



MyHealthAvatar Newsletter

MyHealthAvatar

Issue 1 - April 2014

Editorial

by Prof. Feng Dong, MyHealthAvatar coordinator

We have been a year into MyHealthAvatar.

MyHealthAvatar has been designed as your life-long companion for health. It will help your doctors know more about your health status history and will assist you to look after your own health. This will contribute to the new shift in future healthcare systems where patients will be given more power and will also be asked to make more commitment to their own healthcare. By doing so, self-awareness and positive attitudes towards healthy lifestyles and behaviors will be encouraged. From a more general perspective, citizen empowerment has recently attracted a lot of attentions for collective awareness and sustainability along the dimension of social innovation. MyHealthAvatar contributes to new research in these directions.

There has been a great leap in technology in recent years. For the stakeholders of the MyHealthAvatar system, this brings more opportunities. For example, sensor technologies and wearable computers have opened a new door for us to monitor ourselves for health-related behaviors; Big Data management and cloud computing

technology have increased our capability in handling more and larger datasets. However, these new developments also imply more challenges ahead for the technologists since greater technology depth and width are required to be explored.

The new trend of citizen and patient empowerment brings huge opportunities for new business. New tasks are to be explored for increasing the sustainability of the project outcomes through engaging with the industry. Also, these activities have triggered new complexity in privacy protection and in the legal framework. MyHealthAvatar supports entire data ownership of citizens and the data sharing decisions will be solely made

by individuals who own the data. To this end, new studies are needed to allow citizens to easily control their privacy under complex application scenarios.

Overall, it has been a wonderful experience for the MyHealthAvatar consortium in the first 12 months. The salient trend of citizen and patients empowerment, the rapid landscape changing in technology, the arising business opportunities and the new legal challenges, all together they bring so many dynamic aspects to the project. We have enjoyed the exploration in these new territories and we will continue to share our findings with the public.

Inside this issue:

Editorial	1
The MyHealthAvatar project	2
Project Consortium	3
Patient Empowerment	4
News from MyHealthAvatar	6
Publications overview	7
Upcoming Events of Interest	7
Subscription	8
Contributors	8
Disclaimer	8

Prof. Feng Dong is a Professor of Visual Computing, who joined CCGV in September 2007 from Brunel University. Prof. Dong was awarded a BSc, MSc and PhD from Zhejiang University, where he became a member of academic staff at the State Key Lab of CAD and Computer Graphics, the leading computer graphics lab in China. He has many interests within computer graphics, including medical visualisation, and image processing; his recent work has also developed new areas in texture synthesis, image-based rendering and figure animation.





The MyHealthAvatar project

A Demonstration of 4D Digital Avatar Infrastructure for Access of Complete Patient Information

The present state of healthcare in Europe is characterized by several particular phenomena. Scientists must cope with the overall ageing of the European population, which leads to an exponential growth of social welfare costs, and a high number of fundamentally different systems spread throughout its countries. At the same time they must try to produce results in the direction of proactive healthcare, which amounts to preventing a disease rather than treating it. Thus, there is a significant level of inconsistency regarding the overall patient clinical picture and its cross-border use potential.

To combat this state, the MyHealthAvatar project was launched in March 2013. Its consortium intends to produce a digital representation of patient health status. This will be done through the 4D avatar, an interface that allows data access, collection, sharing and analysis by utilizing modern ICT technology, overcoming the shortcomings of the heterogeneous existing resources in Europe. The main goal is to provide each person with their lifetime electronic “counterpart”, an entity that will not only allow personalized healthcare, but will also use existing VPH resources to promote public involvement in disease prevention by helping citizens maintaining of a healthy lifestyle and notifying them of early symptoms. The system that will be developed will serve as a proof of this concept, featuring the following properties:

- Information collection and access: The system will interact with a number of internal repositories, holding individual avatar data and commonly used computer simulation disease predic-

tive models, as well as external ones, such as hospitals’ Electronic Health Records (EHRs). Information exchange through mobile phone techniques and semantics to aid in searching and reasoning will also be utilized. Moreover, the latest techniques in web information extraction will help gathering information from the vast data pool of social networks and other websites in a semi-automated way.

- Citizen controlled data sharing and management: Since a person is in full control of their own avatar, the contained data can be used and distributed at will.
- Information Analysis: Medical professionals can use the system’s toolbox to display all the medical information of a person in a body-centric view around the avatar, execute simulations by using the stored models and performing visually assisted data analysis to extract clinically meaningful information

Ultimately, there are significant benefits for every part within the healthcare chain. Each of these benefits tackles a specific part of the overall “problem” that the European medical system is confronting. The system uses integrated ICT toolboxes and accessing pertinent models, which represent multiple aspects that are influential to health. Clinicians can use these computer simulation materials with visual data analysis tools and in conjunction with the personal data from the patients’ avatars, reach clinical decisions faster, suggest optimal treatments and speed up recovery. In addition, medical professionals can develop and extrapolate personal-

ized or more generic patterns regarding disease prevention.

Each citizen can use the same pool of resources through a cloud architecture, featuring the latest technology in terms of providing secured data storage and access, to cooperate with clinicians while at the same time enjoying the privileges of determining how and where their personal data is exposed. This feature bypasses legal and ethical problems which are inherent in data exchanging between large organizations. It is a framework that people can trust. That, in turn, can trigger a further increase of citizen self-engagement in future healthcare, thus addressing the matter’s growing attention.

One of the MyHealthAvatar goals is to implement all the previously mentioned features in such a way that will achieve interoperability between the various parties regardless of the underlying medical systems that primary produce and control the initial data, effectively lowering the cost of the European healthcare system in its entirety and maximizing the yield of biomedical research expenditure through integrated models and data.

Project ID Card:

Duration: 36 Months

Start Date: March 2013

Total Cost: 3,364,588.00 €

Project Funding (EU Funding): 2,447,000.00 €

Full Title: A Demonstration of 4D Digital Avatar Infrastructure for Access of Complete Patient Information.

Programme : 7th Framework Programme of European Commission - ICT (FP7-ICT-2011-9)

Project Identifier : 600929

Project Website:

<http://www.myhealthavatar.eu/>



Project Consortium



University of Bedfordshire

The University of Bedfordshire (BED), formed in August 2006 from an amalgamation of the University of Luton and the Bedford campus of De Montfort University, now has 25,000 students. The Department of Computer Science & Technology comprises 40 academic staff and is responsible for the delivery of 20 awards. The Department regularly enrolls over 500 postgraduate students on its taught Masters degrees and it has more than 50 PhD students. The Department has a strong record of international collaboration, in both research and in teaching, where it has collaborative agreements with universities in many countries. Its Center for Computer Graphics and Visualization (CCGV) has undertaken research in computer graphics, computer animation and visualization for over 20 years. It specializes in developing visualization solutions to real-world problems and has been particularly active in the area of medical applications. It has extensive knowledge and experience of GPU algorithms through research. It has been involved in 25 internationally funded projects (including projects in FPs 4,5,6,7) over the last 14 years, 8 of these as Project Coordinator.



FORTH
Institute of Computer Science

The Foundation for Research and Technology - Hellas (FORTH) is one of the largest research centers of Greece. The research and technological focus of the foundation is centered on selected areas of great scientific, social, and economic interest. Its high quality research results as well as its valuable socioeconomic contribution, make FORTH one of the top research centers internationally. The Institute of Computer Science (ICS) - through its Computational Medicine Laboratory has recently been involved in several projects and initiatives related to this project, e.g. ACGT, ContraCancrum, P-Medicine, INTEGRATE, EURECA and TUMOR.



UNIVERSITÄT
DES
SAARLANDES

Saarland University (USAAR) has 8 faculties and provides a broad spectrum of disciplines and a strong focus on life sciences and computer science aspects. At the Faculty of Medicine (University Hospital), located in Homburg/Saarland more than 1800 people are studying medicine. There are 36 hospitals or institutions treating more than 54.000 inpatients and nearly 190.000 outpatients each year. The clinical participant from Saarland University is the Department of Pediatric Oncology and Hematology. The research focus of the Department of Pediatric Oncology and Hematology are kidney tumors and translational research by building an infrastructure for the seamless sharing of clinical and research data in Oncology via a legal and ethical IT infrastructure.



The Institute of Communication and Computer Systems (ICCS) is an academic research body affiliated to the National Technical University of Athens (NTUA). It is the research host of the School of Electrical and Computer Engineering of NTUA. ICCS focuses on fundamental and applied research in information technologies, micro-electronics, communications, biomedical informatics, biomedical engineering etc. It has participated in and coordinated numerous large scale research and development projects funded by the EC in both FP6 and FP7. Its In Silico Oncology Group (ISOG), is a world leader in the field of the emergent discipline of in silico oncology. It has developed, tested and disseminated several novel, clinically driven and clinically oriented simulation models.



Leibniz
Universität
Hannover

Founded in 1831, the "Higher Trade School of Hannover" has today around 21,000 students in the natural sciences and engineering, the humanities and social sciences, as well as in law and economics. LUH will participate via the Institute for Legal Informatics (IRI). IRI, being part of LUH's law school, was established in 1983 and is the first Institute dedicated to scientific research on all issues of Information and Communication Technologies at a German University. With currently more than 40 people staff, IRI is one of Europe's largest institutions in the field and is actively involved in about 10 European research projects with a focus on data protection, data security and intellectual property.



Astrid Research is one of the leading medical/bioinformatics companies in Central Eastern Europe. It is a knowledge-based research SME in which medical doctors, molecular biologists, software engineers, chemists and mathematicians work in close cooperation in multidisciplinary teams. Astrid's main focus is on creating software

and hardware solutions to support research activities in life sciences. Astrid began research in medical image processing in 2007, its first project being the automated detection of melanoma malignum on digital images. Its strong points are genomic bioinformatics, automated phenotyping and data analysis of high throughput technologies (e.g. microarray, NGS, chromatography), processing and evaluation of data from different data sources (e.g. data from lab experiments, clinical data, image processing), data mining and biostatistics.



AnSmart Ltd is a research driven SME. It specializes in the development of intelligent mobile apps using state-of-art technology in computer vision, image processing and machine learning. The company has dedicated a research and development team

consisting of PhD experts who have substantial knowledge in artificial intelligent, machine learning and medical image analysis. AnSmart also has in-house expertise for mobile software development. They follow software engineering principles, including software development lifecycle approaches, project management, version control, source code and document control. The company offers a variety of complete end-to-end intelligent mobile solutions to allow easy information access, data management, data analysis and visualization in mobile environment.



The Technological Educational Institute of Crete was founded in 1983. It is a higher educational institute with full University status. It now comprises the Schools of Applied Technology, Health & Welfare Services, Management & Economics and Agricultural Technology. In addition, there are departments of general sciences, foreign languages, and physical education. With a permanent teaching staff of 200 and approximately 10,000 students, TEI is a thriving academic institution.



University of Lincoln is a research based university with quality teaching and excellent research. The school of computer science at University of Lincoln provides a range of expertise in Computing Technologies and Information Systems, including specialists in computer vision and image engineering, medical imaging for cancer diagnosis and treatment, robotics and autonomous systems, social computing, games computing, cultural computing and business computing. The school scored highly in the UK Research Assessment Exercise (RAE 2008) with 85% of its outputs ranked at international quality or better with 15% ranked world-leading.

Patient Empowerment

by Prof. Dr. Norbert Graf

Patients are typically seen as the recipients of care. An important ideal of personalized medicine is to better enable patients themselves to be participants and guides in their own health care. From a psychocognitive perspective empowering the patient, is to increase his/her quality of life and transform him/her from a passive recipient into an active decision-maker in the treatment process of his/her disease.

More and more information is availa-

ble through the Internet addressing health related issues. Patients are unable to judge the correctness of the vast amount of information provided today. In addition Information Technology has changed our daily life during the last decade dramatically. Citizens and patients are able to gather information about life style, well being and health in a way that was not possible any time before. To make right decisions the role of citizens and patients needs

to be strengthened in future and the society needs to change by allowing patients in a shared decision model to decide at any time what kind of treatment is best fitting their demands. IT technology will and needs to support this endeavour by providing tools for patient empowerment. Such tools can deal with different aspects of this process. Most important are the data related to the health of patients and independent if they are coming from clinical care



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clinical trials or basic research. Patients want to have control over their data. They want to decide whether research is allowed to be done with their data and their own biomaterial or not. Patient empowerment is based on these data and the information and knowledge coming from research. Only by using this information to educate patients, real shared decision support is possible. This will enhance transparency for patients in the healthcare system and will in addition convince patients to use their data for research purposes as shown in figure 1.

Therefore patient empowerment will increase the compliance of patients to their treatment and will improve the quantity and the quality of data for research purposes. Transparency in data handling, augmentation of the patient's knowledge about his/her disease and participation as an active partner in a shared decision process in the management of his/her disease increases trust in the Health Care System including data handling and demands for more research by patients allowing the use of his/her individual data to solve his/her personal medical problem.

In line with patient empowerment will be the infrastructure of MyHealthAvatar, as it aims enabling

the patients understanding of the whole medical data set that have been collected from different sources. This process implies that patients are able to understand medical statements, as well as legal and ethical considerations. Thus empowering patients, developed tools must not only represent data in a convenient format, but data and information needs to be translated into a language that is understood by



patients. Of course, this does not only entail the wording of the information, but the need to come up with ways to organize the data in a manner that makes it easier to decide for the patient what is of interest to him/her at the moment. This statement is consistent with a goal of an empowerment tool: to give a patient a chance to make an informed choice.

For all the tools and software that will be developed within MyHealthAvatar, the needs of patients have to be analysed. This addresses also safety issues. Access to patient managed data in their PHRs is an important source to detect side effects of drugs. It is well acknowledged that serious side effects of treatment may be missed if they manifest themselves outside the hospital setting and relying on the patient's contribution to recognize and report them. This will significantly improve safety and will foster further research to empower patients.

The circuit of patient empowerment from research to decision support and back to research. The green arrow indicates the necessity of tools for patients to provide feedback to enhance clinical research. Adapted from: "The Patients and Consumers Perspective"; eHealth Conference, Barcelona, 15th March 2010.

Prof. Dr. Norbert Graf is Professor of Paediatrics and Director of the Clinic for Paediatric Oncology and Haematology and a member of the Faculty of Medicine. He is the chairman of the Renal Tumour Study Group of the International Society of Paediatric Oncology (SIOP-RTSG) and the Principal Investigator of the current Trial for Kidney Tumours within SIOP. He is an Associate Member of COG (Children's Oncology Group, North America) and closely cooperating the COG Renal Study Group. He is the coordinator of P-Medicine. He has more than 25 years of experience with clinical trials.





News from MyHealthAvatar

MyHealthAvatar Survey:

Partner USAAR has elaborated and published in collaboration with Unit H1, European Commission, DG CONNECT, a news release entitled “Survey Shows Interest in Health Avatar”. This news article has been published in the Digital Agenda for Europe website and has been featured in the European Commission eHealth newsletter. Additionally, the survey has been published and disseminated in the frames of eHealthNews.eu, eHealthServer.com and PharmaNews.eu projects.

Web links:

http://ec.europa.eu/information_society/newsroom/cf/dae/itemdetail.cfm?item_id=13590

<http://www.ehealthnews.eu/research/3777-survey-shows-interest-in-health-avatar>

<http://www.ehealthserver.com/research-development/1464-survey-shows-interest-in-health-avatar>

The Digital Patient concept: Vision and Early Demonstrations, IEEE BIBE 2013 special session

MyHealthAvatar partners BED, FORTH and USAAR joined forces during the 13th IEEE International Conference on Bio-Informatics and BioEngineering (IEEE BIBE 2013, Chania, Greece, November 10-13, 2013) to organize a special session entitled “The Digital Patient concept: Vision and Early Demonstrations”, highly relevant to MyHealthAvatar objectives. The Special Session built on experiences as well as technological and scientific developments stemming from FP7 framework EU-funded projects and aimed at bringing together researchers working in the fields of infrastructures and technologies for integrative biomedical research, ICT for predictive and translational medicine and the VPH at large. More information is available on the following link: http://medlab.cc.uoi.gr/bibe2013/paper_files/Special_Session_4.pdf

Ambient Intelligence Advanced Technologies in Support of Healthcare and Assisted Living

Partner FORTH organized the clustering event “Ambient Intelligence Advanced Technologies in Support of Healthcare and Assisted Living”, held at the Foundation for Research & Technology-Hellas, in Heraklion, Crete, Greece, on 26-27th September, 2013. The aim of the clustering event was to bring together European projects for demonstrations, presentations of innovative solutions, and discussions of potential synergies and cooperation.

MyHealthAvatar Ontology Suite

During the first year, after a thorough requirement analysis, the MyHealthAvatar Ontology Suite was developed. The ontology can model information from a variety of domains such as Personal Information, Lifestyle, Health Status & Clinical Information, Medical Information, Predictive Models, Molecular and Social Information. The Ontology Suite will be used as a global schema to integrate a wide variety of disparate data sources, by mapping the individual schemata to the ontology. The initial steps towards the specification of the mapping formalism and the semantic integration approach were defined and implemented.

Web articles

Partner BED published an article in iSGTW: “Health avatars - your lifetime companion”

<http://www.isgtw.org/feature/health-avatars-%E2%80%94-your-lifetime-companion>

Partner LIN published an article titled “MyHealthAvatar to Reshape the Future of Healthcare”:

<http://www.pharmanews.eu/research-and-development/1263-myhealthavatar-to-reshape-the-future-of-healthcare>

<http://www.ehealthnews.eu/research/3481-myhealthavatar-to-reshape-the-future-of-healthcare>

<http://www.ehealthserver.com/research-development/1333-myhealthavatar-to-reshape-the-future-of-healthcare>

Partner ASTRID published an article about MHA project on Hungarian online health portal: <http://www.webbeteg.hu/cikkek/egeszseges/14693/egeszsegunkkel-kapcsolatos-informaciok> (in Hungarian)



Publications Overview

Xia Zhao, Youbing Zhao, Nikolaos Ersotelos, Dina Fan, Enjie Liu, Gordon Clapworthy, Feng Dong, "A Scalable Data Repository for Recording Self-Managed Longitudinal Health Data of Digital Patients", IEEE 13th International Conference on Bioinformatics and BioEngineering (BIBE) 2013

Hui Wei, Youbing Zhao, George Saleh, Feng Dong, Gordon Clapworthy, Xujiang Ye, "A Cross-platform Approach for Treatment of Amblyopia", IEEE 13th International Conference on Bioinformatics and BioEngineering (BIBE) 2013

Franco Chiarugi, Eirini Christinaki, Sara Colantonio, Giuseppe Coppini, Paolo Marraccini, Matthew Padiaditis, Ovidio Salvetti, Manolis Tsiknakis, "A Virtual Individual's Model Based on Facial Expression Analysis: a Non-Intrusive Approach for Wellbeing Monitoring and Self-Management", IEEE 13th International Conference on Bioinformatics and BioEngineering (BIBE) 2013

Evaggelia Maniadi, Haridimos Kondylakis, Emmanouil G. Spanakis, Manolis Tsiknakis, Kostas Marias and Feng Dong, "Designing a digital patient avatar in the context of the MyHealthAvatar project initiative", IEEE 13th International Conference on Bioinformatics and BioEngineering (BIBE) 2013

Spanakis, M., Papadaki, E., Kafetzopoulos, D., Karantanas, A., Maris, Th.G., Sakkalis, V., & Marias, K. (2013), "Exploitation of patient avatars towards stratified medicine through the development of in silico clinical trials approaches.", IEEE 13th International Conference on Bioinformatics and BioEngineering (BIBE) 2013

Haridimos Kondylakis, Dimitris Plexousakis, "Exploring RDF/S Evolution using Provenance Queries", Workshop on Exploratory Search in Databases and the Web (ExploreDB), Co-located with EDBT/ICDT 2014

Upcoming events of interest

MyHealthAvatar first review meeting

The first review meeting of the project will take place in Brussels, Belgium on May 13 2014. The following experts have been appointed by the Commission:

Paulo Lisboa: <http://www.cms.livjm.ac.uk/staff/staffprofile.asp?UserName=cmsplisb>

Andrea Kübler: http://www.i1.psychologie.uni-wuerzburg.de/en/int/staff/kuebler_andrea_prof_dr/

Piotr Nowakowski: http://dice.cyfronet.pl/people/piotr_nowakowski

Multiscale modeling of cancer Workshop at Virtual Physiological Human Conference 2014

Cancer is a highly complex disease and natural phenomenon. It is manifested at virtually all spatiotemporal scales pertinent to life, spanning from the atomic to the whole body spatial scale and from the nsec to the year temporal scale. The plethora of interdependent mechanisms jointly constituting the natural phenomenon of cancer and its response to treatment dictates the development of complex mathematical and computational multiscale models aiming at both the quantitative understanding of the phenomenon and the optimization of cancer treatment in the patient individualized context. Clinical adaptation and validation are two sine qua non processes in view of the clinical translation of such models (in silico oncology). Clinically validated cancer models are expected to serve as platforms for performing in silico experiments by exploiting the patient's own multiscale data such as imaging, histological and molecular data in order to select the most appropriate treatment scheme. The workshop aims at providing an excellent opportunity for the presentation and discussion of state of the art multiscale cancer modelling efforts along with clinical translation activities. Since the development of cancer hypermodels of which the component models may be developed by different modeling groups is becoming a more and more realistic scenario, aspects of the joint development of cancer hypermodels on a global scale will also be addressed.

The workshop, organized by Research Prof. Georgios Stamatakos, ICCS, MHA WP5 and WP10 leader, will take place at Trondheim, Norway on September 9-12, 2014.

VPH 2014 link: <http://www.ntnu.edu/vph2014>

List of Workshops: <http://www.ntnu.edu/vph2014/programme>



International workshop on “Advances in Personalized Healthcare Services, Wearable Mobile Monitoring, and Social Media Pervasive Technologies”.

This workshop will be held on November 3-5, 2014, in Athens, in conjunction with the “4th International ICST Conference on Wireless Mobile Communication and Healthcare - MobiHealth 2014” conference. Details can be found on the following link: <http://www.aphs.mobihealth.name/2014/show/cf-workshops>

Scope of the Workshop: Personalized healthcare emphasizes on the use of information about an individual/patient to select or optimize patient's preventative, therapeutic care and wellbeing. Modern healthcare solutions emphasize on the need to empower citizens to manage their own health and disease and include smart medical sensors, remote eHealth monitoring, smart-phone enabled data aggregation, medical awareness and analysis and context-aware assistive living technologies.

Modern mobile healthcare systems, supported by information and communication technologies, provide solutions for improving illness prevention, facilitating chronic disease management, empowering patients, enable personalization of care improving the productivity of healthcare provisioning and improve utilization of healthcare enabling the management of diseases outside institutions as well as encouraging citizens to remain healthy.

Subscription

The MyHealthAvatar Newsletter is published by the MyHealthAvatar consortium and is distributed free of charge.

All issues of the newsletter and a form for subscription to the newsletter are available on our website: <http://www.myhealthavatar.eu>

The newsletter can also be requested by contacting Feng.Dong@beds.ac.uk or nikchris@central.ntua.gr

Disclaimer

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Although the MyHealthAvatar consortium endeavours to deliver high quality, no guarantee can be given regarding the correctness and completeness of the content of this newsletter due to its general informational character.

The MyHealthAvatar consortium is not responsible and may not be held accountable for any loss suffered as a result of reliance upon the content of this newsletter.

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