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International Workshop on

Smart and Sustainable Cities:
Between Reality and Aspirations

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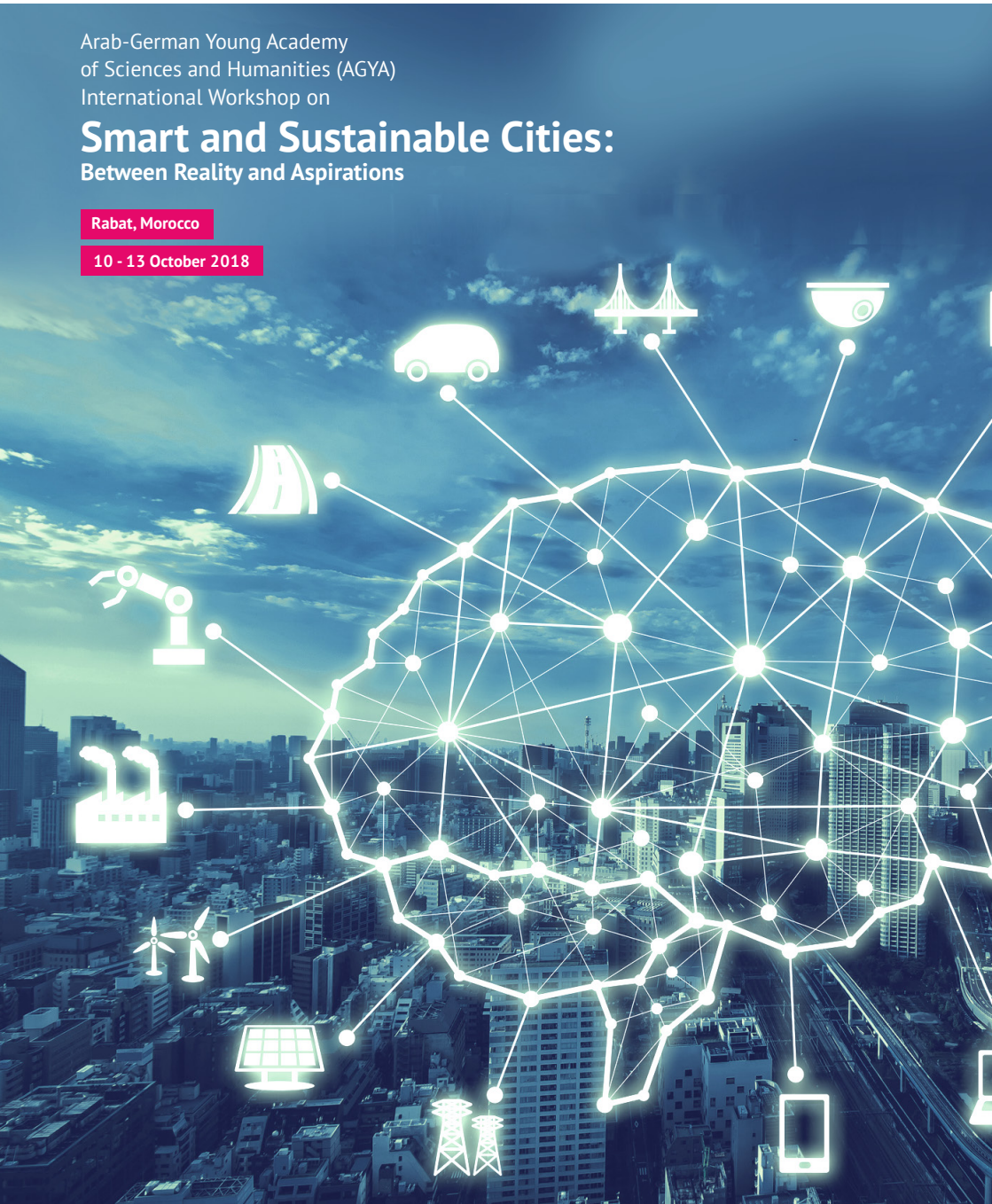

SESSION I:
OPENING REMARKS & OVERVIEW OF SMART CITIES FROM CITIES REPRESENTATIVES

Mohamed Sadiki

Mayor of Rabat city, Morocco

Mohamed Sadiki was trained as an engineer at the Mohammedia School. Later on, he obtained a Master's in Public Services Management. Mohamed Sadiki started his early career as an engineer specialized in Infrastructures and civil engineering, before assuming several leading posts in the private sector. Throughout his career, he notably became Director of Water Investments, and Director of Purchase and Logistics at Redal, which provides electricity, water supply and sanitation services in Morocco. Involved in the political life of his party at regional and national level, Mohamed Sadiki became in 2014 Chief of Staff of the Minister of Transports and Logistics. Besides his professional and political activities, Mohamed Sadiki has also given lectures in the framework of ISCAE Casa's Master's on Cities and Territories, specializing in transferred management of water, electricity and sanitation services. Formerly Councilor of the capital city of Morocco, as well as Regional Councilor and Vice-President of the Council of Rabat-Salé-Zemmour-Zaër Region, Mohamed Sadiki was elected Mayor of Rabat in September 2015.

Ahmad Sakhrieh

American University of Ras Al-Khaimah & AGYA member, United Arab Emirates

Ahmad Sakhrieh received his Ph.D. in Mechanical Engineering from Friedrich-Alexander University, Germany in 2006. He received his BSc and MSc degrees in Mechanical Engineering from the University of Jordan.

Ahmad Sakhrieh is the Chair of the Department of Mechanical and Industrial Engineering at the American University of Ras Al Khaimah since fall 2016. Prior to that, he was the chairman of the Mechanical Engineering Department at the University of Jordan. Sakhrieh is the author and coauthor of more than 60 papers in international journals and conferences. He is a reviewer for several International Journals such as Applied Thermal Engineering, Energy Conversion & Management, Sustainable Cities and Society and Journal of Energy.

His research includes combustion, energy and renewable energy, emission, gas engines, solar cooling, solar ponds and diesel engine exhaust gas reduction using limestone.

He is a member and former Co-President of the Arab-German Young Academy of Sciences and Humanities.

Chistian Fron

University of Heidelberg & AGYA member, Germany

Christian Fron is Research Associate for Ancient History at the University of Heidelberg. He has received his Ph.D. (2014) on the Mobility of imperial Greek scholars at the University of Stuttgart.
His research focuses on cultural and social exchange; especially the cultural impact of Graeco-Roman society in the eastern Mediterranean, as well as the influence of ancient Geography and Topography on ancient society and daily life. He has authored 10 publications on very different topics. One of his recent collaborations focuses on acoustic reconstructions of ancient public speeches. Since 2017, he is a member of the Arab-German Young Academy of Sciences and Humanities (AGYA) and also serves as member of the steering committee of AGYA.

Smart Cities in History

The ancient Greek city, the polis, and its roman counterpart, the urbs, were the foundations of ancient society and daily life. Aristotle got to the heart of the importance of the city, when he stressed "that the city-state is a natural growth, and that man is by nature a political animal (zoon politikon), and a man that is by nature and not merely by fortune citiless is either low in the scale of humanity or above it […] inasmuch as he is solitary, like an isolated piece at draughts." [1] The affiliation to one or in seldom cases even more than one city remained of crucial importance for the ancient self-perception as a place where every citizen had special rights, privileges and duties. In many aspects of daily life (but to a different scale of course) every ancient community had to face similar problems as modern cities. For example: How to increase a safe, steady and reliable water supply for every citizen with preferably good water quality? How to deal with garbage? How to regulate ancient inner-city-traffic? How to keep the citizens healthy? How to deal with heat and cold? Where to put ancient industry facilities? The presentation will try to glimpse some light on ancient problem-solutions, which might even be of interest to modern city concepts.

[1] Aristot. Pol. 1,1253a 1-11. Transl.: http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.01.0058:book=1:section=1253a

Marc Ringel

HFWU – Nuertingen-Geislingen University & AGYA member, Germany

Marc Ringel reads energy policy, energy efficiency and environmental economics as Full Professor at Nuertingen Geislingen University, Germany and as Guest Lecturer at Université d'Aix en Provence, Marseille, France. As former official with the Directorate General Energy of the European Commission and with the German Federal Ministry of Economics and Energy he continues to be deeply involved in the development and economic assessment of national and European energy efficiency policy frameworks. He supports policy-oriented research for several national energy action plans and key strategic EU policy actions (rapporteur for the Integrated Energy Roadmap of Horizon 2020, EU Energy 2030 strategy). Marc holds a Master in Economics from Mainz University, Germany, and Université d'Angers, France. His Ph.D. thesis focussed on energy policy measures to combat climate change. He has published over 70 papers and contributions in peer-reviewed journals, book chapters and conference proceedings and is reviewer for a variety of peer-reviewed journals such as Energy Policy or Applied Energy. He is a member of the climate advisory council of the German state of North Rhine-Westphalia and member of the Arab-German Young Academy of Science and Humanities.

Energy in Smart Cities: Comparison of Cities in Germany and the MENA Region

Cities are expected to account for 90% of future global population growth, 80% of value added and 60% of global energy consumption. This highlights the economic and energy dimension of future city design and development strategies. German towns and cities in the MENA region strive for quite different concepts of "smart cities", though. Whereas strategies in many Arab countries focus on developing or "buying in" new city concepts based on their growing population needs, many German cities work on enhancing the status quo of built infrastructure (patchwork engineering), often clinging to local circumstances and local economic clusters. A comparison of various city concepts with a focus on Kuwait City and Berlin shows that from both economic and energy perspective, the strive is not exclusively for digitalization and "smart". Rather, cities look for "sustainable" models, both in terms of energy and economics, turning the strive for "smart cities" into a quest for "green energy" and "green growth".

SESSION II:
SMART HEALTH

Ilangko Balasingham

Norwegian University of Science and Technology (NTNU)
& Oslo University Hospital, Norway

Ilangko Balasingham received the M.Sc. and Ph.D. degrees from the Department of Electronic Systems, Norwegian University of Science and Technology (NTNU), Trondheim in 1993 and 1998, respectively, both in signal processing. He performed his Master's degree thesis at the Department of Electrical and Computer Engineering, University of California Santa Barbara, USA. He co-founded and worked as Research Engineer developing image and video streaming solutions for mobile handheld devices at Fast Search & Transfer ASA, Oslo, which is now part of Microsoft Inc. Since 2002, he has been with the Intervention Center, Oslo University Hospital, where he heads the Section for Medical ICT R&D. He was appointed Professor of Medical Signal Processing and Communications at NTNU in 2006. For the academic year 2016/2017 he was Professor by courtesy at Nagoya Institute of Technology in Japan. His research interests include super robust short range communications for both, in-body and on-body sensors, body area sensor network, microwave short range sensing of vital signs, and nanoscale communication networks. He has authored or co-authored over 230 journal and conference papers, 7 book chapters, 42 abstracts, 6 patents, and 20 articles in popular press. He is active in organizing conferences (Steering Committee of ACM NANOCOM 2018-2021; General Chair: 2019 IEEE Int. Symposium of Medical ICT and 2012 Body Area Networks (BODYNETS) conference; TPC Chair of the 2015 ACM NANOCOM) and editorial board (Area Editor of Elsevier Nano Communication Networks 2013-unti now).

Wireless Health and Care: Opportunities and Challenges

The demand for medical devices increases at a pace of 6% yearly across the globe. In the developed world this is driven by an ageing, increasingly care-demanding population, while in the developing world improved economic conditions makes use of medical devices economically feasible. Access to wearables, mobile phones and Internet has made remote monitoring of medical conditions feasible. Improved battery and communication technology makes it possible to diagnose and manage disease processes remotely enabling large scale introduction of mobile health applications. Moreover, improved implantable and ingestible micro- and nano-devices are becoming essential tools in the management of chronic disease states affecting the increasingly elderly population. Another field contributing to this development is synthetic biology, which is an emerging scientific field with major disruptive potentials when combined with nanoscale devices directly obtaining information from tissues and individual cells.
My talk will give an overview of reliable wireless sensor communication networks to enable diagnostics, monitoring, and therapy and will include technology trends and applications with the vision to enable "cells to wirelessly connect to the Internet".

Agustí Solanas Gómez

Rovira i Virgili University, Spain

Agustí Solanas is the Head of the Smart Health Research Group (http://smarthealthresearch.com) and Associate Professor in the Department of Computer Engineering and Mathematics at the Rovira i Virgili University (URV) of Tarragona, Catalonia, Spain. He obtained his M.Sc. degree in Computer Engineering from URV in 2004 with honours (Outstanding Graduation Award). He received a Diploma of Advanced studies (M.Sc.) in Telematics from the Technical University of Catalonia in 2006. He received a Ph.D. in Telematics Engineering from the Technical University of Catalonia in 2007 with honours. In 2012, he was Visiting Researcher in the Department of Mathematics and Physics of the University of Rome Tre, Italy. In 2013, he was Visiting Researcher in the Department of Mathematics of the University of Padua, Italy. His fields of activity are mobile health, smart health, cognitive health, data privacy, ubiquitous computing, and artificial intelligence specifically: clustering, pattern recognition and evolutionary computation. He has participated in several European-, Spanish-, and Catalan-funded research projects. He has authored over 150 publications and he has delivered several invited talks worldwide. He has served as chair, programme committee member and reviewer in several international conferences and journals. He serves as external expert reviewer for several National Councils for Scientific Research (e.g., The European COST Association, the Romanian National Authority for Scientific Research and Innovation, or the National Centre of Science and Technology of the Republic of Kazakhstan). He is senior member of the Institute of Electrical and Electronics Engineers (IEEE) and member of the Association for Computing Machinery (ACM). He serves as scientific coordinator for the Anti-Phishing Working Group (https://apwg.eu).

An Introduction to Smart Healthcare: Origins, Evolution and Future Directions

In this talk I will introduce the audience to the concept of Smart Health (or Smart Healthcare, s-Health) understood as the provision of healthcare services within Smart Cities and more generally, in contextual environments. I will briefly summarise the origins of smart healthcare and walk the audience towards its evolution from electronic healthcare (e-health) and mobile healthcare (m-health). The talk, introductory in nature, will provide real application examples of smart healthcare solutions and will point out avenues for the future of smart healthcare.

Ismael Lamouaden

Mohammed V University, Morocco

Ismail El Moudden received the Ph.D degree in Statistics/Data Science from the Faculty of Sciences, Mohammed V University in Rabat. Currently, he is member of the Laboratory of Mathematics, Computing and Applications - Information Security in the same faculty.
His current research interests include Machine Learning, Genes Selection, Mining Cancer Behavior, and its applications to domains where one has to draw inferences from observing the complex, real-world systems that evolve over time. He enjoys challenging and complex data analysis, data mining, machine learning and data visualization tasks. He is now using deep Feature Selection and Extraction based on Neural Network for Cancer Markers Identification.

Mining Prostate Cancer Behaviour using Parsimonious Factors and Shrinkage Methods

Class prediction of gene expression data analysis is a very hot research topic in computer vision nowadays, particularly in the prostate cancer tumor. A problem often encountered in accomplishing this task while using high dimensionality of data, and growing information constituting of prostate cancer tumor combination is the dimensionality reduction. Where the number of genes (variables) is very large compared to the number of samples (observations), makes the application of many prediction techniques very difficult. An appropriate solution to the said problem is the reduction in the number of features which may potentially lead to a more accurate desirable model. A proposed framework to solve this problem is to employ dimension reduction statistical techniques. Successfully used in many areas and applied in statistical-related applications. Various machine learning methods have been used to analyze the high dimensional data for cancer classification. These methods have been shown to have statistical and clinical relevance in the variety of cancer diagnosis, prognosis and therapeutic guidance.

SESSION III: ENERGY EFFICIENCY AND NEW MATERIALS FOR SMART CITIES

Djamel Djenouri

Research Centre on Scientific and Technical Information (CERIST) & AGYA member, Algeria

Djamel Djenouri obtained the Ph.D. in Computer Science from the University of Science and Technology USTHB Algiers, Algeria, in 2007. From 2008 to 2009, he was granted a post-doctoral fellowship from the European Research Consortium on Informatics and Mathematics, and worked at the Norwegian University of Science and Technology (NTNU), Norway. He is currently a Senior Research Scientist (Director of Research) at the CERIST research center in Algiers, where he leads the Wireless Sensor Networking group, and Adjunct Full Professor at the EMP, Algiers. Djamel Djenouri is working on topics related to IoT, wireless and mobile networks, machine learning and application for smart environments, smart building and green applications. He has been conducting several research projects with international collaborations as the principal investigator. He has been granted mobility internships and visited many renowned universities including NTNU, Swedish Institute of Computer Science, Stockholm, University of Cape Town, UPC Barcelona, JMU Liverpool, University of Padova, and the University of Oxford. He published more than 100 papers in international peer-reviewed journals and conference proceedings, two books, and he is holding two national patents. He organized workshops/conferences and served as TPC member of many international conferences (e.g. IEEE GlobeCom, LCN, WiMob, etc.). He is a senior member of the Association of Commuting Machinery and active member of the Arab-German Young Academy of Science and Humanities.

Recent Information and Communication Technologies in Smart Buildings

Energy consumption is sharply increasing in large cities worldwide. The buildings' ratio from this consumption is the highest and estimated at about 40% in most regions, with 30% to 50% waste due to suboptimal energy management solutions. Most of present building automation systems do not capture the dynamic nature of building usage, the user behavior and comfort, energy supplies in an integrated holistic manner, e.g., predefined setting of HVAC, predefined light intensity values in light control system, etc. The new alternative is to use advances in information and communication technologies, e.g., IoT, wireless communication and networking, methods from artificial intelligence and machine learning to develop modern user-centric energy management systems that capture the user preference/comfort and provide motivating tools to attract his implication. This talk introduces these technologies while targeting non-specialist audience.

Nicolas Martin

School of Engineers in Mechanics and Microtechniques (ENSMM) & Franche-Comté Electronics Mechanics Thermal Science and Optics – Sciences and Technologies (FEMTO-ST Institute), France

Nicolas Martin is Full Professor of Materials Science in the National Engineering School (ENSMM) at Besançon in France since 2008. He obtained a Ph.D. in Physical Chemistry from the University of Franche-Comté in 1997 and a habilitation degree (Docent) from the same University in 2005. He was a researcher at the Ecole Polytechnique Fédérale de Lausanne from 1998 to 2000 in the Physics Department. He was a visiting researcher in 2012-2013 at the University of Uppsala (Sweden) where he worked at the Angström Laboratory in the Department of Engineering Sciences, Solid State Electronics. In 2017, he spent a short sabbatical leave in the University of Alberta in Edmonton (Canada) to work in the Department of Electrical and Computer Engineering. His research is focused on the physics and technology of metallic and ceramic thin films prepared by reactive sputtering. He is also interested in nanostructuration of coatings prepared by Glancing Angle Deposition (GLAD). He previously was the Deputy Director of MN2S research department from 2010 to 2014. Nicolas Martin authored or co-authored more than 100 articles in international peer-reviewed journals, 1 patent, 5 chapters in books, 1 ebook, and more than 150 presentations in conferences, workshops and short courses.

New Materials Based-on Sculptured Thin Films: Properties and Anisotropic Behaviours

Structuring of thin solid films at the micro- and nano-scale is presently one of the most exciting challenges of materials science. However, all deposition methods in use today exhibit some drawbacks and involve compromises with respect to the process specifics, substrates, as-deposited film properties and so on. Among these methods, the GLancing Angle Deposition (GLAD) is a recent technique, which was successfully developed to sputter deposit thin films exhibiting original architectures [1]. This approach employs oblique angle deposition and controlled substrate motion to form architecture composed of nanometer scaled columns of designed shape. It allows the fabrication of films with a carefully engineered structure at the sub-micron scale. Thus, very original architectures (zigzags, spirals, oriented columns ...) through the film thickness can be produced, which provide new geometries of the film microstructure [2-4].

This presentation aims at illustrating how physical properties and anisotropic behaviors of metallic and ceramic thin films sputter deposited can be tuned by GLAD. The basic principle of this innovative technique using a fixed and/or mobile substrate will be presented in terms of structural characteristics and surface morphologies. Some behaviors of GLAD thin films will be discussed especially showing the correlations between the dimensions, shapes and geometry of produced architectures and the resulting properties. Finally, anisotropic behaviors (electrical conductivity, refractive index, elastic wave propagation ...) and potential applications of these structured thin films will be reviewed.

[1] K. Robbie, M.J. Brett, J. Vac. Sci. Technol. A15(3) (1997) 1460-1465.
[2] N. Martin, K. Robbie, L. Carpentier, in: J. Takadoum, Nanomaterials and Surface Engineering, ISTE Ltd., London, 2010, pp. 1-30.
[3] M.M. Hawkeye, M.T. Taschuk, M.J. Brett, Glancing Angle Deposition of Thin Films – Engineering the Nanoscale, John Wiley & Son Ltd., West Sussex, 2014.
[4] A. Barranco, A. Borras, A.R. Gonzalez-Elipe, A. Palmero, Prog. Mater. Sci. 76 (2016) 59-153.

Omer Nour

Linköping University, Sweden

Omer Nour (O. Nur) obtained his B. Sc. Honors in Physics from the University of Khartoum, and after working for four years as a Teaching Assistant, he joined Linköping University and obtained his Ph.D. degree in Device Physics in 1990. Afterwards he worked as Researcher at Chalmers University of Technology, Gothenburg, Sweden. In 2002, he has obtained the habilitation and obtained the Associate Professor degree. In 2007 he moved to the Department of Science and Technology at Campus Norrköping, Linköping University, Sweden. At present, O. Nur is the leader of the research group of Physical Electronics and Nanotechnology. O. Nur's research interest is on materials and devices for technical and medical applications. He has authored over 300 scientific articles and 10 book chapters.

Nanomaterials for Smart Solutions

In this presentation, the potential of nanomaterials in providing smart materials for many applications will be presented. We start by introducing nanotechnology history and the driving force that led to the nano-technology era. This will be followed by presenting low temperature chemical synthesis as a suitable approach for developing nanostructures of wide variety. We will concentrate on metal oxide nanomaterials for both single and composite materials. Examples from research findings on the synthesis are to be discussed and analyzed. Finally smart devices based on nanomaterials for different applications that utilize the unique properties of nanostructures for energy harvesting, lighting, sensing etc. are being suggested as smart solutions.

Abdelkrim Khelif

National Center for Scientific Research (CNRS) & University of Burgundy - Franche-Comté, France

Abdelkrim Khelif is a Senior Researcher at CNRS. In 1998, he received his Ph.D. degree in materials science from the Universite de Lille I, France. His dissertation was dedicated to the theory of vibrations of and acoustic scattering by supported wires on a surface. In 2002, he joined the CNRS in Besancon, France and FEMTO-ST institute as researcher. In 2007, he was awarded with Medaille de Bronze from CNRS that acknowledges the first years of research of a talented young scientist. He has authored or co-authored more than 100 papers. His work focuses on phononic crystals, periodically structured materials that display astonishing acoustic properties, such as complete band gap, cavities mode and a phononic waveguides. He is also active to extract the potential application of phononic crystal as a new acoustic device for signal processing, and sensing applications.

Phononic Crystals and Acoustic Metamaterials: From a Rich History to a Bright Future

For the last 20 years, Acoustic Metamaterials are experiencing a growing success, partly due to exotic phenomena and their wide variety of extremely promising applications: "Invisibility Cloak" is the most vivid example of this. Recently, studies involving resonators have shown how to create acoustic black holes through absorption phenomena. The purpose of this talk is to highlight acoustic mechanisms underlying acoustic opacity that can enable the emergence of concrete applications such as sound shields, or can even address issues and challenges encountered in acoustic imaging.

First, we present an experimental demonstration of sound absorption tailor ability, using acoustic metamaterials made of resonant cavities that do not rely on any dissipative material, but rather take advantage of the inherent visco-thermal characteristics of air. As confirmed by numerical calculation, we particularly show that using quarter-wave-like resonators made of deep subwavelength slits allows a high confinement of the acoustic energy of an incident wave. This leads to enhance the dissipation in the cavities and, consequently, generates strong sound absorption, even over a wide frequency band. We finally demonstrate the key role of the filling ratio in tailoring such absorption, using a metamaterial constituted of space-coiled cavities embedded in a polystyrene matrix.

Second, we report on the omnidirectional

sound screening of an acoustic metamaterials based on local resonances. We investigate both experimentally and theoretically how the coupling between two resonators, with different quality factors, can generate asymmetric lineshapes of the transmission, leading to the opaque counter-part of the low frequency Enhanced Acoustic Transmission. Moreover, we study the angular dependence of its transmission properties, and demonstrate that such an opacity band, due to deep subwavelength features of cavities, avoids diffraction that have been proved to be the main limitation of omnidirectional capabilities of locally resonant perforated plates.

SESSION IV: SMART RESOURCES

Nicolas Javahiraly

University of Strasbourg, France

Nicolas Javahiraly is an Associate Professor in Physics at the University of Strasbourg. He did his Ph.D. in Photonics at the same university on fiber optic sensors. After a post-doc at Harvard University on the interaction between ultra-short laser pulses and matter, he worked as a project manager and expert in the Sagem Defense group in Paris. He joined the University of Strasbourg in 2007 and is currently working on nano-optical sensors and plasmonics for various applications such as gas detection, pollutants detection and photoconversion systems.

Nano Materials for Sustainable Development Applications (Detection of Gas, Pollutants ...)

Hydrogen is used in various fields, such as chemical, pharmaceutical, food, and aerospace industries. Industries based on the use of hydrogen gas encounter safety problems due to the chemical and physical properties of this gas. A new configuration of a fiber-based SPR (Surface Plasmon Resonance) sensor using palladium as a material sensitive to hydrogen detection is proposed. The sensitive zone, deposited on the core of the multimode fiber, may for example be a multilayer MIM (Metal, Insulator, Metal) configuration of silver, silica and palladium. The spectral modulation of the light transmitted by the fiber allows the detection of hydrogen. The sensor is only sensitive to TM polarized light and TE polarized light can then be used as a reference signal. A more reliable response is then considered for this SPR sensor based on spectral modulation rather than intensity. The thicknesses of the different layers define the performance of the sensor: the thickness of the silica regulates the resonance wavelength while the thicknesses of the silver and palladium layers determine the sensitivity of the sensor. An optimal configuration is obtained for and suggests a promising future, especially by using of nanoparticles to improve the performances in terms of sensitivity and time response via the LSPR (Localized Surface Plasmonic Resonance) properties effects. These effects can be used for other applications such as pollutants detection, photoconversion, photovoltaic cells etc.

Jan Friesen

Helmholtz Centre for Environmental Research – UFZ & AGYA Co-President, Germany

Jan Friesen is a Research Associate in the Department of Catchment Hydrology at the Helmholtz Centre of Environmental Research – UFZ, Leipzig, Germany. He has received his Ph.D. (2008) in water resources management from the Delft University of Technology, The Netherlands and his diploma (M.Sc., 2002) in physical geography from the University of Bonn, Germany. His research focuses on ecohydrology, remote sensing, and sensor development, where he has authored more than 40 publications in international peer-reviewed journals and book chapters. He has extensive experience in semi-arid and data scarce countries such as Ghana, Burkina Faso, Nigeria, and Oman and his work has a strong connection to water management issues. He has worked as a guest editor to several special issues on water management. Currently, he is involved in several projects in Oman and in Africa including research on submarine groundwater research, forest ecohydrology, and remote sensing. He is a member of the European Geosciences Union (EGU) subdivisions 'Ecohydrology, wetlands and estuaries' and 'Water policy, management and control' and regularly convenes sessions at both EGU and AGU. Since 2014 he is a member of the Arab-German Young Academy of Sciences and Humanities (AGYA) and since 2017 he serves as the German Co-President of AGYA.

Urban Forestry – Towards Sustainable & Economic Urban Water Management

Urban forestry widely affects urban environments, impacting a city's microclimate, recreational value, and water resources. With regard to water resources, urban trees and forests can, for example, dampen the effects of extreme precipitation or help evaporate precipitation to reduce storm water runoff. Yet, urban planners rarely consider urban forestry as a tool in integrated water resource management (IWRM). The presentation focuses on how urban forest setting, canopy manipulation, and tree species selection can significantly alter urban hydrologic processes, using as an example the first interaction between urban forests and the terrestrial hydrologic cycle: canopy precipitation partitioning. Further, the economic relevance of urban canopy precipitation partitioning to IWRM and review research quantifying its connection to manageable urban forest traits is detailed. Since many urban forests around the globe face increased extreme storm frequency, a case study of precipitation partitioning among different forest settings during an extreme storm is presented. Major factors that influence the urban forest's role in storm water quality are also discussed. Conclusions and future directions on how urban water managers may influence urban canopy precipitation partitioning to assist in achieving management goals are provided.

Zeina Hobaika

Saint Joseph University of Beirut & AGYA member, Lebanon

Zeina Hobaika is a Biochemist, holder of a Ph.D. in Structure, Function and Proteins Engineering from Denis Diderot University and an Executive Diploma in Management and Conduct of Strategic Projects from Sciences Po in Paris, France. Today, she is a Faculty Member and Head of Macromolecules Structure and Interactions Research Team at the Faculty of Sciences at Saint Joseph University of Beirut in Lebanon. Her main research interests cover rational drug design to contribute to fighting diseases such as AIDS, Cancer or Alzheimer's. Another major project she is working on consists in the management and the valorization of agro-industrial byproducts and waste. Zeina Hobaika was selected for various national and international prizes and awards. For instance, in 2011, she won the L'Oréal-UNESCO For Women In Science Pan Arab Fellowship and in 2012, she was selected for the TechWomen Program by the U.S. Department of State and she was listed in International Business Times, New York among the top 10 Emerging leaders in STEM Fields in the MENA Region. In 2017, Hobaika became member of the prestigious Arab-German Young Academy of Sciences and Humanities AGYA and in 2018, a Jury member of the L'Oréal - UNESCO For Women In Sciences Levant Program. Last, Zeina Hobaika has a rich and large publication record, one patent and is involved in a variety of projects with the public and private sector.

Smart Sustainable Cities: Towards Sustainable Bioenergy Approaches

A smart and sustainable city can be defined as a city that improves the quality of life and local economy, through moving towards a low carbon future. However, nowadays, a large fraction of the world's total energy demands is supported by non-renewable fossil resources such as coal, oil, and natural gas. These resources are not only limited in supply but also have adverse effects on the environment. Thus, bioenergy is considered to be a highly promising alternative to fossil-derived energy in a future bio-based economy. In fact, the future will be led by the need for renewables in transport followed by heating and electricity sectors. Through a general overview on the supply of biomass and their impacts on environment, economic and health systems, I highlight some successful examples implemented in cities worldwide, particularly in Germany and Arab Countries, in a sustainable approach. Moreover, I discuss the waste to energy technologies, as part of a sustainable valorization of biomass resources. In this context, anaerobic digestion is one of the key elements in the current energy transition. I will focus on agro-industrial byproducts, especially Grape Pomace, Spent Coffee Grounds and Olive Pomace. Their conversion into methane is a promising possibility given that the current methods of valorization have limited markets and can absorb only a limited portion of the produced waste. At first, detailed information on the maximum production of methane from our different biomasses are obtained in batch and continuous mode at 37 °C. Then, a bio-physico-chemical characterization of different biomass varieties from different growing areas was carried out. The diversity of the lignocellulosic content and the methane potential of the selected substrates was underlined. A negative correlation exists, in particular, between the methane potential and the lignin and cellulose contents. In addition, the dimensioning of anaerobic digesters in continuous mode is optimized by determining an optimum of operation in terms of applied load of substrates and residence time. Finally, in order to intensify the production of methane, various green and innovative pretreatments are evaluated and their respective effects on the methane production and the biodegradability of lignocellulosic fractions are assessed. Altogether, our results demonstrate the relevance and pertinence of our approach addressing two issues: waste management and bioenergy recovery.

SESSION V:
SMART MOBILITY FOR SMART CITIES

Sven Kesselring

HFWU – Nuertingen-Geislingen University, Germany

Sven Kesselring holds a Ph.D. and a doctoral degree in sociology. He is Research Professor in 'Automotive Management: Sustainable Mobilities' at Nuertingen-Geislingen University and Research Fellow at the Centre for Interdisciplinary Research (ZiF) at Bielefeld University.

He is the co-director of the Ph.D. program 'Sustainable Mobility in Metropolitan Regions', jointly organized by Technical University Munich and Nuertingen-Geislingen University and the editor of the journal 'Applied Mobilities' (Taylor & Francis) and the book series Networked Urban Mobilities (Routledge).

Future Mobilities - Examples from Germany and Beyond

Cities and regions are comprised of social, cultural, geographic, technological, and digital mobilities. The networks and flows connected to these mobilities build the basis for new socio-cultural practices in everyday life, leisure and business. 'Miniaturized mobilities' (Elliott 2013) have changed the pulse, the pace and the reach of and within cities. Public perceptions of mobility have changed character: the male, purposeful, time-saving and professional traveler is no longer the uncontested 'leitbild'. Instead, the modern mobility concept increasingly grounds in 'work and play' orientations. Travel time is being used for work, gaming, communication, social networking, and media consumption, often all at the same time. The contemporary design of premium cars stands for this. New concepts, i.e. of automated vehicles, 'rest' on these developments. 'Mobile screens' (Verhoeff 2012), sound design of the outside world, and infotainment tools have taken over the aesthetic regime. The industry designs future mobilities around and through them.

The presentation discusses the implication of these developments for urban planning. It presents preliminary results from ongoing research on policy promotion strategies of automated driving on the regional level. The main case here is Munich, Germany, and its long history in sustainable mobility and ITS policies.

Soufiene Djahel

Manchester Metropolitan University, United Kingdom

Soufiene Djahel (SM-IEEE) received the M.Sc. degree in Computer Science from the University of Bejaia, Algeria, in 2007, and the Ph.D. degree in Computer Science from Lille 1 University of Science and Technology, France, in 2010. He was an Engineering Research Manager with the University College Dublin, Ireland, where he conducted and led research activities on smart transportation for almost four years. He has been a Senior Lecturer with the School of Computing, Mathematics and Digital Technology, Manchester Metropolitan University, U.K., since 2015. His current research interests include smart transportation, vehicular networks, security and QoS issues in wireless networks, and e-health. He is a fellow of the Higher Education Academy, U.K. He serves as a TPC Member in many IEEE flagship conferences and as a reviewer for several IEEE journals in his research areas. He was (is) the General Co-Chair of VTM 2014, RA-WERHA 2015, ISNCC 2016, ICT-DM 2018, and Wireless Days 2019 and the TPC Co-Chair of VTM 2012, ISNCC 2015, and IEEE ISC2 2016 and 2017.

Connected and Autonomous Vehicles (CAVs): Challenges and Potential for enabling Safer, Faster and Greener Roads

The projected massive growth of the number of vehicles on the roads (2.9 billion vehicles by 2050 according to a recent UN report), plus urban transformation and a trend towards mega cities create greater and more challenges for road traffic management authorities. Among these challenges, the excessive traffic congestion and its resulting impact on travellers' journey experience, road safety, air quality and economy. In this talk, we will focus on Connected and Autonomous Vehicles (CAVs) technology and highlight its potential in enabling safer driving, shorter journey times and lower CO2 emissions. We focus on CAVs because this technology has recently attracted a lot of attention from major automakers (e.g., BMW and Toyota) as well as tech giants like Google and Uber and some high profile start-up companies. They are all striving to develop the required technological advances that will power autonomous vehicles and enable their connectivity on the roads.

Yann Ben Maissa

National Institute of Posts and Telecommunications, Morocco

Since 2014, Yann Ben Maissa is a Professor in Computer Science at the Institut National des Postes et Télécommunications (INPT). He is a member of the "Laboratoire de Recherche en Systèmes, Télécommunications, Réseaux et Services" and associate member of the "Laboratoire de Recherche en Informatique et Télécommunications" from the Mohammed V University in Rabat.

Before that, he earned (2013) his Ph.D. in Computer Science, Telecommunications and Electronics from the Université Pierre et Marie Curie - Paris 6 Sorbonne Universités (First Class Honors).

Yann Ben Maissa teaches services engineering, next generation networks, multi-platform mobile application development, and software V&V (Verification and Validation) of embedded systems at the National Institute of Posts and Telecommunications and Mohammed V University in Rabat.

He has multiple publications in international conferences and journals, initiated and provided expertise to many national and international projects (e.g., in biomedical sensor networking, military imagery, smart agriculture, smart grids). He is also a reviewer in top tier conferences and journals (e.g., Ad Hoc Networks - Elsevier).

His research themes are wireless sensor networks, formal verification and validation of embedded systems and model driven engineering.

A low Cost Robust Prototype for Vehicle Geolocation in a Smart City

A smart city is a designation given to a city that incorporates information and communication technologies (ICT) to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs. Part of what makes a city smart is fleet (e.g., taxis, ambulances, police cars) management solutions. Current fleet management solutions rely on real time vehicle information, especially geolocation to efficiently solve transportation problems.

However real time geolocation is costly and often prone to errors, when there is no more GPS signal for example, because of vehicles crossing tunnels or urban canyons. In this presentation, I will propose a novel technique and prototype for low cost real time robust geolocation. The idea is to use a special type of predictor (Kalman Filter) combined with low cost sensors to estimate the position of a vehicle when there is no GPS signal. To correct the divergence of the Kalman Filter, machine learning techniques are used. The technique offers up to 90 % improvement compared to a Kalman Filter alone. A prototype is currently being implemented using Arduino Xbee modules and a Raspberry Pi.

SESSION VI:
SECURITY AND SAFETY IN SMART CITIES

Said El Hajji

Mohammed V University, Morocco

Said El Hajji is Professor at the Faculty of Sciences, Mohammed V University in Rabat, Morocco. He is the Director of the Laboratory of Mathematics, Computing and Applications – Information Security (LabMiA-SI), and the responsible of the Master Cryptography and Information Security (CSI). His main research interests include modeling and numerical simulations, security in networked and information systems.

A Flexible Smart Framework on IoT for Preserving Privacy

Internet of things (IoT) can be considered as the culmination of the development of internet technologies. It presents a new technology, which permits to relay processes, people and objects. Wireless sensor networks (WSNs) present the main components in IoT architectures and extend the spectrum of its applications. WSNs are essentially composed of sensors that have limited resources and suffer from several vulnerabilities and security breaches. In addition, wireless networks are deployed in open environments, creating security breaches and challenges for administrators in term of security and quality of service. Encryption can be a good solution to preserve confidentiality and privacy but it raises serious problems concerning time latency and performance. In this presentation I propose a light and an efficient framework that enables preserving confidentiality and privacy and a quick and secure access to collected data by using Blockchain and Cloud Computing services. It is proposed thereafter, an implementation of the framework and a security analysis to proof the efficiency and the correctness of the model.

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El Mamoun Souidi
Mohammed V University, Morocco

El Mamoun Souidi Professor in Faculty of Sciences and founding member of the Laboratory of Mathematics, Computing and Applications, Mohammed V University in Rabat, Morocco. He received his Ph.D. degree in Mathematics and Computer Sciences from the Mohammed V University in Rabat and the Habilitation to Direct theses from the same University. His main research interests include code, cryptology and information systems security.

The (In)security of Smart Cities

Antoni Martínez Ballesté
Rovira i Virgili University, Spain

Antoni Martínez Ballesté is Associate Professor at the Department of Computer Engineering and Mathematics at the Rovira i Virgili University (URV), Spain (since 2003). He obtained his Engineer degree in Computer Science and Technology (URV, 2002) and Ph.D. in Telematics Engineering (Universitat Politècnica de Catalunya, 2004). He is a specialist in the European Higher Education Space (URV, 2006) and Head of studies at URV's Technical School of Engineering (2006-2017). Since 2003, he is Consultant teacher at the Universitat Oberta de Catalunya. Since 2014, he is Senior Researcher in the Smart Health research group on the application of Information and Communication Technologies to health, health care and quality of life. Antoni Martínez Ballesté is Visiting Professor at Shanghai Maritime University (Sept. 2018) and was Visiting Researcher at LAAS-CNRS, Toulouse, France. He authored more than 80 scientific contributions, including ISI JCR journals, conference contributions and book chapters. He is the editor of several books on his research areas. Antoni is member of the IEEE and has taken part in a number research and technology transfer projects at national and international levels, some of them as principal investigator.

Privacy in Smart Cities

Smart cities were born with the aim to provide citizens with a better place to live. Founded on the use of Information and Communication Technologies, these cities aim at tackling many local problems, from transportation and power management to quality of life and e-governance. Although technology helps to solve many of these problems, its ability of gathering unprecedented amounts of information could endanger the privacy of the citizens. In this talk we identify a number of privacy breaches that can appear within the context of smart cities and their services. We define each outstanding privacy-related issue and we show how existing Privacy Enhancing Technologies could be used to preserve the so-called Citizens Privacy.

SESSION VII:
TECHNICAL CONTRIBUTIONS AND MISCELLANEOUS

Abdelouahid Lyhyaoui
L'Ecole Nationale des Sciences Appliquées de Tanger & Abdelmalek Essaadi University, Morocco

Abdelouahid Lyhyaoui received the M.S. degree from the Polytechnic University of Madrid, Spain, in 1997 and the Ph.D. degree from Carlos III University of Madrid, Spain, in 1999. Currently, he is a full Professor in the Electrical and Industrial Engineering Department, and Director of the Innovative Technologies Laboratory, at the National School of Applied Sciences, Abdelmalek Essaadi University.
His research interests include intelligent systems, neural networks, machine learning, data mining and knowledge discovery. His Specific research areas of current interest include the participation in the development of a Sustainable Mobility Plan, and WSN for smart cities.
From 2001 to 2003, he has been a Visiting Professor at Carlos III University, in Signal Theory and Communications Department. In 2010 and 2011 he was an Invited Professor at LIPN Laboratory, Paris 13 University.

Some Scientific Contributions to Develop Tangier as a Smart City

A particular focus has been put on the development of Tangier since the enthronement of HM King Mohammed VI in the late 90s, stressing Morocco's strong political will to create an economic dynamic space in the north of the country. Thanks to the large-scale projects achieved, Tangier has become the second economic hub of the country, after Casablanca. Approximately 100 million Euros were spent in 2000s on road and railroad infrastructure, and soon Tangier will be linked to Casablanca by TGV, the first of its kind in Africa.
Since 2007, "Tanger Med", Tangier's Mediterranean port, has emerged to rival the greatest ports of the region, and has made of the north of Morocco a strategic crossroads of maritime exchange. In addition to that, Tangier has seen the creation of a free zone receiving a large number of companies

engaged in different activities and especially the automotive sector, which has been strengthened by the implementation of the Renault plant in Melloussa.
On the other hand, during the last decade, the Tangier-Metropolis program was elaborated to be an unprecedented urban model in Morocco in the southern shore of the Mediterranean. The development plan spun over five years (2013-2017) and is totaling 7.663 billion dirhams of investment.
The changes taking places in Tangier can greatly benefit from the research carried out in the field of Information Technology (IT) which has so far been the biggest enabler of worldwide businesses by automating, accelerating and increasing business processes. IT brings pragmatic contributions to the empowerment of people to operate day to day effectively. This led to the emergence of many types of smart environments, such as smart homes, hotels, hospitals, and so on.
Technologies are gaining tremendously in both the market and intellectual activities because of their approach centered on people leading directly or indirectly to the formation of the overall concept of smart cities to meet the various needs of their residents.
The purpose of this presentation will therefore be to highlight the contribution of research results in the field of IT in improving the services the city of Tangier can offer as, a smart city in various sectors such as the environment, public transport and communication in Wireless Sensor Networks (WSN).

Cherif Zizoua

Research Centre on Scientific and Technical Information, Algeria

Cherif Zizoua received the bachelor, Master and the Ph.D. degree in Electronic Engineering from the University of Science and Technology USTHB Algiers, Algeria, respectively in 2010, 2012 and 2017. From 2015 to 2017, he pursued a research internship in Rehabilitation Engineering Chair Applied to Pediatrics of École Polytechnique de Montréal with the collaboration of CRME–Ste-Justine University Hospital Center. Currently, he is a Permanent Researcher at the CERIST research center in Algiers, where he is working on the smart building project with the Wireless Sensor Networks & Applications (WSN) group, and Teaching Assistant at the University of Science and Technology USTHB. His research interests focus on sensors and measurement; include biomedical engineering, programming of embedded systems, the development of miniaturized low power consumption electronic circuits and applications in Wireless Sensor System.

Sensors for Patient Movements Monitoring

Advances in new biomedical detection technologies enable the development of several new detection methods and facilitate the integration and installation of new medical sensors in smart cities. The presentation will discuss two methods of detection; i) using sensors that can be installed on the human body, “BSN” body sensor networks, ii) the possibility to integrate the maximum of non-medical sensors like PIR sensors in the healthcare. The objective is to have a real-time monitoring system via IoT connected devices, it can save lives in case of medical emergency, such as heart failure, diabetes, asthma attacks, etc.
The presentation will also focus on recent advances in the development of highly flexible, stretchable and tattoo electrochemical sensors. At last, we will describe the use of a strain gauge as a skin deformation sensor. In addition to that, we will illustrate its mechanical behavior with experiments that carried out in the laboratory.

Workshop Organizers:

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