators as follows: Total IF, Average IF, and the SJR SCImago Journal & Country Rank. Another effect is the strong reduction of the number of publications in domestic Volumes.

The equipment acquired for the SmartLab is the most visible and understandable asset of IICT. It clearly complements the existing high performance computing core and extends significantly the research tasks that can be tackled using the new devices. The activities triggered by the SmartLab acquisition highlight that this is a perfect mechanism to attract additional interest and to generate industrial projects and collaborations. SmartLab reinforces the existing research with complementary activities. This infrastructure opens a clear perspective for cooperation with the industry and makes IICT one of the key actors in advanced computing in South East Europe.

The innovation activities of IICT are considerably extended in 2012-2015. There are six projects in AComIn-related topics, completed within the Competitiveness Operational Programme, coordinated by Bulgarian SMEs which collaborate with IICT as a research partner providing innovation. Based on AComIn results, IICT performed eight projects for contracted research with seven companies and one client from the public sector, in the areas of material analysis, audio processing and 3D modelling and simulation. Fifteen collaboration project for joint research and development of pilot prototypes were accomplished with academic organisations, users from the public sector and companies. Eleven patent applications of six inventions were submitted to the Bulgarian Patent Office, the World Intellectual Property Organisation and the European Patent Office. Certificates for one Registered design and one Utility model were issued by the Bulgarian Patent Office.

The dissemination activities within AComIn (16 Scientific Forums in the project research areas, twenty Technology Transfer events, yearly Doors Open Days, numerous promotional materials including three movies and various media reactions) made the project visible not only in the research

community but in the society at large.

In this way the AComIn project had a definite, direct and clearly visible positive impact through significant strengthening of human potential across all units involved in it. This impact concerns not only personnel directly involved in the project, but all other researchers of the IICT BAS. The indirect effect comes, among others, from strengthening the international reputation of the IICT BAS as a prime research institution, and making it a key player at the regional level.

Summary description of project context and objectives

The Institute of Information and Communication Technologies (IICT), Bulgarian Academy of Sciences (BAS) (http://www.iict.bas.bg) is an independent legal entity established on 1 July 2010. It arose after the Academy has been reorganised, as recommended in its International Evaluation performed by the European Science Foundation/ALLEA (November 2009). As a part of the reorganisation, involving extensive personal attestation and structural optimisation, the IICT was founded with the aim to integrate the research teams from three former Institutes of the Academy: the Institute of Parallel Processing (IPP), Institute for Information Technologies (IIT) and Institute for Computer and Communication Systems (ICCS).

The IICT is a self-governing permanent research unit of BAS established to perform the following major tasks: (i) to carry out basic and applied scientific research; (ii) to train students, on a contractual basis with the higher schools, granting them a possibility to participate in the scientific research process; (iii) to provide postgraduate tutorship to the PhD students and professional researchers. The IICT governing bodies are: (i) the Assembly of Research Scientists, (ii) the Scientific Council and (iii) the Director. The legal basis of the IICT-BAS is legally grounded by the (i) Law of Bulgarian Academy of Sciences and (ii) Statutes of the Bulgarian Academy of Sciences.

IICT-BAS has permanent staff of about 100 scientists and carries out research in different areas. The Institute is leader of two national infrastructures: the supercomputing one and the CLARIN-BG infrastructure for development of language resources and language technologies for Bulgarian. The AComIn project is generally focused on Advanced Computing, Language and Semantic Technologies, Image and Signal Processing as well as Optimisation and Intelligent Control. Nine of the 13 IICT departments worked in the four AComIn topics as follows:

- In Advanced Computing: Department of Parallel Algorithms, Department of Scientific Computations and Department of Grid Technologies and Applications;
- In Language and Semantic Technologies: Department of Linguistic Modelling and Knowledge Processing;
- In Image and Signal Processing: Department of Mathematical Methods for Sensor Data Processing;
- In Optimization and Intelligent Control: Department of Embedded Intelligent Technologies, Department of Intelligent Systems, Department of Hierarchical Systems and Department of Modelling and Optimization.

The general objective of AComIn is to strengthen the IICT research and innovation capacity by increasing the knowledge and skills of IICT 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 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 training in South-East Europe.

More specifically, the project objectives are as follows:

- Strengthening the IICT Human Potential by recruitment of incoming experienced researchers, foreigners and Bulgarian nationals who have left the country, including long-term employments of 7 post-docs;
- Purchase of modern equipment for setting up a Smart Periphery Lab that enables to fully exploit the potential of the existing IICT core Grid infrastructure and the Bulgarian Supercomputer. Organisation and Training of User Communities with company representatives who need deeper expertise and innovative RTD approach in their areas of activities;

- Networking with the partnering organisations and knowledge exchange with established ICT experts as well as participation of IICT researchers in prestigious international scientific events and exhibitions;

- Building an IICT Innovation Strategy and development of innovation potential and IPR management skills. Patent applications to the European Patent Office and the Bulgarian Patent Office are foreseen as well;

- Organisation of various dissemination activities to spread out the project results and the IICT excellence: scientific Conferences and Workshops, Technology Transfer events oriented to User Communities and innovation-absorbing Bulgarian companies, Information Days and Doors Open Days, a non-scientific Stakeholder Meeting and a Round Table, as well as publishing books and monographs, leaflets and Newsletters, posters and other promotional materials, making three movies for dissemination via TV channels, YouTube, Facebook etc.

- Evaluation of IICT by international EC-selected reviewers, scheduled for months 35-42. Four independent reviewers assess the IICT-BAS overall research quality and capacity in the post-evaluation facility in order to assign a "quality label" to the institute.

AComIn is focused on research topics which are fundamental for ICT and enable radical progress and development of novel applications. The state-of-the-art frontiers of these technologies tackle computational tasks with high complexity which underpin the challenges of Horizon 2020. IICT has proven record of excellence in these synergistically connected areas and it is expected that the project will strengthen further the horizontal collaboration within the institute. Advanced computing becomes a broadly-used technology relatively recently because it requires substantial infrastructural developments; thus the available IICT capacity in advanced computing is a chance for the other IICT departments to quickly switch to most modern computational paradigms and to generate state-of-the-art results and corresponding innovation. More precisely, the scientific focus of the project is defined by the following research fields:

- Area 1: Advanced computing and Finite Elements applications including multiscale and multiphysics simulations of strongly heterogeneous media with strongly nonlinear and/or anisotropic behaviour as well as high-performance computing in engineering and environmental problems.

- Area 2: Monte Carlo methods, algorithms and distributed computing including sensitivity analysis of large mathematical models as well as advanced applications of Monte Carlo simulations in computational physics and environmental sciences.

- Area 3: Multimodal enrichment of voice communication by investigation a new generation of intelligent voice-activated technologies that focus not only on the precise recognition of spoken words but on interpretation of meaning and context to deliver more accurate speech recognition results.

- Area 4: Large-scale approach to multilingual terminology available in public sites by integration of separate resources, taking into account the ambiguity and the complex links between terms, and producing dynamic reference collections that will be publicly available at the AComIn site.

- Area 5: 3D modelling and recognition in biometrics applied to 3D face recognition based on large DB of face images, lips dynamics processing to help speech segmentation and recognition, iris dynamics and colors to enrich current eye tracking techniques and/or iris diagnostics, etc.

- Area 6: Digital preservation of cultural heritage for research and education by integration of facilities provided by Smart Lab devices and advanced computing solutions.

- Area 7: High spatial resolution based on near-field focalisation by using knowledge (delivered by the Smart Lab acoustic holography) about sources of noisy signals and any sound field descriptor such as sound pressure, sound intensity, or particle velocity as a function of position.

- Area 8: Hierarchical optimization in real time applications related to transportation systems, in particular for solving problems of optimal control, real time decision making, and on-line resource allocation in communication and transportation networks.

- Area 9: Energy efficient production technologies by using the Smart Lab devices and related IT methods for the precise study of dynamical behaviour of complex industrial systems and processes, further development of energy efficient technologies and improving the production quality.

- Area 10: Maintenance of industrial facilities operating in aggressive environment by creation of IT models for diagnostics and predictive maintenance of facilities operating under high risk of incidents. This includes modelling the dynamic behaviour of complex industrial systems and processes using the Smart Lab devices.

As for the selected equipment, which upgrades the computational facilities of the institute, the AComIn objective is to purchase devices that ensure the "data autonomy" of IICT, i.e. devices that enable flow of real-world data for the IICT research tasks. The core computational infrastructure of IICT integrates GRID clusters and the Bulgarian supercomputer purchased with considerable national funding within various programmes. However, insufficient advanced #periphery# (in a broad sense) to the HPC core was available. IICT needed modern devices to acquire data about objects and processes that might be of interest for the Bulgarian high-tech industry. Therefore AComIn plans to strengthen the IICT research infrastructure by purchasing SmartLab: a set of complementary high-tech devices that enable 3D input (by measuring shapes, microstructure, sound, temperature), 3D output (vizualisation, 3D printing), study of system dynamics, a speech processing studio, as well as an integrating server with software for traffic simulation and modelling. These devices enable highly innovative scientific activities related to material sciences, energy, health, industrial control and optimisation etc.

Description of main S & T results/foregrounds

I. Scientific Foreground

AComIn foreground is defined in terms of new knowledge, generated in modern IT areas as result of the project research activities and technological achievements. The lists of most representative publications and exploitable knowledge items, presented in this Final report, support the claims for innovation and originality.

1. Wigner Monte Carlo Algorithms for Quantum Transport in Nanoelectronics

Efficient Monte Carlo Methods (MCM) are of great importance for the analysis of large-scale computer models. Because of their robustness, MCM is the only viable method for a wide range of high-dimensional problems ranging from Atomic Physics to Finance. MCM is a powerful tool for sensitivity analysis of large and very large mathematical models.

Our research in the frame of AComIn is focused on ground-breaking applications like studying of special nano-structures considered as potential candidates for future quantum computers, where we have considered technologically produced structures. The miniaturisation of devices did bring the developers in the realm of quantum transport. While technologically important quantum effects were only seen as perturbations in the past, today they are so relevant that specialists are exploiting them as principal effects to make new innovative devices work. The MCM has been extremely successful in the description of such devices and effects. The outcomes could be of great impact in the semiconductor community giving the creation of the first fully quantum simulator able to take into account also scattering effects. That could lead to the simulation of 3D devices like FinFETs, nanowires, multi-gate FETs, i.e. devices that are the most likely to be the candidates to substitute the MOSFET technology that is suffering from the miniaturisation effects. Those devices are already considered by industries such as Intel and AMD, as publicly advertised. The code that implements our MC algorithm is parallelised using the MPI library. This allows us to maintain the portability among different operating systems and/or architectures including available computational infrastructure at IICT-BAS.

The applications we are sealing produce advancements of three species: Development of physical insights in the field of Silicon based quantum computing devices; Development of a completely new numerical technique for the time dependent simulation of chemical systems; Development of mathematical advancements and insights in the theories of quantum transport. The following research activities were performed: (i) The research has been focused on the development of a time-dependent MC algorithm. Our MCM represents the first successful attempt in the world to simulate the Wigner equation time-dependently and multi-dimensionally. Groups at the University of Antwerp (Belgium) and in TU-Wien (Austria) are now using this new method on a daily basis. (ii) The two-dimensional Wigner MCM (ballistic regime) has been applied to the study of ordered and disordered arrays of dopants in order to explain the experimental results of various groups (in particular the Shinada’s group from ASMeW, Japan). The results are able to explain the experimentally observed enhanced transport characteristics obtained by ordered arrays. (iii) A

sensitivity analysis of the coherence length in the Wigner MCM has been carried with success using the concepts of L1, L2 norms and the cosine similarity. The aim of this work is to show the efficiency of sensitivity studies of the design of semiconductor devices. (iv) A modification to Density Functional Theory to include the one-body Wigner MCM has been developed and validated in the cases of Hydrogen molecules in different geometrical configurations, Boron and Lithium. This is a very important achievement since the use of single body Wigner MCM allows for the first time the use of the Wigner formalism in the study of complex chemical systems. Let us mention that the many-body quantum problem was considered (before appearing the Wigner MCM) as unsolvable because of the non-polynomial growth of the computational complexity when other methods are used.

2. Robust Finite Element Methods and Algorithms for Advanced Computer Simulations

The modern Finite Element Methods (FEM) provide a computational technology for solving important classes of multiscale and multiphysics problems in science and engineering. The obtained results concern such challenging topics as novel FEM discretization techniques and robust scalability for problems with extremely heterogeneous and anisotropic coefficients.

The FEM discretization is based on conforming or nonconforming approximations. In both cases, the FEM basis functions should have a local support, ensuring sparsity of the matrices of FEM linear systems. The obtained new discretization/approximation results include: (i) interpolation, cubature rules, and least squares fitting of harmonic functions based on Radon projections; (ii) mixed finite element methods based on weighted Hdiv bilinear forms and equivalence between mixed and nonconforming FEM discretization. The robustness of mixed FEM discretization is studied in terms of uniform boundlessness of the constant in the inf-sub condition and the related LBB (Ladyzenskaja-Babuška-Brezzi) inequality.

Many of the nowadays real-life applications involve large-scale parallel processing of FEM linear systems with millions or even billions of degrees of freedom (unknowns). Such huge computational problems are beyond the scope of commercial software tools. The obtained new results are in the field of scalable preconditioned conjugate gradients (PCG) iterative solution methods. They include new or significantly improved multilevel, multigrid and domain decomposition methods, namely: robust algebraic multilevel iteration (AMLI) and semi-coarsening AMLI methods for strongly anisotropic problems; auxiliary space multigrid method based on additive Schur complement approximation; spectral analysis of geometric multigrid methods and full multigrid schemes for isogeometric analysis; finite element tearing and interconnect (FETI) solvers for non-standard finite element equations based on boundary integral operators.

The obtained results allow for advanced computer simulations and studies of complex processes and phenomena in science and high technologies. Among others, the robust solvers are tested on world-wide recognized SPE (society for petroleum engineering) benchmarks. The applications staying beyond the above theoretical achievements include industrial flows in porous media, as well as advanced civil engineering, biomedical engineering, environmental engineering, etc. simulations.

Some algorithms based on the numerical investigation for the seismic analysis of tall reinforced concrete (RC) Civil Engineering structures, which have been degradated due to extreme environmental actions and are strengthened by cable elements are developed. The effects of multiple earthquakes on such RC building frames are computed. Damage indices are estimated in order to compare the seismic response of the structures before and after the retrofit by cable element strengthening, and so to elect the optimum strengthening version.

A new computational model is developed for the mathematically rigorous analysis of Civil Engineering structures, which have been environmentally damaged and subsequently strengthened by cable-elements. The problem is treated as an inequality one, where the governing conditions are equalities as well as inequalities. The cable behavior is considered as nonconvex and non-monotone and is described by generalized subdifferential relations including loosening, elastoplastic-fracturing and other effects. Using piece-wise linearization for the cable behavior, a linear complementarity problem, with a reduced number of unknowns, is solved by optimization algorithms.

3. Advanced Computing in Dynamical Analysis of Elastic Structures

Understanding in details the dynamical behavior of elastic structures provides valuable information for the engineers, which can be used in the design, maintenance and health monitoring. The parametric study in frequency domain by the concepts of nonlinear normal modes (NNM) and nonlinear frequency-response function (NFRF) presents such knowledge that describes completely the dynamical characteristics of the structure. The necessity of obtaining reliable and accurate results requires consideration of nonlinear physical models and development of proper mesh discretization methods, e.g. finite element methods. As a consequence, the whole process of computing the NNM and NFRF becomes computationally expensive and cumbersome. Its effective parallel implementation on high performance computers is essential and unavoidable for the future development of new technologies for design, optimization and health monitoring of engineering structures.

New parallel algorithms for computing numerically the NFRF and NNM of dynamical systems are developed. The numerical methods are applied to large-scale dynamical systems that arise from space discretization of real-life elastic structures. New results, which show the optimal scalability of the proposed parallel implementation, are obtained.

The proposed numerical approach for dynamical analysis presents an iterative process for computing periodic responses of nonlinear systems by varying a parameter (such as frequency of vibration), determination of stability of the periodic solution, establishment of bifurcation points and following the secondary branches of solutions that arise from the bifurcation points. The computation of the NNM or NFRF is achieved by combination of finite element method, shooting and continuation methods. The application of the finite element method to elastic structures, considering geometrical type of nonlinearity, results into nonlinear system of second order ordinary differential equations. The shooting method computes the initial conditions that lead to steady-state periodic response of the dynamical system while the continuation method defines a prediction for the next point from the bifurcation diagram and enables to pass turning points (cyclic-fold bifurcation points). Additionally, the shooting method requires a time integration scheme, achieved by Newmark's method and solution of nonlinear algebraic system, achieved by Newton-Raphson's method.

New parallel realization of the shooting method is developed. The parallel process involves simultaneously efficient algorithms and basic matrix operations for sparse and dense matrices. Effective implementation on high performance computers considering equal distribution of computations and memory among available processors is obtained. New results with optimal parallel speedup and efficiency of the shooting method applied to nonlinear dynamical systems are achieved.

The proposed new technology gives the opportunity to academia and industry to compute efficiently the dynamical properties of real-life applications on high performance computers.

4. Advanced Methods, Algorithms and Innovations Based on 3D Digitisation and Prototyping

A key topic in this area is the voxel data processing based on computed tomography (CT) images of microstructures. The addressed advanced applications vary from fabless technologies for design of new composite and/or porous materials, trough quality control of technological processes and nondestructive defectoscopy, to high-tech innovations in biomedical engineering.

Accurate segmentation of 3D CT data of porous media is crucial for the numerical simulations and the computation of the material/object’s macro characteristics at the next stage. Due to the highly irregular structure of the segmentation phases and the presence of noise in the image, the classical methods are not reliable and the results of different standard algorithms may differ drastically (even on up to 50% of the data). A completely new direction of image segmentation is investigated, where some physical properties of the scanned specimen are incorporated in the segmentation process as constraints. In particular, the volume of the solid phase can be determined from the material’s density and weight measurements and can be a priori prescribed (mass conservation), while the solid phase

itself, should be connected whenever the specimen is a single material piece.

Two different families of 2-phase image segmentation methods are proposed, analyzed and implemented. The conducted numerical experiments are promising in terms of both improved accuracy and decreased computational time. The computational efficiency is further optimized. MPI parallel implementations of the new algorithms on the high performance cluster at IICT-BAS are developed. It is important to notice, that experimental measurements of the macro characteristics of porous materials could be rather expensive and not always possible. In such cases, virtual material design is a modern research direction that significantly speeds up the analysis and the derivation of new porous materials with a priori given physical properties.

New methods, algorithms and software (including parallel) implementations for numerical upscaling are developed. The computed anisotropic tensors of material properties are beyond the nowadays abilities of the lab equipment for measurements and testing. The reported applications include: (i) numerical homogenization (upscaling) of heterogeneous anisotropic linear elastic materials; the studied specimens vary from innovative porous metals (lighted aluminums) to trabecular bone tissues, where the impact of osteoporosis is inspected; (ii) calibration of biomechanical characteristics of hepatic tissues and related parameters for radio-frequency tumor ablation simulation.

A completely new innovative methodology of 3D digitalization and prototyping is developed. Here, we are able to report the obtained extremely promising results concerning a lightweight 3D printed polymer prototype antenna, metallization and experimental test at 14-18GHz.

5. Language and Semantic Technologies

Automatic Processing of Image Annotations in Large-Scale Image Databases. The main challenge in the emerging area “Language and Vision” is how to produce (automatically) high quality annotations that describe the image semantics, with least effort and minimal costs. Automatic assignment of keywords to images is a rather difficult task and current solutions based on machine learning are unsatisfactory.

We proposed an approach for post-editing of keywords which are assigned to images. The suggested post-editing tackles "noisy" tags: mistakes, inflexions, doublets, normalization of keywords-names, abbreviations, and various linguistic and punctuation phenomena that occur at token level. Further we suggested employing linguistic resources that define English lexical semantics (WordNet) for consolidation of tags by removing “unnecessary” annotations.

The emotional classification of images depends on the individual opinion of each person but we proposed and investigated an idea how to compute image sentiment scores using external resources. We presented an approach for analysis of sentiments and emotions in image tagging using SentiWordNet as an external linguistic resource of emotional words. Calculating a "sentiment score" for each image, the system classifies images into three classes (positive, negative, and neutral). Our approach works with 63.53% precision, 58.7% recall and 61.02% F-measure which is coherent with the results reported for sentiment analysis in general.

Automatic tag sense disambiguation is another hot issue in the “Language and Vision” field. In general automatic tag disambiguation is a fundamental issue for modern management of digital resources because content objects with identical tags can be linked together allowing users to search for similar or related content in blogs, videos, image collections, learning objects or categories of web-pages. Tags ambiguity leads to inaccuracy and misunderstandings. We proposed an integrated method for tag disambiguation of images and showed its effectiveness for arbitrary tags in English with nominal and verbal senses using WordNet as an external resource defining tag senses. The main advantage of the method is the combination of known approaches which ensures some non-zero result for all annotation keywords belonging to WordNet. The evaluation is done on a corpus of about 5,600 tags with some 10,000 senses and showed that the correctly disambiguated tags are 95% for professional images and 87% for social images (that are often annotated manually).

Application of Educational Data Mining for Analysis of the eLearning Portal UCHA.SE. Educational Data Mining allows the discovery of new knowledge based on learners’ usage data in order to help validate and/or evaluate educational systems, to potentially improve some aspects of the quality of

education and to lay the groundwork for a more effective learning process. Its potential explains the significant interest it raised in the educational community and the developers of online learning environments. A pilot research projects was carried out in the frame of AComIn. We applied educational data mining to the most popular Bulgarian educational site, UCHA.SE, which offers instructional videos and practice exercises in Bulgarian language. The site can be used to support formal and informal education, that is, in schools and for self-learning. Currently it offers more than 4,300 video lessons in 17 subjects, including the basic K-12 subjects, as well as Introductory level English, German, French, and Spanish, and Introduction to Programming. As of September 2015, the site has more than 400,000 registered users - students (including college students), teachers, and parents. The lessons are seen more than 13 mln times.

The goal of the project was to improve the quality of educational services and the subscription rate for the site by leveraging educational data mining. In order to achieve these goals we extracted a "learner model" by applying BITool (business intelligence software supporting a multidimensional data model) to UCHA.SE relational database in which system logs and students' performance data are stored. As a result the constructed "learner model" contained 30 attributes that reflect four type of information:

- general information about the user (e.g. age, gender, etc.),
- information related to user activities (e.g. "Percent of the total number of all taken exercises", "Average length watched videos per day", "Consecutive days the user has accessed the site", etc),
- information related to user knowledge and skills (e.g. "Percentage of all attempts of these exercises, for which the total score exceeds the threshold of 75 points", "Percent of the watched videos, which the user also commented", etc, and
- information about the use of some gamification elements proposed by the site (e.g. "leadership level", "charisma", "influence", etc.).

The goal for increasing the site subscription rate was reformulated as a classification task for predicting whether the user will renew his current subscription in the period of 3 month after its expiration. The classification task was solved by means of a machine learning approach. The training data reflects the user model and was constructed as of a concrete moment in time (end of February 2015). Since the learning data was highly unbalanced (only 18% of all data represented "positive" examples, i.e. the users who renewed their subscription in due time). The learning dataset was improved by combination of subsampling and undersampling methods. The predictive model was created as a combination of rules learned by two machine learning algorithms - JRIP and CN2, as JRIP rules generalized "positive" examples, and CN2 rules – the "negative" ones.

The predictive quality of this easily understandable to the end-users rule-based model, has classification accuracy 86.1% and F-measure 68%, respectively, which is close to the predictive quality of the model produced by one of best classification algorithms - SVM (87% and 68%). However, the SVM model is not understandable by the end-user.

News Media Analysis and Creation of Language Resources. The contemporary Natural Language Processing (NLP) applications, such as the analysis and extraction of relevant information from huge streams of data as well as context-aware Machine Translation, require high quality knowledge-rich processing. The Web provides an extensive volume of relevant knowledge, but most of it is in a textual or semi-structured format. Also, in the last decades the language and culturally specific information constantly increase. This calls for the development of language technology and resources (LTR) for national and local languages. These LTR need to reflect the language and culture specific features of the raw data. In order to support the interaction with rest of the world they are aligned by rule with LTRs for other languages.

Together with partners from Vrije Universiteit, Amsterdam (Computational Lexicology and Terminology Lab (CLTL)) we have been adapting the IICT-BAS in-house NLP processor for Bulgarian to analyse the events and stories in big news media data.

The NLP processor performs the following analyses: tokenization, POS and morphosyntactic tagging, lemmatisation, syntactic parsing, named entity identification and semantic analysis. Our efforts have been invested mainly in the last step as the most complex component of the processing chain. The semantic tagging includes the following submodules: (i) assigning the correct sense from the BTB WordNet on verbs, nouns, adjectives and adverbs; (ii) assigning the correct semantic role.

The first submodule uses the BTB WordNet, which was developed and is being extended within ACOMIN. It has been made freely available at the following link:
http://compling.hss.ntu.edu.sg/omw/

The second submodule was developed through the WordNet verb semantic classes that were

mapped onto the Bulgarian valency frames. The initial general semantic role labels have been distributed over BulTreeBank (BTB), and now the specialization process is in progress. Additionally, the first automatic transfer of Predicate Matrix (http://adimen.si.ehu.es/web/PredicateMatrix) was performed on Bulgarian data from the Setimes parallel corpora.

For the purposes of semantic annotation and disambiguation, the knowledge-graph tool UKB, developed by the IXA group, Basque country, was used. The experiments have been done with Bulgarian (BulTreeBank) and English data (SemCor). The results show improvement when syntactic relations are added for both languages.

Language Technologies Applied for Generation of a Diabetes Register. This pilot project for large-scale application of language technologies was performed jointly with the University Specialised Hospital for Active Treatment of Endocrinology #Acad. Ivan Penchev# (USHATE), Medical University – Sofia. USHATE is authorised by the Bulgarian Ministry of Health to host an anonymous Register of diabetic patients in Bulgaria. This Register contains 28 indicators of diabetic patients including age, sex, codes of diagnoses of diabetes and its complications, diabetes duration, risk factors, data about compensation, laboratory results, hospitalisations and prescribed medication. The AComIn experienced researchers helped for the automatic construction of the Register using language technologies and business analytics tools.

The register is automatically generated from a Repository of more than 112 million pseudonymised reimbursement requests (Outpatient records, ORs) submitted to the National Health Insurance Fund (NHIF) in 2012-2014 for more than 5 million citizens, including 436,000 diabetic patients. ORs are semi-structured in XML format; in each file some tags contain free-text fields with important explanations about the patient: “Anamnesis”, “Status”, “Clinical examinations” and “Therapy”. In AComIn, pilot prototypes for large scale processing of Bulgarian clinical texts were developed that extract automatically most essential data.

We developed a drug extractor using regular expressions to describe linguistic patterns. There are more than 80 different patterns for matching text units to ATC drug names/codes and NHIF drug codes. This extractor identifies the medication name, dosage, frequency and route of admission. Currently, it handles 2,239 drug names included in the NHIF nomenclatures. For treatment effect assessment we provide a comparative study of patients with insulin therapy, incretine-based therapy and oral medications therapy.

For extraction of clinical examination we designed a Numeric value extractor that processes lab and test results. Using collocation extractor we generate patterns for clinical exam data. After analysis of the positive and negative examples for such data we define the clinical exam data language L by a context-free grammar. For parsing clinical examination data we propose a hybrid method inspired by dependency grammars, constituents and Government and binding theory. The obtained result is a list of attribute-value pairs. For monitoring the compensation of Diabetes Type 2 and risk factors we extract values for body mass index (BMI), weight (W), blood pressure (BP), glycated haemoglobin (HbA1c), blood glucose (GLU), etc.

To identify complex relations between Diabetes Mellitus Type 2, its complications and other chronic diseases we defined a Data mining module for finding (i) frequent patterns and (ii) frequent temporal sequences of chronic diseases. For task (i) we apply modification of the classical frequent itemsets mining algorithms dEclat and association rules generation. We proposed a cascade method that reduces the search space for task (ii). In task (ii) several experiments were done – with no limitations for the distance between events (only the order matters), and with different window limitations between events – 1 to 3 months, etc.

Speech Processing. Modern state-of-the art speech recognition systems crucially use a beam search method in huge graph that combines acoustic model probabilities and language model probabilities. A disadvantage of all beam search methods is that they find a suboptimal, but not the best, path in the search space. This leads to propagation of the recognition errors. We have introduced a novel method for real-time lattice rescoring in speech recognition. It improves the performance of speech recognition systems by providing the option to partially compile the word lattice into a deterministic finite-state automaton, making it suitable for the rescoring step in the speech recognition process. In contrast to the widely used n-best approach our method permits the consideration of significantly larger number of alternatives within the same time-constraint thus providing better recognition results. A description of the new method is presented together with empirical evaluation of its performance in comparison with the n-best method. The achieved WER reduction is up to 3.77% at a p-value below 3%. An important advantage of our method is its applicability for real-time speech

recognition. A pilot prototype of speech-to-text system for Bulgarian is demonstrated.

AComIn supported also the development of a novel effective method for searching similar audio segments in large audio collections. This method is based on original ideas for similarity search and ensures high reliability in noisy environments and exclusively high speed of searching for similar audio records. A pilot prototype for reliable automatic annotation of subtitled audio signals at phonemic level is demonstrated as well.

Annotated corpus of Bulgarian speech. Using the Speech Lab (purchased in AComIn) a multi-signal corpus of Bulgarian speech was developed. The corpus incorporates sounds, laringograph signals and physiological signals for some of the readers. The sentences in the corpus are segmented automatically by original software with manual correction of the accuracy. The resource is available at http://lml.bas.bg/BulPhonC.

6. Signal and Image Processing

Neuro-fuzzy Approach. In the considered period a theoretical investigation of effect of Intrinsic Plasticity (IP) improvement of Echo State Networks (ESN) reservoirs were summarised and commented. It was observed that IP training “captures” input data structure into the reservoir steady state in a way that could be useful for clustering purposes. In search of explanation of these results the Memory Capacity of Reservoir Equilibrium State (MCRES) was introduced. Achieved due to IP tuning MCRES of ESN reservoirs with different sizes was investigated using three benchmark artificial data sets. Two applications of neuro-fuzzy approach were realised. The first one visualises 3D acoustic waves propagation based on multi-dimensional data clustering. The second one implements adaptive critic designs for optimisation of fuzzy rule base parameters, designed to adapt the measurement noise covariance matrix. The proposed approach assures fast tuning of Kalman filter and improvement of the quality of its estimates in changing working conditions of the MEMS in real time application.

Enhancement of Acoustic Noise Source Localization and Identification. Results in several directions are achieved:

- Generation of the acoustic images in range - cross range - elevation coordinates. The approach enables to determine automatically the range to source (Acoustic camera software require measuring it in advance). The approach enables to localize the source with frequency bandwidth about 10 kHz, which is processed simultaneously;
- Enhancement of angular resolution of the acoustic images up to 2.72 (2.56) times in respect to "delay and sum" beamforming (built-in standard beamforming). The resolution enhancement was obtained for center frequencies from 1 kHz to 18 kHz, at bandwidth 10% and 23% of the center frequency. It was obtained based-on modified Capon`s approach, at range span comparable to dimensions of microphone array of the Acoustic Camera;
- A software tool for bearing noise estimation is prepared. It was applied for development of new tools for non-destructive testing of the bearings;
- Improvement of resolution of SONAH method in high frequency range, based on virtual microphones. The small number of microphones in Acoustic Camera limits SONAH method resolution. Virtual microphones are defined by using autoregressive relation for signal interpolation. In this way measurement surface density and/or area are numerically enlarged and resolution improvement of SONAH has been achieved;
- Fast direction of arrival estimation. A single frequency can be calculated on the basis of at least three data samples. Having a set of local frequencies one can calculate a set of direction angles and draw several rays from corresponding points. Estimation of the shift parameter of the distribution of these points gives the source coordinates;
- Multichannel frequency estimation. The task considers estimation of the power spectral density matrix, which consists of elements related to auto-spectrums and cross-spectrums for each pair of channels. By using the maximum likelihood approach the autoregressive parameter estimator has been synthesized. It has been shown that in the single channel case it is equivalent to the known modified covariance method obtained by a least squares approach. The simulation results demonstrate that the new estimator has similar precision in the middle frequency range to a simple one averaged by multiple channels, but the proposed method becomes much better at low frequencies. Additional attention has been paid to influence of the impulsive noise. The proposed solution assumes removing of noise impulses by the separation of the input sample and interpolation

of the detected corrupted values. It has been shown that the proposed approach has advantage over the conventional filtering techniques. Statistical model of the signal sample, description of the detection criterion, flowchart of the filtering procedure and comparison results are published.

Research results achieved in Biometric Authentication. Ear Biometrics is a young topic that is intensively investigated recently. Even if ear has a uniform distribution of color, human external ear characteristics are considered enough unique to each individual and permanent during the lifetime of an adult, almost like fingerprint and/or iris data, but ear data can be gathered without any discomfort for people. A new method representing most essential data of human ear has been proposed, namely the matching potential for ear discrimination was tested via Extended Gaussian Image (EGI) representation and experimentally proved using 3D ear data gathered via the 3D Scanner of the AComIn SmartLab. Another approach to Biometrics Authentication by Ear has been proposed based on an original CBIR (Content Based Image Retrieval) method of IICT-BAS for rapid and reliable recognition of 3D objects using a database of precedents. Each object of interest for recognition is presented in the DB through a sufficient number of 2D projections (images), each from a different view point. Input images for recognition are obtained from conventional 2D cameras, and the most appropriate ear data are retrieved from the DB trough the CBIR method to access that is fast enough and noise resistant. We have already applied successfully this appearance-based approach two times: (i) for recognition of palm signs from a sign language alphabet and (ii) for human face recognition. The effective application for human ears became possible thanks to the 3D scanning technology available in the SmartLab of IICT-BAS (in the frames of AComIn project).

Speech Detection. A new robust feature for contour-based speech endpoint detection is proposed. It is called Group Delay Mean Delta (GDMD) feature and combines the properties of the known Modified Group Delay Spectrum (MGDS) and the original Mean Delta (MD) approach. The effectiveness of proposed feature is experimentally evaluated in the fixed-text Dynamic Time Warping (DTW) - based speaker verification task with short phrases of telephone speech. In comparison with three well know features - Modified Teager Energy (MTE), Energy-Entropy (EE) and MD feature - the experiments have shown that the GDMD feature demonstrates the best performance in endpoint detection tests in terms of verification rate.

Signature verification. A combined off-line signature verification approach is proposed using Neural networks, where global and grid signature features are combined to generate specific feature sets, one for each person represented in the verification system.

Video Stabilisation. A method and robust algorithm for fast 2D video stabilization for handheld devices in real-time is proposed. The BSC (Boundary Signal Computation) chip of TI (Texas Instruments) is essentially used (or emulated herein) for searching of correlations between the 1D integral projections, horizontal and vertical ones, by a SAD (Sums of Absolute Differences) approach. The proposed method is based on an accurate vector model allowing interpretations of increasing complexity for the transformations among frames. Experiments, conducted on testing video clips, are very promising for the future R&D of the method. This method has been extended for the problem of video stabilisation ‘in a point’, related to providing a static background for correct measurements with high-speed industrial cameras, like the one available in the SmartLab of AComIn. This new approach is called “3x3OF9x9” and combines (fuses) the basic method we use with the most lightweight version of the known Optical Flow approach, applying simple Otsu segmentation for eliminating the influence of moving objects in the video. The obtained results show better stabilisation (low that 1% instability for frame size of 640x480) in comparison with commercial software packets, like Warp Stabilizer of Adobe After Effects CS6.

7. Optimisation and Intelligent Control

A New Type of Chemical Nickel Coatings Including Nano Elements. The research on this topic includes a comprehensive study of abrasive wear and starting friction of nickel chemical coatings containing nanosized particles of silicon carbide (SiC) and aluminum oxide (Al2O3) of various sizes. It was carried out with the purpose of replacing old and non-ecological industrial technologies for laying a chrome based coating on different working surfaces. As a result, an advanced technology is developed and tested for renovation of extruding shafts used in industrial manufacturing of sheet

materials, i.e. PVC, Plexiglas, other plastics, etc. The commonly used renovation technologies in this area are known to be exclusively harmful due to the waste cyanide products. Our innovative approach overcomes this drawback by applying advanced nanotechnology for nonelectric chemical laying of a nickel coating with included nanoparticles. Enhanced tribological characteristics are obtained due to the embedded micro- and nanosized particles. The technology is environmentally harmless and the new coating features an increased hardness and wear resistance. A special mechanical manipulator is developed as a part of a robotized systems for inspections of coatings with high mechanical wear-resistance and surface-smoothness.

Intelligent Methods for Technical Diagnostics. Technical diagnostics is a classical interdisciplinary area where results from narrow scientific sciences and specific trends are applied: probability and statistics, pattern recognition, decision making, mathematical logic. Modern industry requires efficient fault discovering and isolation solutions in process equipment service which is a real-world problem of typically ill-defined systems, hard to model, with large-scale solution spaces. Design of precise models is impractical, too expensive, or often non-existent. To cope with this problem, methods and tools are developed for intelligent diagnostics, monitoring and decision making for real detection of potential abnormalities in technological processes without applying expensive diagnostic apparatus. Especially the usage of AI-based methodologies enables us to deal with imprecise, uncertain data and incomplete domain knowledge typically encountered in practical applications. Several types of diagnostic approaches with different structures are applied to a mill fan device in the Bulgarian Maritsa East 2 Thermal Power Plant being the largest thermal power plant on the Balkan Peninsula. The possibility to predict eventual damage or wearing out without switching off the device turns out to be of great importance for providing faultless and reliable work of the plant.

Traffic Optimization in Communication Networks. In communication networks, a crossbar switch node routes traffic from the input to output where a message packet is transmitted from the source to the destination. The randomly incoming traffic must be controlled and scheduled to eliminate conflict at the crossbar switch. The goal of the traffic-scheduling for the crossbar switches is to maximize the throughput of packet through a switch and to minimize packet blocking probability and packet waiting time. In this area of research, new models of the incoming traffic in crossbar switch nodes are proposed including several families of input traffic patterns. As compared to the modeling methods and techniques available in the current literature, an important advantage of our models is that the generation of the traffic patterns does not depend on the type of hardware and software tools. Simulation studies and evaluations for the throughput of a switch node by the proposed family of patterns are performed using the grid-structure of the IICT-BAS. A numerical procedure for computation of the upper bound of the throughput is suggested which enables us to estimate the maximal throughput of the switch for different traffic scheduling algorithms.

Target Detection and Parameter Estimation. The research on this topic includes a thorough study of the latest trends in the design of highly efficient and fully automated systems for processing radar data in terms of a priori uncertainty about the targets and disturbances. Parameter estimation and high-speed small targets detection in randomly arriving impulse interference environment is a challenging task in radar systems design. Conventional radar detection architectures like spectral discrimination and non-coherent integration have been considered and used but with limited success. Within this framework, an improved target detection architecture is developed making use of highly efficient Hough velocity estimation technique. The proposed algorithm is based on a Track-Before-Detect processing method, which allows for the previously collected data to be used in the target detection process and parameter estimation. The presented technique has a lot of advantages compared to traditional ones. The obtained results can be successfully applied for radar target parameter estimation as well as in the existing communication network receivers making use of pulse signals.

Mechatronic Systems for Industrial Automation and Robotics. The investigation on this topic is aimed at developing new mechatronic systems incorporating mechanical constructions, electronic modules and intelligent software for automation of technological processes and operations. Main subjects of study are robots, dedicated for multisensory environment perception and exploration, measurements and samples taking, discovering and putting a mark on the objects as well as environment interactions like transportation, carrying in and out of equipment and objects. An important result obtained in this area is an advanced modular system developed for the mechanical

construction of the mobile robots. It includes special programmable logical controllers for robot control and electronic modules for the wireless communication. New methods, means and algorithms for adaptive environment behaviour and group control of mobile robots are also examined. An innovative application of the international standard BDS ISO 10825 in mechanical transmissions is also proposed.

Intelligent Transportation Systems. The work on Autonomic transportation aims at meeting the challenge of engineering autonomic behavior in Intelligent Transportation Systems. The research integrates approaches from the disciplines of traffic engineering and autonomic computing. Autonomic computing is inspired by a biological example of body's autonomic nervous system and it allows for a more efficient management of heterogeneous distributed computing systems. This type of systems are endowed with a number of properties that are generally referred as "self" properties, including self-configuration, self-healing, self-optimization, self-protection or in general term self-management. In this domain, an advanced approach is developed providing a new formal description of the traffic control policy. More complicated formalization is applied for the control of urban traffic systems using bi-level optimization. Such an approach gives potential for increase of the control space of the control problem. The new formalization of the control policy allows for the traffic flows to be controlled in urban networks not only by the green light duration of traffic lights as it is the common manner, but simultaneously by changing the duration of the traffic lights cycle obtained as solution of optimal control problem. This innovation benefits minimization of the waiting time of the vehicles in the urban network, maximization of the traffic outflows, decrease of traffic congestions, minimizing time for travel.

Numerically Effective Kalman Estimator Algorithm for Urban Transportation Network. The research on this topic addresses a problem of vehicles amount estimation in queues, which appear in front of controlled junctions in a congested Urban Transportation Network. The innovative result of the research is an approach, which leads to an effective numerical algorithm of building steady-state Kalman estimator for the store-and-forward urban transportation network model. The evaluation of the numerical algorithm shows its efficiency and applicability for on-line computations in the urban intelligent transportation system. The research presents an original approach, which uses a special structure of the optimization problem data and expands method of resolvent for constructing a stabilizing solution of discrete algebraic Riccati equation.

According to the AComIn Reviewers (their Review is publicly available at http://iict.bas.bg/acomin/docs/deliverables/D6_2.pdf), "all research teams produced internationally acknowledged results. Several research directions (not envisioned in the original proposal) emerged as result of new ideas brought by the new postdocs". It is also a positive effect that the new research topics are in line with merging activities at an international level, so they may grow and extend the institute research potential.

II. Technological Results

In terms of technological and innovation achievements, the results of AComIn show the high potential of the project team to transfer know-how to Users. Here we briefly summarize the figures illustrating the scale of applied research performed in AComIn.

1. Completed projects in the Competitiveness Operational Programme, coordinated by Bulgarian SMEs which collaborate with IICT as a research partner providing innovation. There are six projects tackling AComIn topics that were performed in 2013-2015:

- Project BG161PO003-1.1.06-0001-C0001 "Innovative technology for efficiency evaluation of ERP systems in small and medium enterprises", with beneficiary ERP Bulgaria Ltd. with R&D activities related to the development of software for efficient management of business processes;
- Project BG161PO003-1.1.06-0004-C0001 "Innovative technology solutions for radiofrequency thermoablation" with beneficiary AMET Ltd. Sofia, Bulgaria, with R&D activities related to the development, modern manufacturing and distribution of electronic medical equipment and modules, mechanical parts and units for incorporation;
- Project BG161PO003-1.1.06-0023-C0001 "Analysis and identification of inexplicit relations in

large scale numerical data: applications in economics and technological analysis” with beneficiary ADISS Lab Ltd, with R&D activities related to the development of integrated information systems and business analytics tools;

- Project BG161PO003-1.1.06-0023-C0001 "Distributed Information System for Group Control, Distance Diagnostic and Service of Specialised Industrial Robots" with beneficiary SPESIMA GMBH, Sofia, Bulgaria - part of the FRECH Holding, Germany, with R&D activities related to the development of automation systems;
- Project BG161PO003-1.1.06-0023-C0001 "Experimental Development of Software Libraries for Improvement of Image Quality and Stabilisation using Inertial Sensors" with beneficiary MM Solutions AD, Sofia; with R&D activities in the area of complete imaging solutions for mobile camera devices;
- Project BG161PO003-1.1.06-0023-C0001 "Industrial Research for New Technologies in Image Stabilization and Image Quality Enhancement by Implementation of Inertial Sensors" with beneficiary MM Solutions AD, Sofia; with R&D activities in the area of complete imaging solutions for mobile camera devices.

2. Contracted Research

There are eight projects performed for external clients based on results of AComIn research activities, as follows:

- Research and development of models for the distribution of particles with a size of 0.01 - 2000 μm in samples of bulk materials - various types of metal powders and/or nanoparticles by using the laser nano particle sizer Analysette 22 Nano Tech + for measuring the size and distribution of particles. Performed for RETEL JSK, a company dealing with the delivery of complete equipment for the mining industry regarding processes of milling and enrichment of ore materials;
- Research for the development of 3D models with the mobile 3D scanner VIUScan, parameterization of 3D models, processing of the received data, followed byre search, analysis, design and visualization of 3D models of industrial, municipal and archaeological sites with the aim to find innovative solutions and testing new models in the field of 3D printing by using the professional 3D Printer Pro Jet 460+. Performed for ECO BIO ENGINEERING, a company engaged in large-scale modelling and engineering of industrial, archaeological and urban installations;
- Development of models for the distribution of particle with a size of 0.01 - 2000 μm in samples of solutions of bulk materials - various solutions, emulsions and mixtures and/or the contained nanoparticles after filtration and percolation using the laser nano particle sizer Analysette 22 Nano Tech + for measuring the size and distribution of particles. Performed for Diamond Properties, a company performing studies of particle distribution in powders as well as their mixtures and solutions for industrial users;
- Analysis and visualization of the size and distribution of particles in the concentrates of fruit juices and emulsions using the laser nano particle sizer Analysette 22 Nano Tech +, performed for Interaroma - a producer of different clear fruit juices and nectar;
- Construction of 3D models of different types of badges and medals and 3D printing in order to find the proper size. This application is done for B&W Consultant - a company engaged in design and production of promotional materials;
- Research and development of models concerning the distribution of particles with a size of 0.01 - 2000 μm in soil samples - various types of clays using the Laser Nano particle sizer Analysette 22 Nano Tech + for measuring the size and distribution of particles. Performed for the National Institute of Geophysics, Geodesy and Geography – Bulgarian Academy of Sciences;
- CT scanning and microstructure analysis of large series of bone tissue samples, done for an International Research Team;
- Development of a real-life application of an effective method for searching similar audio segments in large audio collections, performed for the Bulgarian TV-related company H-Tech.

3. Applied Research in Joint Research Projects

Collaboration activities with Universities were performed as joint projects dedicated to specific topics, as follows:

- Analyses of thermal images of thermal processes in large electrical circuits and electrical

appliances, jointly with the Electrical Faculty of Technical University - Sofia;

- Joint study of high-speed processes concerning the briquetting of metal shavings and powders necessary for the optimization of briquetting of waste products with the purpose of secondary melting. Performed with the Faculty of Mechanical Engineering of Technical University - Sofia;
- Examination of temperature regimes in large buildings to deploy powerful breakers, fuses and distributors, done jointly with the Plovdiv Branch of Technical University - Sofia;
- Study of the high-speed processes of interaction and deformation of different physical bodies by shocks in hit railings and guardrails, performed for the Institute of Mechanics – Bulgarian Academy of Sciences to support the standardisation of protective fences, guardrails, handrails etc.;
- Examination of the temperature image of the cooling process of welding metals for different kinds of welding for medium nano particles in the range of 2000°C– 500°C, performed jointly with the Institute of Metal Sciences – Bulgarian Academy of Sciences;
- Development of models for a distribution of particles with a size of 0.01 - 2000 μm in samples of bulk materials - various types of powders of dried and ground food, performed together with experts from the Bulgarian Agricultural Academy which performs a research project related to dried and freeze-dried foods that are used in extreme sports (mountaineering) and when traveling in aerospace;
- Educational analytics of learning data performed together with the team of the most popular Bulgarian K-12 platform with educational videos and exercises. The results helped them to identify users who are likely to renew their subscription and attract other subscribers;
- Applying language technologies for automatic processing of Bulgarian clinical narratives for automatic construction of the National Diabetic Register, together with the University Specialized Hospital for Active Treatment of Endocrinology "Acad. Ivan Penchev", Medical University - Sofia;
- Non-destructive testing of rolling bearings using the AComIn acoustic camera, performed together with the Faculty of Mechanical Engineering of Technical University - Sofia;
- Microstructure analysis and numerical homogenization of epoxybased nanocomposites based on industrial CT scanning data. Done jointly with the Institute of Mechanics – Bulgarian Academy of Sciences;
- Participation in the project "Study of composition, structure, properties and production of yellow pavement in Sofia" together with the "Bulgarian crystallographic society" and experts from the Institute of Mineralogy and Crystallography - BAS, Institute of Physical Chemistry - BAS, Institute of Catalysis - BAS, Institute of Information and Communication Technologies - BAS, Mining and Geology University "St. Ivan Rilski "and the University of Architecture, Civil Engineering and Geodesy – Sofia. The project was funded by the Sofia Municipality (the yellow pavement is a prominent symbol of Sofia, which was declared national heritage in the beginning of 2014 by the Sofia municipal council);
- Applications of CT Microstructure analysis in Paleoanthropology developed jointly with the Institute of Experimental Morphology, Pathology and Anthropology with Museum – Bulgarian Academy of Sciences;
- Advanced CT study of structural and material properties of fiber reinforced concrete, performed with the Institute of Mechanics – Bulgarian Academy of Sciences;
- Investigations and microstructural analysis of geological materials by scanning with AComIn 3D industrial tomography, performed with the Institute of Mechanics – Bulgarian Academy of Sciences for Ruhr-University of Bochum (Germany);
- Preparation and completing of 3D models of historical figures related to the Battle of Pavia (1525), 3D printing of the figures and printing of 3D tactile matrices that display medieval tapestries to visually impaired people. Performed jointly with the University of Pavia for the Exhibition "The Battle of Pavia" held in Visconti Castle, Pavia, as an accompanying event of EXPO 2015, Milan, Italy.

These applied activities show that the practical results achieved in AComIn are based on the high-tech equipment purchased within the project.

Potential impact and main dissemination activities and exploitation results

I. Potential Impact

Here we present the potential project impact in three dimentions: (i) plans for exploitation of the AComIn research foreground, (ii) socio-economic impact and (iii) wider societal exploitations.

1. Plans for using the AComIn foreground

In Wigner Monte Carlo Algorithms for Quantum Transport in Nanoelectronics: The research carried out in AComIn was focussed on ground-breaking applications that support building up and structuring of a new interdisciplinary scientific community in emerging themes dealing with radically new future technologies. For instance our results involve studying of special nano-structures viewed as potential candidates for future quantum computers since we have considered technologically produced structures. In this way we have studied experimentally nano-structures which are considered as a candidate for a quantum computer. Our research in this fiels directly supports innovations in semiconductor devices. That could lead to the simulation of 3D devices like FinFETs, nanowires, multi-gate FETs, i.e. devices that are the most likely to be the candidates to substitute the MOSFET technology that is suffering from the miniaturization effects. Those devices are already taken into account by industries such as Intel and AMD, as publicly advertised. IICT-BAS plans joint research with Technical University Wien which is particularly focused on magnetic field, entangled electronics, and parallelisation algorithms. A systematic derivation of simulation models accounting for the magnetic field in the Wigner picture is still missing. A major challenge is the incorporation of the electromagnetic potentials and the choice of the gauge. A computationally feasible theoretical approach is pursued, which allows an efficient inclusion of the vector potential in the signed particle method. Entanglement characterises the state evolution in electron lenses, mesoscopic (Aharonov-Bohm) rings, and Quantum Point Contacts (QPC's). Electron transport in such structures comprises phenomena with yet not explored physical and application aspects. For instance, there is no relevant theory which can explain the experimentally observed behaviour in QPC's. All these issues are included in our research agenda for the near future.

In Robust Finite Element Methods and Algorithms for Advanced Computer Simulations: The future plans for research will target top achievements in robust FEM discretization and solution methods. The obtained theoretical results for strongly heterogeneous elliptic problems of high contrast and high frequency will be further developed to the case of coupled problems including models of fluid-structure interactions, flows in deformable porous media, thin plates and shells, etc. The expected new results will play a key role in such high tech applications as new constructive materials, clean technologies, nano membranes, energy efficient combustion in inert porous media. The related problems are inherently nonlinear, three dimensional in space and time dependent. This means that HPC will be without alternative in many of the real life applications. The big challenge here concerns the development of scalable parallel algorithms for the new generation heterogeneous systems including GPU and MIC accelerators.

In Advanced Computing in Dynamical Analysis of Elastic Structures: The research plans for next period will be focused on development of efficient methods, algorithms and codes for dynamical analysis of more complicated structural elements. The first step will address the related problems in the theory of plates. The standard model is described by PDE of fourth order which beans that the FEM approximations should provide higher smoothness of the test functions. Even for linear problems this leads to serious increase of the size of discrete problem from one side and robustness problems from another. One alternative approach (which will be preferred) is based on development of efficient methods and algorithms in terms of Mindlin–Reissner plate theory. Mixed FEM, nonconforming and reduced integration FEM will be studied. The obtained results will be generalized to the case of shells. In both cases, plates and shells the methods should be robust with respect of the thickness which is assumed by default to be small. The parallel implementation of the algorithms (e.g. the shooting algorithm) will be required in many real life applications in machine and civil engineering.

In Advanced Methods, Algorithms and Innovations Based on 3D Digitisation and Prototyping: This is a completely advanced topic. Some of the reported results are really pioneering. There are (at least)

two kinds of challenges in the future research and development activities. The first one is related to the extremely fast development of the equipment for 3D digitalization and prototyping. The sub-micro computed tomography is already available. This means in particular new qualitative and quantitative requirements to the algorithms for segmentation of CT images. Even the formulation of the problem of mass conservative segmentation for multicomponent porous media is a separate challenge. The next plans in the related field of numerical upscaling will be targeted to homogenization of nonlinear properties. The results in the field of numerical upscaling of anisotropic materials have a strong potential for generalizations in the general case of unstructured Big Data analytics. Considering the future plans in prototyping we should notice the new opportunities provided (or expected to appear) in the on-linecontrol of 3D printing with respect to, e.g., changing the material or/and controlling the density etc.

In Language and Semantic Technologies:

Integrating Language and Vision in general requires better understanding of the annotation processes and the psychology of personal behavior in social media where users often assign emotional tags to their photos. Therefore we believe that considerable success in automatic tag disambiguation can be achieved in specific niches e.g. collections of professional images that document mostly material objects denoted by nouns. We plan to extend the present results in the area of disambiguation by integration of further external resources that provide reference sets of senses: like Wikipedia and DBPedia. Then there will be a voting scenario where different disambiguation platforms propose the correct tag sense. Further we plan to make experiments with embedding fine-tuned tags in the image recognition phase when the decision of automatic annotation is made.

Regarding the News Media Analysis and Creation of Language Resources, the results achieved in AComIn will be integrated in the development of a Language Technology and Resources Centre for Linked Open Data. This includes: (i) Further extension of the BTB WordNet through reliable (semi)automatic processes; (ii) Alignment of BTB WordNet with English and other languages wordnets as well as world knowledge databases such as DBpedia, Freebase and other datasets from Linked Open Data cloud; (iii) Further improvement of the knowledge graph performance through the addition of new relations; (iv) Developing of ensemble and supervised methods for solving several language technology tasks; (v) Crosslingual event analysis and information extraction for big news data in Bulgarian and English (also possibly Dutch); as well as (vi) Deployment of the semantic tagging into an MT system between Bulgarian and English.

As for the Language Technologies Applied for Generation of a Diabetes Register, the technologies used at present will be at first extended for automatic extraction of values in the section “Patient Status” in the Outpatient records submitted to the National Health Insurance Fund. Then the plan is to extend the extractors to further chronic diseases in order to generate other registers: like Diseases of the circulatory system, Malignant neoplasms, Mental and behavioural disorders, etc. In addition to the Outpatient records, the extractors should process selected zones in other types of clinical narratives: e.g. Discharge letters and Reports about Clinical examinations issued by Independent Medical Diagnostic Laboratories. A major challenge is the automatic processing of temporal information in clinical narratives: recognition of absolute and relative temporal markers, and ordering them in timelines.

In Speech Processing: A disadvantage of all beam search methods is that they find a suboptimal, but not the best, path in the search space. This leads to propagation of the recognition errors. To the best of our knowledge a method that finds the best path is not known so far. Such a method could significantly improve not only the state of the art of speech recognition systems, but also any other system based on beam search like statistical machine translation systems, optical character recognition system etc. Despite of the fact that the open problem for the best path is considered very hard, we plan further research in this direction that could lead to better quality in comparison with beam search methods. In these ambitious tasks we rely on our previous experience and successes in efficient computations.

In Signal and Image Processing:

Initial plans concern theoretical research with the acoustic camera. This device is a high-quality piece of equipment but belongs to the entry-level due to comparatively low number of microphones and small aperture's size. The number of microphones could not be easily increased (the hardware price depends mainly of number of channels/microphones). The main ideas about acoustic camera improvement are directed to aperture modification and implementation of different algorithms for resolution enhancement, enlargement of applicable frequency band, smart feature extraction and so

on. The already purchased microphone connectors and cables provide the necessary hardware for experimenting with new configurations of microphones on newly designed apertures.

We foresee to develop further the proposed smart approach for features extraction from the multi-dimensional data received by acoustic camera towards:

(i) Refinement of initial features extraction procedures aimed at:

- Investigation of proper frequency ranges for specific diagnostic purposes using focalized spectra;
- Increasing of the resolution of the produced by our algorithm “acoustic picture” aimed at fine detection of sound sources.

(ii) Investigation of different kind of clustering/classification procedures aimed at:

- Increased accuracy of diagnostic;
- Improved visualization of multi-dimensional data.

There are also considerations how to use the research results achieved in Biometric Authentication esp. Ear Biometrics. The plan is to disseminate on-line the 3D Ears Database created in IICT-BAS (for about 100 subjects). This would support the experiments carried out in the ear biometric research community which lacks high accurate 3D ear mesh data. The IICT-BAS team will continue developing and supporting this valuable resource, and will exploit it further in the development of methods and prototypes for Biometric Authentication.

In Optimisation and Intelligent Control:

In New Technologies, Mechatronic Systems and Robotics: in AComIn an advanced nanotechnology was developed for laying of a nickel coating with included nanoparticles on the working surfaces of extruding shafts used in industrial manufacturing of sheet materials. In our future work, the technology will be used for development of new types of innovative metal coatings with increased hardness and wear resistance that can be used for renovation of different mechanical devices in industry and production processes. A robotised system for inspections of coatings with high mechanical wear-resistance and surface-smoothness will be designed and put into exploitation. The research on mechatronic systems and robotics will continue by studying and design of autonomous mobile robots intended for multisensory environment perception and exploration, transportation of equipment and objects and working in harmful environment. New methods and algorithms for group control of mobile robots will also be developed and examined.

In Intelligent Methods and Systems: In our studies we have suggested original methods for diagnostics and predictive maintenance of industrial assets using intelligent techniques for analysis of the facilities condition. As a next step these methods will be used in the development of complex intelligent systems for advanced technological and operational management of various industrial and manufacturing processes.

In the area of radar data processing and target detection, an advantageous method was proposed using a Track-Before-Detect processing technique, which allows for the previously collected data to be used in the target detection process and parameter estimation. The method will be further developed in order to increase the accuracy of the estimated moving target parameters in a dynamic radio location environment. Examination and development of new robust and reliable algorithms for simultaneous trajectory and target detection is also a perspective field of research. The development of new algorithms that can be used to retrieve information about targets, applying a mathematical transformation on the received signals yielding estimates of the parameters of moving targets with extremely high precision in a dynamically changing radar environment is a new and very promising direction in modern information and communication technologies.

One of the most recent directions of the scientific research conducted by the intelligent control team within the project frame is the newly proposed Inter Criteria Decision Making aapproach. Further development and practical applications of this approach will support a decision maker in evaluating data or measurements of multiple objects against multiple criteria, to more profoundly understand the nature of the criteria involved and their correlation.

Information and Communication Systems. In the area of data transfer and optimisation in communication networks, we have proposed a family of models of the incoming traffic in a crossbar switch node together with algorithms for nonconflict scheduling and optimal data transfer as well as numerical procedures for estimating the maximal throughput of the communication node. Further exploitation of these results will include substantial improvements of the models in order to cope with complex traffic flows with different intensity and stochastic parameters, development of new scheduling algorithms, simulation studies including large scale computations in order to obtain precise performance evaluations of the communication network.

Important results obtained in course of the AComIn project also include a sensor system for meteorological data capturing using hierarchical cluster-tree topology and a software platform for smart sensor network data integration based on Service Oriented Architecture. The research work in this direction will continue by developing new software tools and mechanisms for cooperative data mining, self-organization, networking, and energy optimization in order to build higher level service structures.

Knowledge and experience acquired in the ICT sector within the project AComIn will be extensively used in the design of methods, algorithms and software products for local and web-based optimization and decision support systems, development of intelligent procedures and devices leading to innovative applications in industry, manufacturing, production planning and corporate business management.

In Advanced Control of Transport Systems. Our work in the development of multilevel optimisation for transportation system has the potential to improve the control policies and the exploitation of traffic networks in intensive urban areas. The control policies always target reducing the congestions, which deteriorate traffic conditions. Applying multilevel optimization the control space is increased and additional goals can be achieved as minimization of waiting time and maximization of outgoing flows from the urban network.

Potential improvement and future prospects from the multilevel optimization can be expected by development of fast algorithm for solving such class of control problems. Provisionally this could be the derivation of appropriate coordination strategies, which reduce the computational workload for real time purposes. Future developments will be focused on: (i) derivation of analytical approximation of inexplicit relations, concerning the solution of upper and lower level optimization problems; (ii) development of coordination strategies, which reduce the information exchange between the upper and lower level problems.

Having powerful methods to solve in real time multilevel problem, the control policies for transportation system can benefit from the increased control space, which can contain both the duration of the traffic lights, time cycle and the offset between the traffic nodes. Additionally variable speed limits and information signs can be incorporated in the traffic control. The multilevel approach can support additionally the integration of the on-line traffic estimations and optimization of the control states. Thus the multilevel approach can support both control policies for free way traffic and ramp metering.

A mathematical model for improvement of the rail-way passenger transportation in Bulgaria will be developed as an academic response of IICT-BAS towards the request of the Ministry of Transport of Bulgaria for the definition of mathematical model for the future development and exploitation of the Bulgarian state railway passenger transport. This type of transport has to become a backbone for the transportation structure of Bulgaria and has to provide rearrangements and modifications to the current bus transportation systems on national, regional and community scales.

2. Socio-economic impact

AComIn has indirect impact of employments and income. The project clearly helped several Bulgarian companies to improve their competitiveness by

- Increasing the quality of their production and services via new research methods, provided by IICT-driven research, integrated within their production cycles,
- Improving the energy efficiency of their production processes,
- Demonstrating solutions for material analysis and cheaper non-destructive testing that can be employed in their everyday work.

AComIn has direct impact on public services. It provided algorithms and software components for analysis of clinical narratives in Bulgarian language that were integrated in the environment for automatic generation of the (anonymous) national diabetic register (which was done by the University Specialised Hospital in Endocrinology, Medical University Sofia). These language technologies were applied over millions of outpatient records submitted to the Bulgarian Health Insurance Fund in 2012-2014. This allowed for automatic extraction of numeric values concerning diabetes compensation and enabled the statistical assessment of originally unstructured data. The experiment is unique and opens the door to new strategies for better control of chronic diseases like Diabetes Mellitus and Hypertonia.

AComIn also contributes to quality of life since the project elaborated several research proposals how to tackle:

- health problems by analysis of microstructures with various applications and
- ecological problems by simulation of BOD removal in horizontal subsurface flow constructed wetlands via high-performance computations.

3. Wider societal implications

AComIn is coordinated by a female researcher and was performed by many female researchers and experts (something relatively rare in ICT). Among the incoming researchers, who were employed in IICT with long term contracts, about 30% were female: 5 out of 16. As for the permanent staff, the team consisted of 27 women and 39 men.

The research results of the project were published in Open Access Journals whenever possible and uploaded in Open Access Repositories like the Anthology of the Association for Computational Linguistics. Two linguistic resources have been developed within the project, one of them is completely free (core Bulgarian WordNet) and the other one is free for academic research.

The project published a lot of promotional materials in Bulgarian language (and some project leaflets were only in Bulgarian as they were oriented to the visitors of national events).

Last but not least AComIn provided the results of a scientific study (analytics of learning data logs) to UCHA.SE, the most popular Bulgarian on-line portal for K-12 users. Such a large-scale research study is made for the first time in the country. In this way the project supported the emerging eLearning activities in Bulgaria.

II. Main Dissemination Activities of AComIn Project

Seven high-quality scientific Conferences were organised within AComIn as dissemination forums for the project research results:

- The International Conference "Advanced Computing for Innovation" ACOMIN 2015, 10-11 November 2015, Sofia, Bulgaria, with Proceedings "Innovative Approaches and Solutions in Advanced Intelligent Systems" published as Volume 648 of the series Studies in Computational Intelligence, Springer 2015, ISSN:1860-949X
- The 10th International Conference "Recent Advances in Natural Language Processing" RANLP-2015, 5-11 September 2015, Hissar, Bulgaria. The Proceedings is uploaded in the SCOPUS indexed Anthology of the Association of Computational Linguistics (a Digital Archive of Research Papers in Computational Linguistics) at http://aclanthology.info/events/ranlp-2015
- The 10th International Conference "Large-Scale Scientific Computations" LSSC'15, 8-12 June 2015, Sozopol, Bulgaria, with Proceedings published as Volume 9374 in the series Lecture Notes in Computer Science, Springer 2015, ISSN: ISSN 0302-9743
- The 16th International Conference "Artificial Intelligence: Methodology, Systems, and Applications" AIMSA'2014, 10-13 September 2014, Varna, Bulgaria, with Proceedings published as Volume 8722 in the series Lecture Notes in Artificial Intelligence, Springer 2014, ISBN: 978-3-318-10553-6, 92-104
- The 8th International Conference "Numerical Methods and Applications" (NMA'14), 20-24 August 2014, Borovets, Bulgaria, with Proceedings published as Volume 8962 in the series Lecture Notes in Computer Science, Springer 2015, ISSN: ISSN 0302-9743
- The 9th International Conference "Recent Advances in Natural Language Processing" RANLP-2013, 7-13 September 2013, Hissar, Bulgaria. The Proceedings is uploaded in the SCOPUS indexed Anthology of the Association of Computational Linguistics (a Digital Archive of Research Papers in Computational Linguistics) at http://aclanthology.info/events/ranlp-2013
- The 9th International Conference "Large-Scale Scientific Computations" LSSC'13, 3-7 June 2013, Sozopol, Bulgaria, with Proceedings published as Volume 8353 in the series Lecture Notes in Computer Science, Springer 2014, ISSN 0302-9743

Nine Workshops with international participation were organised within AComIn as dissemination forums for the applied research results of the project:

- The International Workshop "Advanced Industrial Control Applications"AICA-15, 8 October 2015, Sofia, Bulgaria
- The International Workshop on Information Fusion, 25 September 2015, Sofia, Bulgaria, with Selected papers published in the Scopus indexed Journal "Cybernetics and Information Technologies", 15(7), 2015, ISSN 1314-4081
- The International Workshop on Big Data in Education and Digital Collections, 29 June 2015, Sofia, Bulgaria, with Selected papers published in the Scopus indexed Journal "Cybernetics and Information Technologies", 15(7), 2015, ISSN 1314-4081
- The International Workshop "Control in Transportation Systems", 10-11 September 2014, Sofia, Bulgaria, with Selected workshop papers published in a Special issue of the Journal "Cybernetics and Information Technologies" 15(5), 2015, ISSN 1314-4081
- The International Workshop on Biometrics (BIOMET'2014), 23-24 June 2014, Sofia, Bulgaria, with Proceedings published as Volume 8897 in the series Lecture Notes in Computer Science, Springer 2014, Print ISBN: 978-3-319-13385-0
- The International Workshop "Advanced Control and Optimisation: Step Ahead" ACOSA, 8-10 May 2014, Bankya, Bulgaria, with Proceedings published by Prof. Marin Drinov Academic Publishing House, 2014, ISSN 1314-4634
- The Workshop "ICT for New Materials and Nanotechnologies" (New Nano), 8-10 October 2013, a co-event of the International Conference "Robotics, Automation and Mechatronic" 2013, Bankya, Bulgaria, with Proceedings published by Prof. Marin Drinov Academic Publishing House, 2013, ISSN 1314-4634
- The International Workshop "Autonomic Computing and Automatic Control in Computer Systems" (ACACCS), 3-4 October 2013, a co-event of the International Conference "#utomatics and Informatics 2013", 3-7 October 2013, Sofia, Bulgaria, with Selected papers published in the Scopus indexed Journal "Cybernetics and Information Technologies", 13(4), 2013, ISSN 1314-4081
- The Workshop "Information and Communication Technologies for Human Health and Quality of Life" (ICT-HuHeQuL), 15-17 May 2013, Stara Zagora - Mineral Baths, Bulgaria. The extended versions of 6 talks presented at the Workshop were published in two referenced Bulgarian scientific journals: "Bulgarian Journal of Agricultural Science" Vol. 20 (2014) ISSN 1310-0351 and "Cybernetics and Information Technology" 13(4), 2013, ISSN 1314-4081

Twenty Technology Transfer Events enabled know-how transfer to User Communities in AComIn:

- International Workshop on Industrial and Applied Mathematics, 21 December 2015
- International Workshop on Mathematics in Industry, 14 September 2015
- Know How Transfer on Speech Technologies, June-September 2015
- Know-How Transfer on Acoustic Imaging, April-September 2015
- International Workshop on Advanced Material Characterisation, Modelling, and Numerical Simulations, 28 June - 1 July 2015
- International Workshop on Advanced Techniques in NonDestructive Testing, 18-19 June 2015
- International Workshop on Advanced Computing for Innovation – Industrial Applications, 14-15 May 2015
- Workshop on 3D Digitisation and Virtual Reality, 18 April 2015
- Workshop on Microstructure Material Analysis, 17 April 2015
- International Workshop on Biomedical Simulations, 4 December 2014
- Workshop on Robotics and Innovations, 18-19 September 2014
- International Workshop on 3D Visualization of Cultural Heritage, 10 September 2014
- International Workshop "Walk on Equations and Sequential Monte Carlo to Solve Linear Systems", 21 August 2014
- International Seminar "Challenges connected with the use of resources of large digital libraries in education and civil science", 9 July 2014
- International Seminar "Introduction of game elements in training systems and education", 3 July 2014
- Workshop on 3D-Scanning and digitization, 17 March 2014
- Workshop on Thermography and its Applications, 11-13 February 2014
- International Seminar on Industrial Mathematics, 19 December 2013
- Technology Transfer Seminar "3D Technologies in the Textile Industry and Fashion", 2-5

September 2013
- Technology Transfer Seminar on Computational Vision Applied to Medical Diagnostics, 24-26 July 2013

Three Doors Open Days with demonstrations of AComIn applied results (using the SmartLab equipment) were organised:
- AComIn Doors Open Days 15-16 January 2016, Sofia, Bulgaria
- AComIn Doors Open Days 17-18 April 2015, Sofia, Bulgaria
- AComIn Doors Open Days 28-29 March 2014, Sofia, Bulgaria

Further presentations to leading figures of the State Authorities and the European Commission as well as the society at large are listed below:
- AComIn was presented to the President of the Republic of Bulgaria – Rosen Plevneliev who visited the Institute of Information and Communication Technologies on 10 February 2014
- AComIn was presented to Mr. Wolfgang Burtscher, Deputy Director General of DG Research and Innovation, European Commission, who visited the Institute of Information and Communication Technologies on 17 February 2014
- AComIn was presented at the Meeting of the Science, Technologies and Innovation Expert Council to the Mayor of Sofia Municipality held in the Institute of Information and Communication Technologies on 14 July 2015
- AComIn poster was shown in Sofia downtown as part of the exhibition "Bulgarian Academy of Sciences - science for the society and the country", dedicated to the 145th Anniversary of the Bulgarian Academy of Sciences, in June-July 2014
- AComIn results were demonstrated at the Promotional presentation of the Exhibition "the Battle of Pavia", Expo 2015 Milan, Italy, on 25 May 2015
- AComIn results were shown in the Exhibition "The Battle of Pavia 1525" in Visconti Castle, Pavia - an associated event of Expo 2015 in Milan, Italy. The Exhibition was opened in June-November 2015
- Public presentation of AComIn Evaluation Report was organised in Sofia, Bulgaria on 24 March 2016

III. Exploitation of Results

The exploitation of results already started in various applied activities, as listed in the Section "Description of main S & T results/foregrounds". The Table with "Exploitable Foreground" in this report lists six patent applications that have been submitted recently to the Bulgarian Patent Office (BPO), the World Intellectual Property Organisation (WIPO) and the European Patent Office (EPO). One research result is now integrated in a real-life application for commercial exploitation and will be soon in use.

To ensure further and more active exploitation of results the project team plans to keep the sustainability of liaisons with AComIn User Communities. We managed to build a Network of Users from specific areas who want to increase their knowledge about modern ICT applications and to take part in pilot developments. Such a network existed before AComIn too, related to e.g. the Bulgarian GRID community, but AComIn and the installation of SmartLab accelerated significantly the process of User Communities formation. The attracted participants in the Technology Transfer Seminars in AComIn year 3 (more than 400 people) will further disseminate the news about SmartLab potential in particular and IICT-BAS capacity in general. These figures show that the AComIn idea to focus on User Communities (among other objectives) was very successful too. It is interesting to note that recently IICT-BAS has established itself as a non-formal transfer center, making successful connections between business and academia. News about the Doors Open Days in IICT-BAS are broadcasted on the national TV channels and the national radio (thanks to the PR-Department of the Bulgarian Academy of Sciences). Many pupils from high-schools come to the Days, as well as students.

Following the recommendations of the AComIn Reviewers, the Network of Users will be extended to foreign countries. Social media will be used to disseminate information about the institute capacity and to keep contacts with potential clients.

Address of project public website and relevant contact details

Project website:
http://www.iict.bas.bg/acomin

Project Newsletters in English:
http://iict.bas.bg/acomin/e-newsletters.html

Project Newsletters in Bulgarian:
http://iict.bas.bg/acomin/bg/e-newsletters.html

Scientific events organised within AComIn (list and short reports):
http://iict.bas.bg/acomin/events.html

Technology Transfer events organised within AComIn (list and short reports):
http://iict.bas.bg/acomin/user_communities.html

AComIn Movies, media reactions and other signs of AComIn recognition (list and short reports):
http://iict.bas.bg/acomin/appreciation.html

Project Deliverables with public access:
http://iict.bas.bg/acomin/deliverables.html

Lists of all project publications including ones without DOI:
http://iict.bas.bg/acomin/publications_talks.html
http://iict.bas.bg/acomin/monographs.html

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4.2 Use and dissemination of foreground

Section A (public)

Publications

LIST OF SCIENTIFIC PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
No.	Title / DOI	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Date of publication	Relevant pages	Is open access provided to this publication ?	Type
1	An introduction to applied quantum mecha nics in the Wigner Monte Carlo formalism 10.1016/j.phy srep.2015.03.001	J.M. Sellier , M. Nedjalkov , I. Dimov	Physics Reports	Vol. 577	Elsevier	Netherlands	01/05/2015	1-34	Yes	Peer revie wed
2	Forced periodic vibrations of cylindrical shells in laminated composites with curvili near fibres 10.1016/j.com pstruct.2015.05.050	P. Ribeiro , S. Stoykov	Composite Structures	Vol. 131	Elsevier BV	Netherlands	01/11/2015	462-478	Yes	Peer revie wed
3	Wigner quasi-particle attributes—An asym ptotic perspective 10.1063/1.480 2931	M. Nedjalkov , P. Schwaha , S. Selberherr , J. M. Sellier , D. Vasileska	Applied Physics Letters	Vol. 102/I ssu e 16	American Institute of Physics Inc.	United States	01/01/2013	163113	No	Peer revie wed
4	A Wigner Monte Carlo approach to density functional theory 10.1016/j.jcp .2014.03.065	J.M. Sellier , I. Dimov	Journal of Computational Physics	Vol. 270	Academic Press Inc.	United States	01/08/2014	265-277	Yes	Peer revie wed
5	The many-body Wigner Monte Carlo me thod for time-dependent ab-initio quantum simulations 10.1016/j.jcp .2014.05.039	J.M. Sellier , I. Dimov	Journal of Computational Physics	Vol. 273	Academic Press Inc.	United States	01/09/2014	589-597	Yes	Peer revie wed
6	On the simulation of indistinguishable f ermions in the many-body Wigner formalis	J.M. Sellier , I. Dimov	Journal of Computational Physics	Vol. 280	Academic Press Inc.	United States	01/01/2015	287-294	Yes	Peer revie wed

	m 10.1016/j.jcp .2014.09.026									
7	The Wigner–Boltzmann Monte Carlo me thod applied to electron transport in the pre sence of a single dopant 10.1016/j.cpc .2014.05.013	J.M. Sellier , I. Dimov	Computer Physics Communication s	Vol. 185/I ssu e 10	Elsevier	Netherlands	01/10/2014	2427-2435	Yes	Peer revie wed
8	Decoherence and time reversibility: The role of randomness at interfaces 10.1063/1.482 8736	J. M. Sellier , M. Nedjalkov , I. Dimov , S. Selberherr	Journal of Applied Physics	Vol. 114/I ssu e 17	American Institute of Physics Inc.	United States	01/01/2013	174902	No	Peer revie wed
9	Semi-coarsening AMLI preconditioning of anisotropic trilinear FEM systems 10.1016/j.cam wa.2014.07.030	Ivan Georgiev , Svetozar Margenov	Computers and Mathematics with Applicati ons	Vol. 68/Is sue 12	Elsevier Limited	United Kingdom	01/12/2014	2103-2111	Yes	Peer revie wed
10	A computational approach for the seismic damage response under multiple earthqua kes excitations of adjacent RC structures strengthened by ties 10.1016/j.cam wa.2015.08.012	Angelos Li olios , At hanasios K arabinis , Aste rios Liolios , Stefan Radev , Krassimir Georgiev , Ivan Georgiev	Computers and Mathematics with Applicati ons	Vol. 70/Is sue 11	Elsevier Limited	United Kingdom	01/12/2015	2742-2751	Yes	Peer revie wed
11	Numerical computation of periodic respon ses of nonlinear large-scale systems by shooting method 10.1016/j.cam wa.2014.01.023	S. Stoykov , S. Margenov	Computers and Mathematics with Applicati ons	Vol. 67/Is sue 12	Elsevier Limited	United Kingdom	01/07/2014	2257-2267	Yes	Peer revie wed
12	Toward solotronics design in the Wigner formalism 10.1016/j.phy sa.2014.09.057	J.M. Sellier , I. Dimov	Physica A: Statistical Mechanics and its Applications	Vol. 417	Elsevier	Netherlands	01/01/2015	287-296	Yes	Peer revie wed
13	A Wigner approach to the study of wave p ackets in ordered and disordered arrays of dopants 10.1016/j.phy sa.2014.03.065	J.M. Sellier , I. Dimov	Physica A: Statistical Mechanics and its Applications	Vol. 406	Elsevier	Netherlands	01/07/2014	185-190	Yes	Peer revie wed
14	Electron dynamics in nanoscale transistors by means of Wigner and Boltzmann appr oaches 10.1016/j.phy sa.2013.12.045	J.M. Sellier , S.M. Amoro so , M. Ne djalkov , S. Se lberherr , A. A	Physica A: Statistical Mechanics and its Applications	Vol. 398	Elsevier	Netherlands	01/03/2014	194-198	Yes	Peer revie wed

		senov , I. Dimov								
15	Molecular descriptors and quasi-distribution functions 10.1016/j.cam wa.2015.06.037	J.M. Sellier , D.Y. Ivanova , I. Dimov	Computers and Mathematics with Applications	Vol. 70/Issue 11	Elsevier Limited	United Kingdom	01/12/2015	2726-2731	Yes	Peer revie wed
16	Interpolation of harmonic functions based on Radon projections dx.doi.org/10 .1007/s00211-013-0592-y	Irina Georgieva , Clemens Hofreither	Numerische Mathematik	Vol. 127/Issu e 3	Springer New York	United States	01/07/2014	423-445	Yes	Peer revie wed
17	Wigner functions, signed particles, and the harmonic oscillator 10.1007/s1082 5-015-0722-0	J. M. Sellier , I. Dimov	Journal of Computational Electronics	Vol. 14/Issue 4	Springer Netherlands	Netherlands	01/12/2015	907-915	Yes	Peer revie wed
18	Vibration energy harvesting by a Timoshenko beam model and piezoelectric transducer 10.1140/epjst /e2015-02587-3	S. Stoykov , G. Litak , E. Manoach	European Physical Journal: Special Topics	Vol. 224/Issu e 14-15	Springer Verlag	Germany	01/11/2015	2755-2770	Yes	Peer revie wed
19	Auxiliary space multigrid method based on additive Schur complement approximation 10.1002/nla.1 959	J. Kraus , M. Lymbery , S. Margenov	Numerical Linear Algebra with Applications	Vol. 21 issue 6	John Wiley and Sons Ltd	United Kingdom	01/10/2014	n/a-n/a	No	Peer revie wed
20	Robust multilevel methods for quadratic finite element anisotropic elliptic problems 10.1002/nla.1 876	Johannes Kraus , Maria Lymbery , Svetozar Margenov	Numerical Linear Algebra with Applications	Vol. 21/Issue 3	John Wiley and Sons Ltd	United Kingdom	01/05/2014	375-398	No	Peer revie wed
21	A sensitivity study of the Wigner Monte Carlo method 10.1016/j.cam .2014.09.010	J.M. Sellier , I. Dimov	Journal of Computational and Applied Mathematics	Vol. 277	Elsevier	Netherlands	01/03/2015	87-93	Yes	Peer revie wed
22	On the Wigner Monte Carlo method coupled to pseudopotential models 10.1016/j.cam .2015.01.033	J.M. Sellier , R.F. Svier coski , I. Dimov	Journal of Computational and Applied Mathematics	Vol. 293	Elsevier	Netherlands	01/02/2016	217-222	Yes	Peer revie wed
23	Scalable parallel implementation of shooting method for large-scale dynamical systems. Application to bridge components 10.1016/j.cam .2015.04.015	S. Stoykov , S. Margenov	Journal of Computational and Applied Mathematics	Vol. 293	Elsevier	Netherlands	01/02/2016	223-231	Yes	Peer revie wed
24	Cubature rules for harmonic functions based on Radon projections	Irina Georgieva , Cl	Calcolo	Vol. 52/Issue 2	Springer Milan	Italy	01/06/2015	153-166	Yes	Peer revie wed

	10.1007/s1009 2-014-0111-2	emens Hofr either								
25	An efficient 3D numerical beam model bas ed on cross sectional analysis and Ritz approximations 10.1002/zamm. 201400139	S. Stoykov , E. Manoach , S. Margenov	ZAMM Zeitschrift fur Angewandte Mat hematik und Mechanik	1–22 (2015)	Wiley-VCH Verlag	Germany	01/10/2015	n/a-n/a	No	Peer revie wed
26	Interpolating solutions of the Poisson e quation in the disk based on Radon proje ctions 10.1016/j.jma a.2014.09.031	I. Georgieva , C. Hofreither	Journal of Mathematical Analysis and App lications	Vol. 423/I ssu e 1	Academic Press Inc.	United States	01/03/2015	305-317	Yes	Peer revie wed
27	A comparison of approaches for the solut ion of the Wigner equation 10.1016/j.mat com.2014.06.001	J.M. Sellier , M. Nedjalkov , I. Dimov , S. Selberherr	Mathematics and Computers in Simulation	Vol. 107	Elsevier	Netherlands	01/01/2015	108-119	Yes	Peer revie wed
28	Nonlinear Vibrations of 3D Laminated Composite Beams 10.1155/2014/ 892782	S. Stoykov , S. Margenov	Mathematical Problems in Engineering	Vol. 2014	Hindawi Publishing C orporation	United States	01/01/2014	1-14	Yes	Peer revie wed
29	Fluctuation limits of a locally regulated population and generalized Langevin eq uations 10.1142/S0219 025715500095	Mladen Savov , Shi-Dong W ang	Infinite Dimensional Analysis, Quantum P robability and Related Topics	Vol. 18/Is sue 02	World Scientific Pub lishing Co. Pte Ltd	Singapore	01/06/2015	1550009	No	Peer revie wed
30	Monte Carlo Simulation of Ultrafast Carr ier Transport: Scalability Study 10.1016/j.pro cs.2013.05.401	Aneta Kara ivanova , Emanuil At anassov , Todor Gurov	Procedia Computer Science	Vol. 18	Elsevier	Netherlands	01/01/2013	2298-2306	Yes	Peer revie wed
31	Coherent radiometric imaging using anten nas with beam synthesizing 10.1017/S1759 078715000550	Konstantin A. Lukin , Vol odymyr V. Kudriashov , Pavlo L. Vyp lavin , Vo lodymyr P. Palamarchuk , Sergii K. Lukin	International Journal of Microwave and W ireless Technologies	Vol. 7/Iss ue 3-4		United Kingdom	01/06/2015	453-458	Yes	Peer revie wed
32	Traffic Lights Optimization with Measure ments of Noise Levels 10.3182/20130 916-2-TR-4042.00019	K. Stoilova , T. Stoilov , H. Abouaïssa	IFAC Proceedings Volumes (IFAC-Papers Online)	Vol. 46/Is sue 25	IFAC Secretariat	Austria	01/01/2013	31-36	Yes	Peer revie wed

33	Human Activity Registration Using Multisensor Data Fusion 10.1515/cait- 2015-0093	Kiril Alexiev , Georgi Shishkov , Nevena Popova	Cybernetics and Information Technologies	Vol. 15/Issue 7	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	99-108	Yes	Peer reviewed
34	Text Mining and Big Data Analytics for Retrospective Analysis of Clinical Texts from Outpatient Care 10.1515/cait- 2015-0055	Svetla Boytcheva , Galia Angelova , Zhivko Angelov , Dimitar Tcharaktchiev	Cybernetics and Information Technologies	Vol. 15/Issue 4	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	58-77	Yes	Peer reviewed
35	Multichannel Modified Covariance Estimator of a Single-Tone Frequency 10.1515/cait- 2015-0087	I. D. Chyrka , I. P. Omelchuk	Cybernetics and Information Technologies	Vol. 15/Issue 7	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	35-44	Yes	Peer reviewed
36	The Impact of the Quality Assessment of Optimal Assignment for Data Association in a Multitarget Tracking Context 10.1515/cait- 2015-0092	J. Dezert , A. Tchamova , P. Konstantinova	Cybernetics and Information Technologies	Vol. 15/Issue 7	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	88-98	Yes	Peer reviewed
37	Current Practices, Trends and Challenges in K-12 Online Learning 10.2478/cait- 2013-0028	Christo Dichev , Darina Dicheva , Gennady Agre , Galia Angelova	Cybernetics and Information Technologies	Vol. 13/Issue 3	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2013	91-110	Yes	Peer reviewed
38	Trends and Opportunities in Computer Science OER Development 10.1515/cait- 2015-0045	Christo Dichev , Darina Dicheva , Gennady Agre , Galia Angelova	Cybernetics and Information Technologies	Vol. 15/Issue 3	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	114-126	Yes	Peer reviewed
39	From Gamification to Gameful Design and Gameful Experience in Learning 10.1515/cait- 2014-0007	Christo Dichev , Darina Dicheva , Galia Angelova , Gennady Agre	Cybernetics and Information Technologies	Vol. 14/Issue 4	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	31/01/2015	80-100	Yes	Peer reviewed
40	Bridging the Gap between Digital Libraries and e-Learning	Milena Dobreva , Galia Angelova , G	Cybernetics and Information Technologies	Vol. 15/Issue 4	Institute of Information and Communicatio n Technologies of B	Bulgaria	01/01/2015	92-110	Yes	Peer reviewed

	10.1515/cait- 2015-0057	ennady Agre			ulgarian Academy of Sciences					
41	Intelligent methods for process control and diagnostics of a mill fan system 10.2478/cait- 2014-0012	Lyubka A. Doukovska , Svetla I. Vas sileva	Cybernetics and Information Technologies	Vol. 14/Is sue 1	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2014	151-160	Yes	Peer revie wed
42	High precision computing of definite int egrals with .net framework c# and x-mpir 10.2478/cait- 2014-0014	Velichko D zhambov	Cybernetics and Information Technologies	Vol. 14/Is sue 1	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2014	172-182	Yes	Peer revie wed
43	Application of HPD Model for Predicting Protein Mutations 10.2478/cait- 2013-0056	Stefka Fid anova	Cybernetics and Information Technologies	Vol. 13/Is sue 4	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2013	95-103	Yes	Peer revie wed
44	A Software System for Classification of Archaeological Artefacts Represented by 2D Plans 10.2478/cait- 2013-0017	Valentin H ristov , G ennady Agre	Cybernetics and Information Technologies	Vol. 13/Is sue 2	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2013	82–96	Yes	Peer revie wed
45	Using a PicoBlaze Processor to Traffic L ight Control 10.1515/cait- 2015-0023	Vladimir N. Ivanov	Cybernetics and Information Technologies	Vol. 15/Is sue 5	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2015	131-139	Yes	Peer revie wed
46	Mapping of Acoustic Noise and Micro wave Radiation 10.1515/cait- 2016-0010	Volodymyr V. Kudriashov , Artem Yu. Garbar , Sergi i K. Lukin , Volodymyr P. Palamarchuk , Konstantin A. Lukin	Cybernetics and Information Technologies	Vol. 16/Is sue 1	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2016	126-134	Yes	Peer revie wed
47	Fusion of Images Generated by Radiometri c and Active Noise SAR 10.1515/cait- 2015-0089	Volodymyr V. Kudriashov , Artem Y. Garbar , K onstantin A. Lukin , Luka sz Masliko	Cybernetics and Information Technologies	Vol. 15/Is sue 7	Institute of Informa tion and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2015	58-66	Yes	Peer revie wed

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48	2D Video Stabilization for Industrial High-Speed Cameras 10.1515/cait- 2015-0086	Atanas Nikolov , Dimo Dimov	Cybernetics and Information Technologies	Vol. 15/Issue 7	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	23-34	Yes	Peer reviewed
49	3D Visualization of Sound Fields Perceived by an Acoustic Camera 10.1515/cait- 2015-0088	Nevena Popova , Georgi Shishkov , Petia Koprinkova-Hristova , Kiril Alexiev	Cybernetics and Information Technologies	Vol. 15/Issue 7	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	45-57	Yes	Peer reviewed
50	Multi-Criteria Models for Clusters Design 10.2478/cait- 2013-0003	Irina Radeva	Cybernetics and Information Technologies	Vol. 13/Issue 1	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2013	18–33	Yes	Peer reviewed
51	Risk estimation and stochastic control of innovation processes 10.2478/cait- 2014-0001	Vassil Sgurev , Stanislav Drangajov	Cybernetics and Information Technologies	Vol. 14/Issue 1	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2014	3-10	Yes	Peer reviewed
52	Natural Language Generation and Semantic Technologies 10.2478/cait- 2014-0015	Kamenka Staykova	Cybernetics and Information Technologies	Vol. 14/Issue 2	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	15/01/2014	3-24	Yes	Peer reviewed
53	Bi-Level Optimization in a Transport Network 10.1515/cait- 2015-0015	Todor Stoilov , Krasimira Stoilova , Markos Papageorgiou , Ioannis Papamichail	Cybernetics and Information Technologies	Vol. 15/Issue 5	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2015	37-49	Yes	Peer reviewed
54	Autonomic Properties in Traffic Control 10.2478/cait- 2013-0050	Krasimira Stoilova , Todor Stoilov , Konstantin Nikolov	Cybernetics and Information Technologies	Vol. 13/Issue 4	Institute of Information and Communicatio n Technologies of Bulgarian Academy of Sciences	Bulgaria	01/01/2013	18-32	Yes	Peer reviewed

55	An Approach for Quality Assessment and Efficiency of a Web-Based System for Distance Learning 10.2478/cait- 2013-0054	Elisaveta Trichkova , Krasimira Stoilova	Cybernetics and Information Technologies	Vol. 13/Issue 4	Institute of Information and Communicati o n Technologies of B ulgarian Academy of Sciences	Bulgaria	01/01/2013	63-73	Yes	Peer revie wed
	Least Squares Fitting of Harmonic Functi ons Based on Radon Projections 10.1007/978-3 -642-54382-1_9	Irina Geor gieva , Cl emens Hofr either , R umen Uluchev	Mathematical Methods for Curves and Surf aces	Vol. 8177	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2014	158	No	Article
	Structural Blocks Retrieval in Macromole cules: Saliency and Precision Aspects 10.1007/978-3 -642-41190-8_40	Virginio C antoni , Dimo T. Dimov	New Trends in Image Analysis and Process ing – ICIAP 2013	Vol. 8158	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2013	372	No	Article
	Echo State Networks in Dynamic Data Clustering 10.1007/978-3 -642-40728-4_43	Petia Kopr inkova-Hri stova , Kiril A lexiev	Artificial Neural Networks and Machine L earning – ICANN 2013	Vol. 8131	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2013	343	No	Article
	Recurrent Fuzzy-Neural Network with Fast Learning Algorithm for Predictive Control 10.1007/978-3 -642-40728-4_58	Yancho Tod orov , Mar garita Ter zyiska , M ichail Petrov	Artificial Neural Networks and Machine L earning – ICANN 2013	Vol. 8131	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2013	459	No	Article
	Applying Language Technologies on H ealthcare Patient Records for Better Tre atment of Bulgarian Diabetic Patients 10.1007/978-3 -319-10554-3_9	Ivelina Ni kolova , D imitar Tch araktchiev , Svetla Boytc heva , Zhivko Angelov , G alia Angelova	Artificial Intelligence: Methodology, Sy stems, and Applications	Vol. 8722	Springer Internationa l Publishing	Cham	01/01/2014	92	No	Article
	Dynamic Sound Fields Clusterization Usin g Neuro-Fuzzy Approach 10.1007/978-3 -319-10554-3_19	Petia Kopr inkova-Hri stova , Kiril A lexiev	Artificial Intelligence: Methodology, Sy stems, and Applications	Vol. 8722	Springer Internationa l Publishing	Cham	01/01/2014	194	No	Article
	ZigBee Smart Sensor System with Distribu ted Data Processing 10.1007/978-3 -319-11310-4_23	Alexander Alexandrov , Vladimir Mon ov	Intelligent Systems'2014	Vol. 323	Springer Internationa l Publishing	Cham	01/01/2015	259	No	Article
	Modeling of Chaotic Time Series by Inter val Type-2 NEO-Fuzzy Neural Network 10.1007/978-3 -319-11179-7_81	Yancho Tod orov , Mar garita Ter ziyska	Artificial Neural Networks and Machine L earning ? ICANN 2014	Vol. 8681	Springer Internationa l Publishing	Cham	01/01/2014	643	No	Article

	A PROMETHEE ? Based Approach for Multiple Objective Voltage Regulator Optimization 10.1007/978-3 -319-08672-9_14	Galia Marinova , Vassil Guliashki	Nonlinear Dynamics of Electronic Systems	Vol. 438	Springer International Publishing	Cham	01/01/2014	100	No	Article
	Slot Machines RTP Optimization with Genetic Algorithms 10.1007/978-3 -319-15585-2_6	Todor Balabanov , Iliyan Zankinski , Bozhidar Shumanov	Numerical Methods and Applications	Vol. 8962	Springer International Publishing	Cham	01/01/2015	55	No	Article
	Neural Network and kNN Classifiers for On-Line Signature Verification 10.1007/978-3 -319-13386-7_16	Desislava Boyadzieva , Georgi Gluhchev	Biometric Authenticati on	Vol. 8897	Springer International Publishing	Cham	01/01/2014	198	No	Article
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	Appearance-Based 3D Object Approach to Human Ears Recognition 10.1007/978-3 -319-13386-7_10	Dimo T. Dimov , Virginio Cantoni	Biometric Authenticati on	Vol. 8897	Springer International Publishing	Cham	01/01/2014	121	No	Article
	Supervised 2-Phase Segmentation of Porous Media with Known Porosity 10.1007/978-3 -319-26520-9_38	Ivan Georgiev , Stanislav Harizanov , Yavor Vutov	Large-Scale Scientific Computing	Vol. 9374	Springer International Publishing	Cham	01/01/2015	343	No	Article
	Numerical Homogenization of Epoxy-Clay Composite Materials 10.1007/978-3 -319-15585-2_15	Ivan Georgiev , Evgeni Ivanov , S. Margenov , Y. Vutov	Numerical Methods and Applications	Vol. 8962	Springer International Publishing	Cham	01/01/2015	130	No	Article
	Fast Constrained Image Segmentation Using Optimal Spanning Trees 10.1007/978-3 -319-26520-9_2	Stanislav Harizanov , Svetozar Margenov , Ludmil Zikatanov	Large-Scale Scientific Computing	Vol. 9374	Springer International Publishing	Cham	01/01/2015	15	No	Article
	FETI Solvers for Non-standard Finite Element Equations Based on Boundary Integral Operators 10.1007/978-3 -319-05789-7_70	Clemens Hofreither , Ulrich Langer , Clemens Pechstein	Domain Decomposition Methods in Science and Engineering XXI	Vol. 98	Springer International Publishing	Cham	01/01/2014	729	No	Article

	Spectral Analysis of Geometric Multigrid Methods for Isogeometric Analysis 10.1007/978-3 -319-15585-2_14	Clemens Hofreither , Walter Zulehner	Numerical Methods and Applications	Vol. 8962	Springer International Publishing	Cham	01/01/2015	123	No	Article
	Hebbian Versus Gradient Training of ESN Actors in Closed-Loop ACD 10.1007/978-3 -319-15585-2_11	Petia Koprinkova-Hristova	Numerical Methods and Applications	Vol. 8962	Springer International Publishing	Cham	01/01/2015	95	No	Article
	On-line Training of ESN and IP Tuning Effect 10.1007/978-3 -319-11179-7_4	Petia Koprinkova-Hristova	Artificial Neural Networks and Machine Learning – ICANN 2014	Vol. 8681	Springer International Publishing	Cham	01/01/2014	25	No	Article
	ACD with ESN for Tuning of MEMS Kalman Filter 10.1007/978-3 -319-26520-9_24	Petia Koprinkova-Hristova , Kiril Alexiev	Large-Scale Scientific Computing	Vol. 9374	Springer International Publishing	Cham	01/01/2015	226	No	Article
	Thermoelectrical Tick Removal Process Modeling 10.1007/978-3 -319-26520-9_41	Nikola Kosturski , Ivan Lirkov , Svetozar Margenov , Yavor Vutov	Large-Scale Scientific Computing	Vol. 9374	Springer International Publishing	Cham	01/01/2015	369	No	Article
	Performance Analysis of Block AMG Preconditioning of Poroelasticity Equations 10.1007/978-3 -319-26520-9_42	Nikola Kosturski , Svetozar Margenov , Peter Popov , Nikola Simeonov , Yavor Vutov	Large-Scale Scientific Computing	Vol. 9374	Springer International Publishing	Cham	01/01/2015	377	No	Article
	Tall RC Buildings Environmentally Degraded and Strengthened by Cables Under Multiple Earthquakes: A Numerical Approach 10.1007/978-3 -319-15585-2_21	Angelos Liolios , Anaxagoras Elenas , Asterios Liolios , Stefan Radev , Krassimir Georgiev , Ivan Georgiev	Numerical Methods and Applications	Vol. 8962	Springer International Publishing	Cham	01/01/2015	187	No	Article
	Numerical Homogenization of Heterogeneous Anisotropic Linear Elastic Materials 10.1007/978-3 -662-43880-0_39	S. Margenov , S. Stoykov , Y. Vutov	Large-Scale Scientific Computing	Vol. 8353	Springer Berlin Heidelberg	Berlin, Heidelberg	01/01/2014	347	No	Article
	A PROMETHEE – Based Approach for	Galia Mari	Nonlinear Dynamics of Electronic Systems	Vol. 438	Springer Internationa	Cham	01/01/2014	100	No	Article

	Multiple Objective Voltage Regulator Optimization 10.1007/978-3 -319-08672-9_14	nova , Vassil Guliashki			l Publishing					
	Noisy Speech Endpoint Detection using Ro bust Feature 10.1007/978-3 -319-13386-7_9	Atanas Ouz ounov	Biometric Authenticati on	Vol. 8897	Springer Internationa l Publishing	Cham	01/01/2014	105	No	Article
	Stochastic Formulation of Newton's Accel eration 10.1007/978-3 -662-43880-0_19	P. Schwaha , M. Nedjalkov , S. Selberherr , J. M. Sellier , I. Dimov , R. Georgieva	Large-Scale Scientific Computing	Vol. 8353	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2014	178	No	Article
	The Role of Annihilation in a Wigner Mon te Carlo Approach 10.1007/978-3 -662-43880-0_20	Jean Michel Sellier , Mih ail Nedjalkov , Ivan Dimov , Siegfried S elberherr	Large-Scale Scientific Computing	Vol. 8353	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2014	186	No	Article
	Sensitivity Analysis of Design Parameters for Silicon Diodes 10.1007/978-3 -319-15585-2_4	J. M. Sellier , Rayna Geo rgieva , Ivan Dimov	Numerical Methods and Applications	Vol. 8962	Springer Internationa l Publishing	Cham	01/01/2015	34	No	Article
	Isogeometric Analysis for Nonlinear Dyna mics of Timoshenko Beams 10.1007/978-3 -319-15585-2_16	Stanislav Stoykov , Clemens Ho freither , Svet ozar Marge nov	Numerical Methods and Applications	Vol. 8962	Springer Internationa l Publishing	Cham	01/01/2015	138	No	Article
	Scalability of Shooting Method for Nonli near Dynamical Systems 10.1007/978-3 -319-26520-9_45	Stanislav Stoykov , Svetozar M argenov	Large-Scale Scientific Computing	Vol. 9374	Springer Internationa l Publishing	Cham	01/01/2015	401	No	Article
	Nonlinear Forced Vibration Analysis of E lastic Structures by Using Parallel Solvers f or Large-Scale Systems 10.1007/978-3 -662-43880-0_46	Stanislav Stoykov , Svetozar M argenov	Large-Scale Scientific Computing	Vol. 8353	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2014	405	No	Article
	A Numerical Study of the Upper Bound of the Throughput of a Crossbar Switch Util izing MiMa-Algorithm 10.1007/978-3 -319-15585-2_33	Tasho Tashev , Vladimir M onov	Numerical Methods and Applications	Vol. 8962	Springer Internationa l Publishing	Cham	01/01/2015	295	No	Article

	Modeling of Chaotic Time Series by Interval Type-2 NEO-Fuzzy Neural Network 10.1007/978-3 -319-11179-7_81	Yancho Todorov , Margarita Terziyska	Artificial Neural Networks and Machine Learning – ICANN 2014	Vol. 8681	Springer International Publishing	Cham	01/01/2014	643	No	Article
	InterCriteria Decision Making Approach to EU Member States Competitiveness Analysis: Trend Analysis 10.1007/978-3 -319-11313-5_10	Vassia Atanassova , Lyubka Doukovska , Dimitar Karastoyanov , František #apkovi#	Intelligent Systems'2014	Vol. 322	Springer International Publishing	Cham	01/01/2015	107	No	Article
	Application of Fuzzy Topsis and Ahp Method in Evaluating Vehicle Roadworthiness Performance 10.1007/978-3 -319-27276-4_7	Jakimovska Kristina , Duboka #edomir , Karastoyanov Dimitar	Proceedings of the European Automotive Congress EAEC-ESFA 2015		Springer International Publishing	Cham	01/01/2016	69	No	Article
	AjTempura – First Software Prototype of C3A Model 10.1007/978-3 -319-11313-5_38	Vladimir Valkanov , Asya Stoyanova-Doycheva , Emil Doychev , Stanimir Stoyanov , Ivan Popchev , Irina Radeva	Intelligent Systems'2014	Vol. 322	Springer International Publishing	Cham	01/01/2015	427	No	Article
	A Self-Optimization Traffic Model by Multilevel Formalism 10.1007/978-3 -319-25808-9_6	Todor Stoilov , Krasimira Stoilova	Autonomic Road Transport Support Systems		Springer International Publishing	Cham	01/01/2016	87	No	Article
	Building of Numerically Effective Kalman Estimator Algorithm for Urban Transportation Network 10.1007/978-3 -319-32207-0_21	Aleksey Balabanov	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	319	No	Article
	Mining Clinical Events to Reveal Patterns and Sequences 10.1007/978-3 -319-32207-0_7	Svetla Boytcheva , Galia Angelova , Zhivko Angelov , Dimitar Tcharaktchiev	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	95	No	Article
	Interpolation of Acoustic Field from Nea	Iurii Chyrka	Innovative Approaches and Solutions in A	Vol. 648	Springer Internationa	Cham	01/01/2016	271	No	Article

	rby Located Single Source 10.1007/978-3 -319-32207-0_17		dvanced Intelligent Systems		l Publishing					
	Error Analysis of Biased Stochastic Algo rithms for the Second Kind Fredholm Inte gral Equation 10.1007/978-3 -319-32207-0_1	Ivan Dimov , Venelin Todo rov	Innovative Approaches and Solutions in A dvanced Intelligent Systems	Vol. 648	Springer Internationa l Publishing	Cham	01/01/2016	3	No	Article
	Finite Element Method for Nonlinear Vibr ation Analysis of Plates 10.1007/978-3 -319-32207-0_2	Stanislav Stoykov , Svetozar M argenov	Innovative Approaches and Solutions in A dvanced Intelligent Systems	Vol. 648	Springer Internationa l Publishing	Cham	01/01/2016	17	No	Article
	A Computational Investigation of the Opt imal Reaction Type Concerning BOD R emoval in Horizontal Subsurface Flow Con structed Wetlands 10.1007/978-3 -319-32207-0_3	Konstantinos Liolios , Va ssilios Tsihrin tzis , Krassimi r Georgiev , Ivan Georgiev	Innovative Approaches and Solutions in A dvanced Intelligent Systems	Vol. 648	Springer Internationa l Publishing	Cham	01/01/2016	29	No	Article
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	Emerging Applications of Educational Dat a Mining in Bulgaria: The Case of U CHA.SE 10.1007/978-3 -319-32207-0_8	Ivelina Ni kolova , D arina Dicheva , Gennady A gre , Zhivko Angelov , Ga lia Angelova , Christo Di chev , Darin Madzharov	Innovative Approaches and Solutions in A dvanced Intelligent Systems	Vol. 648	Springer Internationa l Publishing	Cham	01/01/2016	113	No	Article
	About Sense Disambiguation of Image Tags in Large Annotated Image Collections 10.1007/978-3 -319-32207-0_9	Olga Kanis hcheva , Galia Angelova	Innovative Approaches and Solutions in A dvanced Intelligent Systems	Vol. 648	Springer Internationa l Publishing	Cham	01/01/2016	133	No	Article
	Knowledge Graph Extension for Word Sense Annotation 10.1007/978-3 -319-32207-0_10	Kiril Simov , Alexander P opov , Petya Osenova	Innovative Approaches and Solutions in A dvanced Intelligent Systems	Vol. 648	Springer Internationa l Publishing	Cham	01/01/2016	151	No	Article

	Multi-model Ear Database for Biometric Applications 10.1007/978-3 -319-32207-0_11	Atanas Nikolov , Virginio Cantoni , Dimo Dimov , Andrea Abate , Stefano Ricciardi	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	169	No	Article
	Deblurring Poissonian Images via Multi-constraint Optimization 10.1007/978-3 -319-32207-0_13	Stanislav Harizanov	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	201	No	Article
	Innovative Graphical Braille Screen for Visually Impaired People 10.1007/978-3 -319-32207-0_14	Dimitar Karastoyanov , Ivan Yatchev , Iosko Balabozov	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	219	No	Article
	Smart Feature Extraction from Acoustic Camera Multi-sensor Measurements 10.1007/978-3 -319-32207-0_15	Petia Koprinkova-Hristova , Volodymyr Kudriashov , Kiril Alexiev , Iurii Chyrka , Vladislav Ivanov , Petko Nedyalkov	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	241	No	Article
	Multistatic Reception of Non-stationary Random Wiener Acoustic Signal 10.1007/978-3 -319-32207-0_16	Volodymyr Kudriashov	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	257	No	Article
	A New Method for Real-Time Lattice Rescoring in Speech Recognition 10.1007/978-3 -319-32207-0_18	Petar Mitankin , Stoyan Mihov	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	283	No	Article
	Metaheuristic Method for Transport Modelling and Optimization 10.1007/978-3 -319-32207-0_19	Stefka Fidanova	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	295	No	Article
	Bi-level Formalization of Urban Area Traffic Lights Control 10.1007/978-3 -319-32207-0_20	Todor Stoilov , Krasimira Stoilova , Vassilka Stoilova	Innovative Approaches and Solutions in Advanced Intelligent Systems	Vol. 648	Springer International Publishing	Cham	01/01/2016	303	No	Article
	On Full Multigrid Schemes for Isogeometric Analysis	Clemens Hofreither , Walt	Domain Decomposition Methods in Science and Engineering XXII	Vol. 104	Springer International Publishing	Cham	01/01/2016	267	No	Article

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	Distributed System for Query Processing with Grid Authentication 10.1007/978-3 -662-43880-0_53	E. I. Atan assov , D. Georgiev , T. Gurov , A. Karaivanova , Y. Nikolova	Large-Scale Scientific Computing	Vol. 8353	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2014	467	No	Article
	Intelligent Technical Fault Condition Di agnostics of Mill Fan 10.1007/978-3 -319-14194-7_2	Mincho Had jiski , Lyubka Doukovska	Novel Applications of Intelligent Systems	Vol. 586	Springer Internationa l Publishing	Cham	01/01/2016	23	No	Article
	Adaptive Critic Design and Heuristic Sea rch for Optimization 10.1007/978-3 -662-43880-0_27	Petia Kopr inkova-Hri stova	Large-Scale Scientific Computing	Vol. 8353	Springer Berlin Heid elberg	Berlin, Heidelberg	01/01/2014	248	No	Article
	Experimental Evaluation of Opportunity to Improve the Resolution of the Acoustic Maps 10.1007/978-3 -319-32192-9_11	Volodymyr Kudriashov	New Approaches in Intelligent Image Anal ysis	Vol. 108	Springer Internationa l Publishing	Cham	01/01/2016	353	No	Article
	Quantum insights in gate oxide charge-tr apping dynamics in nanoscale MOSFETs 10.1109/SISPA D.2013.6650565	S. M. Amor oso , L. Gerrer , A. Asenov , J. M. Sellier , I. Dimov , M. Nedjalkov , S. Selberherr	2013 Internationa l Conference on Simulat ion of Semiconductor Processes and Devic es (SISPAD)		IEEE		01/09/2013	25-28	No	Conference
	Two-dimensional transient wigner particle model 10.1109/SISPA D.2013.6650660	J. M. Sellier , M. Nedjalkov , I. Dimov , S. Selberherr	2013 Internationa l Conference on Simulat ion of Semiconductor Processes and Devic es (SISPAD)		IEEE		01/09/2013	404-407	No	Conference
	Automatic information extraction from pa tient records in Bulgarian language 10.1145/25167 75.2516777	Galia Ange lova	Proceedings of the 14th Internationa l Co nference on Computer Systems and Te chnologies - CompSysTech '13		ACM Press	New York, New Y ork, USA	01/01/2013	11-14	No	Conference
	Loading test of Apache HTTP server by vi deo file and usage measurements of the h ardware components 10.1145/25167 75.2516799	Stanislav Dimitrov , Todor Stoilov	Proceedings of the 14th Internationa l Co nference on Computer Systems and Te chnologies - CompSysTech '13		ACM Press	New York, New Y ork, USA	01/01/2013	59-66	No	Conference
	Emotion recognition by face dynamics 10.1145/25167 75.2516794	Svetoslav Nedkov , D imo Dimov	Proceedings of the 14th Internationa l Co nference on Computer Systems and Te chnologies - CompSysTech '13		ACM Press	New York, New Y ork, USA	01/01/2013	128-136	No	Conference

	A program for an automatic PicoBlaze type embedded system generation 10.1145/25167 75.2516784	Vladimir N. Ivanov	Proceedings of the 14th Internationa l Co nference on Computer Systems and Te chnologies - CompSysTech '13		ACM Press	New York, New Y ork, USA	01/01/2013	91-97	No	Conference
	A computer modeling of the throughput of a crossbar switch by PI-patterns for un iform traffic with variable intensity 10.1145/25167 75.2516790	Tasho Tashev , Vladimir M onov	Proceedings of the 14th Internationa l Co nference on Computer Systems and Te chnologies - CompSysTech '13		ACM Press	New York, New Y ork, USA	01/01/2013	53-58	No	Conference
	An algorithm for error reducing in IMU 10.1109/INIST A.2013.6577663	Kiril Alexiev , Iva Nikolova	2013 IEEE INISTA		IEEE		01/06/2013	1-6	No	Conference
	A concept of intelligent e-maintenance d ecision making system 10.1109/INIST A.2013.6577668	Daniela Bo rissova , Ivan Mustakerov	2013 IEEE INISTA		IEEE		01/06/2013	1-6	No	Conference
	Clustering of spectral images using Echo state networks 10.1109/INIST A.2013.6577633	Petia Kopr inkova-Hri stova , Donka Angelova , Denitsa Bo risova , G eorgi Jelev	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference
	Working regimes classification for predi ctive maintenance of mill fan systems 10.1109/INIST A.2013.6577632	Petia Kopr inkova-Hri stova , Ly ubka Douko vska , Peter Kostov	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference
	Why Dempster's rule doesn't behave as Ba yes rule with informative priors 10.1109/INIST A.2013.6577631	Jean Dezert , Albena Tcha mova , Deq iang Han , Jean-Marc Tacnet	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference
	Tracking applications with fuzzy-based f usion rules 10.1109/INIST A.2013.6577630	Albena Tch amova , Jean Dezert	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference
	An intelligent approach to optimal predi ctive maintenance strategy defining 10.1109/INIST A.2013.6577666	Ivan Musta kerov , Da niela Bori ssova	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference

	On applicability of Principal Component Analysis to concept learning from images 10.1109/INIST A.2013.6577623	Boris Strandjev , Gennady Agre	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference
	Fuzzy-neural predictive control using Levenberg-Marquardt optimization approach 10.1109/INIST A.2013.6577624	Yancho Todorov , Margarita Terzyiska , Sevil Ahmed , Michail Petrov	2013 IEEE INISTA		IEEE		01/06/2013	1-5	No	Conference
	EXC CFAR BI processor with Polar Hough transform in the presence of Binominal impulse interference 10.1109/SPS.2 013.6623594	I. Garvanov	2013 Signal Processing Symposium (SPS)		IEEE		01/06/2013	1-4	No	Conference
	Network flow interpretation of innovation processes and risks 10.1109/SPS.2 013.6623603	Vassil S. Sgurev , Lyubka A. Doukovska , Stanislav T. Drangajov , Vassil G. Nikov	2013 Signal Processing Symposium (SPS)		IEEE		01/06/2013	1-4	No	Conference
	Design and application of Artificial Neural Networks for predicting the values of indexes on the Bulgarian Stock market 10.1109/SPS.2 013.6623604	Veselin L. Shahpazov , Vladimir B. Velev , Lyubka A. Doukovska	2013 Signal Processing Symposium (SPS)		IEEE		01/06/2013	1-6	No	Conference
	Predictive maintenance model-based approach for objects exposed to extremely high temperatures 10.1109/SPS.2 013.6623621	Kosta P. Boshnakov , Venko I. Petkov , Lyubka A. Doukovska , Svetla I. Vassileva , Emil G. Mihailov , Stefan L. Kojnov	2013 Signal Processing Symposium (SPS)		IEEE		01/06/2013	1-5	No	Conference
	Recurrent neural networks for automatic clustering of multispectral satellite images 10.1117/12.20 29191	Petia Koprinkova-Hristova , Kiril Alexiev , Denitsa Borisova ,	Image and Signal Processing for Remote Sensing XIX		SPIE		17/10/2013	88920X	No	Conference

		Georgi Jelev , Valentin Atanassov								
	Hybrid GA-ACO Algorithm for a Model Parameters Identification Problem 10.15439/2014 F373	Stefka Fidanova , Marcin Paprzycki , Olympia Roeva	Proceedings of the 2014 Federated Conference on Computer Science and Information Systems		IEEE		29/09/2014	413-420	Yes	Conference
	Sound fields clusterization via neural networks 10.1109/INIST A.2014.6873646	Petia Koprinkova-Hristova , Kiril Alexiev	2014 IEEE International l Symposium on Innovations in Intelligent Systems and Applications (INISTA) Proceedings		IEEE		01/06/2014	368-374	No	Conference
	An approach to unsupervised historical text normalisation 10.1145/25951 88.2595191	Petar Mitankin , Stefan Gerdjikov , Stoyan Mihov	Proceedings of the First International l Conference on Digital Access to Textual Cultural Heritage - DATeCH '14		ACM Press	New York, New York, USA	01/01/2014	29-34	No	Conference
	An extension of flexible job shop problem (FJSP) and method for solving 10.1145/26595 32.2659602	Leoneed Kirilov , Vassil Guliashki	Proceedings of the 15th International l Conference on Computer Systems and Technologies - CompSysTech '14		ACM Press	New York, New York, USA	01/01/2014	210-217	No	Conference
	Computer simulations of a modified MiMa-algorithm for a crossbar packet switch 10.1145/26595 32.2659610	Tasho Tashev , Vladimir Monov	Proceedings of the 15th International l Conference on Computer Systems and Technologies - CompSysTech '14		ACM Press	New York, New York, USA	01/01/2014	94-99	No	Conference
	A customised metric for foods categorization 10.1145/26595 32.2659596	Ivo Marinchev , Gennady Agre	Proceedings of the 15th International l Conference on Computer Systems and Technologies - CompSysTech '14		ACM Press	New York, New York, USA	01/01/2014	234-239	No	Conference
	Real time video stabilization for handheld devices 10.1145/26595 32.2659631	Dimo Dimov , Atanas Nikolov	Proceedings of the 15th International l Conference on Computer Systems and Technologies - CompSysTech '14		ACM Press	New York, New York, USA	01/01/2014	124-133	No	Conference
	Implementation of a Service Oriented Architecture in Smart Sensor Systems Integration Platform 10.5220/00054 22101140120	Vladimir V. MonovAlexander K. Alexandrov	Proceedings of the Third International l Conference on Telecommunications and Remote Sensing		SCITEPRESS - Science and and Technology Publications		01/01/2014	114-120	Yes	Conference
	Electromagnetic Linear Micro Drives for Braille Screen: Characteristics, Control and Optimization 10.5220/00054 21700880093	Lyubka A. DoukovskaVassia K. AtanassovaDimitar N.	Proceedings of the Third International l Conference on Telecommunications and Remote Sensing		SCITEPRESS - Science and and Technology Publications		01/01/2014	88-93	Yes	Conference

		Karastoyanov								
	Maximum Message Flow and Capacity in Sensor Networks 10.5220/00054 21500740080	Stanislav T. DrangajovLyubka A. DoukovskaVassil S. Sgurev	Proceedings of the Third Internationa l Conference on Telecommunications and Remote Sensing		SCITEPRESS - Science and and Technology Publications		01/01/2014	74-80	Yes	Conference
	Intercriteria Decision Making Approach to EU Member States Competitiveness Analysis 10.5220/00054 27302890294	Vassia K. Atanassova Krassimir T. AtanassovLyubka A. DoukovskaDeyan G. Mavrov	Proceedings of the Fourth International Symposium on Business Modeling and Software Design		SCITEPRESS - Science and and Technology Publications		01/01/2014	289-294	Yes	Conference
	Artificial Intelligence Neural Networks Applications in Forecasting Financial Markets and Stock Prices 10.5220/00054 27202820288	Lyubka A. DoukovskaDimitar N. KarastoyanovVeselin L. Shahpazov	Proceedings of the Fourth International Symposium on Business Modeling and Software Design		SCITEPRESS - Science and and Technology Publications		01/01/2014	282-288	Yes	Conference
	Significance of the Predictive Maintenance Strategies for SMEs 10.5220/00054 27102760281	Mincho HadjiskiStefan L. KojnovVladimir V. MonovVassil G. NikovLyubka A. Doukovska	Proceedings of the Fourth International Symposium on Business Modeling and Software Design		SCITEPRESS - Science and and Technology Publications		01/01/2014	276-281	Yes	Conference
	Uncertainty Modeling in the Process of SMEs Financial Mechanism Using Intuitionistic Fuzzy Estimations 10.5220/00054 27002710275	Lyubka A. DoukovskaGeorge L. ShahpazovVassia K. Atanassova	Proceedings of the Fourth International Symposium on Business Modeling and Software Design		SCITEPRESS - Science and and Technology Publications		01/01/2014	271-275	Yes	Conference
	Emotion recognition by face dynamics 10.1145/25167 75.2516794	Svetoslav Nedkov , Dimo Dimov	Proceedings of the 14th Internationa l Conference on Computer Systems and Technologies - CompSysTech '13		ACM Press	New York, New York, USA	01/01/2013	128-136	No	Conference
	Advance study of fiber-reinforced self-compacting concrete 10.1063/1.493 4293	M. Mironova , M. Ivanova , V. Naidenov , I. Georgiev , J. Stary	In Applications of Mathematics in Techniques and Natural Sciences: 7th International Conference for Promoting the Application of Mathematics in Technical and Natural Sciences-AMiTaNS'15, Vol. 1684,		AIP Publishing LLC		01/01/2015	030009	No	Conference
	Implementation of a Service Oriented Architecture in Smart Sensor Systems Integr	Vladimir V. MonovAle	Proceedings of the Third Internationa l Conference on Telecommunications and		SCITEPRESS - Science and and Techno		01/01/2014	114-120	Yes	Conference

	ation Platform 10.5220/00054 22101140120	xander K. Alexandrov	Remote Sensing		logy Publications					
	Fast decentralized optimal control algor ithm on the basis of Bass' relation for vehic les in a platoon 10.1145/28010 81.2801106	Balabanov Aleksey	Proceedings of the 7th Balkan Conference on Informatics Conference - BCI '15		ACM Press	New York, New Y ork, USA	01/01/2015	1-8	No	Conference
	Fast Direction-of-Arrival Estimation for Single SourceNear- and Far-Field Approa ches for 1D Source Localization 10.5220/00058 89400540058	Iurii Chyrka	Proceedings of the Fourth International Conference on Telecommunic ations and Remote Sensing		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	54-58	Yes	Conference
	Conventional Hough detector in presence of randomly arriving impulse interference 10.1109/IRS.2 015.7226256	Lyubka Ata nassova Do ukovska	2015 16th Internationa l Radar Symposium (IRS)		IEEE		01/06/2015	487-492	No	Conference
	InterCriteria Analysis Applied to Various EU Enterprises 10.5220/00058 88302840291	Frantisek CapkovicLy ubka A. Do ukovskaVas sia K. Ata nassovaGeo rge L. Sha hpazov	Proceedings of the Fifth Internationa l S ymposium on Business Modeling and S oftware Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	284-291	Yes	Conference
	InterCriteria Decision Making Approach f or Iron Powder Briquetting 10.5220/00058 88402920296	Nikolay St oymenovLyu bka A. Dou kovskaIvan KalaykovD imitar N. Karastoyanov	Proceedings of the Fifth Internationa l S ymposium on Business Modeling and S oftware Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	292-296	Yes	Conference
	A Pipeline Approach to Image Auto-T agging Refinement 10.1145/28010 81.2801108	Olga Kanis hcheva , Galia Angelova	Proceedings of the 7th Balkan Conference on Informatics Conference - BCI '15		ACM Press	New York, New Y ork, USA	01/01/2015	1-8	No	Conference
	InterCriteria Decision Making Approach f or Metal Chips Briquetting 10.5220/00058 88502970301	Stanislav GyoshevLyu bka A. Dou kovskaDimi tar N. Kar astoyanovIvan Kalaykov	Proceedings of the Fifth Internationa l S ymposium on Business Modeling and S oftware Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	297-301	Yes	Conference
	Non-stationary Random Wiener Signal	V. V. Kudr	Proceedings of the 7th Balkan Conference		ACM Press	New York, New Y	01/01/2015	1-4	No	Conference

	Detection Criterion Variants for Case of Monostatic Reception 10.1145/28010 81.2801089	iashov	on Informatics Conference - BCI '15			ork, USA				
	Non-Stationary Random Wiener Signal Detection with Multistatic Acoustic System 10.5220/00058 89300490053	Volodymyr Kudriashov	Proceedings of the Fourth International Conference on Telecommunic ations and Remote Sensing		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	49-53	Yes	Conference
	InterCriteria Software DesignGraphic Int erpretation within the Intuitionistic Fuzzy Triangle 10.5220/00058 88202790283	Ivan Kalay kovIrina R adevaKrass imir T. At anassovDeyan G. Mavr ovLyubka A. Doukovska	Proceedings of the Fifth Internationa l S ymposium on Business Modeling and S oftware Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	279-283	Yes	Conference
	Software Implementation of Several Produ ction Scheduling Algorithms 10.5220/00058 87202050212	Tasho Tash evVladimir V. MonovAlexan der Alexan drov	Proceedings of the Fifth Internationa l S ymposium on Business Modeling and S oftware Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2015	205-212	Yes	Conference
	Maximum Message Flow and Capacity in Sensor Networks 10.5220/00054 21500740080	Stanislav T. DrangajovLyu bka A. Dou kovskaVassil S. Sgurev	Proceedings of the Third Internationa l C onference on Telecommunications and Remote Sensing		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2014	74-80	Yes	Conference
	Uncertainty Modeling in the Process of S MEs Financial Mechanism Using Intuitioni stic Fuzzy Estimations 10.5220/00054 27002710275	Lyubka A. DoukovskaG eorge L. S hahpazovVa ssia K. At anassova	Proceedings of the Fourth International Symposium on Business Modeling and Software Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2014	271-275	Yes	Conference
	Artificial Intelligence Neural Networks Applications in Forecasting Financial Ma rkets and Stock Prices 10.5220/00054 27202820288	Lyubka A. DoukovskaD imitar N. Karastoyan ovVeselin L. Shahpazov	Proceedings of the Fourth International Symposium on Business Modeling and Software Design		SCITEPRESS - Sc ience and and Techno logy Publications		01/01/2014	282-288	Yes	Conference
	Space discretization by B-Splines on dis continuous problems in structural mechan ics 10.1145/28010 81.2801113	Stanislav Stoykov , Stanislav Harizanov , Svetozar Margenov	Proceedings of the 7th Balkan Conference on Informatics Conference - BCI '15		ACM Press	New York, New Y ork, USA	01/01/2015	1-7	No	Conference

	Simple heuristic approach for training of Type-2 NEO-Fuzzy Neural Network 10.1109/PC.20 15.7169976	Yancho Todorov , Margarita Terziyska	2015 20th Internationa l Conference on Process Control (PC)		IEEE		01/06/2015	278-283	No	Conference
	State-space fuzzy-neural network for modeling of nonlinear dynamics 10.1109/INIST A.2014.6873620	Yancho Todorov , Margarita Terziyska	2014 IEEE Internationa l Symposium on Innovations in Intelligent Systems and Applications (INISTA) Proceedings		IEEE		01/06/2014	212-217	No	Conference
	An intelligent approach to formulate the contents of novel functional food 10.1109/INIST A.2014.6873603	Yancho Todorov , Maria Doneva , Petya Metodieva , Iliana Nacheva	2014 IEEE Internationa l Symposium on Innovations in Intelligent Systems and Applications (INISTA) Proceedings		IEEE		01/06/2014	98-103	No	Conference
	Fine-tuning SIMPLE based Content Based Image Retrieval system 10.1145/28332 58.2833273	Van-Hieu Vu , Hai-Son Le , Olga Kanishcheva , Galia Angelova	Proceedings of the Sixth Internationa l Symposium on Information and Communication Technology - SoICT 2015		ACM Press	New York, New York, USA	01/01/2015	1-8	No	Conference

LIST OF DISSEMINATION ACTIVITIES								
No.	Type of activities	Main Leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Flyers	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn Newsletter 1 in English and Bulgarian, covering activities in project months 1-6	01/04/2013	Sofia, Bulgaria	Civil society - Medias	1000	mostly Bulgaria
2	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Information and Communication Technologies for Human Health and Quality of Life" (ICT-HuHeQuL)	15/05/2013	Stara Zagora - Mineral Baths, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers - Medias	42	Bulgaria
3	Organisation of Conference	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	9th International Conference on "Large-Scale Scientific Computations" LSSC 2013	03/06/2013	Sozopol, Bulgaria	Scientific community (higher education, Research)	154	Countries in Europe, America and Asia
4	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar "Computational Vision Applied to Medical Diagnostics"	24/07/2013	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	33	Bulgaria
5	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar "3D Technologies in the Textile Industry and Fashion"	02/09/2013	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	24	Bulgaria
6	Organisation of Conference	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	9th International Conference "Recent Advances in Natural Language Processing" RANLP'2013	07/09/2013	Hissar, Bulgaria	Scientific community (higher education, Research) - Industry	159	Countries in Europe, America, Asia and Africa
7	Flyers	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn Newsletter 2 in English and Bulgarian, covering activities in project months 7-12	01/10/2013	Sofia, Bulgaria	Civil society - Medias	1000	mostly Bulgaria
8	Organisation of	INSTITUTE OF IN	"Autonomic Comp	03/10/2013	Sofia, Bulgaria	Scientific comm	26	Bulgaria, France

	Workshops	FORMATION AND COMMUNICATION TECHNOLOGIES	uting and Automatic Control in Computer Systems" (ACACCS)			unity (higher education, Research) - Industry		
9	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	"ICT for new materials and nanotechnologies" New Nano 2013	08/10/2013	Bankya, Bulgaria	Scientific community (higher education, Research) - Industry	31	Bulgaria
10	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Information Day: AComIn year 1	24/10/2013	Starosel, Bulgaria	Scientific community (higher education, Research) - Policy makers	22	Bulgaria, Greece, Italy, Sweden, UK
11	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar on Industrial Mathematics	19/12/2013	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	34	Bulgaria, Germany
12	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Information Day related to a visit of the President of the Republic of Bulgaria Mr. Rosen Plevneliev to IICT-BAS	10/02/2014	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers - Medias	80	Bulgaria
13	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar on Thermography and its Applications	11/02/2014	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	21	Bulgaria
14	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Presentations to Mr. Wolfgang Burtscher, Deputy Director General of DG Research and Innovation, European Commission, who visited IICT	17/02/2014	Sofia, Bulgaria	Scientific community (higher education, Research) - Policy makers	23	Bulgaria
15	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar on 3D-Scanning and digitization	17/03/2014	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	42	Bulgaria

16	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	First AComIn Doors Open Days, Demonstrations of equipment and applications	28/03/2014	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	95	mostly Bulgaria
17	TV clips	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	National Bulgarian TV Channel 1 broadcasts news devoted to the Doors Open Days organised by IICT-BAS	29/03/2014	Sofia, Bulgaria	Civil society - Medias	500000	Bulgaria
18	Articles published in the popular press	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	the Newspaper " Alphabet" published an article in Bulgarian about AComIn and Smart Lab in its No 15, April 2014	07/04/2014	Sofia, Bulgaria	Civil society	5000	Bulgaria
19	Flyers	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn Newsletter 3 in English and Bulgarian, covering activities in project months 13-18	11/04/2014	Sofia, Bulgaria	Civil society	1000	mostly Bulgaria
20	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	International Workshop “Advanced Control and Optimisation: Step Ahead” ACOSA	08/05/2014	Bankya, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers	32	Bulgaria, Romania, Poland
21	Posters	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn poster in Sofia downtown as part of the exhibition "Bulgarian Academy of Sciences - science for the society and the country ", dedicated to the 145th Anniversary of the Academy	12/06/2014	Sofia, Bulgaria	Civil society	20000	Bulgaria
22	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	International Workshop on Biometrics (BIOMET' 2014)	23/06/2014	Sofia, Bulgaria	Scientific community (higher education, Research)	28	Bulgaria, Italy, Switzerland, UK, Cyprus

23	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar " Intro duction of game elements in training systems and educat ion"	03/07/2014	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	28	Bulgaria, USA
24	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar "Challe nges connected with the use of resources of large digital li braries in education and civil science"	09/07/2014	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	23	Bulgaria, Malta, Germany
25	Organisation of Conference	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	8th International Co nference on Num erical Methods and Applications (NM A?14)	20/08/2014	Borovets, Bulgaria	Scientific comm unity (higher educat ion, Research)	75	Counties from E urope and North America
26	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar "Walk on Equations and Sequential Monte Carlo to Solve Li near Systems"	21/08/2014	Borovets, Bulgaria	Scientific comm unity (higher educat ion, Research)	23	Austria , Belgium, Bulgaria, France, German Switze rland, UK
27	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar "3D Visualization of C ultural Heritage"	10/09/2014	Varna, Bulgaria	Scientific comm unity (higher educat ion, Research)	20	Bulgaria, UK
28	Organisation of Conference	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	16th International C onference: Artificial Intelligence: Meth odology, Systems, and Application A IMSA'2014	11/09/2014	Varna, Bulgaria	Scientific comm unity (higher educat ion, Research)	61	Countries in Europe
29	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	International W orkshop "Control in Transportation Syste ms"	11/09/2014	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research)	22	Bulgaria, France
30	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI	Technology Tran sfer Seminar on Robotics and Innova	18/09/2014	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind	20	Bulgaria, Japan, FYROM

		ON TECHNOL OGIES	tions			ustry		
31	Flyers	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	AComIn Newsletter 4 in English and Bulgarian, covering activities in project months 19-24	10/10/2014	Sofia, Bulgaria	Civil society	1000	mostly Bulgaria
32	Films	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Movie 1 of ACom In: "The people", av ailable at https://w ww.youtube.com/ watch?v=OBeh0sn sIxw	13/10/2014	Sofia, Bulgaria	Civil society	1000	Disseminated via social networks
33	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar on Biomedical Simulati ons	04/12/2014	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research)	27	Bulgaria, Austria
34	Flyers	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	AComIn Newsletter 5 in English and Bulgarian, covering activities in project months 25-30	03/04/2015	Sofia, Bulgaria	Civil society	1000	mostly Bulgaria
35	Oral presentation to a wider public	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Second AComIn D oors Open Days, Demonstrations of e quipment and ap plications	17/04/2015	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry - Civil society - Policy makers - Medias	200	mostly Bulgaria
36	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar on Microstructure Mate rial Analysis	17/04/2015	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	30	mostly Bulgaria
37	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Seminar on 3D Digitisation and Virt ual Reality	18/04/2015	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	35	mostly Bulgaria
38	Articles published in the popular press	INSTITUTE OF IN FORMATION AND COMMUNICATI	the Newspaper A ZBUKI (Alphabet) published an article	08/05/2015	Sofia, Bulgaria	Civil society	1000	Bulgaria

		ON TECHNOLOGIES	about AComIn and Smart Lab in its No 19, May 2015					
39	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Workshop on Advanced Computing for Innovation – Industrial Applications	14/05/2015	Bankya, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers	66	Bulgaria
40	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Participation of AComIn in the First Children's Festival iCreate: Children's Workshops for Science, High Tech and Art, organised by Contemporary Art Foundation	24/05/2015	Sofia, Bulgaria	Civil society	52	Bulgaria
41	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn participates in the promotional presentation of the Exhibition "the Battle of Pavia", Expo 2015 Milan	25/05/2015	Milan, Italy	Civil society - Medias	120	Italy, Bulgaria
42	Organisation of Conference	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	10th International Conference “Large-Scale Scientific Computations” LSSC’15	08/06/2015	Sozopol, Bulgaria	Scientific community (higher education, Research)	120	Countries in Europe, America and Asia
43	Exhibitions	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn participates in the Exhibition "The Battle of Pavia 1525" in Visconti Castle, Pavia - an associated event of Expo 2015 in Milan, Italy	12/06/2015	Pavia, Italy	Civil society - Medias	12000	Italy, Bulgaria, and countries of visitors of EXPO 2015
44	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Demonstrations of the AComIn acoustic camera to the Mechanical Engineering Department of Technical University Sofia	13/06/2015	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	28	Bulgaria
45	Oral presentation to	INSTITUTE OF IN	Demonstration of	17/06/2015	Sofia, Bulgaria	Scientific comm	18	Bulgaria

	a wider public	FORMATION AND COMMUNICATION TECHNOLOGIES	Large Vocabulary Continuous Speech Recognition of Bulgarian language for professional dictation transcription services			unity (higher education, Research) - Industry - Policy makers		
46	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Workshop on Advanced Techniques in NonDestructive Testing	18/06/2015	Sozopol, Bulgaria	Scientific community (higher education, Research) - Industry	35	Bulgaria, Russia, Belarus
47	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Demonstration of Large Vocabulary Continuous Speech Recognition of Bulgarian language for automatic real-time subtitles generation during Television broadcasting	24/06/2015	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers	11	Bulgaria
48	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar on Advanced Material Characterisation, Modelling, and Numerical Simulations	28/06/2015	Albena, Bulgaria	Scientific community (higher education, Research) - Industry	21	Bulgaria, Italy, Russia
49	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	International Workshop on Big Data in Education and Digital Collections	29/06/2015	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers	27	Bulgaria, USA, Qatar, Malta
50	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn presented at the Meeting of the Science, Technologies and Innovation Expert Council to the Mayor of Sofia Municipality held in IICT	14/07/2015	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry - Policy makers - Medias	35	Bulgaria
51	Organisation of Conference	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOL	10th International Conference "Recent Advances in Natural Language Processi	05/09/2015	Hissar, Bulgaria	Scientific community (higher education, Research)	164	Countries in Europe, America, Asia and Africa

		OGIES	ng" RANLP'2015					
52	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Technology Tran sfer Workshop on Mathematics in Ind ustry	14/09/2015	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	41	Bulgaria, Germany
53	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	International W orkshop on Info rmation Fusion	25/09/2015	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	24	Bulgaria, France, Ukraine
54	Oral presentation to a wider public	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Demonstration of High-quality, natural Text to Speech s ynthesis for Bulgar ian	30/09/2015	Sofia, Bulgaria	Industry	11	Bulgaria
55	Films	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	Movie 2 of ACom In: "SmartLab", avai lable at http://iict .bas.bg/acomin/ news/Acomin-2-S MARTLAB.mp4	01/10/2015	Sofia, Bulgaria	Civil society	1000	Disseminated via social networkd
56	Organisation of Workshops	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	International W orkshop “Advanced Industrial Control Applications, AICA -15”	08/10/2015	Sofia, Bulgaria	Scientific comm unity (higher educat ion, Research) - Ind ustry	27	Bulgaria
57	Articles published in the popular press	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	The Italian New spaper Corriere della Serra presents the "Battle of Pavia" E xhibition and a cknowledges the collaboration betwe en AComIn (IICT -BAS) and the U niversity of Pavia	11/10/2015	Italy	Civil society	50000	Italy, Bulgaria
58	TV clips	INSTITUTE OF IN FORMATION AND COMMUNICATI ON TECHNOL OGIES	AComIn SmartLab shown by Channel 1 of Bulgarian Na tional TV in the rea lity show "The #anuscript" - episod	28/10/2015	Sofia, Bulgaria	Civil society	50000	Bulgaria

			e 4					
59	Organisation of Conference	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	The International Conference ADVANCED COMPUTING FOR INNOVATION - ACOMIN 2015	10/11/2015	Sofia, Bulgaria	Scientific community (higher education, Research)	87	Bulgaria, Greece, Germany, Malta, Sweden, UK, USA, FYROM
60	Flyers	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	AComIn Newsletter 6 in English and Bulgarian, covering activities in project months 31-38	10/12/2015	Sofia, Bulgaria	Civil society	1000	mostly Bulgaria
61	Organisation of Workshops	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Technology Transfer Seminar on Industrial and Applied Mathematics	21/12/2015	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry	31	Bulgaria, Austria, Sweden, USA
62	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Third AComIn Doors Open Days	15/01/2016	Sofia, Bulgaria	Civil society	118	Bulgaria
63	Articles published in the popular press	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	The Newspaper "Alphabet" published an article in Bulgarian about AComIn Doors Open Days in its No 3, January 2016	21/01/2016	Sofia, Bulgaria	Civil society	5000	Bulgaria
64	Films	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Movie 3 of AComIn: "The Users", available at http://iict.bas.bg/acomin/news/Acomin-3-USERS.mp4	29/01/2016	Sofia, Bulgaria	Civil society	1000	Disseminated via social networkd
65	Articles published in the popular press	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	The Newspaper "Alphabet" published an article in Bulgarian about AComIn results and patents in its No 6, February 2016	06/02/2016	Sofia, Bulgaria	Civil society	5000	Bulgaria

66	Oral presentation to a wider public	INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Public presentation of AComIn Evaluation Report by AComIn Reviewers	24/03/2016	Sofia, Bulgaria	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	84	Bulgaria

Section B (Confidential or public: confidential information marked clearly)

LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS,UTILITY MODELS, ETC.					
Type of IP Rights	Confidential	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant(s) (as on the application)
Registered designs	Yes		BG7826	Night viewing device (registered 25.06.2013)	Boiana Bantutova, Daniela Borissova, Evgeni Bantutov and Ivan Mustakerov
Utility models	Yes		BG7827	Night viewing device (registered 25.06.2013)	Boiana Bantutova, Daniela Borissova, Evgeni Bantutov and Ivan Mustakerov

OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND								
Type of Exploitable Foreground	Description of Exploitable Foreground	Confidential	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use or any other use	Patents or other IPR exploitation (licences)	Owner and Other Beneficiary(s) involved
General advancement of knowledge	Simulation of time-dependent many-body quantum systems	No		A simulator (GNU package) known as nano-archimedes	Any field that exploits quantum effects to achieve some goal	N.A.	Released under GP license	Jean Michel Sellier, IICT
General advancement of knowledge	A general frame work for 3D 2-phase mass conserve rvation image segmentation	No		C++ software for segmentation with MPI parallel implementation on HPC, handling high-resolution CT data in teal time	Virtual Material Design, Bio-medical engineering	N.A.	No	Stanislav Harizanov, IICT
General advancement of knowledge	New parallel and efficient algorithms for performing parametrical analysis of large-scale nonlinear dynamical systems	No		HPC software for investigating the dynamical behaviour of real-life structures	Industrial design and health monitoring of engineering structures	N.A.	No	Stanislav Stoykov, IICT
General advancement of knowledge	Efficient beam model suitable for discretization of complex beam structures with few degrees-of freedom	No		Academic software TOBECS (TOol for BEam Cross Sectional analysis)	Numerical simulation of dynamics of complex beams (helicopter blades, wind turbine blades, rotor bla	N.A.	No	Stanislav Stoykov, IICT
General advancement of knowledge	BulTreeBank Wordnet	No		A language resource (core Bulgarian WordNet) with open access http://compling.hss.ntu.edu.sg/omw??	Language and speech technologies	N.A.	Open access - see http://compling.hss.ntu.edu.sg/omw	Kiril Simov, Petya Osenova, IICT
General advancement of knowledge	BulPhonC Bulgarian Phonetic Corpus	No		A language resource (annotated multisignal corpus of Bulgarian speech) ??http://lml.bas.bg/BulPhonC	Speech processing technologies	N.A.	Free for academic use	Stoyan Mihov, Petar Mitankin, IICT
Exploitation of resu	Nail	Yes		# nail with increase	Construction, furnit	After validation of	BG111824 Bulgar	IICT and Dimitar Kar

lts through (social) innovation				d circumference section of the body which is difficult to eject and with a shape which is applicable in mass production	ure industry, h ouseholds	the Patent Applicati on	ian Patent Office (r egistered 18.09 .2014)	astoyanov, Todor Pen chev, Petar Bodurov, Pencho Sirakov
Exploitation of resu lts through (social) innovation	Gravitational E nrichment Device	Yes		Cascade of sepa rators for enri chment of raw m aterials from spill fields	Industrial processes requiring separation of heavy comp onents	After validation of the Patent Applicati on	BG111918 Bulgar ian Patent Office (r egistered 03.02 .2015)	IICT and Valentin Ab adjiev, Emilia Abadj ieva, Dimitar Karast oyanov
Exploitation of resu lts through (social) innovation	Braille Display	Yes		A tactile matrix that creates an auxiliary computer interface for visually impai red people	Quality of life (help visually impaired people to work with graphical computer interface)	After validation of the Patent Applicati on	BG111638 Bulgar ian Patent Office (r egistered 29.11 .2013)	IICT and Dimitar Kar astoyanov, Ivan Yatc hev, Krastyo Hinov, Yosko Balabosov
Exploitation of resu lts through (social) innovation	Polarized Elect romagnet	Yes		Electromagnet with applications for vibration drives or drives with one or two stable positions in mechanic, h ydraulic, and p neumatic systems??	Automation	After validation of the Patent Applicati on	BG112130 Bulgar ian Patent Office (r egistered 30.09 .2015)	IICT and Dimitar Kar astoyanov, Ivan Yatc hev, Krastyo Hinov, Yosko Balabosov
Exploitation of resu lts through (social) innovation	Burning Body	Yes		Burning body with the shape of a Re uleaux triangle of t he body section with a hole inside	Heating, energy effi ciency	After validation of the Patent Applicati on	BG112173 Bulgar ian Patent Office (r egistered 14.12 .2015)	IICT and Dimitar Kar astoyanov, Todor Pen chev, Petar Bodurov, Pencho Sirakov
Exploitation of resu lts through (social) innovation	Lifter Bar	Yes		Lifter bar with the shape of a Reul eaux triangle of the body section and sh arp edge	Processing industry (esp. in ball mills)	After validation of the Patent Applicati on	BG112174 Bulgar ian Patent Office (r egistered 14.12 .2015)	IICT and Dimitar Kar astoyanov, Nikolay S toimenov
Commercial expl oitation of R&D results	Effective method for searching simi lar audio segments i n large audio collec tions	Yes		A method based on original ideas for similarity search which ensures high reliability in noisy environments and exclusively high s peed of searching	Media industry	June 2016	Embedded in an industrial applicati on built by IIC T-BAS for H-Tech	IICT and Stoyan Miho v, Petar Mitankin??

ADDITIONAL TEMPLATE B2: OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND	
Description of Exploitable Foreground	Explain of the Exploitable Foreground
Simulation of time-dependent many-body quantum systems	During the project, a new formulation of quantum mechanics has been developed, known as the signed particle formulation, along with its corresponding discretization, known as the Wigner Monte Carlo method. This represents a result of fundamental importance: on one side, it allows the understanding of the evolution of quantum systems from a novel perspective, on the other side it represents a new tool for the development of new technologies exploiting quantum effects. In particular, the field of nanotechnology could have a serious boost by utilizing this novel approach. In fact, we have been able to tackle the problem of simulating time-dependent many-body quantum systems, an extremely demanding and computationally complex problem which solution can provide significant insights in terms of developing new drugs, electronic devices, etc.
A general framework for 3D 2-phase mass conservation image segmentation	A general framework for 3D 2-phase mass conservation image segmentation was established. Additional linear terms can be incorporated in the optimization function and the solid phase characteristics are controlled/induced by the user. For example, connectivity of the object's reconstruction is guaranteed. Numerical experiments on 3D CT porous data showed significant improvement of the segmentation accuracy in comparison with other non-mass-preserving state-of-the-art segmentation algorithms. Hence, the numerically computed material macro characteristics are much more reliable, when the proposed segmentation techniques are used.
New parallel and efficient algorithms for performing parametrical analysis of large-scale nonlinear dynamical systems	New parallel and efficient algorithms for performing parametrical analysis of large-scale nonlinear dynamical systems. The algorithms are applied to elastic structures and they can determine the shape of vibration of the structure and its variation when some of the parameters are changed. They perform full parametrical analysis, including stability and appearance of bifurcation points.
Efficient beam model suitable for discretization of complex beam structures with few degrees-of freedom	The model works in two steps: first, it accomplishes two-dimensional cross sectional analysis and computes numerically the twist center of the cross section, the warping function and all cross sectional properties which characterize the cross section of the beam. Then, it derives and discretizes the equation of motion, with respect to the twist center, as a system of ordinary differential equations. The model is appropriate for beams with arbitrary cross sections, initially twisted and tapered beams, as well for beams of isotropic and composite materials.
BulTreeBank Wordnet	This dictionary is a linguistic resource (called BTB-WN) aligned with the multilingual WordNets developed for many languages. It has been compiled in several steps. Initially, the Core WordNet (http://wordnetcode.princeton.edu/standoff-files/core-wordnet.txt) was created for Bulgarian, which covered 4,999 synsets. Then, nearly the same number of new synsets were added to the WordNet (now we have more than 11,000 synsets) on the basis of the semantic annotation within the treebank. The additional definitions were taken from a machine-readable dictionary if appropriate, or they were formulated by the annotators and later checked by a professional lexicographer.
BulPhonC Bulgarian Phonetic Corpus	The corpus contains 319 phonetically rich Bulgarian sentences divided into two parts. Part 1 contains 148 sentences and Part 2 contains the remaining 171 sentences. The records were made with 140 speakers, 59 male and 81 female speakers, average speaker's age - 37 years. Most of the speakers have read only Part 1. Each utterance has a corresponding annotation on phoneme level in a format supported by praat. The recorded signals were automatically segmented into utterances. All automatically segmented utterances were manually verified and the incorrectly segmented utterances were removed from the corpus. The remaining utterances were automatically annotated on phoneme level. The phonetic system consists of 30 phonemes.
Nail	The invention relates to a nail comprised of a body with the shape of an equilateral triangle with convex sides, representing the arcs. At the upper end of the body a head is shaped of three convex parts of a sphere and, at its upper side the head is flat, and in its centre a groove is formed having the shape of a triangle with convex sides. The body ends up with a peak at its bottom end representing a triangular spheroidal convex pyramid whose sides are part of a sphere. The nail is used in construction, in the furniture industry and in households. Some AComIn Smart Lab devices were used for justification of the claims in the Nail patent application; the nail has been modeled and printed. Different types of nail's heads have been investigated as well as different shapes of the nail gad.
Gravitational Enrichment Device	The device is intended for direct separation of heavy components contained in the enriched material, in particular for enrichment materials from spill fields. The device adjusts quickly and easily to the optimum enrichment process of raw materials with different characteristics, increasing the amount of fine classes in the treated material. The AComIn Smart Lab devices enabled the experimental tests related to the invention. The Laser Nano Sizer Analysette 22 N

	ano Tech+ was used to study the material after enrichment; the subject of investigation was the size and size distribution of the fine class particles. Mor eover the presence of heavy components has been investigated.
Braille Display	The Braille screen is a matrix with linear electromagnetic micro drives and non-magnetic needles, passing trough the axes of the electromagnets. Over the e lectromagnets is mounted a grid with holes. The needles go though the holes and move up pimples. The visually impaired peoples feel them in a tactile way and can adopt symbols and graphics. The display is used to create an auxiliary textual/graphical computer interface for visually impaired people. The A ComIn Smart Lab termocamera FLIR P640 substantially helped to justify the claims concerning the matrix: especially the termodistribution given the high number electromagnetic linear microdrives, distribution of electromagnetic field as well as mutual influence between the linear electromagnetic microdriv es.
Polarized Electromagnet	The invention relates to a polarized electromagnet with applications for a vibration drive, or a drive with one and two stable positions of mechanical, hyd raulic, pneumatic, and electrical switching devices and equipment for automation systems. Some AComIn Smart Lab devices were used for justifying the c laims of the device especially the high speed camera Nac Memrecam HX6 and the thermo camera FLIR P640. The #lectromagnet sketched above has been filmed in action. The subject of investigation was the speed of the switching. Moreover the temperature distribution and the presence of eventually hot poi nts have been investigated.
Burning Body	The Burning Body is used as material in the heating systems. We suggest a Burning Body with an innovative shape of the body - a Reuleaux triangle, hav ing larger contact surface, which helps for higher temperature of the burning process and complete (fully) incineration of the material. An additional adva ntage for better burning is a hole inside. Patent claims are justified using the AComIn EDEM software (modeling the burning body and heat transfer) and the thermo camera (for investigation of the temperature distribution).
Lifter Bar	The Lifter Bar is an additional module on the internal side of the ball mill’s drum. The Lifter Bar is used for crushing and grinding of the input material. The form of the Lifter Bar and the sharp edge are important for better crushing and grinding. We suggest a Lifter Bar with an innovative shape of the body - a Reuleaux triangle, having larger contact surface with the input material. Also we suggest a pocket on the base of the Lifter Bar, helping for lifting of the material to a higher level in the drum. Patent claims are justified using the AComIn EDEM software (modeling the material flow in the drum) and laser pa rticle nano sizer (particle size and size distribution of the milling material).
Effective method for searching similar audio segments in large au dio collections	AComIn supported the development of a pilot prototype, based on original ideas for similarity search that ensure high reliability in noisy environments and exclusively high speed of searching of “similar” audio records. Software for reliable automatic annotation of subtitled audio signals at phonemic level was demonstrated in AComIn as well. These results exploit the Speech Lab installed in the project and enable automatic processing of audio segments that cont ain speech in Bulgarian language. The contracted application will be used for on-line monitoring of audio advertisements broadcasted on dozens of Bulg arian TVs and radios.

4.3 Report on societal implications

B. Ethics

1. Did your project undergo an Ethics Review (and/or Screening)?	No
If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final reports?	

2. Please indicate whether your project involved any of the following issues :

RESEARCH ON HUMANS

Did the project involve children?	No
Did the project involve patients?	No
Did the project involve persons not able to consent?	No
Did the project involve adult healthy volunteers?	No
Did the project involve Human genetic material?	No
Did the project involve Human biological samples?	No
Did the project involve Human data collection?	No

RESEARCH ON HUMAN EMBRYO/FOETUS

Did the project involve Human Embryos?	No
Did the project involve Human Foetal Tissue / Cells?	No
Did the project involve Human Embryonic Stem Cells (hESCs)?	No
Did the project on human Embryonic Stem Cells involve cells in culture?	No
Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	No

PRIVACY

Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	No
Did the project involve tracking the location or observation of people?	No

RESEARCH ON ANIMALS

Did the project involve research on animals?	No
Were those animals transgenic small laboratory animals?	No
Were those animals transgenic farm animals?	No
Were those animals cloned farm animals?	No
Were those animals non-human primates?	No

RESEARCH INVOLVING DEVELOPING COUNTRIES

Did the project involve the use of local resources (genetic, animal, plant etc)?	No
Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	No

DUAL USE

Research having direct military use	No
Research having potential for terrorist abuse	No

C. Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator	1	0
Work package leaders	2	4
Experienced researchers (i.e. PhD holders)	11	25
PhD student	1	4
Other	12	6

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	16
Of which, indicate the number of men:	11

D. Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project ?	No

6. Which of the following actions did you carry out and how effective were they?	
Design and implement an equal opportunity policy	Not Applicable
Set targets to achieve a gender balance in the workforce	Not Applicable
Organise conferences and workshops on gender	Not Applicable
Actions to improve work-life balance	Not Applicable
Other:	

7. Was there a gender dimension associated with the research content - i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?	No
If yes, please specify:	

E. Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?	Yes
If yes, please specify:	Promotional event – demo of 3D technologies, printing and scanning. Yearly Doors Open Days

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?	No
If yes, please specify:	

F. Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?	
Main discipline:	1.1 Mathematics and computer sciences [mathematics and other allied fields: computer sciences and other allied subjects (software development only; hardware development should be classified in the engineering fields)]
Associated discipline:	2.2 Electrical engineering, electronics [electrical engineering, electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects]

Associated discipline:	3.3 Health sciences (public health services, social medicine, hygiene, nursing, epidemiology)

G. Engaging with Civil society and policy makers

11a. Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)	Yes
11b. If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?	No
11c. In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	
12. Did you engage with government / public bodies or policy makers (including international organisations)	Yes - in implementing the research agenda
13a. Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?	Yes - as a secondary objective (please indicate areas below - multiple answer possible)
13b. If Yes, in which fields?	
Agriculture	No
Audiovisual and Media	No
Budget	No
Competition	No
Consumers	No
Culture	No
Customs	No
Development Economic and Monetary Affairs	No
Education, Training, Youth	No
Employment and Social Affairs	No
Energy	No
Enlargement	No
Enterprise	No
Environment	No
External Relations	No
External Trade	No
Fisheries and Maritime Affairs	No
Food Safety	No

Foreign and Security Policy	No
Fraud	No
Humanitarian aid	No
Human rightsd	No
Information Society	Yes
Institutional affairs	No
Internal Market	No
Justice, freedom and security	No
Public Health	Yes
Regional Policy	No
Research and Innovation	No
Space	No
Taxation	No
Transport	No
13c. If Yes, at which level?	National level

H. Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	174
To how many of these is open access provided?	68
How many of these are published in open access journals?	54
How many of these are published in open repositories?	15
To how many of these is open access not provided?	106
Please check all applicable reasons for not providing open access:	
publisher's licensing agreement would not permit publishing in a repository	Yes
no suitable repository available	No
no suitable open access journal available	Yes
no funds available to publish in an open access journal	No
lack of time and resources	No
lack of information on open access	No
If other - please specify	Often the highly-ranked journals (with IF) are not open access, but the scientific quality is a project performance indicator – so the researchers are expected to publish in these highly-ranked

	journals without open access
15. How many new patent applications ('priority filings') have been made? ("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).	0

16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	
Trademark	0
Registered design	1
Other	1

17. How many spin-off companies were created / are planned as a direct result of the project?	0
Indicate the approximate number of additional jobs in these companies:	0

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:	Increase in employment, None of the above / not relevant to the project

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:	10

I. Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?	No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?	Yes

22. Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?	
Press Release	Yes
Media briefing	Yes
TV coverage / report	Yes
Radio coverage / report	Yes
Brochures /posters / flyers	Yes
DVD /Film /Multimedia	Yes

Coverage in specialist press	Yes
Coverage in general (non-specialist) press	Yes
Coverage in national press	Yes
Coverage in international press	Yes
Website for the general public / internet	Yes
Event targeting general public (festival, conference, exhibition, science café)	Yes

23. In which languages are the information products for the general public produced?	
Language of the coordinator	Yes
Other language(s)	No
English	Yes

Attachments	Acomin-news-5-BG.pdf, Acomin-news-4-EN.pdf, Acomin-news-4-BG.pdf, Acomin-news-3-EN.pdf, Acomin-news-2-EN.pdf, Acomin-news-2-BG.pdf, EDF_oct2015.pdf, 3D_Skanirane.pdf, Optimizacia.pdf, Nail.pdf, brail.pdf, SmartLab_uredi.pdf, LangSem.pdf, HPC.pdf, Vigner_MonteKarlo.pdf, Acomin-news-6-BG.pdf, Acomin-news-5-EN.pdf, Acomin-news-3-BG.pdf, Acomin-news-1-EN.pdf, Acomin-news-1-BG.pdf, Acomin-news-6-EN.pdf
Grant Agreement number:	316087
Project acronym:	AComIn
Project title:	Advanced Computing for Innovation
Funding Scheme:	FP7-CSA-SA
Project starting date:	01/10/2012
Project end date:	31/03/2016
Name of the scientific representative of the project's coordinator and organisation:	Prof. Galia Angelova INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES
Name	
Date	29/05/2016

This declaration was visaed electronically by GALIA ANGELOVA (ECAS user name nangelgg) on 29/05/2016