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AComIn: Advanced Computing for Innovation

**FP7 Capacity Programme
Research Potential of Convergence Regions**

D2.4 Building User Communities m. 36

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Version 1.0

EXECUTIVE SUMMARY

Deliverable D2.4 “Building User Communities” m. 36 presents activities in Task 2.3 “Building User Communities” in Work Package 2 (WP2) “Purchasing Smart Lab and building User Communities”. Task 2.3 started in month 6 and continues to the end of WP2. The activities presented here concern developments with the User Communities in project months 19-36.

13 Technology Transfer seminars were organised intended for 5 different User Communities:

- 2 seminars were intended for the User Community “Intelligent Management of Digital Content”;
- 3 seminars - for the User Community “Advances in 3D Technologies”,
- 3 seminars were organised for the User Community “Industrial Mathematics”,
- 3 seminars – for the User Community “Advances in Material Analysis”, and
- 2 seminars were organised for the user Community “Mechatronics and Industrial Applications”.

The results of all these technology transfer seminars can be evaluated as very successful since they have allowed strengthening the existing and creating new contacts of IICT researchers with Bulgarian industrial organisations, their regional branches as well as with individual professionals from various spheres. These contacts have served as a basis for carrying out some pilot projects in the area of Industrial mathematics, Non-destructive testing and 3D digitisation. In total, more than 430 participants attended these seminar.

D2.4 also contains an Assessment of the Added Value of Task 2.3 activities measured in terms of the AComIn Performance indicators – how many contracts/contacts with potential Users were established as a result of the User Community seminars.

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Summary	Deliverable D2.4 describes all activities oriented to establishing connections with Users during Reporting period 2 of the AComIn project. In order to raise awareness about novel technologies enabled by AComIn and to promote the potential of the Smart Lab devices, thirteen Technology Transfer seminars were organised intended for different User Communities. Numerous Awareness Raising Meetings helped to establish a User Community in Speech and Sound processing and another one in Acoustic Imaging. The Added Value of User Community Building is very high; it enabled the contracted research and joint project with dozens of Users.	
Keywords	User Communities, Technology Transfer Seminars, Know-How Transfer, Awareness Raising Meetings, Smart Lab devices, Added Value	
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1. INTRODUCTION

The Objectives of Work Package 2 (WP2) “Purchasing Smart Lab and building User Communities” are, in general, to ensure the delivery of the Smart Lab equipment, its installation and maintenance, and to organise its exploitation by building User Communities. Only Task 2.3 runs during the Reporting period 2 of the project.

According to the AComIn Technical Annex: **Task 2.3** starts at month 6 and organises at least four User Communities in the following areas:

- 3D input/output,
- speech processing,
- microstructure dynamics and
- advanced transportation systems.

These User Communities will have mailing lists and their members will be included in intensive industrial training seminars, hands-on experiments with the Smart Lab devices and exchange of best industrial practices. Led by IICT seniors, these Communities are viewed as dynamically-growing expert groups that disseminate the AComIn results to the innovation-absorbing Bulgarian companies. Each User Community will have dedicated pages in the project Web-site which will be constantly updated.

In Reporting period 1 (month 1-18), an active Community in “3D input/output” was already operational with two clearly seen sub-communities of Users who are interested correspondingly

- primarily in the object shapes (i.e. *3D scanning and printing*) and
- in the 3D microstructure (i.e. *the tomography*).

Another User Community in “Microstructure dynamics” brought to IICT real-world tasks for studying changes in the microstructures of various materials and objects when different processes affect them. In addition new groups of AComIn supporters (“fans”) in various areas were formed: in Termography, Medical imaging and biometrics, Industrial mathematics and Intelligent management of digital and electronic content.

The deliverable D2.4 describes further developments with newly established User Communities which arose driven by the interest of various experts to join the novel developments in AComIn and more, especially, to take part in research activities that exploit the SmartLab devices.


2. USER COMMUNITY SEMINARS MONTHS 19-36

2.1. TECHNOLOGY TRANSFER SEMINARS FOR THE USER COMMUNITY “INTELLIGENT MANAGEMENT OF DIGITAL CONTENT”

During the reporting period two Technology Transfer (TT) seminars were organised for the User Community “Intelligent Management of Digital Content”.

2.1.1. New Trends in e-Learning

The first seminar was held in IICT-BAS on 3 July 2014 and was devoted to *new trends in e-learning*.



ИСТ
АComIn

БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ
ИНСТИТУТ ПО ИНФОРМАЦИОННИ И КОМУНИКАЦИОННИ ТЕХНОЛОГИИ
Проект “Съвременните пресмятания в полза на иновацията”

Въвеждане на игрови елементи в системите за обучение: теоретично-технологична перспектива
Проф. Христо Дичев, Winston-Salem State University, USA - 3 юли 2014, 11 часа

Лекцията ще разгледа мотивиращите аспекти на игрите и психологическите аспекти, които обуславят мотивировката. На тази основа ще се представи идеята за извличане и обособяване на мотивиращите елементи, характерни за игрите, и въграждането им в системите за обучение, което всъщност е материалният израз на понятието (gamification). Лекцията ще завърши с критичен анализ на практическото използване на системите за обучение, базирани на технологии с игрови елементи, и подходите за тяхното усъвършенстване.

Игрови елементи в образованието: какво, защо, как? (Gamification in Education: What, Why, How?)
Проф. Дарина Дичева, Winston-Salem State University, USA - 3 юли 2014, 13 часа

Един от сериозните проблеми в съвременното традиционното обучение е липсата на мотивираност и ангажираност на обучаемите. За голяма част от тях обучението е скучно или трудно, или без достатъчно предизвикателства. Сред най-перспективните подходи за заинтересоване са образователните видео игри, които освен усвояване и затвърждаване на знания подпомагат изграждането на умения за решаване на проблеми, съвместна работа и комуникация. Традиционните и електронни игри използват различни механизми за насърчаване на хората да играят, често без никаква награда освен участие в играта и победа. Създаването обаче на интересни и ангажиращи обучаващи игри е трудно, времеемко и скъпо. Освен това те често изискват подходяща техника и са фокусирани на единствена тема/умение от съответния предмет. Алтернативен подход е да се използват не „пълни“ игри, а принципи и техники от игрите за структуриране и организиране на обучение, което е привлекателно, мотивиращо и ангажиращо за обучаемите.

Подходът за въвеждане на игрови техники и елементи на дизайн в не-игрови ситуации и приложения (Gamification) е широко прилаган в редица области. В последните две години се наблюдава засилване на интереса към него и в образованието. Тази лекция ще представи концепцията на този подход, както и възможностите за използването му в учебния процес. Ще бъде направен и преглед на съвременното състояние и тенденциите на използването на игрови техники в образованието в международен мащаб.

Как обучението може да бъде игра, Дарин Маджаров (www.ucha.se) - 3 юли 2014, 14 часа

Лекцията ще представи един от най-популярните портали за електронно обучение в България: Уча.се. След нея се предвижда дискусия.

Three lectures were presented at the seminar. Prof. Christo Dichev gave a talk entitled “*Using game elements in educational systems: theoretical and technological perspectives*” that was focused on the psychology of gamification in education and training. Prof. Darina Dicheva delivered a lecture entitled “*Gamification in Education: What, Why, How?*” with an accent on the results of a meta-study conducted jointly with IICT researchers. The lectures were followed by a lively discussion about the possibilities of using gamification in Bulgarian educational institutions. The final presentation “*How learning can be a game*” was done by Darin Madzharov, the founder of the company “UCHA.SE”.



He presented the popular Bulgarian online learning portal “UCHA.SE / I learn” (www.ucha.se) - a school-oriented platform for online learning and supporting online comment exchange with teachers. The emphasis was on the comprehensive coverage of the learning material in the form of appealing video lectures and on the user interactivity. The following discussion was focused on enhancing the online platform to meet the growing pupils’ needs and to increase its acceptance. The seminar was attended by 25 participants from academic institutions, secondary schools and Bulgarian companies.

2.1.2. New Trends in the Development of Cultural Heritage Digital Libraries

The second seminar was held on 9 July 2014. It was aimed at presenting *new trends in the development of cultural heritage digital libraries* and discussing *best practices and innovative approaches of their usage for education and citizen science*.



The poster is for a seminar titled "Съвременните пресмятания в полза на иновацията" (Modern calculations in the interest of innovation). It is organized by the Bulgarian Academy of Sciences (БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ) and the Institute for Information and Communication Technologies (ИНСТИТУТ ПО ИНФОРМАЦИОННИ И КОМУНИКАЦИОННИ ТЕХНОЛОГИИ). The seminar is part of the AComIn project. The topic is "Предиизвикателства пред използването на ресурси от големи дигитални библиотеки в образованието и гражданската наука" (Challenges before the use of resources from large digital libraries in education and citizen science), held on July 9, 2014, from 11-13 hours. The goal is to present trends and innovative approaches in the use of digital libraries for cultural heritage and education. The program includes presentations by Prof. Milena Dobrova, Dr. Vladimir Alexiev, and Mr. Petar Miladinov, followed by a discussion on challenges and future goals.

БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ
ИНСТИТУТ ПО ИНФОРМАЦИОННИ И КОМУНИКАЦИОННИ
ТЕХНОЛОГИИ
Проект "Съвременните пресмятания в полза на иновацията"
AComIn

Семинар за трансфер на технологии на тема "Предиизвикателства пред използването на ресурси от големи дигитални библиотеки в образованието и гражданската наука"
9 юли 2014 г., 11-13 часа

Целта на семинара е да се представят нови тенденции в развитието на дигиталните библиотеки от областта на културното наследство и да се обсъдят добри практики и иновативни подходи за тяхното използване в образователната сфера и в т.нар. гражданска наука (citizen science). Семинарът е подготвен с активното съдействие на фирмата Ontotext (<http://www.ontotext.com>), изключително успешна в областта на семантичните технологии и тяхното приложение в различни сектори, вкл. културно наследство, и Bulgaria1914 (<http://bulgaria1914.eu>)- агрегатор на българско културно наследство за Европа.

Програма:

- 11:00 – 11:30 **Добри практики в използването на дигитални ресурси в образованието и гражданската наука**
Д-р. Милена Добрева,
Раководител на департамент Библиотеки, информатиконни и архивни науки на Малтийския университет
- 11:30-12:00 **Семантични технологии в културното наследство**
Д-р Владимир Алексиев, Ontotext
- 12:00-12:30 **Кръжок: Виртуален музей – пример за интегрирано познание**
Петър Милadinov, Софийски Университет „Св. Кирил и Методиус“
- 12:30-13:00 **Обогатяване на образователни ресурси с материали от дигитални библиотеки и други актуални тенденции в областта на е-обучението**
Илиан Узунов, Ontotext
- 13:00-13:30 **Дискусия: Кои са предизвикателствата за използване на ресурси от дигиталните библиотеки за образователни и научни цели?**

НИИТ, зала 2 на ул. "Акад. Г. Бончев" блок 25А. Поканват се всички заинтересовани



The event was organized with the active participation of Ontotext (www.ontotext.com) - a leading Bulgarian company in the area of semantic technologies and digitisation of cultural heritage. The seminar program included 4 presentations: Prof. Milena Dobrova (from the University of Malta) gave a talk on best practices in using digital resources in education and citizen science; Dr. Vladimir Alexiev (from Ontotext) spoke about using

semantic technologies for cultural heritage; Mr. Petar Miladinov (from the University of Sofia) presented an example of integrated learning – the Virtual Museum group. In the final presentation Mr. Ilian Uzunov from Ontotex discussed approaches for enhancing the educational resources with materials from digital libraries as well as other actual tendencies in e-learning. The seminar was concluded by an interesting discussion on the current challenges in using digital libraries’ resources for education and research purposes. The seminar was attended by 22 participants from research institutions and companies.

2.2. TECHNOLOGY TRANSFER SEMINARS FOR THE USER COMMUNITY “ADVANCES IN 3D TECHNOLOGIES”

During the reporting period three technology transfer seminars for the User Community “Advances in 3D Technologies” were organised.

2.2.1. 3D Visualisation of Cultural Heritage

The first seminar devoted to *3D Visualization of Cultural Heritage* was held in Varna on 10 September 2014 as an associated event to the 16th International Conference on Artificial Intelligence AIMSA'14 (www.aimsaconference.org). The seminar was designed to give an introduction to the theory, process and practice of capturing and preparing digital models of cultural heritage artefacts. The event was implemented as a one-day tutorial that combined several theoretical lectures with a number of practical sessions allowing delegates to get hands on experience with technologies available with an emphasis on low cost, ease of use and sustainability.

An Introductory Tutorial into 3D Visualisation of Cultural Heritage	
A Technology Transfer event in the frame of the FP7-REGPOT-2012-2013-1 Grant 316087 Project AComIn	
Golden Sands Resort, Varna, Bulgaria, September 10, 2014	
<i>The Schedule</i>	
9:00 - 9:30	Welcome
9:30 - 10:15	Lecture: <i>Digitising Cultural Heritage - An overview of the state of digital cultural heritage, its importance, use and potential</i>
10:15-11:00	Lecture: <i>Best Practice for 3D Digitisation - The London Charter for the Computer-based Visualisation of Cultural Heritage: initiative and other approaches</i>
11:00 -11:30	Break
11:30 - 12:15	Lecture: <i>Making Spaces - An entry level introduction to multi dimensional theory (space, time and probability), interaction design and dissemination</i>
12:15 -13:00	Lecture: <i>3D Capture Techniques</i> <ul style="list-style-type: none">• An overview of the types of technologies available for 3D capture from laser scanning to low cost solutions.• Practicalities of scanning - material suitability, lighting, transparency issues• Preparing a 3D Capture campaign
13:00-14:00	Lunch
14:00-15:00	Hands on workshop: <i>Depth Map Sensor scanning and Hand scan</i>
15:00-16:10	Hands on workshop: <i>Photogrammetry</i>
16:00-16:30	Break
16:30-17:30	Lecture: <i>Next Steps</i> <ul style="list-style-type: none">• Cleaning capture data• Documenting your capture• Bring your data into other 3D environments• Steps to preserve your data.
17:30-18:00	Event conclusions and close
Notes	
<ul style="list-style-type: none">• For hands on workshops the delegates will use their own computers.• Photogrammetry requires a digital camera. The Autodesk's catch 123D software (http://www.123dapp.com/catch) will be used so the delegates can use their own computers (or even iPhone/iPad) if they want to make their own models.• For Depth Map Sensor scanning workshop the Volumental software (https://www.volumental.com/) will be used	

The morning session included the following lectures: Drew Backer (Kings College, London, UK). “Digitising Cultural Heritage - An overview of the state of digital cultural heritage, its importance, use

and potential” and “Making Spaces - An entry level introduction to multi dimensional theory (space, time and probability), interaction design and dissemination”, Martin Blazeby (Kings College, London, UK): “Best Practice for 3D Digitisation - The London Chapter” and “3D Capture Techniques”. The afternoon session consisted of two hands on workshops - *Depth Map Sensor scanning* and *Handyscan and Photogrammetry*. The event was attended by 21 participants from Bulgarian research institutions and from abroad.



2.2.2. Digitisation and Creation of 3D Replicas of Cultural Heritage Objects

Интензивен курс по дигитализация и създаване на реплики на обекти на културното наследство и по използване на нови технологии и мобилни приложения за музеи

19-21 май и 25-27 май 2015 г.
Smart Fab Lab работилница, УАСГ, София, бул. Христо Смирненски

AComIn Европейски проект по Темата Република програмата AComIn - Advanced Computing for Innovation FP7-REGPOT-2012-2013

Цели на курса и учебни изисквания да се запознаят с някои от най-новите технологии за дигитализация и създаване на реплики на обекти от културното наследство, а също и с някои от най-инновативните мобилни приложения, устройства и сензори създадени за музеи и културното наследство.

Курсът включва и приобщаване на практически умения за създаване на 3D реплики на обекти от културното наследство.

Участниците в курса ще получат сертификати за професионална обучение и диплома за 18 часа свободно време на работни с 3D принтери в Smart Fab Lab.

Начин на провеждане:
Курсът ще се проведе в рамките на семинари - от 9:30 до 13:30 на 19-21 май и 25-27 май 2015 г.

Организатори:

ИИСТ
SmartFabLab
DSLL
B2N

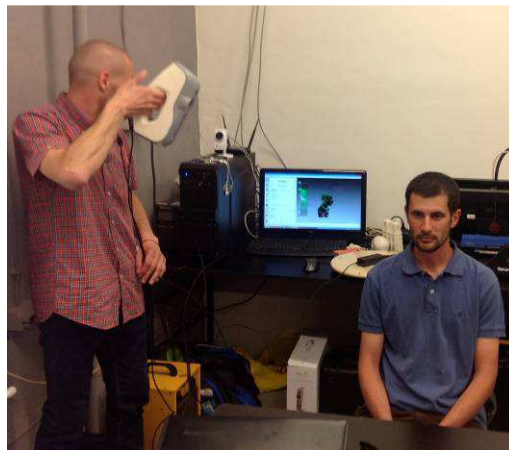
Проект АComIn. Институти по инициативата и координаторите на темата - IICT
www.iict.bas.bg/acomin

Smart Fab Lab
<http://www.smartfablab.org/>

Digital Spaces Living Lab
<http://www.digitalspaces.info/>

B2N
<http://b2n.bg/>

The second seminar was held in the period of 19-27 May 2015. It was organised by IICT-BAS in collaboration with three Bulgarian SMEs – the Smart Fab Lab (www.smartfablab.org), the Digital Spaces Living Lab (www.digitalspaces.info) and B2N (<http://b2n.bg>). The seminar was organised as an intensive tutorial on digitisation and creation of 3D replicas of cultural heritage objects and use of new technologies and mobile applications for museums. The main objective of the tutorial was to familiarise the young researchers from IICT and museum experts with some newest technologies for digitising and creating 3D models as well to create initial practical skills for creating 3D replicas of cultural heritage objects. The tutorial was attended by 12 participants from IICT, Bulgarian Museums and experts from Bulgarian academic institutions working in the area of Cultural Heritage preservation.



2.2.3. 3D Digitisation and Virtual Reality

The third seminar was held on 18 April 2015 at IICT-BAS. It was organised within the Second AComIn Door Open Days and was devoted to *3D Digitisation and Virtual Reality*.



The seminar was opened with a talk given by Assoc. Prof. Vessela Statkova, entitled “3D visualisation of artefacts” in which she presented results of a joint pilot project between IICT-BAS and the Master Program “Multimedia and virtual reality” at the Academy of Music, Dance and Fine Arts (AMDFA), Plovdiv.



Then Dr. Kristina Jakimovska from IICT-BAS gave an introductory talk about 3D laser scanning and made a practical demonstration of the scanning process. The demonstration session continued with presentation of alternative methods for 3D image acquisition based on the photogrammetry technique as well as of 3D printing by means of the Smart Lab 3D printer. The latter technology was demonstrated using the 3D models designed by master students from AMDFA and 3D scanned paleo-anthropological artefacts. The Workshop continued with poster presentations about 3D digitisation of cultural heritage and applications of 3D technologies in the design of clothing, games, and virtual reality. The seminar was attended by 55 participants from Bulgarian universities, academy and industry.

2.3. TECHNOLOGY TRANSFER SEMINARS FOR THE USER COMMUNITY “INDUSTRIAL MATHEMATICS”

During the reporting period three technology transfer seminars for the User Community “Industrial Mathematics” were organised.

2.3.1. Advanced Numerical Methods

The first seminar was organised in the frame of [8th International Conference on Numerical Methods and Applications](#) (NMA'14) and was held in Borovets on 21 August 2014. The seminar consisted of the lecture “*Walk on equations and sequential Monte Carlo to solve linear systems*” presented by Dr. Sylvain Maire from Université du Sud Toulon-Var, France, and the discussion “*Ultimate numerical methods for solving problems in modern physics and emerging technologies*” moderated by Prof. Ivan Dimov from IICT-BAS.

Focusing strongly on the theoretical side on Monte Carlo calculations Prof. Maire’s talk provided the attendees with information how his method could be successfully used for creating non-invasive breast cancer search and how the technology used by the previous talks could be applied in the medical industry.

The seminar was attended by more than 22 participants – not only researchers and University lecturers, but also industry representatives, and several PhD students as well. The audience came from various countries including Austria, Belgium, Bulgaria, France, Germany, Switzerland and UK.

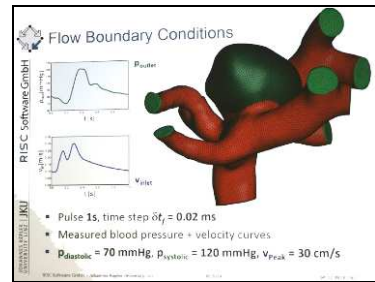
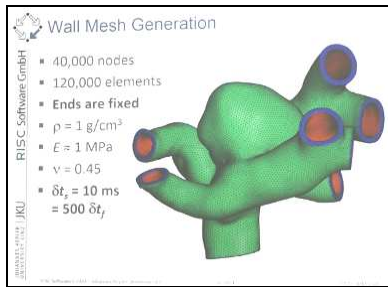


2.3.2. Biomedical Simulation

The second seminar was organised on 14 December 2014 in IICT-BAS and was devoted to *Biomedical Simulation*. The aim of the seminar was to present some recent activities related to biomedical simulations and advanced applications developed in the IICT-BAS in collaboration with medical and industrial partners. The event was opened by the vice-director of IICT- BAS, Prof. Krassimir Georgiev. Then the program continued with a plenary lecture “*Good practices in medical-informatics applications*” given by Dr. Wolfgang Fenz from RISC Software GmbH, Johannes Kepler (University Linz). Other topics of extensive research addressed at the workshop were related to computer simulation of radio frequency ablation and text analysis in large repositories of patient records. The specialized medical software MEDVIS 3D - a system for visualization, segmentation of medical image data, and simulation of blood flow through 3D structures, was presented.



The event was concluded by a hands-on demonstration of haptic simulator for clipping surgery of intracranial aneurysms based on the technology of MEDVIS 3D. The seminar was attended by 28 participants.



2.3.2. Mathematics in Industry

The third TT seminar devoted to *Mathematics in Industry* was held in Sofia on 14 September 2015. The seminar took part as an associated event to the 113th European Study Group with Industry, organised by IICT-BAS in cooperation with the Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski", the Institute of Mathematics and Informatics - BAS, and the European Consortium for Mathematics in Industry. The Study Groups with Industry are an internationally recognised approach for Technology Transfer between academic mathematicians and industry. This week-long event provided a forum for industrial scientists to work together with academic mathematicians on problems of direct industrial relevance.



The event was opened by the directors of IICT-BAS (Prof. Svetozar Margenov) and IMI-BAS (Prof. Julian Revalski) who presented the main topics of research, pointing particularly to the industrial applications. Then five representatives of Bulgarian SME's and one representative of a German startup presented particular problems from their work. Some 43 participants from industry and academy attended the event. At the end, two HORIZON 2020 projects carried out by IICT-BAS in topics related to the workshop were presented.

2.4. TECHNOLOGY TRANSFER SEMINARS FOR THE USER COMMUNITY “ADVANCES IN MATERIAL ANALYSIS”

During the reporting period three technology transfer seminars for the User Community “Advances in Material Analysis” were organised.

2.4.1. Microstructure Material Analysis

The first seminar was devoted to *Microstructure Material Analysis*. It was organised as a part of the AComIn Doors Open Days on 17-18 April 2015 at IICT-BAS. The program started with the presentation of Prof. Alexander Karamanov from the Institute of Physical Chemistry, Bulgarian Academy of Sciences entitled “*Structural characterization of the yellow pavement stones of Sofia*”. The talk was devoted to the complex study of the composition, structure and technology for production of this prominent symbol of Sofia, which was declared national heritage in the beginning of 2014 by the Sofia Municipal Council. Dr. Ivan Georgiev from IICT-BAS took part in the study in the area of CT microstructure analysis and characterisation of porosity and inclusions distribution.



Assist. Prof. Julius Afzali from the Technical University of Sofia gave a talk entitled “*Assessment and diagnostics of computer hardware performance by digital radiography, thermography, and computed tomography*”. Presented results were obtained in close collaboration with colleagues from IICT-BAS, extensively using AComIn SmartLab devices.

The program continued with poster presentations of particular applications in the area of composite and porous materials. Promising new results were obtained by using the information for the micro structure of the studied materials, obtained by micro CT scanning and image analysis. New results concerning segmentation of CT data with volume preservation were presented by Dr. Stanislav Harizanov from IICT-BAS.



Some 36 participants from universities, academy and industry attended the scientific program and the following panel discussion.

2.4.2. Advanced Techniques in Non-Destructive Testing

The second seminar devoted to *Advanced Techniques in Non-Destructive Testing* was held in on 18-19 June 2015 in Sozopol. The event was organised by IICT-BAS in cooperation with the Bulgarian Society for Non-Destructive Testing. The aim of the workshop was to demonstrate the potential applications of the AComIn Smart Lab devices in the area of Non-destructive testing (NDT).



The event was opened by the Chairman of the Bulgarian Society for Non-Destructive Testing, Prof. M. Mihovski and Assoc. Prof. I. Georgiev from IICT-BAS. An overview presentation about the main research directions of IICT was given by Prof. D. Karastoyanov. He presented the objectives of the AComIn project, the Smart Lab equipment, and main applications developed so far. Two keynote lectures were given by the invited speakers, Acad. E. Gorkunov from the Institute of Engineering Science, Russian Academy of Sciences (Urals Branch) and Prof. S. Zolotarev from the Institute of Applied Physics of the National Academy of Sciences in Belarus.

More than 20 talks were given during the two days of the workshop, presenting novel NDT techniques, equipment, and advanced applications. Particular problems and detailed characteristics of AComIn Smart Lab devices were presented during the poster session. The seminar was attended by 35 participants.

2.4.3. Advanced Material Characterisation, Modelling, and Numerical Simulations

The third seminar on *Advanced Material Characterisation, Modelling, and Numerical Simulations* was held in Albena on 28 June - 1 July, 2015. The seminar was organized as an associated event to AMiTaNS'15, the 7th Conference of the Euro-American Consortium for Promoting the Application of Mathematics in Technical and Natural Sciences. The seminar was devoted to advanced techniques for material characterization, nonlinear, multi-scale and multi-physics modelling, and emerging numerical techniques used in the computational and engineering practice. Three invited keynote lectures were given by Prof. Svetozar Margenov, IICT-BAS (on the left photo below), Prof. Gabriella Bolzon, Politecnico di Milano (middle photo below), and Prof. Anatoly Filippov, Gubkin from the Russian State University of Oil and Gas, Moscow (on the right).

The seminar program included more than 13 talks and posters. Six talks were given by participants from IICT, three by foreign scientists and four by participants from the Institute of Mechanics, BAS. More than half of the speakers were female and young scientists. The number of participants was 21.



2.5. TECHNOLOGY TRANSFER SEMINARS FOR THE USER COMMUNITY “MECHATRONICS AND INDUSTRIAL APPLICATIONS”

During the reporting period two technology transfer seminars for the User Community “Mechatronics and Industrial Applications” were organised.

2.5.1. Robotics and Innovations

The first seminar was devoted to *Robotics and Innovations* and was held on September 18-19, 2014 in IICT-BAS.

The scientific program of the seminar included four lectures of Prof. Ken’ichi Yano - head of Mechatronics Laboratory and dean of Mechanical Engineering Department) at MIE University – Japan, poster presentations of young researchers from IICT-BAS and discussion. The seminar was attended by 22 participants from academy institutions and Bulgarian universities.

AComIn Transfer Technology Seminar on Robotics and Innovations

PROGRAM

September 18th, 2014

14.00 – 15.00 PM

Session 1: Industrial robotics and modeling of industrial casting processes

Lecture 1: Prof. Ken' Ichi Yano. Development of Machining Support Robots

Haptic control methods that improve human force sensing and touch sensing ability have been studied. Machining support robots that enable workers to make high-quality products without making mistakes are developed.

15.00 – 16.00

Lecture 2: Prof. Ken' Ichi Yano. Modeling and Optimization of Robotized Casting Processes

Optimization algorithms using Computational Fluid Dynamics (CFD) have been developed. Also study is developed on optimization of mold design and product shape as well as optimization of casting process and die casting process.

16.00 – 17.00

Poster Presentations of Bulgarian Scientists and Discussion

September 19th, 2014

9.00 – 10.00 AM

Session 2: Medical robots and Life Support Robots

Lecture 1: Prof. Ken' Ichi Yano. Development of Robots for Physical Therapy and A New Catheter System

Robots for physical therapy are developed. These robots assist therapeutic exercise for shoulder joint in order to relieve the physical load on physiotherapists. We will continue to contribute to the development of medical technologies. We develop liquid handling technologies in the field of regenerative medicine and new catheter systems to improve the precision of treatment for arteriosclerosis. Furthermore, we develop a support system for human-robot collaborative surgical operation.

10.00 – 11.00

Lecture 2: Prof. Ken' Ichi Yano. Development Life Support Robots
We develop assistive robots for disabled or elderly persons to improve kinesthetic sense and relaxation. We support activities such as taking meals, sports, playing guitar and drawing.

11.00 – 12.00

Poster Presentations of Bulgarian Scientists and Discussion


14.00 – 15.00

Discussion about AComIn Activities




2.5.2. Advanced Computing for Innovation - Industrial Applications

The second seminar was devoted to *Advanced Computing for Innovation - Industrial Applications*. It was organised as an associated event to the 23rd International Symposium on Control of Power Plants, Industrial and Ecological Systems held in Bankya on 14-15 May 2015.



**Technology Transfer Seminar on
Advanced Computing for Innovation
Industrial Applications**



Organized by Institute of Information and Communication Technologies
Bulgarian Academy of Sciences

Supported by FP7-REGPOT-2012-2013-1, under the AComIn project,
Grant Agreement - 316087

May 14-15, 2015, Bankya Palace Hotel, Bankya, Bulgaria

SCIENTIFIC PROGRAMME

14 May 2014

1. Mapping of acoustic noise and microwave radiation - Volodymyr Kudriashov
2. Acoustic fields reconstruction - Yuriy Chyrka
3. Research of moving and interaction between spheroidal tetrahedrons in ball mills - Nikolay Stoymenov
4. High speed briquetting of metal waste using rocket engine - Stanislav Gyoshev
5. Inspection and observation using infrared thermal camera by service mobile robots - Denis Chikurtev

15 May 2014

1. Determination of particle size distribution and analysis of a natural food supplement with prophylactic action - Yancho Todorov
2. Determination of particle size distribution and analysis of a healthy functional food - Margarita Terzyiska
3. Industrial transport optimization through multigraphs - Stanislav Drangajov
4. Inference control system for the flame position in the combustion chamber of power plant system - Stefan Koynov
5. Robust stability analysis of perturbed single area power system model - Svetoslav Savov

The seminar is organized as associated event to the 23th International Symposium on Control of Power Plants, Industrial and Ecological Systems.

The seminar aimed at presenting the potential of some unique devices from the AComIn Smart Lab. The presented talks concerned mapping of acoustic noise and microwave radiation, acoustic fields reconstruction, research on moving and interaction between spheroid tetrahedrons in ball mills, high speed briquetting of metal waste using rocket engine, inspection and observation bay means of infrared thermal camera, etc. The workshop gathered 63 participates working in the areas of power generation, mining and processing industry as well as from the Academy and several Bulgarian technical universities.

2.6. KNOW-HOW TRANSFER MEETINGS

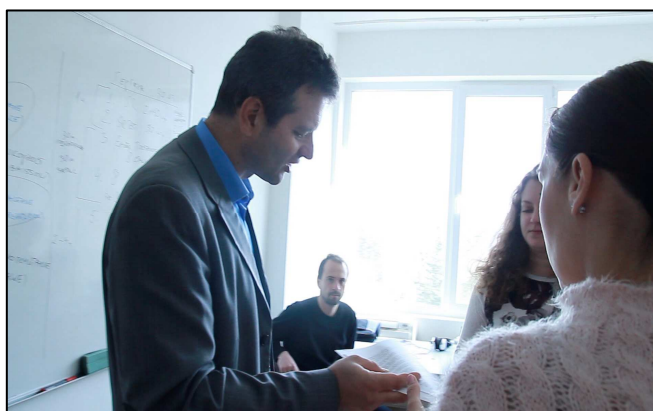
In July-September 2015 several *meetings with potential Users of the AComIn Speech Lab* were organised. The meetings included demonstrations of the speech processing prototypes, developed in

the frame of AComIn, and discussions of potential applications in various scenarios of practical importance. In total some 15 participants attended these meetings.

The first set of meeting (held on 17.06.2015 and 25.06.2015) was devoted to the *Large Vocabulary Continuous Speech Recognition of Bulgarian language for professional dictation transcription services*. The invited parties included CIELA NORMA AD, Sofia Municipality and Civic participation and direct democracy NGO. During the meetings a prototype of a LVCSR system for Bulgarian for the law domain was demonstrated. The demonstration included also adaptation to a new speaker (selected from the invited participants) and evaluation of the perceived accuracy for the new speaker. The discussed topics included the technological background, application areas, accuracy of transcription and implementation issues. It has been concluded that the demonstrated technology is already mature for wider industrial usage.

The second set of meetings (on 24.06.2015 and 30.06.2015) was devoted to *the problem of real-time subtitles generation during Television broadcasting*. Two Bulgarian SMEs - Convergent Media EOOD and Doli Media Studio EOOD were invited. During the meetings a prototype of a LVCSR system for Bulgarian was demonstrated both on specialized domains and on unrestricted domains, with and without speaker adaptation and in the presence of environmental noise. The discussed topics included unsupervised real-time speaker adaptation, adaptive language model and noise robustness. It was concluded that the demonstrated technology has to be further developed for wider industrial usage.

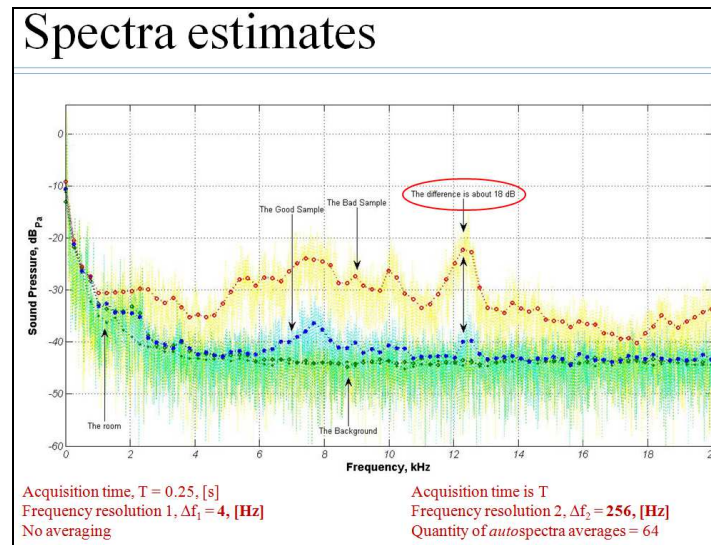
The speech synthesis systems as a crucial technological tool for the visually impaired people were the topic of the third meeting (on 30.09.2015). The invited parties included the Union of the Blinds in Bulgaria. During the meeting new technologies for the synthesis of naturally sounding voice using advanced concatenative methods, statistical methods for automatic phonological and prosodical speech description were presented.



A cycle of meetings with representatives of industrial companies devoted to the *Know-How Transfer on Acoustic Imaging* were held in the period of April – September 2015. The meetings included demonstrations of the Smart Lab Acoustic Camera as well as discussions of its potential applications in different practical cases. In total 15 participants took part in the meetings.

The first meeting was with Dundee Precious Metals Inc. – a Canadian-based international mining company that is engaged in the acquisition, exploration, development, mining, and processing of precious metal properties. In Bulgaria the company is mining in the village of Chelopech and in Krumovgrad. Ground-based equipment of the mine generates unwanted amount of acoustic noise. It was demonstrated that the Acoustic Camera could be suitable for noise source localisation and noise

characterisation; the obtained data could be used for the noise suppression via acoustic cloaking or other approaches.



The second meeting was with two bearings manufacturing companies - SKF Bearings Bulgaria EAD and the Timken Company, Romania. The standard bearing testing approach requires the bearing to be placed into the special device and measured by vibration signals processing. It was shown that the Acoustic Camera could provide non-contact acquisition of acoustic signals, emitted by the bearing under analysis. The health monitoring tasks may be resolved on place, in industrial conditions, without dismounting.

During the meeting with AtomToploProekt OOD a possibility of non-contact acquisition of acoustic emissions of equipment of power plants in Bulgaria was discussed. Such an approach may be used for performing health monitoring and non-destructive testing tasks.

The potential of the Smart Lab Acoustic camera was also demonstrated in a series of meetings with Bulgarian education institutions. After presentation of the Acoustic camera to scientific staff of the Laboratory of vibration and noise in machines at Technical University (TU) of Sofia, it was concluded that the camera could be applied for acoustic imaging for noise source localization and diagnosis of passing railway carriages. During the meeting with scientific staff of Air transport Department from the Faculty of Transport of the same university, a possibility to provide acoustic diagnostics of internal combustion engines and helicopter engines at helicopter repair factory were discussed. The acoustic camera was presented to scientific and student staff of Mechanical engineering Department of TU - Sofia. As a result, a joint research work on non-contact acoustic diagnostics of ball bearings was initiated with Assist. Prof. Ph.D. Vladislav V. Ivanov from SKF Laboratory at TU – Sofia and the first measurement session on acoustic diagnostics of the bearings was carried out on 13.05.2015.

3. ADDED VALUE OF USER COMMUNITY BUILDING ACTIVITIES

In D2.3 (month 18), after presenting the emerging User Communities, we wrote that “*AComIn enabled a whole new world of tasks and potential research projects in the institute, and this extended research capacity implies that IICT will accomplish its mission to become the Bulgarian research leader in ICT. Building successful and sustainable User Communities is one of the key activities in the project*”.

Some 18 months later we can repeat the statement with much higher confidence. Deliverable D4.3 shows that in month 36 AComIn brought to IICT:

- 8 projects for contracted research, 7 of them with companies;
- 14 projects for joint developments, where the AComIn team contributed pilot studies and/or prototypes, 3 of them with companies;
- 2 projects for pilot developments in international collaborations with Universities in Germany and Italy;
- 4 contacts with Business Representatives, 2 of them subsidiaries of large international industry, who are potential collaborators in future joint activities.

About one half of these 28 contacts were initiated in relation to some User Community.

In terms of the AComIn Performance indicators, the User Communities clearly contribute to indicator 2:

*(ii) **Relevance to the socio-economic needs:** the number of contacts with industrial, governmental and NGO users and clients will be increased by 15% via contracts, established during AComIn. The number of joint development initiatives will be increased by at least 8-10 new initiatives starting within AComIn. As a baseline, the number of IICT applied projects and contracts in 2011 will be used: 5 projects, funded by the Bulgarian SMEs Promotion Agency and 10 contracts for industrial research, funded by Bulgarian companies.*

The figures in this respect are:

According to the IICT Annual Report for 2014, IICT (as a partner of innovative Bulgarian SMEs) participates in 11 projects with Bulgarian companies. By 30 September 2015, IICT has 15 contracts with Bulgarian companies (36.3% increase).

The IICT Team intends to support the User Communities beyond AComIn. The AComIn team members keep active connections to scientists in academia and representatives of SMEs who are involved in the User Communities. This knowledge about the competence, research directions, available equipment, and existing international partnership plays an important role while working on interdisciplinary projects. The connections with the business are highly valuable for IICT, since innovative companies constantly need to solve various "problems" in order to increase their competitiveness. Based on the existing ICT infrastructure and the SmartLab equipment, using the research potential of User Communities, IICT can host successfully innovative projects with industry.

User communities are also the proper medium for dissemination of new results and activities, since the people and organisations there have certain training, experience level, and connections with other research organisations and business partners.

An interesting observation is that recently IICT establish itself as non-formal transfer centre, making successful connections between business and academia.