

JUNE 16-17, 2014, BOSTON, USA





HUMANKIND IN HARMONY WITH NATURE THROUGH WISE USE OF TECHNOLOGY



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Greetings From Conference Chairs

From General Chair, Professor Berthold K. P. Horn:



It is great to see all of you here at the International Conference on Universal Village.

We live at a unique time in history where, on the one hand, marvelous new technology is available, and on the other hand, great societal needs have arisen. The new technology comes in part from the maturation of computer hardware and software and in part from better understanding and modeling of the physical processes underlying systems interactions particularly those of a living community.

In some cases, we even have the unique opportunity to "start from scratch" in that, with rapid growth in some of the developing world, it is possible to actually design communities and the underlying infra-structure to better suit the modern world.

At MIT, we have a diverse set of efforts addressing different aspects relevant here today, including intelligent traffic research and work on machine vision, my own specialty. But there is much more to this topic and we will hear about that in the next two days.

But I won't take any more of your time since I am sure you are eager to hear the technical presentations, as I am, since that, after all, is why we are all here.

From General Chair, Dr. Ichiro Masaki:



Welcome to the International Conference on Universal Village. Universal Village (UV) is a desired future society which provides their residents with sustainable happiness. In order to develop UV, we take a top-down or, in other words, system-oriented approach instead

of a bottom-up or element-oriented approach. In the development process, a higher-level objective such as sustainable happiness of the residents defines lower-level objectives including environment protection, energy management, communication, healthcare, transportation, and other related systems. Feedback from the bottom to the top is also important in this integration and collaboration. I hope this conference stimulates various kinds of collaborations.

At the end of my greeting, I would like to say "Congratulations!" to everyone who contributed to starting up this conference. Please enjoy the conference. Thank you very much!

From Local Chair, Lionel C. Kimerling:



We meet to envision the future of our life on this planet. It is clear to each of us that our common ecosystem, as it exists today, cannot support the global security and economic parity that embodies that vision. Our envisioned world is a system built on the unity of our existence and comprised of a variety of solutions that are organically linked and constantly adapting to new realities. We can differ in the political will that sets regional priorities, but as the chief engineers with the responsibility to construct that world, we must recognize that UV 2014 is a critical feedback element that enables our common vision to be achieved and to be sustained.



We come here today from around the world for a common purpose: to make life better on this planet, this universal village that we all call home. Humans today face a host of serious problems that threaten the quality of our life and the lives of our children and grandchildren, problems like global warming, the energy crisis and the pollution of our earth and our environment. We are all residents of the Earth; therefore, no matter which country we live in, what language we speak, what kind of political views we hold and which religion we believe in, we all share in the fate of our world and we are all equally responsible for tackling these problems that we face. This is why today we are gathered here today, at the Massachusetts Institute of Technology, at UV2014.

- We are here to exchange our research results and experiences;
- We are here to discuss the issues we have come across in our research efforts and to collectively find potential solutions and pose new questions
- We are here to discuss how we can make this world a better place through innovation, technology and the endless human capacity for learning and discovery

I wish us all success in these ambitious endeavors!

Thank you very much for attending UV2014! It is you who made UV2014 happen today! It is you who will make UV2014 successful tomorrow! Because you care, our "Universal Village" has a chance for a brighter future!

From Program Chair, Dr. Yajun Fang:



I would like to express my warmest welcome to all attendees to the Second International Universal Village Conference, UV2014. I would also extend my sincere thanks to our host, Massachusetts Institute of Technology and all supporters of UV2014 during the conference preparation in the past year.

As you all have known, human being has been making great stride in modern technology. Today it is very common to see "smart" or "intelligent" word added to household items to infrastructure, which reflects people's desire for smartness or intelligence. In the meantime, Mother Nature has been enduring the footprint left by the evolution of human society. The challenge is how to achieve harmony between human and nature so that sustainable happiness maybe realized for all communitymembers.

The concept of "Universal Village (UV)" is proposed as a possible solution to the challenge. UV comprises the following aspects: multi-functional multi-format communities and a new life style incorporating the ideal mixture of city and suburban areas. This new concept is need-based, human-oriented and nature-oriented. A systematic top-down design approach is necessary to in this new paradigm. Modern technology will be wisely used to satisfy the needs from human and nature. It is essential to investigate the integration and dynamic interactions among different components of future development and the dynamic impact of sub-components on the system as a whole. During the process, there will be the development of key intelligent technologies that may bring true intelligence to the future urbanization and the development of UV.

This conference has experts from different fields. Through the conference, new ideas for UV may be born through the interaction among the experts. I hope everyone will enjoy UV2014 and have a good time in Boston, USA.

From Publication Chair, Yasunori Kimura:



On behalf of Fujitsu, I would like to welcome you to the Universal Village Conference. I am Yasunori Kimura, president & CEO of Fujitsu Laboratories of America.

As a global ICT leader, the Fujitsu Group actively thinks about its social responsibility to use the power of ICT to contribute to the realization of a sustainable earth and society, and to maintain and strengthen the safety and security of digital society. To this end we have put forth a vision of a "Human Centric Intelligent Society" in which the potential of everyone will be maximized through ICT, and society will develop along a sustainable path. Working together with others, we use the power of ICT to create social innovation that will give rise to solutions in the fields of energy, transportation, food, health, the environment, and education.

We believe that conferences such as the Universal Village 2014 are core to expanding our understanding of the social issues facing humanity today and they provide a forum for dialogue and creation of practical solutions that can be applied on the ground. We are proud to sponsor this conference and be part of the Universal Village family.

Vision, Mission, & Actions of UV Program @ MIT ITRC

Vision: human-oriented sustainable community and new life style incorporating the ideal mixture of city and suburban.

Mission: use a systematic top-down design approach to improve quality of life and environment.

Actions

- Promote a systematic top-down design approach to develop sustainable and harmonious communities between human and nature;
- Explore the key technologies that may bring true intelligence to the future UV and the impact of the new vision on life style, economics, and future society;
- Investigate the integration and dynamic interactions among different subsystems of communities and their dynamic impacts on the whole system;
- Embrace the regional/culture factors and their impacts on regional development paths and key technologies appropriate for different countries/regions.

Open invitation letter

On behalf of the Organization Committee of the International Conference on Universal Village 2014(UV2014), we are writing to invite you to attend UV2014 and its exhibition hosted at MIT on June 16-17th 2014.

Newly proposed by MIT, Universal Village exemplifies a desired future society that pursues human-nature harmony through the wise use of technologies. The concept is an expanded & advanced version of Smart Cities and signifies that we should follow the law of universe, protect environment/eco-system, understand humans' need in depth, and innovate new lifestyles. UV2014 calls for collective effort from multi-disciplinary fields in order to find a systematic, coordinated, long-term solution for environmental challenges, and innovative technologies to create sustainable happiness to residents of the society. UV2014 will convey the following themes and special sessions to explore different aspects of future technologies life, including:

- 1) Green energy sources,
- 2) New technologies for environmental protection,
- 3) Innovative technologies that support new life styles on intelligent healthcare, intelligent transportation, city management, future music/art, remote education, etc.
- 4) Integrated solutions on urgent challenges on safety, security, privacy, climate changes, etc.

We would be extremely grateful if you would share your great vision at UV2014. We sincerely hope that you will accept this invitation. Please feel free to contact us at <u>MIT.UV.Program@universal-village.org</u>.

Thank you very much for your kind consideration.

Sincerely yours,

UV2014 Organization Committee

Program at a glance

Day 1: Single Sessions @MIT Marriott, Salon III

8:00am-8:15am	Registration				
8:15am-9:00am	Opening Ceremony				
8:55am-9:15am	Keynote Opening Speech by Felix Moesner, Swissnex Boston,				
Consulate of Switze	erland				
9:15am-1pm	Single Sessions				
1pm-2pm	Lunch @ Exhibition area in MIT Stata Center				
2pm-6:40pm	Single Sessions				
6:40pm-7:10pm	Networking				
7:10pm-9:30pm	Dinner Banquet				
8:00pm-8:30pm	Keynote Banquet Speech by Peter Olu Jack (Director General,				
Nigeria NITDA), ICT, Capacity Building and Community Development in Nigeria as an					
approach towards Conflict Resolution and Peace					

8: 30pm-9: 30pm Concert

Day 2: Parallel Sessions @ MIT Marriott/ MIT Stata Center

8:00am-8:30am Single Session @ Site A: Highlight of UV Case Studies 8:35am-12:25pm Parallel Sessions @ Site A/B/C/D

- 8:35am-12:25pm Site A: 1. Case Studies of Universal Village. 2. Green Energy
- 8:45am-11:45am Site B: Intelligent Healthcare
- 8:45am-11:45am Site C: UV new life style
- 10:30am-12:30pm Site D: New life style: Future Music & Art

11:45am-1:30pm Lunch

12:15pm-1:30pm Performance from "Future Music" session @ Site B

1pm-5:05pm Parallel Sessions @ Site A/B/C

- 1:15pm-5:05pm Site A: 1. Robotics & Universal Village 2. Robotics & Therapy
- 1pm-3:05pm Site B: Data Processing & Platform Supporting

 1:00pm-5:05pm Site C: Environmental Protection / Integrated Solutions for challenges.

5:20pm-6:10pmPanel Discussion: Quality of Life / Environmental Sustainability6:10pm-6:25pmClosing Ceremony

Program Deails

Relevant Sites for Day 1:

- 1. Presentation Site A: MIT Marriott, Salon III
- 2. Lunch Area: MIT Stata Center, 1st floor, G-tower
- 3. Exhibition Area: MIT Stata Center, 1st floor, G-tower
- 4. Dinner Banquet Area: MIT Marriott, Salon IV
- 5. Concert Area: MIT Marriott, Salon IV

Program details for Day 1:

- 8am-8:15am Registration
- 8:15am-9:00am Opening Ceremony
- 9:00am-9:15am Zero Power Smart Systems for healthcare and environmental monitoring by Felix Moesner, Swissnex Boston, Consulate of Switzerland
- 9:15am-9:45am Universal Village
- 9:45am-10:15am Achieving Human-Centric Intelligent Society through Smart Energy Technologies, Yasunori Kimura, Fujitsu Laboratory of America, USA
- Break: 5minutes
- 10:20am-11:00am Trends in Autonomous Driving Technology, Alverto Broggi, IEEE ITSS
- 11:00am-11:30am OLEV technology by Nam P. Suh (KAIST/MIT)
- 11:30am-12:00pm A Wireless Intermediate-range Scheme for Energy and Signal Transmission (WISEST) for Medical Implantable Devices with Significantly Reduced Coil Voltage by Sai Chun Tang (Harvard)
- 12:00pm-12:30pm Humanoid Robotics, and History and Culture of Japan by Atsuo Takanishi

 12:30pm-1:00pm Charlie Sodini, Revolutionizing Medical Device Design, MIT MEDRC Medical Electronic Device Research Center, USA

Break: 60minutes Lunch

- 2pm-2:30pm Green Energy by Yasha Yi (MIT Photonics/U. of Michigan)
- 2:30pm-3:00pm New business for environment, Ken Isono
- 3:00pm-3:30pm Nitride Semiconductors and their applications to Solid State lighting and Water/Air purification, Theodore D. Moustakas, BU

Break: 5 minutes

- 3:35pm-4:05pm Assistive technology for people with disabilities: The power of user-centered design, Seth Teller & William Li, MIT
- 4:05pm-4:35pm Impact of new biomedical technologies and sensors on human health and well-being by Pratik Shah(MIT Broad Institute)
- 4:35pm-5:05pm Components of Ideal Healthcare At a Glance by Min sheng Yuan (Medical and Research Information Consult)
- 5:05pm-5:35pm Universal Village & Public Health by Jing Ma (Harvard)

Break: 5 minutes

- 5:40pm-6:10pm Planning Universal Village in China: Policy Prospect on Mobility Management, Jinhua Zhao, MIT, USA
- 6:10pm-6:40pm Smart Cities in China by Zhang Xiong (Beihang U.)
- 6:40pm-7:10pm Networking
- 7:10pm-9:30pm Banquet
- 8:00pm-8:30pm Banquet Speech: *ICT, Capacity Building and Community Development in Nigeria* by Peter Olu Jack (Director General, Nigeria NITDA)

• 8:30pm-9:30pm Concert

Relevant Sites for Day 2:

- 1. Presentation Site A: MIT Marriott, Salon III
- 2. Presentation Site B: MIT Stata Center, Patil-Kiva Room, G449
- 3. Presentation Site C: MIT Stata Center, Star Room, D463
- 4. Presentation Site D: MIT Stata Center, Hewlett Room, G882
- 5. Lunch Area: MIT Stata Center, 1st floor, G-tower
- 6. Exhibition Area: MIT Stata Center, 1st floor, G-tower
- 7. Performance Area: MIT Stata Center, G882 4th floor, R&D Faculty Dining Area
- 8. Appreciation Dinner: 73 Guggins Ln / Boxborough, MA

Program details for Day 2: Site A: MIT Marriott, Salon III

- 8:00am-8:30am Highlight of UV Case Studies by Naohiko Kohtake (Keio U.)
- 8:35am-10:20am Case Studies of Universal Village. Session chair: Naohiko Kohtake
- 8:35am-9:05am Keynote: UV Case Study: / Yokohama City (+Sun city), Yok ohama Smart Community: "Project which thinks about sustainable future living," Toshihiko Tsutsui, Dspace
- 9:05am-9:30am UV Case Study: / Miyako City, Post Earthquake Reconstruction Scheme for Smarter Approaches – Challenges of MiyakoCity using Hydrogen from Biomass, Yuriko lida, Keio U.
- 9:30am-9:55am UV Case Study: / Dubuque City, The Dubuque Smarter Discard Portal: Tracking Changes in Residential Waste Diversion, Heather Achilles, IBM

• 9: 55am-10:20am UV Case Study: / Malaysia, An eco city development project with special consideration for harmonious coexistence of human, nature and microbiome, in Malaysia, Masaki Shintani, EM Research Organization

Break: 5 minutes

- 10:25am-12:25pm UV Green Energy. Session chair: Yasha Yi (U. of Michigan-Dearborn)
- 10:25am-10:55am Nuclear Power as a Clean Energy: the Reality and Challenges, Luming Wang, University of Michigan
- 10:55am-11:25am *Hydrogen fuel cells and applications in universal village*, Tim Cheng, Vancouer Clean Energy and Advanced Materials Technology, Co.
- 11:25am-11:50am Solar electricity: High efficiency solutions, L C. Kimerling
 and B. Albert, MIT
- 11:50am-12:05pm The future of LED lighting, Michael Chen, MIT
- 12:05pm-12:25pm Singlet Fission for Solar Cell Application, Tony Wu, MIT

Break: 50minutes Lunch

1:15pm-5:05pm Robotics & Future Universal Village

Special Session 1: Robotics & UV. Session chair: Makoto

Mizukawa

- 1:15pm-1:40pm Naoyuki Kubota (Tokyo Metropolitan U.)
- 1:40pm-2:05pm Toshio Hori (Japan Digital Human Research Center)
- 2:05pm-2:30pm Koji Kamei (Japan Advanced Telecommunications Research Institute)
- 2:30pm-2:55pm Yumeko Imamura (Hokkaido U.)
- 2:55pm-3:20pm Takashi Kusaka (Hokkaido U.)

Break: 5minutes

• 3:25pm-3:50pm Keynote: Makoto Mizukawa (Shibaura Inst. of Tech)

Special Session 2: Robot Therapy. Session chair: Toshimitsu Hamada

- 3:50pm-4:15pm Toshimitsu Hamada(Tsukuba Gakuin U.)
- 4:15pm-4:40pm Ryuhei Kimura(Teikyo Univ. of Sci. and Tech.)
- 4:40pm-5:05pm Barbara Klein(U. of Applied Sciences)

Break: 15minutes

5:20pm-6:10pm Panel Discussion: Quality of Life / Environmental Sustainability. Moderator: Naohiko Kohtake (Tentative)

Site B: MIT Stata Center, Patil-Kiva Room, G449

8:45am-11:45am Intelligent Healthcare. Session chair: John Hu (Hstar)

- 8:45am-9:10am The da Vinci and Beyond: the Advancement of Surgical Robotics, Samuel K. Au, Intuitive Surgcal, USA
- 9:10am-9:35am Technology for monitoring patients with epilepsy in the home and beyond new approaches, Steve Schachter, Harvard/ MGH, USA
- 9:35am-10:00am Putting Paro in Place: The Meaning of Human-Robot
 Interaction in Danish Care Institutions, Shawn Bender, Dickinson College, USA
- 10:00am-10:25am The Doctor will visit you at home: How wearable technology is changing healthcare, Paolo Bonato, Harvard Medical School, MGH, USA
- Break: 5 minutes

- 10:30am-10:55am *Towards Developing a Smart Kitchen for Cognitive and Physical Assistance,* Dan Ding, U. of Pittsburgh, USA
- 10:55am-11:20am User Participatory Design: A Design Framework for Assistive Robotic Devices, Hongwu Wang, Human Engineering Research Laboratories, USA
- 11:20am-11:45am Robotic Avatar for Future Healthcare in an Intelligent Urban District, John Hu, Hstar Technologies, USA

Break: 75minutes Lunch

1pm-3:05pm Data Processing & Platform Supporting

- 1:00pm-1:25pm OLEV technology: Development of High Power Wireless Charging Technology based on SMFIR and its Application to Bus and Train by Jang (KAIST/MIT)
- 1:25pm-1:50pm Deng.Yong, A novel genetic clustering algorithm with variable-length chromosome representation
- 1:50pm-2:15pm Gengliang Zhu, Mobile Surfing Pattern Analysis over Time and Location on a Large Access Record (Beihang U)
- 2:15pm-2:40pm Zhang Ming-an, A Novel Rath Planning Algorithm for Ship Fire Rescue Based on Spatio-temporal Database
- 2:40pm-3:05pm Juan Blanco Ruiz, Construction Typologies

Site C: MIT Stata Center, Star Room, D463

8:45am-11:20am UV new life style. Session chair: Francisco Bozzano-Barnes

- 8:45am-9:10am *Our Settlement Patterns; Restoration of Harmony between Urban and Rural Environments* by Francisco Bozzano-Barnes
- 9:10am-9:35am Super Energy Efficiency: A broad Based Solution for Many
 Problems by Thomas A. Peterson
- 9:35am-10:00am Rural Planning Towards a Sustainable Energy Future: Integration of Spatial and Energy Planning in Urbanizing China by Jie Yin(Shanghai Total Architectural Design & Urban Planning Co.)
- 10:00am-10:25am New Rural Region in China by Yimin Wen (HUST)
- 10:25am-10:50am Yohji Suhara (Community Technology Institute, Japan)
- 10:50am-11:20am Build-It-Yourself: an online education vision for Universal Village

Break: 100minutes Lunch

1:00pm-5:05pm Environmental Protection / Integrated Solutions for challenges. Session chair: Shuguang Zhang, Mai Nomura, Fei Tao, B. Xiang

- 1:00pm-1:25pm A stable and absolute atmospheric carbon dioxide instrument for air quality, climate change and energy consumption monitoring by B. Xiang (Harvard)
- 1:25pm-1:50pm Boston Column Network: solar-tracking spectrometers for urban air quality by Jia Chen (Harvard)
- 1:50pm-2:15pm Global Warming So What by Gene Fry
- 2:15pm-2:40pm Learning from smart bugs to develop technology, Fei Tao (Shanghai Jiao Tong U.)

- 2:40pm-3:05pm Comprehensive Utilization of Vinasse Biomass Based on Ecological Living Environment by Wei Jiang (Sichuan U.)
- 3:10pm-3:35pm Generation of Electricity Using Novel Gasification Process for Solid Urban Waste in West Africa, Advanced-Technology for Garbage Disposal, Dr. Thomas O. Mensah, Chairman of Lightwave Corporation USA, Green Electricity Concept
- Break: 5 minutes
- 3:40pm-4:05pm Democratization of information and imperatives of sustainable development in Africa: A nexus of people, press, peace, and public policy by Uchenna Ekwo (Center for Media & Peace Initiatives Inc.)
- 4:00pm-4:25pm Masahiko Haraguchi
- 4:25pm-4:50pm Dr. Jose
- 4:50pm-5:05pm Mai Normura

Site D MIT Stata Center, Hewlett Room, G882

10:30am-1:30pm New life style: Future Music & Art. Session chair: Chen Chen Gong (MIT)

- 10:30am-10:55am Chen Chen Gong (MIT)
- 10:55am-11:20am Elizabeth Reian Bennett (Tufts U.)
- 11:20am-11:45am David Fiuczynski (Berklee College of Music)
- 11:45am-12:10pm Greg Ondo Steinberg (North America)
- 12:15pm-1:30pm Performance
- 10:00am-1:30pm New life style: Music & Art. Session chair: Chen Chen Gong (MIT)
- 10:00am-10:30am Elizabeth Reian Bennett (Tufts U.)
- 10:30am-11:00am Chen Chen Gong (MIT)
- 11:00am-11:30am Yazhi Guo (Berklee College of Music)

Break: 15 minutes

- 11:45am-12:30pm David Fiuczynski (Berklee College of Music)
- 12:30pm-1:30pm Greg Ondo Steinberg (North America)

Bio of Invited Speakers

Achilles, Heather

Heather Achilles, IBM Distinguished Engineer, has been in the networking and computing fields for over 25 years. As an early member of three successful start-ups, Alliant Computer, Wellfleet Communications and DataPower Technology, she has developed a broad technical and business background in parallel computing, networking, and web services.

Heather joined IBM in 2005 with the acquisition of DataPower Technology and has worked for the Next Generation Computing Research team since 2008. Her current area of research is focusing on how technology can help optimize the waste/resource management cradle-to-cradle supply chain.

Heather has a BSEE from Worcester Polytechnic Institute and SMEE from Massachusetts Institute of Technology.

Bennett ,Elizabeth Reian



Professor, Tufts University

Elizabeth Reian Bennett is the first woman to be certified a Grand Master of the shakuhachi, which she has studied with Living National Treasure Aoki Reibo for over 30 years. Since her debut recitalin Tokyo in 1984, Reian Bennett has performed in Japan and worldwide, from Australia and Europe to Mexico, Afghanistan and the United States. Tokyo appearances are planned for every other year, notable venues include Tokyo National Theater and NHK TV. She has been interviewed on National Public Radio by Faith Middleton of *Fresh Air*, Robert J. Lurtsema of *Morning Pro Musica* and Richard Knisley of *Classical Performances*. Her CD entitled *Song of the True Hand*, was nominated 'Instrumental Album of the Year' by Jon Sobel at Blogcritics Magazine. She teaches privately in the Boston area and through the world music program at Tuffs University. Reian Bennett's next CD is a set of compositions for the shakuhachi written for her by Tuffs composer John McDonald.

Bozzano-Barnes ,Francisco



Francisco Bozzano-Barnes, is the Founding President and Managing Director of Tenure and Ecology, LLC. He has a BA and an MES and is writing a Ph. D. thesis on Educational Paradigms. Francisco is an ecological economist with a background in sustainable urban and rural development and a focus on land tenure, energy and food production and access. He is associated with other enterprises to develop distance education, modelling and sustainable planning capabilities. Francisco also works with the Center for Media and Peace Initiative as Director of International Projects, which has created a Center for Media and Democratic Governance at Rutgers University.

dynamics on development in urban/rural settings, provides an enriching context to his local activities, which in the last years have been focused on Africa and on Nigeria and West Africa in particular.

Broggi, Alberto



Prof. Alberto Broggi received the Dr. Ing. (Master) degree in Electronic Engineering and the Ph.D. degree in Information Technology both from the Universita` di Parma, Italy. He is now Full Professor at the Universita` di Parma and the President of VisLab, the Artificial Vision and Intelligent Systems Laboratory.

As a pioneer in the use of machine vision for automotive applications and on driverless cars, he authored of more than 150 publications on international scientific journals, book chapters, refered conference proceedings. He served as Editor-in-Chief of the IEEE Transactions on Intelligent Transportation Systems for the term 2004-2008; he served the IEEE Intelligent Transportation Systems Society as President for the term 2010-2011. He is recipient of two ERC (European Research Council) prestigious grants.

Chen, Michael



Michael Chen (PhD Candidate, Department of Chemistry, MIT).

Michael graduated from Chu Kochen Honors College in Zhejiang University with a B.S. in physics. Now he is a Ph.D. Candidate studying computational chemistry at MIT. He has 5 papers published. In 2013, Michael co-founded a clean tech startup, PolymerGreen, which was sold. He is founding a smart LED lighting startup, Belleds Technologies, with MIT alumni. At MIT, Michael was serving the co-president of MIT-China Innovation and Entrepreneurship Forum and the co-president of MIT Chinese Students and Scholars Association. He also has working experiences in IBM China Research Laboratory and China Development Bank, a major state development bank in China.

Cheng,Tim



Have solid professional Materials Science and Engineering background and over 30 years research and engineering working experience in industrial companies, research institutes, and universities in Canada, England, Germany and China. Have worked in automotive fuel cell area in Ballard Power Systems and AFCC (Automotive Fuel Cell Cooperation, owned by Daimler and Ford) as Senior Product Development Engineer and Senior Research Scientist respectively in recent 10 years. Have led and worked on many projects related to design, testing, processing and materials of various automotive PEM fuel cell components and systems leading to 102 internally published technical reports. Was invited to write a Chapter in books of "Proton Exchange Membrane Fuel Cells - Materials Properties and Performance" (2010) and Encyclopedia of Chemical Processing (2012) respectively published all by CRC Press, Taylor & Francis Group. Currently work in part time as Technical Consultant in Vancouver Clean Energy and Advanced Materials Technology Co. The work is mainly focused on fuel cells, integration of renewable energy and related materials & processing after took early

retirement from AFCC in 2013. Contact E-mail: t1cheng602002@gmail.com

Duan ,Xiaoman



Research Scientist Department of Materials Science and Engineering

Dr. Xiaoman Duan is a Research Scientist in the Department of Materials Science and Engineering at MIT. She is also appointed as a "Chang-Jiang Scholar Professor" by the Chinese Ministry of Education and a Visiting Professor by the Chinese Academy of Science. Dr. Duan has been a part of the Department of Materials Science and Engineering at MIT since 1987, as first a joint-training Ph.D. candidate, and later a postdoctoral fellow, research associate and research scientist. Dr. Duan's research interest is micro-structures and micro-photonics of semiconductor materials. Her current scientific activities focus on the frontier of research on high efficiency silicon solar cells. Her team pioneered the research on the development of a new light trapping scheme using textured photonic crystal that can improve thin film solar cell efficiency by more than

50%. This innovative research on high efficiency solar cells was featured in <u>Nature Photonics Research Highlights</u>, <u>Science Daily</u>, Nano Technology, Global Solar Technology, <u>MIT News Office</u> and other media as a significant breakthrough to boost solar cell efficiency.

Fiuczynski ,David



Director, Planet MicroJam Institute Berklee College of Music Professor, Guitar & Ensemble Dept. Band Leader, Screaming Headless Torsos

Iconoclastic and prolific microtonalist, jazz-rock guitarist and RareNoiseRecords artist David 'Fuze' Fiuczynski, a jazz player who "doesn't want to play just jazz," and has been hailed by the world press as an incredibly inventive guitar hero, who continues to deliver with music that is unclassifiable, challenging and invigorating. An innovative musician who has released 10 CD's and a double live DVD; Fuze is best known as the leader of the Screaming Headless Torsos and has played with MeShell Ndegeocello,

Hiromi, Rudresh Mahanthappa, Stewart Copeland and most recently Jack DeJohnette. David was born in the US and raised in Germany. He returned to the US for college, and was awarded a Bachelor of Music degree from the New England Conservatory in 1989 and a Masters in Music in 2008. In recognition of his unique artistry as an instrumentalist, writer and arranger, David is a past nominee for the Herb Alpert/Cal Arts "Genius" Award for outstanding musical achievement and is a current 2011 Guggenheim Fellowship winner. He is also the director of the Planet MicroJam Institute at Berklee College of Music Fuze's recordings are an experimental mix of tradition with modern sounds and rhythms, a m dange of other-worldly sounds: Chinese melodies, Arabic calls to prayer and Indian invocations with Fuze's signature brand of highly funky jams ranging from rocked-out madness to drumn'bass, GoGo to plaintive meditations and moving, emotional ballads topped with Fuze's unique writing, extraordinary soundscapes and passionate soloing. In response to the less than supportive environment for his unusual and uncompromising music in the corporate recording industry, David started a record label, FuzeLicious Morsels, to release his own recordings, with a current catalog of nine CD's and the live DVD. Planet MicroJam is his first CD on RareNoiseRecords. "Ilove painters," says Fiuczynski, director of the Planet MicroJam Institute at Berklee College of Music. "I very much think in colors. That's a big thing for me. I like painters that mix Eastern and Western elements." From American Delta blues to the Arabic call to prayer, Chinese and Moroccan melodies, jazzy improvisations and funkified grooves, Fuze has concocted a tasty non-tempered gumbo on Planet MicroJam.

Gong, Chen Chen



Chen Chen Gong has been a research associate in the Brain and Cognitive Sciences Department, MIT, since 2005. She is a Visiting Professor at Beijing Normal University and an honorary Associate Professor at Hong Kong University.

Chen Chen Gong is a classically trained pianist. She is interested in the effects of early piano learning on the development of the brain and cognitive abilities in children. She developed a method for teaching young children piano and has authored a series of 40 books for piano education. Her method and books are being used for piano instruction in the US and China, and they are also the basis for an international collaborative research project on the effects of early piano education on

cognitive and neural development of kindergarten children, carried out in Beijing.

Guo, Yazhi



Widely known as "THE" best suona player in Asia, Mr. Guo was the winner of the 1998 International Pro Musicis award, and the 2012 Hong Kong Award for Best Artist. A graduate of the Central Conservatory of Music in Beijing, Mr. Guo invented the "Flexible Core of Suona" that solved the problem of suona playing complicated modulations and temporary inflexions, allowing suona to play in orchestras and significantly broadening the expressive force of this instrument. Mr. Guo performed at the official State Banquet in Beijing for visiting President Clinton in 1998, as well as at CCTV and at several largescale solo concerts entitled "GuoYazhi's Wind Music World: Legend of Suona" to a soldout audience at prestigious venues in Hong Kong and China. Mr. Guo is a versatile and charismatic player. Aside from the suona, he can also play many other wind instruments such as pipes, sheng, piccolo, flute, xun (ocarina), cucurbit flute, saxophone and even a leaf from a plant! His musical talent, unique way of interpreting music, and personal charm have established a large following in China, Hong Kong and Taiwan, as well as changing people's attitude towards the suona – thereby inspiring many students to learn this musical instrument while helping promote this traditional instrument to be perceived as "fashionable" and "modern".

In 2012, Guo embarked upon a new journey to continue his musical career. He is studying Jazz at the Berklee School of Music in Boston. Since his arrival, Guo has performed with the Planet MicroJam Institute at the Berklee Performance Center, for the Frank Withey Memorial Scholarship Foundation. He also lectured at Harvard University.

He, Jessica Junyan



Dr. Jessica Junyan HE received her doctoral degree in 2006 from Department of Architecture, the University of Hong Kong. Her Ph.D research topic is *Sustainable Residential Landscaping: A Conceptual Framework and Its application in High Dense Urban Context of Hong Kong.* After graduation, she worked as research assist in HKU, landscape designers in world top architecture firms. Now she is an associate principal landscape designer in Atkins and in charge of sustainable landscape planning projects.

Holding a Ph.D degree in Landscape Architecture and Urban Sustainable Development, Dr. Jessica Junyan He has a comprehensive knowledge in landscape planning and design, botany as well as urban sustainable development. Up to now, she has published many

papers on international conferences and journals. Her conference paper *Classic Chinese Lingnan Garden in Housing in sustainable development -- A Comparative Study in Canton, China* was awarded Best Student Paper in the 2005 World Sustainable Building Conference in Tokyo as the only student from Asia. She also has many successful completed landscape projects in both Hong Kong and Mainland China. In 2012, the Shanghai Songjiang Intercontinental 5 Star Quarry Hotel Landscape Design project, which worked with Atkins architecture department, was awarded the best design project in MIPIM. She is not only creative in design, but also interested in combining design with research. Recently, her project Yunnan Kunming Expo-xingyun Hotel Conceptual Landscape Design was published on EXPO journal and the entire project got the 2012 RIBA International Award from UK.

Jack ,Peter Olu



Peter Olu Jack is the Director General of the National Information Technology Development Agency (NITDA), an organ of the Federal Government with the mandate of regulation and development of information technology in Nigeria. He is a Development Consultant in the areas of Multi-Stakeholder Partnerships (MSPs), Entrepreneurship, Information Technology for National Transformation, Job Creation and Poverty Alleviation.

Mr. Jack was until January 2007 a Technical Assistant to the Director General/CEO of the National Information Technology Development Agency (NITDA), Nigeria (a position he held for seven years). He represented the DG/CEO on several key national committees including the National Committee on Outsourcing, and the Public Service Reform Committee and led the team that wrote Strategic Plan for Economic Sectors of

Nigeria, sponsored by United Nations Economic Commissions for Africa (UNECA). He was also a member of the United Nations Development program (UNDP) consulting team that wrote the Country's Strategy Plan (2007-2011) for Nigeria, representing the National Information Technology Development Agency (NITDA). He set up the National Cisco Networking Academy Program in Nigeria. Mr. Jack designed and implemented the Niger Delta Youth Computer training Program for Niger Delta Development Commission (NDDC) in 2003.

He is a Government Research Fellow of the United Nations University at Macau, China and a Research Fellow of the Columbia University Centre for International Conflict Resolution. He is currently a PhD Candidate at Seoul National University, Seoul, South Korea.

He has written and presented papers in diversed areas of information technology and development at various fora within and outside Nigeria. He is keen on new developments in Information Technology, Nanotechnology, Bio-Technology, Banking, Entrepreneurship, Education and Oil and Gas Technology.

Kimerling, Lionel C.



Lionel C. Kimerling is the Thomas Lord Professor of Materials Science and Engineering at MIT. He is the founding Director of the MIT Microphotonics Center where he conducts an active research program in the design and processing of semiconductor materials and devices. He was Head of the Materials Physics Research Department at AT &T Bell Laboratories, when he joined the faculty of MIT as Professor in 1990. He has authored more than 350 technical articles and more than 50 patents. He leads the MIT - Industry team of the Communication Technology Roadmap

Kimura, Yasunori



Klein, Barbara

President and CEO, Fujitsu Laboratories of America, Inc.

Mr. Kimura joined Fujitsu Limited in 1981. Throughout his career, he has been engaged primarily in computer system design and development. Some of the projects he contributed to include: the development of a compiler for parallel inference machines used on the Japanese fifth generation computer system, energy efficient server systems, and supercomputers. He spent a summer at Stanford University as a visiting scholar in 1995, and served as a visiting professor at the University of Tokyo for four years from 2002. Mr. Kimura transferred to Fujitsu Laboratories of America in November, 2009, and in 2011, was appointed as president & CEO. His personal interests include reading and walking.



Barbara Klein is professor for organization and management in social work at the Fachhochschule Frankfurt am Main – University of Applied Sciences in Germany (FH FFM) and Visiting Professor at Northumbria University in Newcastle, UK. Her research focusses on assistive technologies and service development in the healthcare sector. She developed and implemented an independent living center displaying assistive technologies such as innovative light concepts, sensor-based assistive devices and emotional and social robots. For that she is currently conceptualizing and generating cross media-contents. The Independent Living Centre was honored by the Hesse National Award for Universal Design Recognition (Hessischer Staatspreis für Universelles Design Anerkennung). Barbara studied at universities in Mainz, Frankfurt and London and graduated as Dipl.-Soz. at the Goethe-University in Frankfurt in 1984. Here she completed her doctorate (Dr. phil) in 1994. More than 20 years Barbara worked at the Fraunhofer Society, Europe 's largest applied research institution. From 1994-1995 she had a Marie-Curie scholarship and did research and lecturing on quality assurance in the nursing

care sector at the University of Stirling, UK. Coming back to Germany she established a market focus unit "Public Health" at the Fraunhofer IAO. Since 2007 she is professor at the FH FFM and was vice dean from 2009-2012. Currently Barbara establishes a network on emotional and social robotics in order to generate and share knowledge on application fields and effects on well-being and quality of life.

KOHTAKE, Naohiko

Ph.D. Associate Professor, Graduate School of SDM, Keio University

Naohiko Kohtake is an associate professor and current director of Smart System Design Laboratory (<u>http://www.ssdlab.org/</u>) at Keio University where he is responsible for space system engineering and intelligent systems. He has worked in research and development on avionics systems for the H-IIA rocket at Japan Aerospace Exploration Agency, ubiquitous computing systems at Keio University, and on-board software at European Space Agency. He was a visiting researcher of user interfaces at Sony Computer Science Laboratories and an associated senior engineer at Digital Innovation Center in Japan Aerospace Exploration Agency working on software independent verification and validation



Masaki, Ichiro

Ichiro Masaki joined the Senior research staff at MIT in 1993 and is currently the Director of the Intelligent Transportation Research Center at MIT's Microsystems Technology Labs where they are trying to integrate multiple aspects of intelligent transportation systems. He is the founding Chair of IEEE Intelligent Vehicl His principal fields of expertise are microsystems, machine vision, and intelligent transportation systems. Ph.D serves as Board Observer of Smal Camera Technologies. Dr. Masaki is a Co-founder of Smal Camera Technologies

Mensah, Thomas



Chairman and CEO of Lightwave Corporation USA.

for satellites and the international space station.

Dr. Thomas Mensah, is Chairman and CEO of Lightwave Corporation USA a leader in Large Scale infrastructure Development projects on the Continent of Africa. He is one of the four original inventors of Fiber Optics in the United States, and was awarded 7 pioneering patents in Fiber Optics in six years. He worked at Corning Glass Works and at AT&T Bell laboratories. He has served on the MIT visiting committee in Chemical Engineering, and received his Ph. D in Chemical Engineering from Montpelier University in France, and a post graduate certificate in modeling and simulation of Chemical Processes at MIT. He is a Fellow of AIChE and Associate Fellow of the American Institute of Aeronautics and Astronautics), and serves as Chairman of the Scientific Council for the United Nations Energy Forum. He is the

recipient of many awards including the Percy Julian Award, Golden Torch Award from NSBE, AIChE Eminent Engineer Award, Turner Trumpet Award, and was named member of the AIChE 100 in 2008. He is the author of many publications and three books including Fiber Optics Engineering.

MIZUKAWA, Makoto



Dean, College of Engineering, Professor Department of Electrical Engineering, College of Engineering, Shibaura Institute of Technology 1987 Received DE from Waseda University

Currently serving as Chair of the ORiN Forum (<u>http://www.orin.jp/</u>) Working Robotics Software Standardization in Robotics DTF of OMG(Object Management Group) as well as an Expert in ISO TC184-SC2. 1. De-facto Standard API for Open and Networked Industrial Robots", Proc. 30th International Symposium on Robotics (ISR), pp. 455-462, 1999 2. Robot Technology Ontology Targeting Robot Technology Services in Kukanchi "Interactive Human-Space Design and Intelligence", Journal of Robotics and Mechatronics, Vol.21 No.4, pp 489-497, JSME RMD, Fuji Publishing, 2009 3. Trung Ngo Lam, Haeyeon Lee, Makoto Mizukawa, Automatic Building Robot Technology Ontology Based on Basic-Level Knowledge Network, Journal of Robotics and Mechatronics, Vol.23 No.4 pp. 515-522, 2010 4. Mohd Azizi Abdul Rahman and Makoto Mizukawa, Model-based development and simulation for robotic systems with SysML, Simulink and Simscape profiles, International Journal of Advanced Robotic Systems (IJARS), vol.10(112), pp. 1-12, 2013

Moustakas, Theodore D.



Dr. Moustakas received his PhD from Columbia University. The research towards his thesis was conducted at IBM T. J. Watson Research Laboratories. He held research positions at Harvard University and Exxon Corporate Research Laboratory prior to joining Boston University in 1987 as a Professor of Electrical and Computer Engineering. He is also a Professor of Physics and Associate Head of the Division of Materials Science and Engineering.

Dr. Moustakas' research contributions cover a broad spectrum of topics in optoelectronic materials and devices, including nitride semiconductors, amorphous semiconductors, III-V compounds, diamond thin films and metallic multi-layers. Intellectual property that resulted from his work has been licensed to a number of companies, including major manufacturers and users of blue LEDs and lasers

Dr. Moustakas is a Fellow of the American Physical Society, the Electrochemical

Society and the IEEE. He holds an honorary doctoral degree from the Aristotle University; he received the MBE Innovator Award in 2010 and the Distinguished Scholar Award from the BU College of Engineering in 2011. In 2012 he was elected a Charter Fellow of the National Academy of Inventors and in 2013 he received the Boston University Innovator of the Year Award.

Ondo, Greg



Field Marketing Manager, Steinberg, North America

Greg Ondo is the Field Marketing Manager for Steinberg North America and has done over 2,000 seminars on music technology. He has worked with many high profile clients including NPR, Electronic Arts, Hans Zimmer, Stevie Wonder, Peter Frampton, Grandmaster Flash and Phil Ramone. Greg Ondo has worked on many projects and was awarded a prestigious TEC award for his audio engineering on Eric Clapton's Crossroads Guitar Festival DVD. He graduated James Madison University with a Bachelor of Music Industry where he was also an accomplished bassist. Thomas A. Peterson has a diverse and unique background that has provided him with a wide base of knowledge that enables him to speak in

broad terms about energy efficiency housing matters. He is a native New Englander, who now resides in Southern Maine. He earned a BSBA in Business Management from U. Mass. – Dartmouth in 1971 and an MBA in Marketing from Tulane University – New Orleans in 1973.Beyond academics he did marketing research for five years for several Northeast retailers providing detailed written and oral presentations to top management. He became interested in solar energy in 1975 affer the first "energy crisis". In 1979, affer the second "energy crisis", he started his own company, Solar Design & Construction. Thus, began his career in researching, designing, building, and promoting active and passive solar homes as well as increasingly energy efficient homes in Southern Maine. Cost containment for his designs was always a top priority. Initially paralleling his construction career, he began teaching Marketing and Management courses at SL Joseph's College in Windham, Maine then at the University of Southern Maine in the Portland area. As a college professor, he honed his oral presentation skills. In addition, he also developed and presented Marketing Export Seminars for Canadian Federal and Provincial Governments for experienced businesses in the Provinces of New Brunswick & Nova Scotia.

Peterson ,Thomas A.



As his knowledge of solar and energy efficient housing expanded, he wrote pamphlets for his company and conducted seminars at home shows, in addition to writing newspaper articles. After years of developing highly energy efficient passive solar homes, he realized that the homes that he now designed and built used 75% less energy for heating and cooling than standard built energy efficient homes built to minimum codes. To differentiate his housing concepts from those of standard Energy Efficient (EE) homes, he designated his homes as being Super Energy Efficient (SEE for short). To promote his SEE homes, he researched the cost of ownership for such homes as well as information on government and mortgage programs that were available. Once amassed, he was amazed at how compelling an argument could be made for building every new or converting every existing home to SEE standards. Energy dollar savings could cover the cost of financing

SEE insulation upgrades for all new homes and for most existing homes. Realizing that no one else had ever compiled these facts in one place, prompted him to author his first book in 2012, "SEE" The EMPOWERING Energy Solution. Written as a "consumer" book, its intention was to inform the general public about the multiple and diverse benefits of SEE and to thus stimulate demand for energy efficient housing. Society was essentially ignorant of the fact that a simple solution could help to solve many of the multiple and diverse problems that most countries and cultures face. SEE can simply create countless manufacturing and local construction jobs, save home & building owners money, provide a hedge against rising energy costs, assure a vibrant long-term economy, significantly cut pollution, reduce foreign energy dependence, and make homes and buildings significantly more comfortable in which to live and work. In addition, SEE homes and buildings can provide all of these benefits while paying for the additional cost of building to SEE's higher insulation standards with energy dollar savings. Given the World's current economic and environmental problems, he feels that what he has learned about SEE needs to become general public knowledge. He now spends much of his time promoting SEE concepts to the World.

Rebecca Sugrue



Rebecca Sugrue attends Massachusetts Institute of Technology (MIT). As a rising sophomore he plans to major in Civil and Environmental Engineering focusing on atmospheric chemistry and mechanics. She hopes to minor in Public Policy as well as Energy studies. Throughout her freshmen year, she served on MIT' s Undergraduate Association Sustainability Committee. The UA Committee on Sustainability is the undergraduate student government organization that promotes sustainability awareness and sustainable lifestyles through events, awareness campaigns, and projects on campus.

Ruiz, Juan Blanco



I have a likelong fascination with and dedication to the architectures of humanity. This has fostered firm foundations in architecture, historic preservation as well as civic history and design. My dedication to the built environment has given me a knowledge about the intimate ties between building as sustainable forms of habitation and energy. Indeed the gathering and preparation of building materials as well as their subsequent assemblage into the multitude of architectures that have graced as they have defined the history of humanity are all expressions of energy. All express intimate local knowledges of how people can work with their environments to create habitats in harmony with nature. Unfortunately, in modern times this balance has come to be broken into ever greater pieces. The balance which the collectivity of

humanity achieved through its diversity of action has been abandoned as small provinces of humanity have succeeded in transforming their limited local knowledge into an overarching mentality. This has created a scenario where everything and anything which does not look like the assumed barometer of order and development is a pathology. This has created one of the chief perpetrators of the destruction of the world. The built environments fostered today are so out of balance with any environment that they are responsible for over 50% of the carbon emissions that threaten the planet today. In my profession capacity I make use of all opportunities to reflect on reigning assumptions on the objectives and goal of "Progress" and "Modernization" as universal givens. I seek to create places both conceptual and physical which address the vital need to conserve a balance between built habitats and nature with the resources that it contains for all life on this planet. To do so requires one to question the assumed infallibility of the contemporary paradigms of Modernity, Progress and Development on building and habitats. My work addresses the need to confort the all inclusive metropolitan paradigm for cities in the world today trough recognizing the role of autonomous micro centers if habitation capable of fostering a civic life fully the equal of the great pre automobile cities of the past. This entails fostering regional cities sensitive to transforming their micro environments into autonomous habitats. Thus my architectures are designed to create buildings capable of generating power from geothermal, wind and solar sources necessary for their own needs as well as their surrounding quarters. This entails designing cities with their natural environments in order to assure aquifers as well as the local production of foods. I believe that any discussion on sustainable architectures and cities must also address the need to restore environments reduced to virtual brown-fields to new vitality. This must also look at building systems that can generate energy.

Schachter, Steven

Dr. Steven Schachter attended medical school at Case Western Reserve University in Cleveland, Ohio. He completed an internship in Chapel Hill, North Carolina, a neurological residency at the Harvard-Longwood Neurological Training Program, and an epilepsy fellowship at Beth Israel Hospital in Boston, Massachusetts. He is Chief Academic Officer and Program Leader of NeuroTechnology at CIMIT and a Professor of Neurology at Harvard Medical School (HMS).

Dr. Schachter is Past President of the American Epilepsy Society. He is also past Chair of the Professional Advisory Board of the Epilepsy Foundation and serves on their Board of Directors.

He has directed over 70 research projects involving antiepileptic therapies, and published over 200 articles and chapters. He compiled the 6-volume Brainstorms series, which has been distributed to over 150,000 patients and families worldwide in several languages, and edited or written 23 other books on epilepsy and behavioral neurology. Dr. Schachter is the founding editor and editor-in-chief of the medical journal Epilepsy & Behavior.

Shah, Pratik



Dr. Pratik Shah is at the infectious Disease Initiative at Broad Institute of MIT and Harvard, Department of Molecular Biology at Massachusetts General Hospital and the Department of Microbiology and Immunology at Harvard Medical School. Dr. Shah applies high-throughput Omics and nanotechnology to identify new pathways to design diagnostics, therapeutics and prophylactics against a variety of debilitating clinical conditions related to gastrointestinal and respiratory diseases. He discovered a new vaccine component to protect against bacterial pneumonia, novel pathways and metabolites associated with gastrointestinal infections and a

rapid and low-cost water quality test. Dr. Shah is a honorary visiting scientist at the MIT Media Lab, where he instructs a course on prototyping low-cost and portable heath-tech solutions such as automatic stethoscopes, rapid otoscopes and non-invasive blood diagnostic sensors. He is also a cofounder of clean-water initiative based in Ghana, Tanzania and Nigeria that utilizes mobile technologies to connect large urban communities to safe drinking water.

Suh,Nam



He is the Cross Professor Emeritus at M.I.T. and former President of KAIST. He was awarded the ASME Medal, the General Pierre Nicolau Award of CIRP, and many others. He advanced axiomatic design theory, wear theories, and microcellular plastics. He invented a large number of products and processes, including the OLEV, MH, and MuCell. He received 9 honorary degrees from four continents. During his tenure at KAIST, KAIST became the second highest-ranked university in Asia.

Takanishi, Atsuo



Professor of Science and Engineering, WASEDA University.

1982 Degree of Master of Engineering, Department of Mechanical Engineering,
Graduate School of Science and Engineering, Waseda University, Japan
1985 Research Assistant of the School of Science and Engineering, Waseda University,
Japan

1988 Full-time Lecturer of the School of Science and Engineering, Waseda University, Japan

1990 Associate Professor of the School of Science and Engineering, Waseda University, Japan

1997 Professor of the School of Science and Engineering, Waseda University, Japan Research Interests: Humanoid Robot, Medical/Welfare Robot, Educational Robot

Tang, Sai



Sai Chun Tang received the B.Eng. degree (with First Class Honours) and the Ph.D. degree in electronic engineering from the City University of Hong Kong in 1997 and 2000, respectively, where he was a Research Fellow after he graduated. He joined the National University of Ireland, Galway, as a Visiting Academic in 2001, and then the Laboratory for Electromagnetic and Electronic Systems at the Massachusetts Institute of Technology, Cambridge, in 2002. Since 2004, he has been with the Radiology Department, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, for the developments of ultrasound diagnosis devices and noninvasive treatment systems using high-intensity focused ultrasound. In 2008, he became a Faculty in Radiology at Harvard Medical School. His current research interests include electronic medical devices, wireless energy transfer, and high-intensity ultrasound systems.

Tao, Fei



Trivedi, Mohan

Dr. Fei Tao received the Ph.D. degree in Microbiology from the Shandong University, China. He is now associate professor at the Shanghai Jiao Tong University, State Key Laboratory of Microbial Metabolism and Visiting scientist at MIT, Center of Bits and Atoms. As a young researcher in the biodegradation and biocatalysis, he authored of more than 40 publications on international scientific journals. His research interests focus on investigating and engineering bacterial cells for developing green technologies to solve the pollution problems and to produce degradable materials.



Mohan Trivedi is a professor of Electrical and Computer Engineering in U. of CA San Diego. Mohan Trivedi received his PhD in Electrical Engineering from Utah State University in 1979, after completing undergraduate work in India. He has published extensively and has edited over a dozen volumes including books, special issues, video presentations, and conference proceedings. Trivedi is a recipient of the Pioneer Award and the Meritorious Service Award from the IEEE Computer Society; and the

Distinguished Alumnus Award from Utah State University. He is a Fellow of the International Society for Optical Engineering (SPIE). He is a founding member of the Executive Committee of the UC System-wide Digital Media Innovation Program (DiMI). Trivedi is also Editor-in-Chief of Machine Vision & Applications (<u>http://link.springer-</u>

ny.com/link/service/journals/00138/index.htm).

Wang,Lumin



Professor Department of Nuclear Engineering and Radiological Sciences University of Michigan

Professor Lumin Wang, originally from Beijing, China, received his PhD in Materials Science from the University of Wisconsin-Madison in 1988 with a thesis topic on radiation effects in nuclear engineering materials. He worked at Argonne National Laboratory as a post-doctoral fellow and University of New Mexico as a research scientist before joining the faculty of the University of Michigan in 1997. He is now a tenured professor in the Department of Nuclear Engineering & Radiological Sciences with a joint appointment in the Department of Materials Science & Engineering at the University of Michigan, Ann Arbor. He also served as the director of the Electron Microbeam Analysis Laboratory (EMAL), a campus wide user facility for material characterization at the University of Michigan during 2005-2009. Professor Wang has been appointed as an adjunct chair professor at the

College of Energy of Xiamen University of China since 2010. Professor Wang's interest is in nuclear engineering materials, nuclear fuel cycles including nuclear waste management, and transmission electron microscopy (TEM) characterization of materials at the nanoscale, as well as ion beam modification of materials. Professor Wang has published more than 300 SCI indexed research papers with a h-index value of 42. Professor Wang has delivered over 100 invited talks in national and international conferences or at research institutions worldwide.

Wen, Yimin



Associate Prof. Yimin Wen is a PHD of Urban Planning in Huazhong University of Science and Technology, received Architecture and Civil Engineering (Master) degree and Landscape Architect (bachelor) degree in Huazhong University of Science and Technology, China.

He has worked in Wuhan HUST Institute of Architectural Design and now is the CEO of Hubei Efar Urban Planning and Architectural Design Company.

As a Practitioners in the Urban Planning or Architect or Landscape, he has nearly twenty years experience and has managed over more than ten projects of Urban planning every year. He served as Landscape Architect for the term 1996-2003; he served as Architect for the term 2003-2008. He served as urban planner for the term 2009-2014. He is still on his way to practice.

Wu,Tony



Tony Wu is a third-year graduate student at MIT in the Department of Electrical Engineering and Computer Science, focusing in Engineering Physics. He received a B.S. in both Electrical Engineering and Physics from National Taiwan University in 2011. His current research involves organic photovoltaics and OLED.

Yi,Ya Sha



Integrated Nano Optoelectronics Laboratory, University of Michigan, Dearborn, MI

Dr. Yi is currently an associate professor at department of Electrical and Computer Engineering, University of Michigan, Dearborn campus and also a faculty affiliate of University of Michigan Energy Institute. He received his Ph.D from MIT and worked as a postdoctoral associate at MIT electronic materials processing center the following year, focusing research on integrated nano optoelectronic materials and devices. He has worked in Los Alamos National Laboratory (LANL) and 3M corporate research laboratory. He is also a research affiliate at MIT Microsystems technology/microphotonics center. He has published more than 50 journal papers, held 11 US patents, and written two book chapters. He has led several government/industry funded projects, has been at review panel for NSF and DOE, and has been a reviewer for leading journals. His research interests are solid state electronics, semiconducting devices, photovoltaics & energy related optoelectronic devices,

solid state lighting (LEDs), bio inspired nano optoelectronic structures, nanoelectronics/MEMS and intelligent vehicle and transportation system. He is currently serving as vice chair of IEEE Southeast Michigan section.

Yin, Jie



Jie Yin is currently a deputy chief planner of Shanghai Total Architectural Design & Urban Planning Co.,Ltd. Before that, he had worked as a principle planner at Shanghai Tongji Urban Planning & Design Institute for three years. As a Certified Planner and Certified Engineer in China, he has led or participated in a number of projects on land use planning, urban design, and rural planning. His prior researches mainly focused on Eco-city theories and practices, while he also developed interest in environmental policy and planning, as well as rural development in China. He is now researching on rural mobility and rural energy in urbanizing China. Jie holds a Master of Engineering in Urban Planning and Design from Tongji University (2010) and a Bachelor of Engineering in Urban Planning from Central South University (2006).

Yuan, Minsheng



type 2 diabetes.

Dr. Yuan finished his medical education and got his PhD from SUMS (Zhongshan University) in China 1995. He did his postdoctoral training at Joslin Diabetes Center 1999-2005. His *Science* paper 2001 identified NF- B as central target of high dose Aspirin to reverse insulin resistance and led an inflammatory theory of metabolic syndrome in more than 10 years. He was International Young Researcher's Aspirin Award winner2003 and Iacocca fellow at Joslin 2004-2005. He was invited to be the chief of Endocrine department, Professor at Zhongshan University 2006-2009. He was a senior scientist in CHGR, MGH for studying mTORmediated insulin resistance 2010-2012. During his MGH season he was also a senior managerin Translational Medicine Group, MGH to help develop new drug for treating

Dr. Yuan devoted his energy to bridge the gap of medical research between US and China. He started company, Medical and Research Information Consult (MRIC) at this purpose. He collaborated with US-China Chamber of Commerce to promote new healthcare model in China. Dr. Yuan was certified by USMLE/ECFMG 2008, and recently he got his doctor of optometry degree. He will practice primary eye/vision care in Boston area. He will continue to seek new approaches to bring more effectiveness and convenience to future healthcare.

Zhang, Xiong



Professor School of Computer Science and Engineering, Beihang University

Xiong Zhang is a full professor in School of Computer Science of Engineering of Beihang University and director of the Advanced Computer Application Research Engineering Center of National Educational Ministry. During his academic career in Beihang University for more than 20 years, he has supervised over 30 PhD students and won a National Science and Technology Progress Award. He is now the chief scientist of "smart city" project supported by the National High Technology Research and Development Program of China.Prof.Xiong serves as members of several national committees, e.g., the National Computer Science and Technology Teaching Steering

Committee of Ministry of Education. His research interests and publications span from computer vision, wireless sensor networks and information security.

Zhao, Jinhua



Jinhua Zhao is the Edward H. and Joyce Linde Career Development Assistant Professor of urban planning at DUSP. He holds Master of Science, Master of City Planning and Ph.D. degrees from MIT and a Bachelor's degree from Tongji University. He studies travel behavior and transportation policy, public transit management, and China's urbanization and mobility. He sees transportation as a language, to describe a person, to characterize a city, and to understand an institution. His current project examines the interaction between policy making by the governments and behavioral response from the public in the context of China's urban development. He very much enjoys working with students.

Paper abstracts

1. Barbara Klein, Thomas Kaspar, Kordula Zöller: Interventions with an Emotional Robot on Patients with Unresponsive Wakeful Syndrome.

Fachhochschule Frankfurt am Main – University of Applied Sciences (FH FFM), Nibelungenplatz 1, 60318 Frankfurt am Main, Germany

Johanna-Kirchner-Stiftung, AWO District Association, Frankfurt am Main, Germany

August-Stunz-Zentrum, Johanna-Kirchner-Stiftung, AWO District Association, Frankfurt am Main, Germany

<u>Abstract:</u> Unresponsive wakefulness syndrome is a new term for the persistent vegetative state or the apallic syndrome. Dealing with patients suffering from the unresponsive wakefulness syndrome is a challenge for the patients 'relatives and nursing care profession. Due to medical progress the life expectancy of these patients is increasing. Since 1995 the neurological phase model of the German Federal Association for Rehabilitation (BAR) has been introduced all over Germany. Patients in Phase F have severe damage of the nervous system with no functional improvements in the previous rehabilitation phase. The project

"PARO and Co.- Robots in Nursing Home Care" tested the use of the therapeutic seal PARO in three nursing care homes of the AWO District Association. In one of the nursing care homes PARO was used with residents with the unresponsive wakeful syndrome in Phase F. The aim was to determine whether PARO is able to contribute to the patients' well-being or even to stimulate some form of communication response and to become a new instrument for professionals in order to evaluate the effects of robot-therapy.

Keywords: assessment instrument, nursing care, robot-therapy unresponsive wakefulness syndrome.

2. B. Xiang*, D.D. Nelson, J.B. McManus, M.S. Zahniser, S.C. Wofsy : A stable and absolute atmospheric carbon dioxide instrument for air quality, climate change and energy consumption monitoring

School of Engineering and Applied Sciences, Harvard Univeristy, Cambridge, MA 02138 USA

Abstract: We present a novel spectral method to measure atmospheric carbon dioxide (CO2) with high precision and stability without resorting to calibration tanks during long-term operation. This spectral null method improves precision by reducing spectral proportional noise associated with laser emission instabilities. We employ sealed quartz cells with known CO2 column densities to serve as the permanent internal references in the null method, which improve the instrument's stability and accuracy. A CO2 instrument - ABsolute Carbon dioxide (ABC) is developed using this new approach. The instrument's stable and accurate performances also benefit from good optics thermal control (on the mili Kelvin level) and accurate sample cell pressure measurements (mili torr level). ABC has been deployed and measuring continuously at a long-term ecological research site (Harvard Forest, USA) for more than eight months without any onsite calibrations, showing no signs of drifts or inaccuracies of more than 0.1 ppm during this period. Field comparison with another CO2 instrument (Picarro, Inc.) shows very good agreements. This successful field demonstration implies that ABC is capable to perform high accuracy unattended continuous field measurements with much simplified reference standards, relieving the need for calibration cylinders.

3. Charles G. Sodini: Revolutionizing Medical Device Design

MIT, USA

<u>Abstract:</u> The vision of the Medical Electronic Device Realization Center (MEDRC) is to facilitate the microelectronics and medical device industry in the transformation of medical electronic devices as it has successfully demonstrated in computation, communication and consumer electronics. The successful realization of such a vision also demands innovations in the usability and productivity of medical devices, and new technologies and approaches to manufacture devices. Information technology is a critical component of the intelligence that will enhance the usability of devices; real-time image and signal

processing combined with intelligent computer systems will enhance the practitioners' diagnostic intuition. All of the key ingredients are in place at MIT and in Cambridge and Boston. The leadership of MEDRC has had strong industry interaction for over twenty-five years. The MIT research portfolio includes low power integrated circuits and systems, micro electro-mechanical systems, bioelectronics, sensors and microfluidics which are world leading by any measure. The medical researchers and clinicians at world-renowned hospitals located within a mile of MIT, provide the patient settings to prove the efficacy of innovative devices. In this talk I will introduce the research directions of the MEDRC and discuss the circuit and system design issues and clinical measurements for wearable vital signs monitors and portable medical ultrasound imaging.

4. Cosima Wagner: Techno-imaginations and robot role models: discussing the influence of popular culture on the development of next generation robots in Japan.

Freie Universität Berlin, University Library, Project "24 in 1", Cluster East Asia, Garystr. 39, 14195 Berlin, Germany

Abstract: This paper analyses the role of a popular robot character – Astro Boy (Japanese: Tetsuwan Atomu) – from the 1950s, which until today is believed to have an influence on the idea and technical realization of humanoid robots in the country. In contrary to the western image of robots as frightening machines there seems to be a different concept and attitude in Japan. By presenting a critical view on the Japanese example of Astro Boy and his instrumentalization for the promotion of humanoid robots this paper aims at stirring a debate between natural scientists and humanities scholars on the role of robots in the future "Universal Village".

<u>Keywords:</u> Astro Boy, cultural background of technology, interface of the fictional and scientific-technological construction of robots, Japan.

5. Chenchen Gong: A View of Brain and Cognitive Research in Piano

MIT USA

Abstract: Music production, like language production, is unique to humans and requires lengthy experience or training to become proficient. Music and language understanding also appear to depend on some shared neural systems, although there does not appear to be complete overlap. Numerous studies have shown structural and functional differences in the brains of musicians versus non-musicians, and piano training in adults causes a regular sequence of functional neural changes that can be tracked with stimulation and imaging methods. In children, early music training leads to general improvements in cognitive abilities. Although the neural bases for these improved cognitive abilities have not yet been identified, it clear that music training has measurable effects on brain development. Training is essential for music production, but inborn abilities may also play a role. Perfect pitch, for example, is more common in individuals with early music training and who have

a relative with perfect pitch, suggesting an interaction between genes and training effects. In spite of the known benefits of music training on cognitive and brain development, the necessity for lengthy training in music production for successful music composition and performance in the future is now called into question by new developments in software-aided music composition and performance. Future software may replace the need for training or, more likely, will simply alter the content of the training, much the way that students are now trained to write differently as keyboards and software have largely replaced pens and quills in recent years.

6. Dalai Tang, Janos Botzheim, Naoyuki Kubota: Informationally Structured Space for Community-centric Systems

Graduate School of System Design, Tokyo Metropolitan University, Tokyo, Japan

Abstract: Recently, the importance of community-centric systems is increasing as a new paradigm in the aging society. Social media have played an important role in creating, sharing, and exchanging information within a community. Various types of assistive technologies should be developed from the humancentric and community-centric points of view to realize such information support. In this paper, we discuss the availability of smart devices and robot partners for information support in community-centric systems. First, we explain the concept of life hub to connect a person with information, and propose the total architecture of an informationally structured space. Next, we explain the life hub using smart devices and robot partners based on informationally structured space. Then, we present some application examples. Finally, we discuss the future direction of community-centric systems.

<u>Keywords:</u> component; Community-centric Systems; Robot Partners; Informationally Structured Space; Life Hubs

7. David Fiuczynski: New Planet MicroJamz® – Shape of Jamz to come?

Berklee College of Music, USA

Abstract:Now that we are at the beginning of the 21st century, it is exciting to witness new movements and innovations in Music. I'm very curious about microtonal developments. Microtonality is a way of measuring notes that do not fall into the Westem 12-note-per octave system. I experiment with avant-garde classical 24-, 36-, 48-, 72- note per octave systems and am very interested in Turkish, India and Chinese tuning systems. What is new about my approach is stacking so-called "non-western" scales into chords. This is basically unheard of in traditional styles and jazz or popular/groove musics. At the crossroads of innovative rhythms, microtonal harmonies and eastern melodic inflections and improv concepts, I think brand new musical ideas are on the horizon. This is what we experiment with at the Planet MicroJam Institute at Berklee College of Music.

8. Dalai Tang, Janos Botzheim, Naoyuki Kubota: Informationally Structured Space for Community-centric Systems.

Graduate School of System Design Tokyo Metropolitan University Tokyo, Japan

<u>Abstract:</u> Recently, the importance of community-centric systems is increasing as a new paradigm in the aging society. Social media have played an important role in creating, sharing, and exchanging information within a community. Various types of assistive technologies should be developed from the humanœntric and community-centric points of view to realize such information support. In this paper, we discuss the availability of smart devices and robot partners for information support in community-centric systems. First, we explain the concept of life hub to connect a person with information, and propose the total architecture of an informationally structured space. Next, we explain the life hub using smart devices and robot partners based on informationally structured space. Then, we present some application examples. Finally, we discuss the future direction of community-centric systems.

<u>Keywords:</u> component; Community-centric Systems; Robot Partners; InformationallyStructuredSpace; Life Hubs.

9. Dan Ding Towards Developing a Smart Kitchen for Cognitive and Physical Assistance

Doctor, Assistant Processor, University of Pittsuburgh

Abstract:In the most recent U.S. Census, over 12.3 million (4.4%) people reported needing physical assistance with one or more activities of daily living or instrumental activities of daily living (IADLs). Also the combined prevalence of all individuals living with cognitive disability in the United States is 20 million or about 7% of the population [Scherer 2005]. The purpose of this project is to develop a smart kitchen testbed aimed at providing cognitive and physical assistance for people with varying disabilities. In this paper, we will introduce two sub-systems for this testbed. The Cueing Kitchen is a cognitive orthosis with a variety of embedded sensing and prompting components designed to alleviate problems with attention, memory, and executive function for people with cognitive impairments such as Traumatic Brain Injury (TBI) and dementia. Sensing is accomplished through low-cost off-the-shelf sensors such as power consumption monitor, contact switches, barcode scanners, water temperature and flow rate sensors, and Kinect sensor for user activity recognition. The KitchenBot is an overhead track mounted robotic manipulator being designed to aid individuals with physical impairments to complete common kitchen tasks such as meal preparation or cleanup.

10. DongHo Cho*, GuHo Jung*, Uooyeol Yoon*, ByungSong Lee**, SoonMan Hong*, Nam Pyo Suh*** *Development of High Power Wireless Charging Technology based on SMFIR and its Application to Bus and Train*

Wireless Power Transfer Center(WPTC), KAIST, Daejeon, Korea

Current affiliations: *KAIST, ** KRRI, ***MIT

<u>Abstract:</u> The On-Line Electric Vehicle (OLEV) based on the wireless electric power transfer system, SMFIR (Shaped Magnetic Field in Resonance), is presented. The design of the underground power-supply system, overall infrastructure, pick-up device, and the regulator for buses and trains is described. Results of commercial operation of OLEV bus are reviewed.

11. Elizabeth Reian Bennett: A Musician on Music and Technology Professor, Tufts University

<u>Abstract:</u> One of the handful of westemers who first studied the shakuhachi (the Japanese end-blown flute) under a traditional master, Elizabeth Reian Bennett will describe her traditional education and where it has led her, followed by a discussion about technologies used by musicians for distribution, composing, building a fan base, making a living and teaching. She will briefly reflect on intercultural exchange, impacts technology has had on music, and what the future might bring; and open the floor to questions.

12. Francisco Bozzano-Barnes: Our Settlement Patterns; Restoration of Harmony between Urban and Rural Environments

B.A., MES, Ph. D. Candidate in Educational Historyand Paradigm Shifts

Abstract: We think that Urban Ecology, the study of ecosystems including humans, is a critical science for the restoration of harmony between cities and landscapes submitted to urban ecosystem expansion. It searches for the sustainable coexistence of humans and their habitats. We will explain how our settlement patterns can be functionally segregated or highly integrated, including wilderness and agricultural activities inside urban ecosystems. The more integrated uses in settlements can have great impact on energy consumption by reducing commutes to work, entertainment, etc., or urban gardening. ICT technologies can contribute to reducing the need to commute. Also, we will see how land tenure systems help establish the relationship between humans and nature, because they define the way we occupy and share the landscapes of the world. Together with technological systems and increasingly, knowledge systems, they will define access to resources and their impact. Indigenous and traditional knowledge systems will add experiential knowledge, based on trial and error, to our conventional scientific approach. System Dynamic modelling tools can add to our ability to plan for sustainability if combined with stakeholder participation processes in national and regional domains, contributing to conflict resolution and peace building.

13. Gengliang Zhu¹, Wenge Rong^{1;3};_, Chao Li^{1;2}, Yanwei Zheng¹, Yi Zhang¹, Hao Sheng¹, Zhang Xiong^{1;2}: *Mobile Surfing Pattern Analysis over Time and Location on a Large Access Record*.

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<u>Abstract:</u> The fast increasing usage of Wireless Application Protocol(WAP) technologies makes mobile surfing a more frequently behavior of people's Internet life. As its critical to mobile service market and city management, this study is aiming at identifying surfing patterns of subgroups of WAP users over time and based on locations. In this study, the variation of surfing access was firstly examined ,including download and upload flow based on time and locations in which significantly and stable accessing peaks were found. To detect the surfing behaviors of individuals, the author traced the variation of surfing accessing. The author finally obtained several surfing patterns that fit smaller subgroup of users but more precise to them.

Keywords: mobile surfing; user pattern; time based; location based

14. Gene Fry: *Global Warming – So What?*

Abstract: Since 1880, Earth's surface has warmed the fastest in many million years, due mostly to human CO2 emissions. Oceans now gain more energy per 2 years than cumulative human energy use. Since 1993, the US warmed very fast: 1.2°F / decade. That pace tums Kansas, "breadbasket of the world", to desert by 2100. Sulfate level variations explain temperature deviations from a smooth CO2-induced trend.Current CO2 levels entail large lag effects: ~3°F, on top of 2°F (land) since 1913: ~1°F each from Arctic Ocean albedo changes, phasing out coal's sulfur emissions (both complete by 2100), and warming Earth enough so outgoing radiation equals its heat gain. This CO2 level-temperature relation is supported by multiple paleodimate studies. In 1990, Rind et al. projected that, warmed 4°C by CO2 double 1750 levels, Earth's "1/century" drought frequency would rise to 45% by 2059. This results in savannas, prairies and deserts replacing forests; 70% lower biological net primary productivity; and 30-50% losses in America's major food crops. In 2004, Dai et al. found that 1950-2002 actual severe drought frequency matched Rinďs projections.Farmers have staved off crop declines by mining groundwater, notably in north China, north India, central California and the Great Plains. Most major wheat producers (plus the Amazon, twice) have suffered 1/century droughts in the past decade. Grain vields per hectare have plateaued worldwide since 2008. Several studies found that warming cut (absolute or growth in) crop yields, such as 10%/°C warming. One warned of 37-82% crop losses by 2100, due to heat spikes. Doubled world food commodity prices from 2007 to 2011 have led to food riots and toppled governments. The world faces a loss of up to half its food supply, perhaps by 2100, featuring water wars. Human population would fall steeply, threatening civilization's collapse. But other species would fare worse. One study estimated that the present value of projected warming's damages exceeds the gross world product. It is vital not only to reduce CO2 emissions to zero (many methods are reviewed), but go

carbon-negative in a big way. Major ways to move carbon from air to soils or elsewhere include include fast-rotation grazing, organic (and no-till) farming, accelerated rock weathering, farming the ocean, and biomass burning with CCS

15. Greg Ondo: Evolution of computers and music over the last 30 years

Field Marketing Manager Steinberg North America

<u>Abstract:</u> Greg Ondo will discuss the evolution of computers and music over the last 30 years. See the evolution unfold through discussions of sequencing, sampling, digital audio recording, digital editing, digital sequencing, digital signal processing, remote collaboration and even artificial musical intelligence. He will demonstrate the evolution of advanced technologies that help people realize their musical creativity in new and exciting ways.

16. Hitoshi Arima, Yoshimichi Nakamura, Fujio Kurokawa: Yokohama Smart Community "Project which thinks about sustainable future living".

Yokohama Smart Community dSPACE Japan K.K. Tokyo, Japan Smart Energy Laboratory Shizuoka, Japan Nagasaki University, Nagasaki, Japan

Abstract: Yokohama Smart Community is a community of companies and organizations which support a philosophy of "For a truly affluent and fulfilling social life, it is important to learn from nature." and aims to establish technologies which effectively utilize natural energy. As a place to demonstrate this aim, the "Smart Cell" model house was constructed with an energy system using natural energy This article explains about applications of Model Based Development (MBD) that were used in this energy system development.

17. Hongwu Wang, User Participatory Design: A Design Framework for Assistive Robotic Devices

Doctor, Research Scientist, University of Pittsburgh

<u>Abstract:</u> Robotic Towards Developing a Smart Kitchen for Cognitive and Physical Assistance devices may provide beneficial assistance to people with disabilities and elders in natural environment show increasing progress. Therefore, a design and development approach that breaks from traditional robotics of creating fully autonomous and tele-operated robots towards symbiotic robotic systems that work in partnership with humans is needed. The participatory action design (PAD) model, emphasizing the involvement of end users along the entire product development processes, together with tradition product development process, have been applied to develop a design framework called user participatory design (UPD). UPD is widely used within the Quality of Life Technology (QoLT) center, a National Science Foundation funded engineering research center between Carnegie Mellon University and University of Pittsburgh. QoltBots, including the Personal Mobility and Manipulation Appliance (PerMMA), the Strong Arm, and the Mobility Enhance robot (MEBOT), are assistive robotic devices that aim to provide users with mobility and manipulation assistances during their activities of daily life (ADL) as well research platforms and test beds in the center. In this paper, details of how UPD was applied to QoltBots development, and how this process contributed to the success of design and development are presented.

18. Jonathan Heckerman, Dana Maloney Peter Glass: Build-It-Yourself Proprietary Assets

Build-It-Yourself, 269 Pearl Street, Cambridge, MA 02139 <u>Abstract:</u> 1) Build-It-Blocks ---- An online database of hardware, software and art modules enables kids to build complex solutions quickly. 2) Network of TA's ----Art and engineering students from well-known universities are contracted to teach up to 10 hrs. / week from their dorm rooms and are trained to engage kids in a computer game-like environment. 3)Invention Universe----A social media site for builders enables our members to show off their work and

A social media site for builders enables our members to show off their work and post a portfolio of projects that could be useful in school applications.

 John Hu, Yi-Je Lim, *Steve Schatcher, *Paolo Bonato, Jayson Ding, Robotic Avatar for Future Healthcare in an Intelligent Urban District Hstar Technologies Corp., Cambridge, MA, USA *Harvard Medical School, Boston, MA, USA

Abstract:Like a dynamic and intelligent agent, the system that we are developing is an Integrated Robotic System (or Robotic Avatar) for Advanced Healthcare Services and Management (HSM) that provides a dynamic platform with available healthcare sensors to maximize the effectiveness and efficiency in the HSM by integrating those discrete technologies in sensor fusion, on-site information processing, just-in-time response and telepresence operation etc. This is a natural and significant step following pioneer researches and great progress in fundamental healthcare sensory technologies in the past years. Existing wireless network communication and sensing devices for in-home and community health care, however, offer only "passive and static monitoring" to provide medical interventions. These passive systems depend on sensors wom by the patient and on a finite number of sensors in fixed positions around the household. Hstar Technologies is developing an integrated system to convert and materialize existing and promising research into a useful monitoring device. This development includes selecting and testing different wearable sensors, building the system to wirelessly transmit data to the robot (Data Transmission). storing data on the robot (Data Recording), and initiating an appropriate and onsite response (Navigation and Remote Telepresence). The robot system we aim would "wake up" if it is in a standby mode and receives the alarm message, and then start its navigation to the service site. At the same time, the robot will contact human caregivers and initiate telepresence operation immediately for safety reason. This communication, data storage and reactive response infrastructure will form the foundation of our integrated healthcare system and is our primary goal. With this in place, we will also investigate, as a secondary

goal, the use of alternative, robot-mounted sensors for dynamic healthcare services and management. This will add the ability to detect illness and symptoms in case the patient forgets to wear a sensor or in case of a dead sensor battery. The robot will be fitted with an array of sensors for navigation, necessary manipulation control and telepresence operation. We will look carefully at all possible methods to exploit these multiple-use, non-contact sensors for healthcare detection and general health monitoring. Sensors to be investigated include, but are not limited to, video cameras, far infrared cameras, audio sensors, LIDAR and Microsoft Kinect. In Figure 1 we show a schematic diagram of a healthcare detection sensor suite, data recording and communication network. This core system of Robotic Avatar consists of multiple modules, such as sensory perception for environment and detection for patients, manipulation for adequate services, navigation control for motion and safety, interactive operation via speech, visual guidance and mind control signals etc. as well as telepresence control. All the modules work in a synergetic way and through a network and designed protocols.

20. Juan Blanco Ruiz, Francisco Bozzano-Barnes: construction Typologies and Settlement Patterns Yesterday, Today and Tomorrow.

M. Arch., M.S.H.P., Ph.D., Director of Arquibis M.E.S., Ph.D candidate, Director of TEnure and Ecology LLC.

Abstract:Architecture has always shared intimate origins with Agriculture. In the past the design of buildings was intimately tied to the resources and climate of the regions where they were located. This condition dictated in large part the materials and form of construction. Rooted in the resources of the territories where they are built, passive and active forms for the production and expenditure of energy and water have always formed an intrinsic part of the architectures of the world. In keeping with this, in the past this condition fostered the development of technologies that defined building in regional terms as schools of construction that served foundation for stable economies that sustained the societies which they sheltered. In this way the traditional cultural economy of architecture defined an effectively ontological basis for the production of energy in regional terms. All rested on the production of buildings of necessarily reduced -albeit ever increasing- carbon footprints intimately tied with their environs in economic and existential terms. And this condition fostered mutually sustaining technological and socio-economic forms of building production that gave shelter to their communities as necessarily regional cultural habitats. In recent times the production of buildings has become as global in its sources as the availability of materials and energy. This condition reinvented the intimate ties between building and their materials in accord with the global availability of materials in an age of artificially cheap energy derived from hydro carbons. Thus in recent times the carbon footprint of buildings and their metropolitan presence have grown to become one of the major contributing factors fostering global warming and all that this entails. However, it is possible to reverse this trend by returning to the traditional paradigms for building design which rested on architectures of

intrinsically regional nature. Not only is it possible to adapt traditional paradigms on passive energy and water usage in building design in future conditions, but it is also possible to invent a new paradigm based on active energy and water usage in building design. This entails the introduction of a vast variety of ancient and emergent low and high technologies in contemporary and future building design capable of making architectures that are designed to also serve as generators of energy if not accumulators of water as well. This not only offers great savings through the efficient use of energy and water resources in the production and operation of buildings, but also in the design of buildings capable of serving as local energy generating stations and cisterns.

Ruralization versus Urbanization

A look at the mottos for the two of the participants in the epochal competition for the design of the eixample which sought to transform Barcelona, Spain into a capital worthy of the nineteenth century enables one to grapple the opposition between the country / city and the urban /global metropolis in the modern world. Their respective proposals illustrate implicit seminal discussions of epochal meaning pertinent even today. Partners in the composition of the topographical map of Barcelona and its hinterlands that served as base plan for both, the subsequent proposals by Josep Fontsere and Ildefons Cerdà took on radically different focus. These plans highlight the value of continued respect for the regional hinterlands of habitats as the genuine basis for civic form versus the prototypical normative urban indices of a would be universalizing sociological objective. As such the two schemes highlight antagonical mentalities pitting sense of place against index of space. Cerdà won the competition for the design of the eixample of Barcelona and defined the indexical premises of the sociological mentality that would later emerge. However, the concern with topography and history which formed the explicit basis of the proposal by Fontsere remains a telling metaphor of the continuing value of the regional bases for all genuine civic areas even when of metropolitan scale. Indeed, the subsequent history of the architecture of the city of Barcelona emerged as markers of the will to regional bases for that city's sense of the modern as forms of resistance to Cerdà's eixample. Today, Fontsere's proposal speaks to the telling need to rethink modernity as forms of knowledge based on possible regional diversities rather than the impossible universality of global ubiquity. As such the opposition between Fontsere and Cerdà allegorizes the increasing contradiction of contemporary discourse on urbanization as the proclaimed embodyment of progress for all peoples everywhere in the world. Humanity has entered a period in which all of the peoples of the world are united more than ever before in history. However, while the threats are common to all, the solutions must be many and unique to each people. Indeed, the response to global warming, dwindling supplies of clean water, and the growing potential of ecological collapse are closely tied to the urgent need to develop impoverished regions of the world so often seen as a block to ecological salvation. This can only be achieved through harnessing all possible resources to meet local needs. Yet this requires the acknowledgement of the diversity of abilities implicit in each region as a place. Thus any long-term solution to the macro-problems must include grounded engagements with the micro-problems of the present moment. The current emphasis of economic development on mega capital intensive production restricted to metropolitan centers must find a compliment in micro capital extensive production. And this must focus on, and open to, rural and marginal urban zones as autonomous regions of revitalized traditional forms of production, or ruralization. The re-empowement of traditional forms of production will create new, and necessarily green markets, of sustainable development and

global presence. Such micro development will foster a sustainable green economybased on a dynamic of sustenance rather than subsistence.

21. Koji Kamei, Chandraprakash Sharma, Dylan F. Glas, Masahiro Shiomi, Takamasa lio, Tadahisa Kondo, Takahiro Miyashita, and Norihiro Hagita: *Cloud Networked Robotics for Life Support Services--Robotic Service Platform Technologies and Standardization*.

Intelligent Robotics and Communication Laboratories, Advanced Telecommunications Research Institute International, 2-2-2 Hikaridai, Seika-cho, Soraku-gun, Kyoto, JAPAN

<u>Abstract</u>: This paper introduces a field experiment for life support with robotic services that were developed as applications on a common infrastructure for cloud networked robotics. We propose the Ubiquitous Network Robot Platform (UNR-PF) as an open standard infrastructure for networked robot services and conducted field experiments of robotic services for elderly people and caregivers in super-aging societies. From case studies in our field experiments, we extracted requirements for developing life support robotic services using cloud networked robotics technologies and propose several extensions to existing standards.

<u>Keywords:</u>Networked Robot Systems, Cloud Robotics, Elderly Support, Robotic Service Framework

22. Lionel C. Kimerling, *Solar Electricity: High efficiency solutions* MIT, USA

Abstract: As the standard of living in developing countries improves and use of energy intensive technologies such as the Internet and its associated data centers increase around the globe, global energy demand is increasing at an alarming rate. Further, current energy generation depends primarily on the availability and consumption of fossil fuels. Continued use of this limited resource is expected to cause irreversible changes to the global climate if the energy sector does not modify its current behavior. To sustain the growth in energy consumption in a responsible manner, the universal village of the future will require efficient and sustainable methods to generate and utilize energy. Solar energy is one such solution that will fill a major role in the future energy portfolio. This talk will describe advancements to several solar and specifically. photovoltaic (PV), approaches to energy generation (as well as energy recovery) that improve efficiency. The guiding principles for choosing a technology and its further development consider physical fundamentals of device operation, natural abundance of materials involved in fabrication, device manufacturability, and system deployment. The methods to be discussed include: boosting absorption in thin film Silicon solar cells via light trapping structures; increasing the efficiency of Germanium thermophotovoltaic (TPV) converters via integrated photon recycling; and improving the efficiency of concentrated solar power (CSP) systems by incorporating multijunction solar cells with thermal energy receivers using spectrum splitting optics.

23. Lumin Wang: Nuclear Power as a Clean Energy: the Reality and Challenge, Department of Nuclear Engineering and Radiological Sciences Department of Material Science & Engineering The University of Michigan, Ann Arbor, MI 48109

Abstract: The nuclear power is a high-density energy source that emits little greenhouse gas to the environment. It currently provided about 5.7% of the world's energy and 13% of the world's electricity in 2012. Despite of the three major nuclear power plant accidents in Fukushima Daiichi, Chernobyl, and the Three Mile Island, records show that the nuclear power is still a safe and dean sustainable energy source. In terms of lives lost per unit of energy generated, nuclear power has caused much less fatalities per unit of energy generated than the other major sources of energy generation. However, the economic costs of nuclear power accidents is high, and meltdowns can take decades to clean up and there are still unresolved issues with the management of high level nuclear waste. The presentation will outline the current status of nuclear power development in the world and emphasize the material issues associated with the nuclear power safety.

24. Mayuri Sridhar: Educating the Next Generation of Leaders and Builders

Build-It-Yourself, 269 Pearl Street, Cambridge, MA 02139

<u>Abstract:</u> How do we prepare the next generation of leaders and builders to develop intelligent energy, food production, transportation, health care and pollution control systems? Our mission is to offer an education program that teaches students 21st century technical and social science skills in a unique global classroom. The strategy we used is that we propose an online classroom environment with interactive, dynamic, indexed content delivered by a network of art and engineering students from well-known universities that engages students, drives creativity, teaches technical skills, reduces the cost and footprint of traditional education systems.

25. Ming-an ZHANG, Yong DENG*, Qing-meng ZHU: A Novel Rath Planning Algorithm for Ship Fire Rescue Based on Spatio-temporal Database.

Science and Technology on Integrated Information System Laboratory Institute of Software, Chinese Academy of Sciences, Beijing, China

Abstract: The increasing contradiction between the traditional damage control and the demand of high efficiency and reliability of ship system is more and more prominent. A ship damage control system based on spatio-temporal database is presented to integrate complex static and dynamic spatial data at first. Due to spatio-temporal data organization, management efficiency of damage control is improved well, and it can provide a more capable, intelligent experience for other systems. A novel path planning algorithm is proposed to meet the dynamic road network when fire rescue. The binary group is adopted to describe the weight of the path, and, path network is pruning to reduce nodes accessed in advance. At last, simulation results show that the algorithm proposed based on spatio-temporal database solution can improve the efficiency, capacity, intelligence and user experience, and provide efficient support for assistant decision-making.

<u>Keywords:</u> damage control; cloud computing; service; spatiotemporal database; path planning

26. Masaki Shintani, Hia Hui Ching, Yoshitaka Fukugauchi, Makoto Miyagi, Teruo Higa and Steven Shum: An eco city development project with special consideration for harmonious coexistence of human, nature and microbiome, in Malaysia.

EM Research Organization, Inc. (EMRO), Kitanakagusuku-son, Okinawa 901-2311, Japan Tanah Sutera Development Sdn Bhd, Johor Bahru 81200, Malaysia EMRO, Kitanakagusuku-son, Okinawa 901-2311, Japan EMRO, Kitanakagusuku-son, Okinawa 901-2311, Japan International Research Center of EM Technology, Meio University, Nago-city, Okinawa 905-8585, Japan

Tanah Sutera Development Sdn Bhd, Johor Bahru 81200, Malaysia

Abstract: Today many eco cities are being developed worldwide with careful consideration for the eco-system, especially with regard to the environmental loads. In these activities, special emphasis has been placed on such issues as low-carbon life, resource recycling, reduction of environmental burden and harmonious coexistence of nature and humans. Apparently, however, little attention has been paid for the coexistence of humans and microbial communities, i.e. microbiome. Recent studies have shown that humans are not the sole entity having close relationship with microbiome, but that a wide variety of microbes constitute key members of our planet, namely, soil, water, air, plant and animal kingdoms. Furthermore, it has been realized that microbes inhabiting our body amount to 10 times the cells of our body and that they are closely connected with our quality of life and health. These microbial communities are called earth microbiome or human microbiome. We report here an eco city development project which applies the technology involving beneficial microorganisms with a goal of creating healthy and balanced environment for residents of Malaysia.

Keywords: Eco City, EM, Environment, Health, Malaysia, Microbiome.

27. Masahiko Haraguchi: Disaster Preparation through Improved Water-Energy Nexus – A Case Study of New York City during Hurricane Sandy

Department of Earth and Environmental Engineering, Columbia University

<u>Abstract:</u> Hurricane Sandy demonstrated how water and energy sectors are interlinked. Many high-rise buildings in New York City were unable to pump water to residents on upper floors due to the loss of power supply to their pumping systems. Many wastewater treatment facilities and approximately 20

pumping stations could not operate because of the power outage. However, the case of Hurricane Sandy also showed that improving the water-energy nexus would make cities resilient to disasters. This case study will demonstrate how water and energy sectors are interdependent and how a Combined Heat and Power (CHP) plant with microgrid systems will become powerful tools to generate appropriate adaptive responses to climate vulnerabilities of cities as well as improving efficiency of water and energy use. Efficiency improvements such as these will make cities more resilient to disasters and more prepared for future instances of extreme weather.

28. Paolo Bonato The Doctor will visit you at home: How wearable technology is changing healthcare

Harvard-MIT Division of Health Sciences and Technology, Harvard Medical School, MGH

Abstract: The staggering costs of acute care are pushing the healthcare system to a tipping point. More than ever before, we are coming to realize that we cannot afford to provide everybody with access to unlimited healthcare services. The situation in the US exemplifies the mechanisms that underlie the crisis of the healthcare systems around the world. Over the past twenty years, we have witnessed a process of consolidation of hospitals in large healthcare networks. Hospitals have come together into networks for the purpose of improving their bargaining power when negotiating reimbursement rates with insurance companies. Consequently, reimbursement rates have been rapidly increasing. Insurance companies have "passed" the costs to their clients. Thus, premiums have skyrocketed to levels that are no longer sustainable. Meanwhile, the increase in life expectancy and the high prevalence of long-term medical conditions in older adults have raised concerns that healthcare costs might get out of control. As we live longer, more and more individuals among us have to deal with long-term conditions such as congestive heart failure, chronic obstructive pulmonary disease. Parkinson's disease, and the consequences of a stroke. The costs associated with the clinical management of these conditions are very substantial. The anticipation that this "perfect storm" of healthcare costs would bring the system to its knees has motivated large healthcare networks to seek alternatives to the fee-for-service business model that they have utilized so far. An emerging, alternative model is focused on "keeping people healthy", namely on primary and secondary prevention. This business model can only work if healthcare networks manage to capitalize on the decrease in acute care services that is expected as a result of aggressive primary and secondary prevention programs. To achieve this goal, healthcare networks have to merge with health insurance companies into single-payer systems. This ongoing revolution in the healthcare system is demanding the rapid development of enabling technologies to "keep people outside of the hospital". Hence, we have witnessed a fast-growing interest for mobile health technologies. This talk will discuss current R&D efforts and future potential developments in the field of mobile technology that aim to address the growing demand in the healthcare sector for systems designed to achieve health monitoring of individuals in the home and community settings. Case scenarios based on ongoing studies on patients with chronic obstructive pulmonary disease and patients with

Parkinson's disease will be presented. The discussion of the case scenarios will emphasize the technical challenges associated with the development of mobile health systems, the potential roadblocks in the path toward adoption of these technologies in the clinic, and the potential economic and societal impact of mobile health systems.

29. Peter Jack: ICT, Capacity Building and Community Development in Nigeria--As An Approach Towards Conflict Resolution and Peace

DG National Information Technology Development Agency, Nigeria

Abstract: This paper discusses the role ICT is being planned to play towards Nigeria's capacity building. It includes capacities in ICT professionals' development, infrastructure development, teacher training, pedagogical contents development, as well as ICT hardware, software and contents development. It makes the point that there is a positive correlation between usage and mastery of ICT and economic development. The Nigerian Government attaches great importance to the power of ICT in evolving a modern economy. It is for this reason that a full ministerial position was created in the country with Mrs Omobola Johnson as the first ICT Minister of the country. It is also the reason for the creation of the National Information Technology Development Agency (NITDA) and for the mandate given to it through the NITDA ACT of 2007, to plan, regulate, provide policy guidelines and assist in developing the ICT capacity and capability of the country. This paper thus presents some of the policy blueprints of NITDA for dramatically improving the country's ICT capacity and ecosystem, to aid the country towards the enhancement of its capacity for rapid economic development. This will be in terms of human capacity development, technological development and infrastructural development. It is the central position of this paper that ICT plays a catalytic role in undertaking capacity building in the country.

 Pratik Shah, Impact of new biomedical technologies and sensors on human health and well-being MIT USA, pratik@broad.mit.edu

Abstract: New technologies such as hand-held DNA sequencers, high-throughput nano-proteomics, metabolomics, microfluidics and sensors are changing the landscape of diagnostics, prophylactics and therapeutics against several debilitating conditions such as Cancer, Tuberculosis and cardiovascular diseases. Several of these devices and sensors are now miniaturized and have become portable, affordable and accessible to patients, doctors and clinical/diagnostic laboratories all over the world. I will provide two examples from the list (some from my own research) below to demonstrate how these new medical devices and technologies will have an universal impact in making medical treatment more affordable, effective and accessible to everyone.

31. Ryuhei Kimurai: Investigation of Pre-School Aged Child - Entertainment Robotic Pet Playing Interaction in Nursery School? Teikyo Univ. of Sci. and Tech. 2525, Yatsusawa, Uenohara Yamanashi, Japan

<u>Abstract:</u> Three types of personal robot were introduced into classroom environment of nursery school in order to investigate pre-school aged; 4-6 years old child (Human) – personal robot (Robot) interaction (HRI). In this work, three kinds of robots; entertainment robotic pet; AlBO, mental commit seal robot; PARO, and communication robot; ifbot were used. Videotaping was carried out for child's behavioral analysis during playing time (30 min.) and considered child's recognition against robot. By this analysis, it was found that all children interacted gently against our expectation; stroking, holding, and negative responses; beating, fearing, were rarely observed. It is note worthy that all children gently stroked robot and most of children held robot on their knee although most of robot has hard and smooth body; which is not suitable for physiological interaction. From these observation results, we concluded that preschool aged child seemed to recognize imperfect consciousness and otherness in robot; as artificial emotional creature, but did not accept robot as living thing.

<u>Keywords:</u> Robotic pet, Personal robot, AlBO, Paro, ifbot, Preschool aged child, Child-Robot Interaction, Human-Robot Interaction, Social interaction, Nursery school

32. Sachiko Masaki, Yajun Fang, Ichiro Masaki: Universal Village and Global Ecological System

MIT, USA

<u>Abstract:</u> In this paper three examples are used to illustrate how human behavior is making significant change to global ecology. The examples lead us to put forward a comprehensive action plan to achieve the life style advocated by Universal Village. Universal law and Earth law are discussed to show how various life forms are connected and coexisted. The paper calls for the recognition of importance of bacteria and other microorganisms.

<u>Keywords:</u> Universal Village, Global Ecology, Universal Law, Earth Law, Energy Source, PM2.5, Bee Colony, Organic Pesticides, Symbiosis, Bacteria, Microorganisms

33. Sai Chun Tang, A Wireless Intermediate-range Scheme for Energy and Signal Transmission (WISEST) for Medical Implantable Devices with Significantly Reduced Coil Voltage.

Department of Radiology, Harvard Medical School, Brigham and Women's Hospital, USA Harvard University, USA

<u>Abstract:</u>The continuous growing energy requirement of sophisticated medical implantable devices has motivated the research on wireless transcutaneous energy and signal transmission. Recently, some research groups demonstrated that a locomotive capsule endoscope can be powered up wirelessly using a pair of transmitting coils wrapped around the body. However, with the traditional methods, the required voltage over the transmitting coil is more than several

kilovolts which can impose safety issues and notably increase the manufacturing cost. We developed a wireless intermediate-range scheme for energy and signal transmission (WISEST) with significantly reduced coil voltage by using a novel coil segmentation technique. We demonstrated that the required excitation coil voltage can be reduced to less than 7Vrms to wirelessly power up a 0.35-W locomotive implantable device. The proposed method is especially suitable for deep-seated and locomotive medical implant applications. In this paper, an operating frequency of 6.1MHz is chosen for energy transmission. At such a high frequency, the receiving coil does not need ferromagnetic core so MRI compatible implantable devices can be accomplished.

34. Shawn Bender: Putting Paro in Place: The Meaning of Human-Robot Interaction in Danish Care Institutions.

Department of East Asian Studies Dickinson College Carlisle, PA, USA

<u>Abstract</u>: While the bulk of research on the therapeutic effects of the seal robot Paro has been conducted in controlled experimental situations, this paper explores interactions between staff, residents, and robot ethnographically in the everyday context of care in Danish nursing homes. The paper argues that Paro functions within these institutions not just as a therapeutic device for individual residents but also as a technology that assists in the management of disruptive affect. Moreover, the ways in which Paro helps nursing homes regulate affective display without coercive action accords with the legal context of nursing care in contemporary Denmark. The paper concludes with a suggestion of how the case of Paro within Danish nursing homes encourages a rethinking of prevailing social scientific understandings of total institutions.

<u>Keywords:</u> social robots; therapy; dementia; human-robot interaction; institutional care; quality of life

35. Samuel K. Au, *The da Vinci and Beyond: the Advancement of Surgical Robotics* Senior Engineer, Intuitive Surgcal

Abstract: In the past two decades, medical robots are crossing the chasm that lies between laboratory bench-top prototypes and commercial products. Despite significant regulatory and adoption barriers, highly complex robotic technologies such as the Accuray CyberKnife®, the Hansen Medical Sensei®, and the Intuitive Surgical da Vinci®, are beginning to make clinical impact. Next-generation surgical systems are now on the horizon and the research community is already developing many advanced technologies that will extend computer-assisted surgery even further. In this talk, we will review the origins of the da Vinci telerobotic system, its present capabilities, and limitations; its acceptance, as well as new technologies on the horizon, and how we might see such platforms evolve in the future. I will talk from the perspective of a researcher embedded in industry and will share some of the challenges that we have experienced in taking research concepts and prototypes toward product.

36. Steve Schachter Technology for monitoring patients with epilepsy in the home and beyond – new approaches.

Professor of Harvard Medical School/ MGH, Chief Scientist of CIMIT

<u>Abstract:</u> Ambulatory and home monitoring with simultaneous brainwave (EEG) monitoring and video may provide valuable diagnostic information in the medical evaluation of episodic behaviors in many patients. As sociated challenges, technical limitations, and feasibility and safety issues have diminished with technological advancements and greater availability of ambulatory video-EEG systems as well as consumer video products. As technologies for ambulatory and home-based seizure monitoring further expand, their utilization will likely extend beyond short-term diagnostic evaluation to facilitate the development of home-based and ambulatory systems that provide long-term monitoring to enhance self-management in patients with epilepsy, reduce their safety risks, diminish the possibility of sudden death, track their responses to changes in therapy during drug trials, and increase our understanding of how epilepsy begins.

37. Takashi Kusaka, Takayuki Tanaka and Hiroyuki NARA: Smart Suit for Dairy Working -A Wearable Power Assistive Device based on Semi-active Assist Mechanism-

Graduate School of Information Science and Technology, Hokkaido University, Hokkaido, Japan

Abstract: The purpose of our study is to achieve an independent life and a social involvement for the elderly using KEIROKA Technology (fatigue-reduction) which makes it possible to improve the quality of chores and occupations by removing excessive strain and tiredness. The authors have developed a power assist suit named ``smart suit". The smart suit has semi-active assist mechanism which is one of KEIROKA technology and the mechanism consists of elastic materials and actuators. The elastic materials are the source of assist force and the actuators can control the assist force by adjusting the fixed point of the elastic materials. The target motion of previous smart suit was only bending down. In this study, the authors extend the smart suit for 3-dimensional motion assisting. The new smart suit has two sensors and two actuators. The two independentlydriving actuators can realized 3-dimensional motion assist. Therefore, the smart suit got possible to assist not only bending but also twisting motion. Moreover, the authors have evaluated the effect that the purpose of dairy work assistance, to measure EMG of the worker, compared to the potential of the surface of the non-wearing and wearing "smart suit.".

Keywords: Assistive devices, Semi-active assist mechanism and Wearable sensors.

38. Takashi Sakairi, Heather D. Achilles, Ai Ishida, Tatsuya Ishikawa, Scott Trent, Hiroshi Horii, Yukihisa Yonemochi: *The Dubuque Smarter Discard Portal: Tracking Changes in Residential Waste Diversion.*

IBM Research – Tokyo, 6-52, Toyosu 5-chome, Koto-ku, Tokyo, Japan.

IBM T. J. Watson Research Center, P. O. Box 250, Gilmanton, NH 03237, USA.IBM Research

Abstract: Many local governments are now trying to reduce waste and to increase diversion ratios. To accomplish these goals, citizens' cooperation is necessary. The authors assume that eco-feedback technology can be useful to improve individual and group behaviors with the goal of reducing environmental impact by providing citizens with information about their discard behavior. The City of Dubuque, lowa, and IBM Research performed the Smarter Discard Pilot Study research project, to analyze and help improve waste diversion through curbside trash and recycling collection service. The authors developed a portal site, called the Smarter Discard Portal, which utilizes eco-feedback technology. Volunteer residences used this portal to access customized information visualizations of their waste discard data.

<u>Keywords:</u> behavior change, closed-loop supply chain, eco-feedback technology, recycling and waste management, waste diversion.

39. Thomas O. Mensah, Green Process for Generating Electricity Using a Novel Gasification System Based on Urban Solid Waste in West Africa.

Fellow of the American Institute of Chemical Engineers (FAIChE), AFAIAA, President Lightwave Systems USA

<u>Abstract:</u> Most African countries are plagued by persistent interruption of electricity that hamper serious economic development. A new paradigm is emerging on the continent of Africa, where industrialization has been stymied by lack of adequate electricity and good infrastructure for decades. Hydro Electric Power generation may cost over a billion dollars and take 5 years to construct. Wind Mill and Solar require expensive batteries to store generated electricity for Night time use. They also require importation of all critical components including photovoltaics and windmill structures. Most countries continue to rely on Thermal techniques of burning Oil or in a few cases Natural Gas or even coal which contribute to Greenhouse emissions. This paper will examine Green approaches to generating electricity using urban solid waste in West Africa. The benefits of deaning the environment from urban solid waste that breed mosquitoes causing malaria, etc, while generating employment and producing green electricity is leading to this paradigm shift on the continent.

40. Tim Tianyi Cheng: Hydrogen Fuel Cells and Applications in Universal Village

Vancouver Clean Energy and Advanced Materials TechnologyCo.

<u>Abstract:</u> The energy as essential of modern society has dominated economic and social development, which would be one of key subsystems in future Universal Village. The energy shortage crisis, serious pollutions, deteriorated ecologic environment and extreme weather conditions have warned us that the fossil fuel based conventional energy must have changes. Replacement of conventional energy by clean and renewable energy is a direct and effective solution. Hydrogen energy and related fuel cells as such clean and renewable energy have attracted great attentions and obtained solid development in recent years. The basic information, including the mechanism, type, major advantage, of the fuel cells will be introduced first in the talk. Next, the major function of the fuel cells in stationary energy supply, transportation, environment protection will be reviewed and typical applications in recent years will be introduced. The hydrogen production technology and its influences on emission will be also discussed. The significant role of fuel cells in integration and optimization of renewable energies, such as solar power, wind power, will be addressed. The challenge in commercialization of hydrogen energy and related fuel cells and the suggestion for accelerated development of clean and sustainable energy for Universal Village will be briefly touched at the end.

41. Tony Wu, Marc A Baldo: Singlet fission for solar cell application

MIT USA

Abstract: Solar power is a promising, clean and sustainable energy. However, the theoretical limitation of single bandgap photovoltaic cells is 33.7%, due to Shockley-Queisser limit. This conversion efficiency limitation has two main loss mechanisms: the first loss to photons with energy lower than the solar cell band gap, and the second loss to energy relaxation for generated carriers that have energies larger than the band gap. The maximum efficiency for a single p-n junction solar cell under sunlight is 33.7% for a band gap of 1.34 eV. Singlet fission is an efficient process to convert one high energy singlet exciton into two lower energy triplet excitons, with internal quantum efficiencies demonstrated to near 200%. Using singlet fission material could potentially overcome the Shockley-Queisser limit. Tetracene is a potential candidate for singlet fission photovoltaic cells. In this study, the internal and external quantum efficiency of various tetracene devices are measured, reporting 127% internal quantum efficiency. Additionally, we calculated the triplet yield rate from magnetic field effect, showing that the triplet yield rate in tetracene is near 192%.

42. Toshimitsu Hamada, Ayane Ukegawa, Mizue Watanabe, Yoshihito Kagawa, Mitsuru Naganuma, Tomomi Hashimoto and Toshihiko Yoneoka: Study on Reactions of Elderly People in Robot Therapy.

Tsukuba Gakuin University, 3-1 Azuma, Tsukuba, Ibaraki 305-0031 JAPAN Aikoku Gakuen University, 1532 Yotsukaido, Yotsukaido-shi Chiba 284-0005 JAPAN

Takushoku University, 815-1 Tachimachi, Hachioji –shi Tokyo 193-0985 JAPAN Saitama Institute of Technology, 1690 Fusaiji, Fukaya-shi, Saitama 369-0203 JAPAN

Passetemps Asamadai, 2-17-1 Asamadai Ageo-shi i, Saitama 362-0073 JAPAN

<u>Abstract:</u> Most elderly people staying in nursing homes have dementia, and various kinds of recreation program are provided in order to improve their condition or prevent this problem. Robot therapy is a recreationprogram that has recently been introduced in some nursing homes. However, the effects of robot

therapy are difficult to evaluate. In this study, we identified events occurring during therapy that are important in the proliferation and evolution of robot therapy. We also found that the presence of an intervener encourages elderly people to be more active.

43. Toshio Hori1, Koji Kamei: Standardization of Service Robots Software Interface —Introduction of Robotic Interaction Service (RoIS) Framework—.

Digital Human Research Center, AIST, Japan Intelligent Robotics and Communication Laboratories, ATR, Japan

<u>Abstract:</u> This paper introduces a standardized software interface for service robots, adopted and published by Object Management Group (OMG). Service robots are expected to be employed in our daily living environments for supporting our daily life. Their examples are reception robots, porter robots, navigation robots and so on. Many human-robot interaction functions, such as person detection, speech recognition and mobility, are commonly used in these service robots but their application programs are not "reused" currently. To avoid such inefficiency, OMG has been developing a standard framework for service robots. This framework focuses on defining software interfaces between an application program and functional components developed for service robots and enhances a reuse of the programs.

44. Wei Jiang, Yanyan Li, Wei Long: Comprehensive Utilization of Vinasse Biomass Based on Ecological Living Environment.

School of Manufacturing Sci. and Eng., Sichuan University, Chengdu, China

<u>Abstract:</u> In the past 20 years, the production of distillation wine in China increased explosively. A large number of vinasse residue caused catastrophic damage to the local ecological environment. The ecological living and natural environment of Chishui River basin in China destructed and influenced by solid vinasse are analyzed, taking the Maotai town in Chishui River basin which is largest sauce wine vinasse production base as an example. The technology solutions of four industrialization projects for comprehensive utilization of the vinasse biomass were proposed. With the implementation of these projects, the huge economic benefits were achieved. And the benign restoration and sustainable development of ecological of Chishui River basin in China were also safeguarded.

Keywords: ecological living environment, biomass, vinasse, utilization

45. William Li: Assistive technology for people with disabilities: The power of usercentered design

MIT, USA

<u>Abstract:</u>Technology can help people with disabilities lead more independent, fulfilling lives. I will discuss a few examples of successful assistive technologies from MIT and beyond.

46. Xinyu Tan¹, Xin Zhang², Xiaozhong Zhang², Ping Zhang¹: Photovoltaic properties of Co2-C98/Al2O3/Si solar Cells.

¹ Department of Materials and Chemical Engineering, China Three Gorges University, Hubei Province, 443002, P. R.China

² Department of Materials and Engineering, Tsinghua University, Beijing, 100084, P. R.China.

Abstract: The Co doped amorphous carbon Co2-C98 films were deposited on n-Si substrates with or without an Al2O3 layer using the pulsed laser deposition. The photovoltaic characteristics of the Co2-C98/Si , Co2-C98/SiO2/Si and Co2-C98/Al2O3/Si junctions were studied. It is found that under light illumination of 100 mW/cm2 at room temperature, the Co2-C98/Al2O3/Si solar cell has a high open-circuit voltage of 447 mV and a power conversion efficiency of 3.3%, which is much better than most of the a-C film/Si junctions reported. The enhanced photovoltaic properties are ascribed to the reduction of the interface states, defects and the improvement of the barrier height by the insertion of the Al2O3 layer.

Keywords: Photovoltaic effect, carbon film, Pulsed laser deposition, Interface effect.

47. Ya Sha Yi: Integrated nanophotonics for next generation renewable energy applications

Integrated Nano Optoelectronics Laboratory, University of Michigan, dearborn, MI

Abstract: Nanophotonics is an emerging field that can be utilized to mold the flow of light on a single chip. Recently, nanophotonics has found very interesting applications in telecommunications, next generation photovoltaics, biophotonics and medical imaging. In this talk, I will first talk about basic mechanism of nanophotonics, especially nano photonic structures and its analogy to electrons in solid state semiconductors. After giving an introduction on the available renewable energy sources on earth, I will talk about next generation solar cells utilizing nanophotonics, and our recent research on optoelectronic properties of composite (structurally designed) materials at nm scale for the applications on energy related materials and devices. Utilizing current microelectronics technology and measurement techniques, it is possible to study these novel energy related materials and devices in ways that were unimaginable a decade or two ago. Lastly, I will talk about many potential challenges and future work to be pursued in dean energy fields that require good control of photons and electrons at nanometer scale. This capability can efficiently convert sunlight energy to electricity and meet our demand for dean and renewable energy in the future.

48. Yazhi Guo: Horn the Future - A Dream of A Nation

Berklee College of Music

<u>Abstract:</u> China's rise attracts attention worldwide, how should we introduce and promote our national culture under this context? Who is the next most influential country? Now we are starting a race.

Guo Yazhi, called as "The first Chinese Suona Player", "The best suona blower in the world", is going to talk about his dream of stepping into the world stage.

49. Y. Imamura, T. Tanaka, and F. Shibukawa: *Investigations of Needs for KEIROKA technology in Field of Nursing Care in Denmark and Japan.*

Hokkaido University, Hokkaido, 0600814 Japan

<u>Abstract:</u> KEIROKA technology have been proposed as technologies to reduce workers fatigues. Denmark is one of the best welfare countries. The investigations were conducted to obtain the impressions about assistive device Smart Suit Lite for care work h from the workers in Denmark. This report shows the results of interviews and questionnaires at hospital, research institute and welfare center. Furthermore, it is compared to the survey results of care workers in Japan. In this investigation, existence of care workers who has back pain in Denmark is confirmed. The needs of prevention to the back pain and KEIROKA technologyare also found in Denmark care work field.

Keywords: care works, fatigue reduction, power assistance.

50. Yong Deng, Ming-an Zhang, Dong-xia Chang: A novel genetic clustering algorithm with variable-length chromosome representation.

Institute of Software, Chinese Academy of Sciences, Beijing, China Institute of Software, Chinese Academy of Sciences, Beijing, China Institute of Information Science, Beijing jiaotong University, Beijing, China

<u>Abstract:</u> Data segmentation is one of the research hotspots in the field of big data processing. The clustering segmentation is the most frequently and extensively used method. The paper proposed a new genetic clustering algorithm with variable-length chromosome representation(GAVCM), which can be automatically evolve and find the optimal number of clusters as well as proper cluster centers of the data set. In order to solve the clustering problem more effective, a set of problem specific evolutionary operators and a new clustering criterion based on message passing between data points and the candidate centers described by the chromosome are presented. The simulation results demonstrate the effectiveness of the proposed algorithm.

Keywords: Clustering analysis; Genetic algorithm; Data segmentation.

51. Yuriko Iida, Ichiro Nagoshi, Yasuie Takeda, Hidekazu Nishimura: Post Earthquake Reconstruction Scheme forSmarter Approaches – Challenges of Miyako City using Hydrogen from Biomass.

<u>Abstract</u>: Since the 2011 Great East Japan Earthquake, Japanese government and business entities involve in various reconstruction projects of the affected areas using smart city business schemes. This paper presents one of postdisaster community reconstruction programs using biomass to generate hydrogen, called Blue Challenge of Miyako City, lwate Prefecture, Japan. The project, applies Blue Tower, the unit for generating hydrogen from biomass, is ongoing as a post-disaster reconstruction model to use biomass from the forests accounting for 90% of the total land of the city to generate hydrogen, as well as electricity and heat. Although it shows the potentials for the development of disaster-affected areas, there remain many issues to tackle for realization of sustainable development of rural communities. Given the current situation, we also discuss its potentials and issues through a systems approach.

Keywords: Blue Project, Blue Tower, post-disaster reconstruction scheme, smart city, biomass, hydrogen

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