2018 Joint 7th International Conference on Informatics, Electronics and Vision
&
2nd International Conference on Imaging, Vision & Pattern Recognition (ICIEV-IVPR)

Honorary General Chair of 8th ICIEV:
Toshio Fukuda, *FIEEE, IEEE President-Elect 2019 candidate; Meijo University, Japan; Beijing Institute of Technology, China*
Yasushi Yagi, *Osaka University, Japan*
Takeshi Yamakawa, *FIEEE, Fuzzy Logic Systems Institute; Sojo University, Japan*

General Chair of 8th ICIEV:
Md. Atiqur Rahman Ahad, *SMIEEE, University of Dhaka, Bangladesh; Osaka University, Japan*
Yutaka Hata, *FIEEE, University of Hyogo, Japan*

General Chair of 2nd IVPR:
Md. Atiqur Rahman Ahad, *SMIEEE, University of Dhaka, Bangladesh; Osaka University, Japan*
Toshio Fukuda, *FIEEE, IEEE President-Elect 2019 candidate; Meijo University, Japan; Beijing Institute of Technology, China*

General Co-chair:
Syoji Kobashi, *SMIEEE, University of Hyogo, Japan*

IEEE Catalog Numbers for Conference Record # 43342:

Media Type	ISBN
XPLORE COMPLIANT	978-1-5386-5163-6
USB	978-1-5386-5162-9
PRINT	978-1-5386-5161-2

Keynote Speech 1:

Identifying and Handling a Biological Cell by Employing Dielectrophoresis

***Takeshi Yamakawa**, IEEE Fellow*
Fuzzy Logic Systems Institute; Former Vice-President, Sojo University, Japan

Abstract: The complex permittivity of a biological cell reflects its substance and structure and thus seems to reflect its function, activity, abnormality, life/death, age, and life expectancy. Although it may be very difficult to measure the complex permittivity of each cell, the movement or behavior of the cell as affected by its complex permittivity can be observed under the microscope. The dielectrophoretic force (DEP force) generated on a particle in a nonuniform electric field causes movement of the particle in accordance with its complex permittivity or polarizing characteristics. Thus, differences in the substance or structure of biological cells lead to differences in their movement or behavior in a nonuniform electric field. The principle of dielectrophoresis (DEP) and the estimation of the DEP force are presented in this Keynote Speech. The distinctive features of DEP are applied in the separation of biological cells, e.g., leukocytes from erythrocytes, leukemia cells from normal leukocytes. This cell separation ability is affected by the frequency and amplitude of the applied voltage. In order to estimate the DEP force generated on a single cell, the mass of the cell is needed, which is very difficult to measure. One way to estimate the mass is to measure the terminal velocity of the cell in the medium without taking it out of the DEP device. The procedure to measure the terminal velocity of a single biological cell is also presented. This technology is to be applied to identify the CTC (circulating tumor cell) and separate it from healthy blood cells.

Short biography: Takeshi Yamakawa, Professor Emeritus of Kyushu Institute of Technology, Japan. Takeshi Yamakawa is now the Founding Director of Fuzzy Logic Systems Institute (FLSI) in Japan. His main research interest lies on hardware implementation of fuzzy systems, fuzzy neural networks, and chaotic systems. He holds 11 patents in U.S.A., 4 patents in Europe, 1 patent in Australia and 1 patent in Taiwan, and he has also applied for more than 100 patents in Japan. Prof. Yamakawa is a fellow of IEEE, International Fuzzy Systems Association (IFSA) and Japan Society of Fuzzy Theory and Systems (SOFT). He received IEEE 2008 Fuzzy Systems Pioneer Award.
Prof. Yamakawa is now studying acupuncture (oriental medicine) in the college (night course) as a third-year student aiming at the national license of professional acupuncturist.
Prof. Yamakawa plays Karate (Japanese traditional martial arts) and possesses a black belt (5th Dan). He has been playing Shakuhachi for about 50 years, which is Japanese traditional musical instruments. He also enjoys, every morning, taking care of two gentle dogs and one female American quarter horse on which he enjoys dressage and show jumping.

Luncheon Keynote Speech 2:

Management of sports-related musculoskeletal problems

Shinichi Yoshiya
Department of Orthopaedic Surgery, Hyogo College of Medicine

Abstract: Sports-related musculoskeletal problems are classified into two categories. One is injuries caused by trauma such as fracture and ligament tear, and the other is over-use injuries such as tendinopathy which are caused by repetitive mechanical stress (not by single trauma). Evaluation of those problems are comprised of history taking, physical examination, and imaging examinations (such as radiography and MRI). Appropriate management is feasible based on the accurate evaluations and diagnosis.
Management measures are classified into two categories: Conservative treatment and surgery. Conservative treatment measures are comprised of training, bracing, and taping. Training for injury prevention is another issue of current interest. Most of the surgeries are currently performed under endoscopic control (such as arthroscopic surgery). Representative conservative treatment and injury prevention programs are shown in this talk. In addition, some examples of arthroscopic surgeries for ligament and meniscus injuries of the knee will be also shown.

Short biography: Shinichi Yoshiya graduated Kobe University School of Medicine and received M.D. in 1979. He went through orthopaedic residency of Kobe University from 1979 to 1984, and special fellowship in orthopaedic research in the Cleveland Clinic Foundation from 1984 to 1986.
Since 2005, he has been serving as Chairman of Department of Orthopaedic Surgery, Hyogo College of Medicine in Nishinomiya, Japan.
His clinical subspecialties are knee surgery and sports medicine.

Keynote Speech 3:

Human Gait Analysis

Yasushi Yagi

Vice-President, Osaka University, Japan

Abstract: We have been studying human gait analysis for more than 10 years. Because everyone's walking style is unique, human gait is a prime candidate for person authentication tasks. Our gait analysis technologies are now being used in real criminal investigations.

We have constructed a large-scale gait database, and proposed several methods of gait analysis. The appearances of gait patterns are influenced by changes in viewpoint, walking direction, speed, clothes, and shoes. To overcome these problems, we have proposed several approaches using a part-based method, an appearance-based view transformation model, a periodic temporal super resolution method, a manifold-based method and score-level fusion. We show the efficiency of our approaches by evaluating them with our large gait database.

Furthermore, I introduce the novel research project 'Behavior Understanding based on Intention-Gait Model' that was supported by JST-CREST in 2010. In this project, we focus on a new aspect that a human gait pattern is influenced by our emotions, the object of our activity, our physical/mental condition, and the people surrounding us. In this talk, I briefly introduce an overview of this project and some studies on its medical application.

Short biography: Yasushi Yagi is the Executive Vice President of Osaka University in 2015. He received his Ph.D. degree from Osaka University in 1991. In 1985, he joined the Product Development Laboratory, Mitsubishi Electric Corporation, where he worked on robotics and inspections. He became a research associate at Osaka University in 1990, a lecturer in 1993, an associate professor in 1996, and a professor in 2003. He was the director of the Institute of Scientific and Industrial Research at Osaka University from 2012 to 2015.

The studies in his laboratory focus on computer vision and media processing including basic technologies such as sensor design, and applications such as an intelligent system with visual processing functions. Some of our major research projects are: the development of a novel vision sensors such as an omnidirectional catadioptric system; biomedical image processing such as endoscope and microscope images; person authentication, intention, and emotion estimation from human gait, and its applications to forensic and medical fields; photometry analysis and its application to computer graphics; an anticrime system using a wearable camera; and 3D shape and human measurement using infrared light.

He is a member of the Editorial Board of the International Journal of Computer Vision, the Editor-in-Chief of IPSJ Transactions on Computer Vision & Applications and the Vice-President of the Asian Federation of Computer Vision Societies. He is a fellow of IPSJ and a member of IEICE, RSJ, and IEEE.

Keynote Speech 4:

Ellipse Fitting for Computer Vision

***Kenichi Kanatani**, IEEE Fellow*
Professor Emeritus, Okayama University, Japan

Abstract: Ellipse fitting is one of the most fundamental tasks of image processing and computer vision. We first present mathematical fundamentals and review existing methods: (1) least squares, (2) the Taubin method, (3) HyperLS, (4) iterative reweight, (5) renormalization, and (6) geometric distance minimization. Then, we introduce Hyper-renormalization and investigate its mathematical structure. Doing simulated and real image experiments, we demonstrate that hyper-renormalization performs the best among all existing methods. Considering real applications, we discuss two cases where standard ellipse fitting fails: (i) Some segments may belong to other objects. (ii) Available segments are too short and/or noisy. For (i), we summarize the classical RANSAC. For (ii), we compare (a) the ellipse-specific method of Fitzgibbon et al., (b) the random sampling method of Matsuzaki et al, and (c) the penalty method of Szpak et al. Doing simulated and real image experiment, we show that the well-known method of Fitzgibbon et al. performs very poorly and that the random sampling method returns the most reasonable results.

Short biography: Kenichi Kanatani received his B.S., M.S, and Ph.D. in applied mathematics from the University of Tokyo, Japan, in 1972, 1974, and 1979, respectively. He joined the Department of Computer Science, Gunma University, Japan, in April 1979 as Assistant Professor. He became Associate Professor and Professor there in April 1983 and April 1988, respectively. From April 2001 to March 2013, he was Professor of Computer Science, Okayama University, Okayama, Japan. He retired in March 2013 and is now Professor Emeritus of Okayama University. He was a visiting researcher at the University of Maryland, U.S.A. (1985-1986, 1988-1989, 1992), the University of Copenhagen, Denmark (1988), the University of Oxford, U.K. (1991), INIRA at Rhone Alpes, France (1998), ETH: Swiss Federal Institute of Technology Zurich, Switzerland (2013), University Paris-Est, France (2014), and Linkoping University, Sweden (2015). His main research interests are mathematical analysis of images and 3-D reconstruction from images. He is the author of ``Group-Theoretical Methods in Image Understanding'' (Springer, 1990), ``Geometric Computation for Machine Vision'' (Oxford University Press, 1993), ``Statistical Optimization for Geometric Computation: Theory and Practice'' (Elsevier Science, 1996), ``Understanding Geometric Algebra: Hamilton, Grassmann, and Clifford for Computer Vision and Graphics (CRC Press, 2015), ``Ellipse Fitting for Computer Vision: Implementation and Applications'' (Morgan & Claypool, 2016), and ``Guide to 3D Vision Computation: Geometric Analysis and Implementation'' (Springer 2016). He received many awards, including the Best Paper Awards from IPSJ (Information Processing Society of Japan) in 1987, from IEICE (Institute of Electronic, Information and Communication Engineers), in 2005, and from the Pacific-Rim Symposium on Image and Video Technology (PSIVT'09) in 2009, and the Most Influential Paper over the Decade Award from IAPR MVA Conference in 2009, Distinguished Educational Practitioners Award from IEICE in 2017. He was elected IEEE Fellow in 2002, IEICE Fellow in 2012, and IAPR Fellow in 2016.

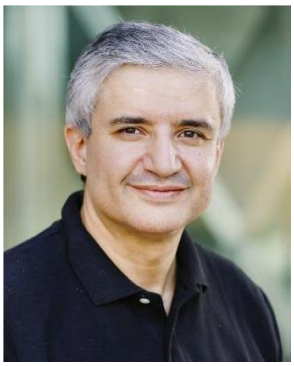
Keynote Speech 5:

"Beyond Human Technology" Opens A New World

***Makoto Kaneko**, IEEE Fellow*
Hyper Human Laboratory, Mechanical Engineering Department, Osaka University

Abstract: This talk begins by explaining what is "Beyond Human Technology". All human actions start by perception, such as vision, tactile, hearing, tasting, and smelling sensor. For example, human vision has potential recognition capability even under various different illumination conditions, while the recognition speed is not that fast compared with the existing online high speed camera. Knowing of the limitation of human perception and action, we show how to design an artificial system leading to "Beyond Human Technology" by utilizing two kernel components, an online high speed vision and a high speed actuator where both speeds are several hundred times faster than human eye and muscle, respectively. We introduce a couple of examples in both robotics and bio/medical fields. As for robotics, we show "The 100G capturing robot", "Two-fingered hyper human robot hand", "Hyper plate manipulation learnt from pizza master", and "Hyper magician". As for bio/medical application, we first show a fast and fine cell manipulation system with the frequency of 100Hz and the resolution of 250 nanometers by using both a newly developed syringe pump and an online high speed vision. As an application of cell manipulation, we show "Cell Stress Test" where a mechanical stress is continuously imparted to a cell until it eventually gets damages. Through experiments, we found an interesting behavior of red blood cell where after several hundred times mechanical stress, the cell eventually loses any recovery characteristics. We are expecting to see some correlation between deceases and the number of stress leading to knock out state. All topics in this talk will be explained together with video demonstration.

Short biography: IEEE Fellow (2006), JSME Fellow (2003), RSJ Fellow (2009), SICE Fellow (2014), Professor of Hyper Human Laboratory, Mechanical Engineering Department, Osaka University. He received Ph.D. at the University of Tokyo in 1981. His current research interests include innovative dynamic active sensing, such as strobe imager, cell deformability sensing, dynamic sensing of human eye, and dynamic sensing of internal organs by using both high speed vision and high speed actuator. He has received 30 awards, including the Humboldt Research Award in 1997, the IEEE ICRA Best Manipulation Paper Award in 2000, the IEEE ISATP Outstanding Paper Award in 2001, the IEEE RAS King-Sun Fu Memorial Best Transactions Paper Award in 2003, the IEEE ICIA Best Conference Paper Award in 2005, the IEEE ICMA Best Paper Award in 2012 and 2015, and the IEEE MHS Best Paper Award in 2011 and 2014. He also received the Honorary Doctor from Darmstadt University of Technology, Germany in 2013.



Keynote Speech 6:

Addressing spectrum scarcity through hybrid optical and radio-frequency wireless networks

***Mohamed-Slim Alouini**, IEEE Fellow*
King Abdullah University of Science and Technology, KSA

Abstract: Rapid increase in the use of wireless services over the last two decades has led the problem of the radio-frequency (RF) spectrum exhaustion. More specifically, due to this RF spectrum scarcity, additional RF bandwidth allocation, as utilized in the recent past, is not anymore a viable solution to fulfill the demand for more wireless applications and higher data rates. The talk goes first over the potential offered by optical wireless (OW) communication systems to relieve spectrum scarcity. It then summarizes some of the challenges that need to be surpassed before such kind of systems can be deployed. Finally, the talk offers two recent studies illustrating how supplementing OW networks with RF backup access points increases these networks reliability and coverage while maintaining their high capacity.

Short biography: Mohamed-Slim Alouini was born in Tunis, Tunisia. He received the Ph.D. degree in Electrical Engineering from the California Institute of Technology (Caltech), Pasadena, CA, USA, in 1998. He served as a faculty member in the University of Minnesota, Minneapolis, MN, USA, then in the Texas A&M University at Qatar, Education City, Doha, Qatar before joining King Abdullah University of Science and Technology (KAUST), Thuwal, Makkah Province, Saudi Arabia as a Professor of Electrical Engineering in 2009. He is an Fellow of IEEE.

Keynote Speech 7:

Object Segmentation and Its Visual Quality Assessment for Images

***King Ngi Ngan**, IEEE Fellow*
National Thousand Talents Program Chair Professor, University of Science and Technology of China, China

Abstract: In the first part, we investigate interactive object segmentation with an input rectangle. Here, a coarse-to-fine method from region-level segmentation to pixel-level segmentation is presented. In the region-level segmentation, the best combination of adjacent refined superpixels is selected as the coarse segmentation result by measuring its global contrast and tightness degree. Subsequently, we use the coarse segmentation result to construct the energy function in the pixel-level segmentation. The result can be further refined with the fusion of the region-level and pixel-level segmentation.
In the second part, we explore visual quality assessment of object segmentation in terms of subjective evaluation and objective measure. Firstly, we present a subjective object segmentation visual quality database, in which a total of 255 segmentation results were evaluated by more than 30 human subjects. This database is used to evaluate the performance of the objective measures and analyze their pros and cons. Then, we propose a full-reference objective measure for object segmentation visual quality evaluation, which involves four human visual properties. Finally, our measure is compared with some state-of-the-art objective measures on our database. The experiment demonstrates that the proposed measure performs better in matching subjective judgments.

Short biography: King N. Ngan received the Ph.D. degree in Electrical Engineering from the Loughborough University in U.K. He is currently a Chair Professor at the University of Electronic Science and Technology, Chengdu, China, under the National Thousand Talents Program. He was previously a Chair Professor at the Chinese University of Hong Kong, the Nanyang Technological University, Singapore, and the University of Western Australia, Australia. He holds honorary and visiting professorships of numerous universities in China, Australia and South East Asia.
Prof. Ngan served as associate editor of IEEE Transactions on Circuits and Systems for Video Technology, Journal on Visual Communications and Image Representation, EURASIP Journal of Signal Processing: Image Communication, and Journal of Applied Signal Processing. He chaired and co-chaired a number of prestigious international conferences on image and video processing including the 2010 IEEE International Conference on Image Processing, and served on the advisory and technical committees of numerous professional organizations. He has published extensively including 3 authored books, 7 edited volumes, over 400 refereed technical papers, and edited 9 special issues in journals. In addition, he holds 15 patents in the areas of image/video coding and communications.
Prof. Ngan is a Fellow of IEEE (U.S.A.), IET (U.K.), and IEAust (Australia), and an IEEE Distinguished Lecturer in 2006-2007.

Invited Talk 1:

Joint Intensity and Spatial Metric Learning for Robust Gait Recognition

Yasushi Makihara
Osaka University, Japan

Abstract: This paper describes a joint intensity metric learning method to improve the robustness of gait recognition with silhouette-based descriptors such as gait energy images. Because existing methods often use the difference of image intensities between a matching pair (e.g., the absolute difference of gait energies for the l_1-norm) to measure a dissimilarity, large intra-subject differences derived from covariate conditions (e.g., large gait energies caused by carried objects vs. small gait energies caused by the background), may wash out subtle inter-subject differences (e.g., the difference of middle-level gait energies derived from motion differences). We therefore introduce a metric on joint intensity to mitigate the large intra-subject differences as well as leverage the subtle inter-subject differences. More specifically, we formulate the joint intensity and spatial metric learning in a unified framework and alternately optimize it by linear or ranking support vector machines.[1] Experiments using the OU-ISIR treadmill data set B with the largest clothing variation and large population data set with bag, *b* version containing carrying status in the wild demonstrate the effectiveness of the proposed method.

Short biography: Yasushi Makihara received the B.S., M.S., and Ph.D. degrees in Engineering from Osaka University in 2001, 2002, and 2005, respectively. After working as a specially research associate in 2005, a research associate in 2006, and an assistant professor from 2007 to 2014 in the Institute of Scientific and Industrial Research, Osaka University, he is currently an associate professor of the same institute. He is a recipient of The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, Prizes for Science and Technology, Research Category in 2014. He also received Honourable Mention Paper Award at the 9th IAPR Int. Conf. on Biometrics (ICB 2016), and was certificated as outstanding reviewers at CVPR 2017, BMVC 2015, 2017, FG 2015, ISBA 2016, PCM 2015. His research interests are computer vision, pattern recognition, and image processing including gait recognition, pedestrian detection, morphing, and temporal super resolution.

Invited Talk 2:

Developing Social Services based on Cyber Physical System

Rin-ichiro Taniguchi
Kyushu University, Japan

Abstract: In this talk, development of IT-based social services led by his group is presented. The key technology is Cyber Physical System (CPS), where a feedback loop consisting of real world sensing, data analysis and information presentation is realized to make social systems effective, efficient, and comfortable. It is also very important to realize the sustainability. The talk covers people congestion analysis, smart energy management, and smart agriculture.

Short biography: Rin-ichiro Taniguchi received the PhD degree in Engineering from Kyushu University, Japan, in 1986. In 1989, he became an associate professor of Interdisciplinary Graduate School of Engineering Sciences, Kyushu University. Since 1996, he has been a professor of Graduate School of Information Science and Electrical Engineering (ISEE), Kyushu University. From 2011 to 2014, he was the dean of ISEE, and, from 2014 to 2018, he was the director of Research Institute for Information Technology, Kyushu University. Currently, he is a council member of Science Council of Japan (SCJ) as well. His research interest includes computer vision, multimedia, cyber physical system, etc.

Invited Talk 3:

Estimation of bounded faults using sliding mode observers

Tan Chee Pin
Monash University Malaysia, Malaysia

Abstract: This paper presents a new approach for fault estimation, by assuming that the faults are bounded and therefore its dynamics are known. Then, the fault dynamics are combined with the original system dynamics to form an augmented system, and a sliding mode observer (SMO) is used to estimate the states of the augmented system (which contains the fault signal). It is found that this approach greatly relaxes the existence conditions for successful fault estimation and hence enables fault estimation to be applied to a wider class of systems. Furthermore, the assumption of fault boundedness is not restrictive, as the main challenge in fault estimation is to estimate slowly-varying faults which can be easily modelled as a bounded fault, and this approach of bounding the faults unearths vast potential in the area of fault estimation. A simulation example verifies the effectiveness of the proposed method.

Short biography: Chee Pin Tan received the B.Eng. (first class honors) and Ph.D. degrees from Leicester University, Leicester, UK, in 1998 and 2002, respectively. He was appointed as Lecturer at the School of Engineering, Monash University Malaysia, in 2002, subsequently promoted to Senior Lecturer in 2008 and Associate Professor in 2013. He has served as Deputy Head of School (Research), and is currently the Head of the Mechatronics Engineering program at Monash University. His research interests include robust fault estimation and observers, and he has published over 60 internationally peer-reviewed research articles including a book on fault reconstruction. He currently is a member of the Conference Editorial Board of the IEEE Control Systems Society.

Invited Talk 4:

Overview of Deep Learning and Its Advanced Applications in Medical Image Processing, Analysis, and Diagnosis

Kenji Suzuki

Institute of Innovative Research (IIR), Tokyo Institute of Technology, Japan Medical Imaging Research Center, Illinois Institute of Technology, Chicago, USA

Abstract: It is said that artificial intelligence driven by deep learning would make the 4th Industrial Evolution. Deep learning becomes one of the most active areas of research in computer vision, pattern recognition, and imaging fields, because "learning from examples or data" is crucial to handling a large amount of data ("big data") coming from informatics and imaging systems. Deep learning is a versatile, powerful framework that can acquire image-processing and analysis functions through training with image examples; and it is an end-to-end machine-learning model that enables a direct mapping from raw input data to desired outputs, eliminating the need for handcrafted features in conventional feature-based machine learning. I invented ones of the earliest deep-learning models for image processing, semantic segmentation, object enhancement, and removal of specific patterns in medical imaging. I have been actively studying on deep learning in medical imaging in the past 20 years or so. In this talk, deep learning in computer vision and imaging is overviewed to make clear a) what has changed in machine learning after the introduction of deep learning and b) differences and advantages over conventional feature-based machine learning. Advanced deep-learning applications to medical image processing, analysis, and diagnosis are described, including 1) separation of bones from soft tissue in chest radiographs, 2) computer-aided diagnosis for lung nodule detection in chest radiography and thoracic CT, 3) distinction between benign and malignant nodules in CT, 4) polyp detection and classification in CT colonography, and 5) radiation dose reduction in CT and mammography.

Short biography: Kenji Suzuki, Ph.D. (by Published Work; Nagoya University) worked at Hitachi Medical Corp., Japan, Aichi Prefectural University, Japan, as a faculty member, and in Department of Radiology, University of Chicago, as Assistant Professor. In 2014, he joined Department of Electrical and Computer Engineering and Medical Imaging Research Center, Illinois Institute of Technology, as Associate Professor (Tenured). Since 2017, he has been jointly appointed in World Research Hub Initiative, Tokyo Institute of Technology, Japan, as Full Professor. He published more than 320 papers (including 110 peer-reviewed journal papers). He has been actively studying deep learning in medical imaging and computer-aided diagnosis in the past 20 years. He is inventor on 30 patents (including ones of earliest deep-learning patents), which were licensed to several companies and commercialized. He published 11 books and 22 book chapters, and edited 13 journal special issues. He was awarded more than 25 grants as PI including NIH R01 and ACS. He served as the Editor of a number of leading international journals, including Pattern Recognition and Medical Physics. He served as a referee for 91 international journals, an organizer of 62 international conferences, and a program committee member of 170 international conferences. He received 26 awards, including Springer-Nature EANM Most Cited Journal Paper Award 2016 and 2017 Albert Nelson Marquis Lifetime Achievement Award.

Invited Talk 5:

Road-Speed Profile for Enhanced Perception of Traffic Conditions

MAS Kamal
Monash University Malaysia, Malaysia

Abstract: Anticipative driving based on preceding traffic prediction may significantly improve the traffic flows and fuel consumption of individual vehicles. Recent relevant research mostly focusses on a fully connected vehicle environment (CVE), where 100% vehicles frequently share their states using vehicle-to-vehicle (V2V) communication technology. Prediction of traffic and implementation of anticipative driving in a CVE are not much difficult. However, the fully CVE is a distant goal in intelligent transportation systems (ITS) as the penetration of V2V and automated vehicles will increase very gradually over 2-3 decades. Therefore, a very upcoming scenario of partially connected vehicle environment (PCVE) is considered, where unconnected vehicles are mixed in the traffic in any proportion, to develop a new method of comprehending preceding traffic conditions and realizing smart driving. For enhanced perception of the traffic conditions in PCVE, a road-speed profile (RSP) is developed that dynamically describes the mean speed in each small segment of the road by effectively extracting information from V2V traffic big data broadcasted by surrounding vehicles. Finally, incorporating the proposed RSP, a smart driving scheme in a receding horizon control framework is developed, and performance of the smart anticipative driving is evaluated and compared with the existing scheme that depends on the fully CVE.

Short biography: Md Abdus Samad Kamal received his B.Sc. Eng. (1997) from Khulna University of Engineering and Technology (KUET), Bangladesh, and obtained both his Master (2003) and Doctor (2006) degrees from Kyushu University, Japan. Currently he is a Senior Lecturer in School of Engineering, Monash University Malaysia. Earlier, he worked as a Visiting Researcher in Toyota Central R&D Labs., Inc., Japan (2014-2016), as a Research Fellow in the University of Tokyo (2011-2014) and Kyushu University, Japan (2008-2011). He was also an Assistant Professor in the International Islamic University Malaysia (2006-2008) and a Lecturer in KUET (1997-2000). Currently, he is serving as a leader or collaborator in several research projects, including the projects of Japan and Malaysia Governments, and Industries. He has been involved in Editorial Board of several Journals and organizing committee in many International Conferences in his area of expertise. His research interests include Intelligent Transportation Systems (ITS), Cooperative and Eco-driving, and Model Predictive Control and its application to engineering systems. He is a Chartered Engineer (C.Eng., UK) and a member of IEEE, IET, SICE and BEM.

Invited Talk 6:

How to Conduct a Big Data Research in Real Fields?

Sozo Inoue
Kyushu Institute of Technology, Japan

Abstract: In this talk, we share our experiences on conduciting big data research in realfields, utilizing activity recognition technology using mobile type sensors including smartphones and applications to medical and nursing fields. Although a lot of activity recognition technology has already been introduced, there are many challenges in collecting realistic datasets and developing algorithms for complicated and long-term activities. To this problem, from our research, we proposed a method [UbiComp2015] that uses prior knowledge of the activity segment of the day, and a method that automatically corrects when the timing of the labels are inaccurate [MobiQuitou2016]. We also proposed a method [MobiQuitous2016] that corrects differences among individuals by transfer learning. Along with these works, we talk about the future prediction of nursing work volume and patient prognosis in combination with medical data in the hospital[UBI16], and talk about the trial of recognizing whole staffs' activities in nursing homes for 4 months [UBI17].

Short biography: Sozo INOUE is an associate professor in Kyushu Institute of Technology, Japan. His research interests include human activity recognition with smart phones, and healthcare application of web/pervasive/ubiquitous systems. Currently he is working on verification studies in real field applications, and collecting and providing a large-scale open dataset for activity recognition, such as a mobile accelerator dataset with about 35,000 activity data from more than 200 subjects, nurses' sensor data combined with 100 patients' sensor data and medical records, and 34 households' light sensor data set for 4 months combined with smart meter data.
Inoue has a Ph.D of Engineering from Kyushu University in 2003. After completion of his degree, he was appointed as an assistant professor in the Faculty of Information Science and Electrical Engineering at the Kyushu University, Japan. He then moved to the Research Department at the Kyushu University Library in 2006. Since 2009, he is appointed as an associate professor in the Faculty of Engineering at Kyushu Institute of Technology, Japan. Meanwhile, he was a guest professor in Kyushu University, a visiting professor at Karlsruhe Institute of Technology, Germany, in 2014, and a special researcher at Institute of Systems, Information Technologies and Nanotechnologies (ISIT) during 2015-2016. He is a technical advisor of TeamAIBOD Co. Ltd since 2017, and a guest researcher at RIKEN Center for Advanced Intelligence Project (AIP).
He is a member of the IEEE Computer Society, the ACM, the Information Processing Society of Japan (IPSJ), the Institute of Electronics, Information and Communication Engineers (IEICE), the Japan Society for Fuzzy Theory and Intelligent Informatics, the Japan Association for Medical Informatics (JAMI), and the Database Society of Japan (DBSJ). Contact him at sozo@acm.org; 1-1 Sensui-cho, Tobata-ku, Kitakyushu, 804-8550, Japan.

Invited Talk 7:

Convolution Neural Network for Khmer Handwritten Text Recognition

***Norliza Mohd Noor**, SMIEEE,*
UTM, Razak School of Engineering and Advanced Technology, Malaysia

Abstract: This talk presents a pilot study on Khmer handwritten symbols recognition using Convolutional Neural Networks (CNNs). The motivation for this study is to develop a recognition system for digitizing large corpora of Khmer handwritten documents. Image data consists of six handwriting sample sets, each of which consists of 33 consonants (root radicals) and 17 vowels, total of 561 syllables. A CNN-based model was trained for offline recognition of root radicals. One CNN was trained for recognition of a particular consonant. All 33 networks have been combined into an assembly. The recognition results are compared against ANN-based classifier with full feature set and ANN -based classifier with dimensionality reduction. Feature correlation two-dimensional Fourier transformation (FT2D) and Gabor filters are used for dimensionality reduction. Recognition rate of Khmer handwriting (alphasyllabary system) is increased to 92-97% with Convolutional Neural Networks (CNN).

Short biography: Norliza Mohd (pronounced as Mohamed) Noor is currently attached as Associate Professor in UTM Razak School of Engineering and Advanced Technology, Universiti Teknologi Malaysia (UTM), Kuala Lumpur Campus. She received her B. Sc. In Electrical Engineering from Texas Tech University in Lubbock, Texas and her Master of Electrical Engineering (by research) and PhD (Electrical Engineering) from UTM. Her research area is in image processing and image analysis for medical and industrial applications. She has published many papers in journals and in indexed conference proceedings, and has published one academic book and two book chapters. She is a senior member of IEEE where she has been a member for more than 25 years starting as student member while studying in USA. In the year of 1998-2001, she held honorable secretary and then treasurer in IEEE Malaysia Section. She is the founding chapter chair for IEEE Signal Processing Society Malaysia Chapter in 2002 and she held the position till 2006. She is an active IEEE volunteer and held key positions in IEEE Signal Processing Society Malaysia Chapter and IEEE Engineering Medicine and Biology Society Malaysia Chapter till now. She has co-organized many IEEE educational and professional activities and conferences in Malaysia under these two chapters. She was elected as the IEEE Malaysia Section Chair for two years 2013-2014. She was the co-chair for IEEE Region 10 Symposium (TENSYMP2014) and was the general chair for IEEE Region 10 Conference (TENCON2017) that was held in Malaysia. She has served in IEEE R10 as the Individual Benefits and Services Coordinator. For IEEE MGA, she has served as the MGA Geographic Unit Operations Support Committee – Technical Chapter Representative (2015-2016), IEEE Educational Activity Board (EAB) – Student Educational Resources Committee (SERC) in 2017, and IEEE Members Benefit Portfolio Activity Committee for 2017-2018. Currently, she is the IEEE R10 Director Elect Candidate for 2019-2020.

Invited Talk 8:

Neonatal Brain Development Modeling Using Brain MR images

***Syoji Kobashi**, SMIEEE*
Director, Advanced Medical Engineering Center (AMEC), University of Hyogo, Japan

Abstract: Some brain diseases may deform the brain shape, and shape analysis of brain shape will assist physicians to diagnose the brain diseases. In addition, brain shape of neonates will be changed significantly with brain development. Thus, the main difficulty of diagnosing brain diseases based on the brain shape is that it is hard to differentiate the deformation due to disease or brain development. This study introduces a statistical modeling method of brain shape deformation with brain development. The model is called 3-D spatio-temporal statistical shape model (stSSM), and is constructed from neonatal brain MR images of training subjects with different ages. It provides the temporal change of brain development deformation.

Short biography: Syoji Kobashi received BE in 1995, ME in 1997, and Doctor of Engineering in 2000, all from Himeji institute of Technology. He was an assistant professor at Himeji Institute of Technology (2000-2004), an associate professor at University of Hyogo (2005-2016), am currently a professor at University of Hyogo (2016-), and a manager of Advanced Medical Engineering Research Center, University of Hyogo (2016-). And, he was a guest associate professor at Osaka University, WPI immunology frontier research center (2010-2016), and was a visiting scholar at Department of Radiology, University of Pennsylvania (2011-2012). His research interests include medical image understanding and analysis. He received 16 international awards, including Lifetime Achievement Award (WAC, 2016), Franklin V. Taylor Memorial Award (IEEE-SMCS, 2009), and IEEE-EMBS Japan Young Investigators Competition (EMBS Japan Chapter, 2003). He has been serving on the publication chair of IEEE SMC2018, the chair of IFMIP since 2012, General Co-chair of ICIEV since 2016, and others. Moreover, he is an editor-at-large of Intelligent Automation & Soft Computing journal, an associate editor of 4 journals, and a guest editor of some special issues. And, he is organizing many special sessions in international conferences including IEEE SMC and IEEE EMBC. He is the senior member of IEEE.

Invited Talk 9:

Optimization of Acoustic Emission Technique in Diagnosis of Knee Osteoarthritis - a Major Concentration in Damage Characterization and Source Localization

Md Tawhidul Islam Khan
Saga University, Japan

Abstract: Diagnosis of knee joint involves damage identification and characterization of anatomical parts inside the knee. The damage of these anatomical parts, particularly the damage in cartilage causes the osteoarthritis (OA) which is a major knee joint problem of aged people, and therefore, major concentration implies for it in the present research. Since the damage of cartilage frequently occurs at getting ages, the epidemic of this disease increases with increasing ages as well. Acoustic emission (AE) technique has been applied for evaluating the damage criteria as well as damage source of knee joint involving in OA. The technique of AE is medically safe for human body as it does not insert extra harmful energy to the human body like X-Ray, UT or so on. The present investigation especially focuses on the dynamical behavior of knee joint for its integrity analysis. Similarly, multidimensional AE source location for damage identification inside the knee joint are also applied for its clarification. AE signals have been collected from different positions of tibia, patella, and femur for getting sufficient information about the condition of cartilage of knee joint. Data shows that the increasing of age increasing knee problems, and thus, the present non-invasive technique in clarifying OA is focused to become a vital diagnostic tool in optimization of knee integrity as a significant biomarker.

Short biography: Md. T. I. Khan graduated from the Department of Mechanical Engineering, Khulna University of Engineering and Technology (KUET), Bangladesh in 1991. He completed his masters and doctorate degrees from Saga University, Japan in 1997 and 2003 respectively. After his PhD, he awarded the JSPS postdoctoral fellowship and continued his research at Saga University until September, 2007. Since October 2007 till to date he has been working as an Associate Professor in Graduate School of Science and Engineering, Saga University, Japan. He also worked as Lecturer and Assistant professor in the Department of Mechanical Engineering of KUET until February, 2005. His current research interests are acoustical emission in NDE, bio-medical motion sensing, diagnostics, noise reduction, signal processing, image processing and moiré topography. He is the author of more than 80 technical papers. He is actively holding the membership of SICE, ASJ, JSME, JSNDI, IIAV and IEB.

Invited Talk 10:

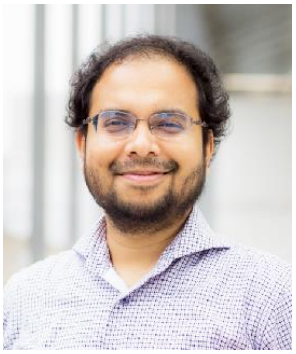
Biology-driven Image Analysis across Scales

M Julius Hossain

European Molecular Biology Lab (EMBL), Germany

Abstract: Microscopy has been widely used as an observational technique in a variety of scientific fields such as atomic structural studies, cell and tissue analysis, disease detection and forensic science. In modern biology, the microscope is an indispensable instrument to record key structures and events in different scales ranging from molecular, cellular, organ to whole organism in order to understand the structures and functions that are crucial for life. The rapid technological advancement in the microscopy field over the last two decades triggered a big influx of data generation in cell biology. Fully automated analysis of this huge volume of data to extract reproducible measurements in order to interpret them in a biological context has turned to be one of the major bottlenecks of scientific productivity. As a result, the development of sophisticated image analysis techniques that are able to process such large and complex datasets with high level of heterogeneity is now in more demand than ever before. The Ellenberg Group at EMBL performs state-of-the-art microscopy across scales to integrate and connect data from different levels in a meaningful manner in order to understand how cells and their molecular machines are constructed and dynamically work together to carry out the essential functions of life. The studies carried out in the group involve substantial development of new computational frameworks in order to process complex and often new types of images acquired with many different imaging modalities. This talk will first briefly introduce these imaging and image analysis activities in our multi-disciplinary research group. It will be followed by more detailed discussion on few recently developed image analysis pipelines to demonstrate how advanced image processing methods are combined with relevant a priori biological knowledge to develop more specific biological image analysis solutions and achieve higher accuracy. It will also demonstrate why image analysis frameworks are so important and how they make significant impact in achieving overall research goals in a multi-disciplinary environment such as biology.

Short biography: Dr. M. Julius Hossain is a Research Scientist in the Cell Biology and Biophysics Unit at the European Molecular Biology Laboratory (EMBL), Germany. Dr. Hossain was trained as an Engineer and obtained his PhD degree in Computer Engineering with a major in computer vision and image processing from Kyung Hee University, South Korea. He did his postdoctoral research in biomedical/biological image analysis in Dublin City University, Ireland and then moved to EMBL where he has been very active in interdisciplinary research for many years. Dr. Hossain has collaborated actively with scientists in several other disciplines including biology, physics, chemistry, and bioinformatics to develop computational methods for quantifying and modeling biological systems specially the dividing human cell and mouse embryo. Dr. Hossain had spent more than a year in the industry as a Software Engineer before he started his academic career at the University of Dhaka where he served as a full time Lecturer and then Assistant Professor in the Department of Computer Science and Engineering. His current research focus includes multi-dimensional image analysis, modeling cell and embryo shape, parameterization of dynamic protein distributions in the dividing human cell.



Invited Talk 11:

Design Techniques for Low-Energy IoT devices: Circuit and System Challenges

A.K.M. Mahfuzul Islam
The University of Tokyo, Japan

Abstract: In this talk, I will present several low-power techniques from circuit and system perspectives to realize ultra-low-energy IoT devices for longer battery life. To achieve the next 1000 times energy saving in the devices, optimization across the multiple layers of design abstraction is required starting from sensing to system and programming. I will first present some of the circuit techniques optimized for low-energy and low-speed IoT devices. I will touch on the increasing importance of power management techniques for low-energy operation. Then, I will show how a system level optimization utilizing signal conditioning can increase the energy-efficiency up to 100 times. Finally, I will emphasize on the need of a reconfigurable hardware platform to meet the need of large diversity and use-cases of IoT devices.

Short biography: A.K.M. Mahfuzul Islam received the B.E., M.E. and Ph.D. all from the Kyoto University, Kyoto, Japan in 2009, 2011 and 2014 respectively. He has been Research Fellow of the Japan Society for the Promotion of Science from 2013 to 2015. Since 2015, He has been working as a Research Associate at the Institute of Industrial Science, The University of Tokyo. His primary research focuses on ultra-low-power CMOS sensor circuits, characterization and modeling of noise in scaled transistors and low-power design techniques CMOS digital circuits. Dr. Mahfuzul received the best paper award at ICMTS '2017, student design award at A-SSCC'2013 and was nominated for best paper at CICC'2018. He is a member of IEEE and IPSJ.

Invited Talk 12:

Fuzzy Logic in Artificial Intelligence: ~A Classical View and Modern Trends~

Atsushi Inoue
Eastern Washington University, USA

Abstract: This talk addresses how Fuzzy Logic should be, as well as has been, incorporated within Artificial Intelligence. The aim is to consider and discuss together the significance of Fuzzy Logic in Artificial Intelligence. In this talk, we consider the modern.

Short biography:

Atsushi Inoue, Ph.D.
Director of Intelligent Informatics Initiative (I3)
Professor of Information Systems and Business Analytics
College of Business and Public Administration (Professor of Computer Science by courtesy)
Eastern Washington University, Spokane, WA 99202, USA

Atsushi Inoue is specialized in Artificial Intelligence (AI hereafter) at large and Fuzzy Logic in specific. He has been affiliated with top-notch industries and institutes in several countries, including Hitachi Ltd. (Japan) and Carnegie Mellon University (USA), for his specialties. He is currently home at Eastern Washington University to enjoy his life with his family in the beautiful evergreen and necessary freedom. His current activities are centered in future AI technology development, especially those related to Blockchain as a platform.

Invited Talk 13:

F-transform in image inpainting applications

Pavel Vlasanek

Institute for Research and Applications of Fuzzy Modeling, University of Ostrava, Czech Republic

Abstract: We propose to reconstruct a damaged image with help of a fuzzy technique, namely the F-transform. In the last ten years, the theory of F-transforms has been intensively developed in many directions. In image processing, it has successful applications in image compression and reduction, image fusion, edge detection, noise removing, etc. F-transform can approximate the original function with an arbitrary precision and thus it can be chosen as an appropriate technique. This paper is a survey of several techniques used for different types of images.

Short biography: Pavel Vlašánek was born in Opava, Czechia, in 1986. He received the bachelor degree in computer science from the University of Ostrava, Ostrava, Czechia, in 2008, and the master and Ph.D. degrees from the same university in 2010 and 2014, respectively. In 2014, he joined the Institute for Research and Applications of Fuzzy Modeling, as a researcher and his alma mater as a lecturer.
His main field of research is image processing aimed to image reconstruction. He is an author of several papers and techniques of image inpainting as well as OpenCV module for fuzzy image processing.

Invited Talk 14:

Imaging techniques in the field of fluid mechanics and applications

Naohisa Takagaki
School of Engineering, University of Hyogo, Japan

Abstract: Measurement of fluid and particle motions is of great important in both geophysics and engineering. Nowadays, by grace of the technical advancement of camera and computer, several imaging techniques are used in the field of fluid mechanics. This time, I'll introduce imaging techniques in the field of fluid mechanics, and how to apply such techniques for investigating fluid dynamics' problems. Particularly, the state-of-the-art study for tropical cyclones will be introduced as an example.

Short biography:
2000 – 2004, Faculty of Engineering, Kyoto University, Japan
2004 – 2009, Department of Mechanical Engineering, Graduate school of Engineering, Kyoto University, Japan
2009, PhD. Eng., Kyoto University, Japan
2009 – 2016, Assist. Prof., Kyoto University, Japan
2013 – 2014, Visiting Researcher, Scripps Institute of Oceanography, University of California, San Diego, USA
2016 – Present, Assist. Prof., University of Hyogo, Japan

Tutorial 1: Non-Orthogonal Multiple Access (NOMA) in 5G and Beyond in the Era of Spectrum Scarcity

S.M. Riazul Islam, Ph.D.

Assistant Professor, Dept. of Computer Science and Engineering, Sejong University, South Korea

E-mail: islam.smriaz@gmail.com, riaz@sejong.ac.kr

Abstract: The increasing popularity of all-wireless access has uncovered that the radio spectrum is a scarce resource. The available spectrum must accommodate various forms of wireless services, including voice and data traffic that is cumulatively increasing at an unprecedented rate. Wireless researchers around the world are continuously working hard to find the way for smart spectrum utilization. On that, non-orthogonal multiple access (NOMA) is now recognized as a promising and potential candidate for 5G and Beyond radio access due to its superior spectral efficiency. Unlike orthogonal multiple access (OMA) techniques, such as time-division multiple access (TDMA), NOMA exploits the non-orthogonal resource allocation. The key reason for adopting NOMA in 5G owes to its ability of serving multiple users using the same time and frequency resources.

In this tutorial session, we will elaborate to talk about NOMA and its types, advancements in power-domain NOMA, uplink and downlink NOMA, resource allocation, cooperative NOMA, physical layer security, multiple-input multiple-output (MIMO) NOMA, and the applications of NOMA in various potential wireless communications systems. A set of research challenges and implementation issues of NOMA will be discussed such as; error propagation, implementation complexity, inter-cell interference issues, standardization activities, energy-efficiency, scalability, and carrier-aggregation issue.

This tutorial session will offer a reasonable learning opportunity to the audience in terms of understanding the NOMA schemes in the domains of 5G cellular radio access technologies. It is expected that the audience will be able to associate the dots of different co-existed technologies while they are researching and/or implementing academic/enterprise level systems and services.

Short biography: S.M. Riazul Islam is an Assistant Professor with the Dept. of Computer Engineering at Sejong University, South Korea. From 2014 to 2017, he worked at the Wireless Communications Research Centre, Inha University, Korea as a Postdoctoral Fellow. In 2014, he was with the Samsung R&D Institute Bangladesh as a Chief Engineer at the Department of Solution Lab for advanced research. From 2005 to 2014, he was with the University of Dhaka, Bangladesh as an Assistant Professor and Lecturer at the Dept. of Electrical and Electronic Engineering. His research interests include wireless communications, enabling technologies for 5G and beyond, internet of things, and wireless health.

Tutorial 2: Raspberry Pi for Computer Vision

--Vein Visualization--



Shu Isaka
Department of Electrical and Electronic Engineering, Mie University, Japan
Takumi Kitajima
Department of Public Health and Occupational Medicine, Graduate State of Medicine, Mie University, Japan
Atsushi Inoue, Ph.D.
College of Business and Public Administration, Eastern Washington University, USA
Contact E-mail: ainoue@ewu.edu

Abstract: Raspberry Pi is a low-cost, open source, credit card size computer. Potential applications vary from supercomputing to the Internet of Things. The most notable feature of Raspberry Pi is its affordability. This hands-on tutorial introduces a configuration of Raspberry Pi with various cameras for computer vision applications -- a USB webcam and a dedicated camera module. We use Python and an open source library such as OpenCV and SimpleCV as the programming platform. The goal is to configure a Raspberry Pi as an IoT sensing node for various computer vision applications in a short period. We specifically demonstrate our recent advancement in the vein visualization work (also to be presented in a general session).

Target audiences:

Scientists seeking a low-cost solution for Computer Vision framework. Participants are expected to prepare the following for their own hands-on work:

- A laptop with a native Ubuntu OS installed and an Ether port. A USB Ether adapter should work if your laptop does not have it.
- A micro SD card >=8GB.
- A micro SD card reader -- a USB card reader (recommended) or an adapter that works with an internal SD card reader on your laptop.
- A short CAT5/6 Ether cable to connect Raspberry Pi with your laptop. (optional)
- A USB-micro USB cable and a portable power bank. Alternatively, you may feed the power from your laptop. You may share those for your smartphone in many cases.
- Raspberry Pi 3.

- Raspberry Pi NoIR camera module.
- A HDMI monitor and cable. (optional)
- USB keyboard & mouse. (optional)

Agenda:

1. Introduction to Raspberry Pi. (by Prof. Inoue)
2. Raspberry Pi installation and configuration. (by Prof. Inoue)
3. Simple sensing app development -- Python with a library such as OpenCV and SimpleCV. (by Mr. Isaka)
4. Hackathon: a simple computer vision task -- Vein Visualization. (by Mr. Kitajima)

Short biographies:

Shu Isaka is the first-year graduate student in the Department of Electrical and Electronic Engineering in Mie University, Japan. He graduated as the top student from the Department of Electrical and Electronic Engineering at Mie University in 2017. He received the Presidential Award and the alumni association scholarship for his exceptional academic performance.

Takumi Kitajima is the first-year graduate student in the Graduate School of Medicine at Mie University, Japan. He is specialized in Public Health and Occupational Medicine. He graduated from the Department of Electrical Engineering at Mie University in 2017. He received the Encouragement Award from the Mie Prefectural Public Health Association in 2018.

Atsushi Inoue is specialized in Artificial Intelligence (AI). He earned his Ph.D. in Computer Science and Engineering at the University of Cincinnati in 1999. He is currently a full professor at Eastern Washington University to enjoy his life with necessary freedom. He has recently kicked off the PiLab in order to promote the low cost platform such as Raspberry Pi for innovations and entrepreneurship. (Web: http://www.inoueatsushi.net/)