

Keynote Speaker I



Professor Tohru YAGI

Graduate School of Information Science
and Engineering 2-12-1-W8-20

O-okayama, Meguro-ku, Tokyo 152-8552, Japan

E-mail: tyagi@mei.titech.ac.jp

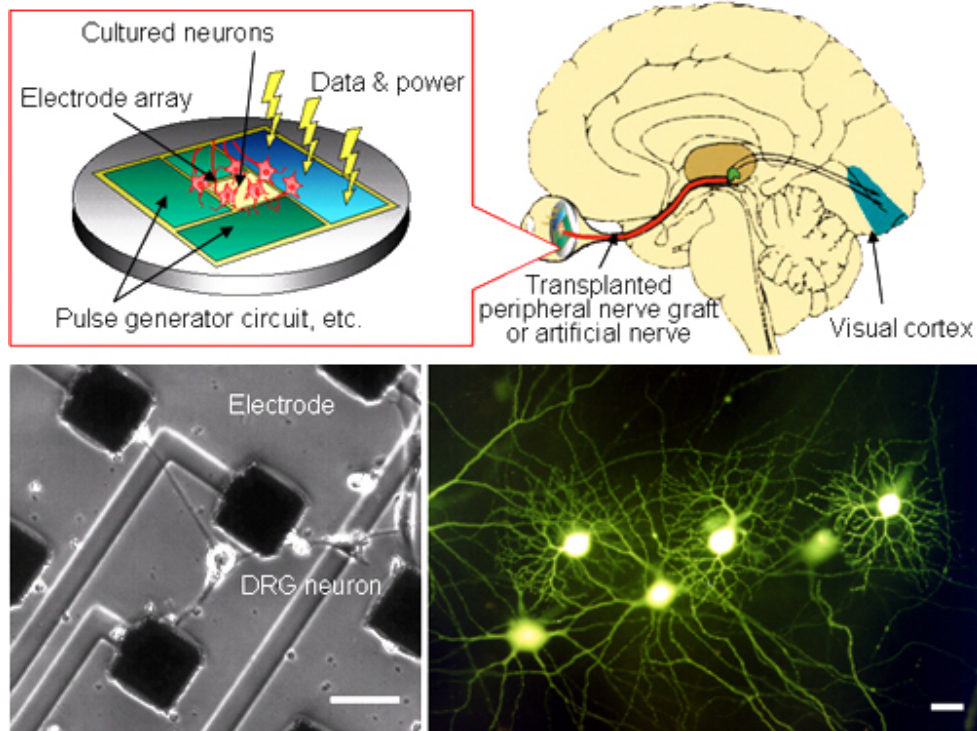
<http://www.io.mei.titech.ac.jp/members/yagi/>

Title:

Neural Interfaces: From Robot Eye to Human Eye

Abstract: A visual prosthesis is an artificial organ to restore vision in blind patients by applying electrical stimulation to the visual nervous system. For years, our research group has been studying "biohybrid" visual prosthesis, which combine the characteristics of regenerative medicine and visual prostheses. They require the implantation of not only the MEMS (microelectromechanical system), but also the transplantation of nerve cells. It has been shown that when nerve cells and Schwann cells are together, irrespective of their origin, the visual cortex or periphery, the lengthening of nerve fibers is promoted by factors produced by Schwann cells, and myelin sheath formation occurs. Hence, the biohybrid implants require the ocular implantation of the MEMS with nerve cells for transplantation attached to the surface of an electrode array. Using a peripheral nerve graft or an artificial optic nerve prepared from Schwann cells (a semipermeable membrane tube filled with cultured Schwann cells, extracellular matrix, and neurotrophic factors), the axons of these nerve cells are guided to the higher visual cortex, connecting the MEMS with the visual cortex. That is the nerve cells are used as a "living electrical cable." Once the connection is complete, it is considered that nerve cells transmit signals to the visual cortex in response to electrical pulses provided by the electrode array. Because nerve cells are transplanted as part of the process of fitting this visual prosthesis, a biohybrid implant is appropriate for blind patients whose optic nerves and/or retinal ganglion cells are NOT intact such as glaucoma and diabetic retinopathy patients.

Keynote Speaker I



Top: Concept image of a biohybrid visual prosthesis. Bottom-left: A cultured neuron on an electrode array. Bottom-right: Regenerated neurons with a peripheral nerve graft.

Biography:

Dr. Yagi received his Ph.D. degree in Electro-Mechanical Engineering from Nagoya University, Japan, in 1996 and became a postdoctoral fellow at the Institute of Physical and Chemical Research (RIKEN), Japan. He worked at Nagoya University from 1998 to 2001 as an assistant professor. He was invited by NIDEK Co., Ltd. in 2001 to start directing the national research project of a visual prosthesis under the support of Japanese governmental agency, NEDO (New Energy and Industrial Technology Development Organization). In 2002, he commercialized eye-gaze interface with SeaStar Corporation. After he completed the first prototype of the visual prosthesis in 2004, he moved to the Institute of Physical and Chemical Research (RIKEN) as a research scientist. He also held a research position as visiting research scientist at the University of Tokyo, Research Center for Advanced Science and Technology, from Apr. 2004 to Mar. 2005. Since September, 2005, he has joined a faculty staff in the Tokyo Institute of Technology and concurrently held a visiting research scientist position in RIKEN.

Keynote Speaker II



Professor Fernand S. Cohen

Department of Electrical and Computer Engineering, Drexel University, Philadelphia, PA, USA

Title:

On-the-fly Detection of Changes on and below the Surface in Epithelium Mucosal Tissue Architecture from Scattered Light

Abstract: In this talk we present our ongoing research work on modelling scattered light off epithelium mucosal tissue using a stochastic decomposition method (SDM) that models the scattered light reflected from the layered structure over an area (2-D scan) illuminated by an optical sensor (fibre) emitting light at either one wavelength or with white light. Our technique correlates the differential changes in the reflected tissue texture with the morphological and physical changes that occur in the tissue occurring inside the structure. This work has great potential in detecting changes in mucosal structures and may lead to enhanced endoscopy when the disease is developing to the outside of the mucosal structure and hence becoming hidden during colonoscopy or endoscopic examination.. Unlike previous works that analyze scattering signal at one spot as a function of wavelength or angle, our method statistically analyzes 2-D scan of light scattering data over an area. We also present a segmentation technique that raises a flag on-the-fly as to when a transition occurs between different mucosal architectures while travelling along the surface of the tissue for careful and subsequent examination. Our segmentation technique has the potential to enhance the endoscopist's ability to locate and identify abnormal mucosal architectures; and to help in the decision as to when and where to take biopsies; steps that should lead to improvement in the diagnostic yield. The segmentation scheme is based on detecting an abrupt change in the parameters extracted from the Stochastic Decomposition Method (SDM) that models the scattered signal. Subsequent evaluation of the homogeneous regions separated by the found edges for further mucosal type classification is then possible.

Keynote Speaker II

The tests are performed on phantom data and animal tissue data collected from rat and rabbit colons in vitro. The results demonstrate the effectiveness of the SDM model in detecting structure difference at and below the mucosal surface, and the effectiveness of the segmentation scheme in detecting transition between different mucosal structures on-the-fly with sensitivity reaching 40 μ m which corresponds to the sliding segmentation window step size used in our experiments.

Biography:

Fernand S. Cohen received his B.Sc. degree in physics from the American University in Cairo in 1978, and M.Sc. and Ph.D. degrees in electrical engineering from Brown University, Providence, RI, in 1980 and 1983, respectively. He joined the Department of Electrical Engineering at the University of Rhode Island in 1983 as an assistant professor. In 1984 he joined the Robotics Research Center, University of Rhode Island and was responsible for the vision research in the center from 1986 to 1987. In 1985 he was the recipient of a Research Excellence Award from the College of Engineering, University of Rhode Island. In 1986 he was invited by the French government (Mission Scientifique) to tour research laboratories and universities. In 1987 he joined the Department of Electrical and Computer Engineering at Drexel University, Philadelphia, PA, as a named Chair Associate Professor (George Beggs). He is currently a professor of Electrical and Computer Engineering and is affiliated with the School of Biomedical Engineering, Science and Health Systems, and serves as Director of the Imaging and Computer Vision Center (ICVC). In summer 1994 he was invited as a visiting Professor by the National Institute of Research in Information and Automation (INRIA) in Sophia Antipolis, France. In 2003 he was the recipient of the Thomas W. Moore Award for Excellence and Innovation in teaching from the Electrical and Computer Engineering Department at Drexel University. His research interests include medical imaging; computer vision; pattern recognition; signal processing; and applied stochastic processes.

Keynote Speaker III



Professor Tsuyoshi Shiina

Graduate School of Medicine, Human Health Sciences
Kyoto University. 53 Kawahara-chou, Shogoin Sakyo-ku,
Kyoto 606-8507, Japan

TEL:075-751-4998 / FAX:075-751-3909

E-mail: shiina@hs.med.kyoto-u.ac.jp

Title:

Ubiquitous Image Surveillance and Its Medical Application

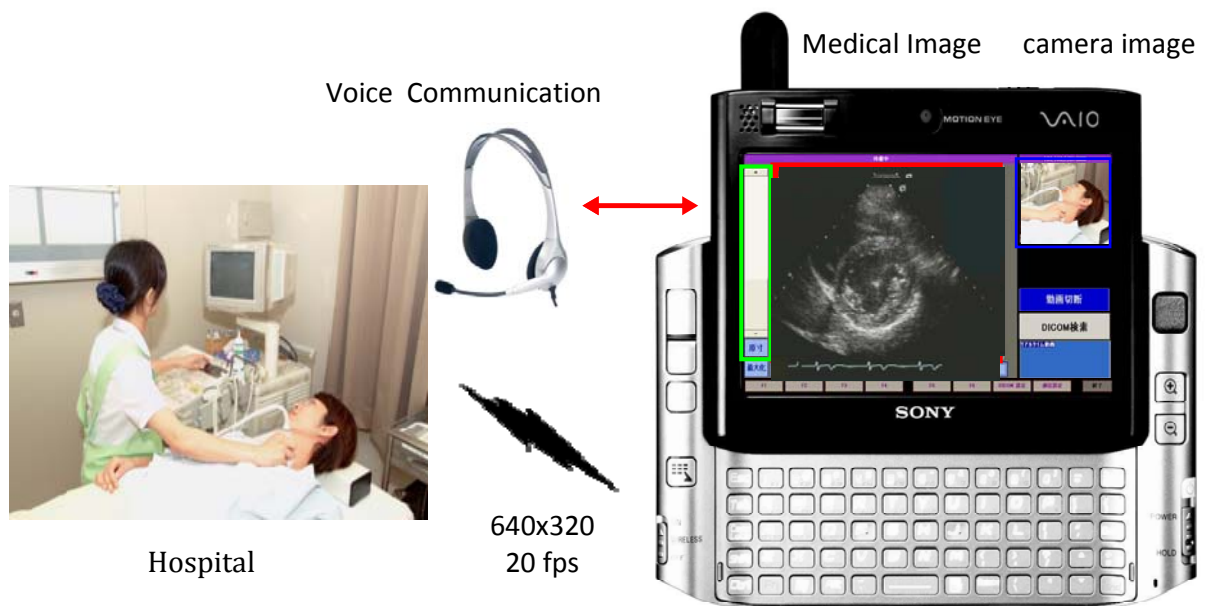
Abstract: In Japan, rapid aging of the population resulting from the decline in the birthrate become an object of public concern. The Japanese government is pushing ahead with an initiative called the u-Japan Strategy for helping people to live safe and anxiety-free lives even as the population grows older and the number of young people declines. This is to be achieved before 2010 by creating a “ubiquitous” info-communications environment that gives everyone access to the internet and other services anytime, wherever they may be.

In order to enjoy safe lives and peace of mind in our life, it is important to make appropriate judgments in various aspects whenever we wish from wherever we wish. Since the most efficient manner to grasp the situation is to visually observe it, a project entitled by Ubiquitous Images Surveillance for Safe and Anxiety-free Urban Life has been promoted with Japanese government grant, 2005-2007.

The project aims to develop systems to enable us to assess the situation in real time by using sensor-network, intelligent recognition of abnormality, and mobile display device which can be applied in ubiquitous info-communications environment. The systems are widely available for various applications, i.e., security, environment and medical care. With regard to the application to medical care, as is often the case with urgent patient, doctors on duty take a band-aid measure resulting in inappropriate care when a specialist is outside the hospital.

Keynote Speaker III

However, if a specialist can diagnose and advise as to treatment, it is possible to adopt more suitable measures. For the case of the diagnosis using ultrasonograph and endoscope, real-time diagnosis with moving image is important. Then mobile monitoring device is required to display the high resolution medical image with high frame rate. In addition, voice and image must be sent at the same time for instruction on probe manipulation and communication. Then, we have developed the Ubiquitous Medical Images Diagnosis System (UMIDS) which satisfies these conditions. The performance of system was evaluated by demonstration in Tsukuba University Hospital. Ultrasound and endoscope images captured from equipment at hospital and video pictures of patients were transmitted by way of wireless LAN and monitored in real time by mobile device. The results validated high performance of the system in clinical use.



Ubiquitous Medical Images Diagnosis System (UMIDS)

Keynote Speaker III

Biography:

Dr. Shiina was graduated from the Electronic Engineering Department, the University of Tokyo, Tokyo, Japan, in 1982. He received the MS and PhD degrees in electronic engineering in 1984 and 1987, respectively, from the University of Tokyo. From 1987 to 1992, he worked at the Department of Electronic Engineering, Tokyo University of Agriculture and Technology. In 1992, he moved to the University of Tsukuba, Japan and he has been a Professor of Graduate School of Systems and Information Engineering, the University of Tsukuba since 2001.

From 1995 to 1996, he was with the institute of Cancer Research and the Royal Marsden NHS Trust in UK as Visiting Professor. His current research interests include visualization technique of structural and functional bio-information, for example, ultrasonic elasticity imaging, 3D blood-flow measurement, and bio-signal processing based on EEG.

He was awarded the distinguished paper prize about his research on elasticity imaging. and Matsuo Prize for his major contribution in the field of medical ultrasound by the Japan Society of Ultrasonics in Medicine, 2000 and 2002, respectively. He was also awarded the novel technology prize about Real-Time Tissue Elasticity Imaging System which was produced by cooperation with Hitachi Medical Corporation by Japan Society of Medical Electronics and Biological Engineering, 2005. Dr. Shiina performed editors of many academic journals, IEICE, IEEJ and Ultrasound in Medicine and Biology. He is Councilor of the Japan Society of Medical Electronics and Biological Engineering. He is also Executive Trustee of the Japan Society of Ultrasonics in Medicine.

Keynote Speaker IV



Professor Chusak Limsakul

Prince of Songkla University, Faculty of Engineering,
Thailand.

Co-Authors:

Angkoon Phinyomark, Pornchai Phukpattaranont

Title:

Feature Extraction of EMG signal

Abstract: Myoelectric control refers to the process of utilizing the Electromyography (EMG) signal from the human muscle in order to operate an external device like a prosthetic robot arm for people who lost their arm or part of it or use for exoskeleton robot control. EMG recognition system consists of three stages including feature extraction, dimensionality reduction, and classification. In this paper presents the results of literatures about feature extraction stage.

The first and the most important one is the feature extraction stage. This stage is how to specific temporal structure for each kind of movement. Generally, most of the attempts to extract features from EMG signal can be classified into three categories including time domain, frequency domain, and time-frequency domain methods. In each stage have both the advantages and the disadvantages. The problem is what a high quality feature is. A high quality EMG should have following three properties. The first is the maximum class separability. This ensures that the resulting misclassification rate will be as low as possible. The second is robustness or noise tolerance and the third is computational complexity that related procedure can be implemented with reasonable hardware and in real-time.

Because of their comparative computational simplicity, time domain features are the most popular in myoelectric classification and are based on signal amplitude. Two well-known time domain features are mean absolute value (MAV) and root mean square (RMS). Although EMG pattern recognition using feature extracted by time domain methods were successful to some limit because such methods assume that EMG signal is stationary, while the EMG signal is non-stationary.

Keynote Speaker IV

Thus changing the researcher's trend toward the use of information contained in frequency domain. Mean and median frequencies are two characteristic variables in power spectral density that a major role in frequency domain and autoregressive model became significant improvements in the quality of feature estimation but it increases computation complexity. Limits of feature in time domain and frequency domains became time-frequency domain methods that correspondence both time and frequency. Many researchers investigated various time frequency approaches to signal processing in myoelectric control problem. Many methods were used in EMG pattern recognition. Wavelet transform and wavelet packet transform are suggested.

All of them above are adopted in EMG classification for myoelectric control. The first generation often offers ON/OFF control schemes or only open/close hand control. Today, EMG signal can control multifunction system. They can control six to seven motions from two or three channels and performance accuracy more than 90 percents.

Keynote Speaker IV

Biography

Name: Dr. Chusak LIMSAKUL
Title Assoc. Prof.

Major Field of Scientific Specialization: Electronics and Signal processing

Institute: Department of Electrical Engineering
Faculty of Engineering
Prince of Songkla University
Hadyai, Songkhla
90112 Thailand.

Telephone: +66 74 287000

Fax: +66 74 212805

E-Mail lchusak@ratree.psu.ac.th

Education:

Name and location of Institute	Field of Study	Graduation Year	Degree
King Mongkut's Institute of Technology Ladkrabang Bangkok , Thailand	Electronics	1974	B.Eng.
Institute National des Sciences Appliquees de Toulouse, France	Electronics	1985	D.Ing.

Thesis

Docteur Ingenier Etude du Bruit de Fond des Transistor Bipolaires a Hererojunction $Ga_{1-x}Ai_xAs/GaAs$. 160 P

Experience

Staff at Department of Electrical Engineering, Faculty of Engineering, Prince of Songkla University , Hat Yai Songkla 90112, Thailand

Administrator:

-Acting Head of the Department of Electrical Engineering, Faculty of Engineering, Prince of Songkhla University, Hat Yai, Songkhla 90112, Thailand. October 1978 – December 1987

-Head of the Department of Electrical Engineering, Faculty of Engineering, Prince of Songkhla University, Hat Yai, Songkhla 90112, Thailand. 1992 – 1996.

- Deputy Dean for Research and Graduate studies, Faculty of Faculty of Engineering, Prince of Songkhla University, Hat Yai, Songkhla 90112, Thailand. 1999 – 2001.

- Dean of Institute of Engineering and Resources, Walailak University, Nakhon Si Thammarat, Thailand. 2001-2003.
- Dean of Faculty of Engineering, Prince of Songkla University, Hatyai, Songkhla, Thailand. 2003-present.

Speaker:

Workshop on optical Fibre for Technology Development, Hat Yai, Thailand. 22 – 26 May 1995.

Training:

Optoelectronics
Physics Division, University of New England, Australia.
Department of Applied Physics, Victoria University of Technology, Australia.
4 April – 6 June, 1992.

Neural Network Assisted EMG Recognition
Interdisciplinary Graduate School of Science and Engineering
Tokyo Institute of Technology
Nagatsuda Campus, Japan
25 September – 24 October 1996.

Research Area of Interest:

- Digital Signal processing
- Neural Network
- Sensors and Instrumentation

Keynote Speaker V



Professor Banchong Mahaisavariya

Faculty of Graduate Studies,
Mahidol University, Salaya,
Nakorn Pathom 73170, Thailand
Email: sibmh@mahidol.ac.th

Title:

Osteoporotic Fractures: Problems & Future Treatments

Abstract

Osteoporosis is a systematic skeletal disease characterized by progressive age-related loss of bone strength that increase to fracture risk. It is a common disease resulting in millions of potentially preventable fractures each year. Women are disproportionately affected by osteoporosis compared to men, with loss of gonadal functioning and aging being the 2 most important contributing factors to osteoporosis.

Bone mineral density (BMD) testing is a clinical tool to diagnose osteoporosis or low bone density, predict fracture risk, and monitor changes in bone density over time. Non-invasive measurement of BMD is done with a variety of technologies for many different skeletal sites. Dual-energy X-ray absorptiometry (DXA) is the gold-standard for diagnosing osteoporosis and monitoring changes in BMD over time. BMD is commonly expressed as a T-score, the standard deviation variance of the patient's BMD compared to a young-normal reference population. In untreated postmenopausal women, there is a strong correlation between T-score and fracture risk, with fracture risk increasing about two-fold for every standard deviation decrease in bone density. BMD in postmenopausal women is classified as normal, osteopenia, or osteoporosis according to criteria established by the World Health Organization. BMD testing, combined with assessment of clinical risk factors for fracture, allows healthcare providers to identify patients who may benefit from pharmacologic therapy to reduce the risk of future fractures.

Menopausal hormone therapy (HT) has been the mainstay for the prevention and treatment of osteoporosis among menopausal women. While recent randomized trial data have confirmed findings from observational studies concerning HT's protective effect on osteoporosis, they showed that HT increases the risks of breast cancer, venous thromboses, stroke, and coronary heart disease.

Keynote Speaker V

With a strong body of evidence showing the benefit of HT in preventing osteoporotic fractures, the challenge facing clinicians is not whether HT helps to prevent osteoporotic fractures, but whether HT's fracture-prevention benefits outweigh its risks. With several medications now available having efficacy comparable to HT in preventing fractures, decision on therapy for osteoporosis or osteopenia should take into consideration bone mineral density, other risk factors for osteoporotic fracture, and a careful examination of the benefits and risks of each treatment option.

Prevention of osteoporotic-related fractures is dependent on the ability to identify individuals with low bone mass, including those women who are asymptomatic. Treatment of osteoporosis involves the use of either anti-resorptive (e.g. estrogen and bisphosphonate) or bone formation agents (e.g. fluoride and PTH). Aerobics, weight bearing and resistance exercises are all effective in increasing the BMD of the spine in postmenopausal women. Weight-bearing is also effective on the hip. Uncertainty remains about the efficacy of regimens with or without vitamin D or its analogues in fracture prevention. Particularly if co-supplementation with calcium is required, significant cost differences are likely to exist between regimens. Further randomized trials are currently being conducted to clarify the effectiveness of community-based fracture prevention programmes employing vitamin D supplementation.

Surgical treatment is commonly used to stabilize the fracture of the extremities to maintain the patient mobility. New surgical technique using minimally invasive modality will help to minimize post-operative pain and fasten the rehabilitation. New fixation devices and implants are being developed to enhance stability of fracture fixation and the healing process.

Biography:

Professor Banchong Mahaisavariya was born in 1955. He graduated M.D. from the Faculty of Medicine Siriraj Hospital, Mahidol University in 1979. He is a Professor in Orthopaedics since 1999. From 1993 to 2002, he was chairman, subcommittee research methodology of Royal College of Orthopaedic Surgeon of Thailand (RCOST), and he was also the 2nd Vice President of RCOST. He is currently the President of Thai Engineering in Medicine and Biology Society (ThaiEMBS).

Professor Banchong Mahaisavariya is currently the Dean, Faculty of Graduate Studies, Mahidol University. In 1990, he received award of the Best Research Paper of ASEAN-Junior Traveling Fellow Contest, outstanding Scientific Paper in the Annual Meeting of the Royal College of Surgeon of Thailand in 1994 and 1995, Best Scientific Paper and Poster of the Annual Meeting of the Thai Orthopaedic Association in 1994, 1995, and 1998, and Best National Research Award in medicine in 2001 from National Research Council of Thailand. For international affiliation, he is a Council Member of Asian Association for Dynamic Osteosynthesis (AADO) since 1992.