Institute of Microelectronics
A*STAR

Engineering Hope with Biomimetic Microelectronic Systems

GUEST SPEAKER

Prof. Wentai Liu
Professor of Electrical Engineering
Campus Director of NSF-ERC on Biomimetic MicroElectronic Systems (BMES)
University of California at Santa Cruz

When: **3rd November 2010, 4.30 p.m. to 5.30 p.m.**
Where: **Institute of Microelectronics, Singapore**
11 Science Park Road Singapore Science Park II Singapore 117685

Abstract

Research in biomimetics has progressed rapidly in the recent years, fueled by the unique interdisciplinary efforts fusing engineering, medicine, and biology. This research has to address the aspects of humanity and societal impacts, technical challenges and barriers, targeting a wide range of applications, which range from understanding the highly complex biological systems, to treating/restoring/repairing lost biological functions such as deafness, blindness, and paralysis, to building human-machine interface for performance enhancement. Biomimetic systems will offer viable solutions to neural disorder diseases which potentially affect very large populations of people worldwide and thus occupies a large market share in healthcare.

The major enabling technology for implantable biomimetic systems include biological recording, stimulation, bio-signal processing, wireless communication, sensing, electrode, hermetic packaging, and powering, where the implants must deal with critical constraints of size, power, reliability, safety, and technology. Integration and miniaturisation of the implants become very essential and rely on solutions from many fronts – device, circuit, architecture, system, algorithm, design, testing, packaging, and technology. This talk defines enabling technologies and challenges to realise integrated and miniaturised biomimetic systems, especially neural implants, which can be used for building advanced neuroscience and neuroprosthetics platform with closed-loop control mechanisms. We will cover the development history, market opportunity, technical challenge/barriers, enabling technology, and application examples.

About the Speaker

Prof. Wentai Liu received a B.S. degree from National Chiao-Tung University in Taiwan, a M.S. degree from National Taiwan University, and a Ph.D. from the University of Michigan. In 1983, he joined North Carolina State University, where he held the Alcoa Chair Professorship in electrical and computer engineering and was the founder of the Analog/Mixed-Mode Design Consortium. Since 2003, he has been a professor in the electrical engineering at the University of California, Santa Cruz, where he is also the campus director of the NSF Engineering Research Center on Biomimetic Microelectronic Systems. His research interests include neuroengineering, invasive and non-invasive neural prosthesis, brain-machine interface, bioelectronics, transceiver, sensors and actuators, timing/clock optimisation, computer vision/image processing. Since its early stages, he has been leading the engineering efforts of the retinal prosthesis to restore vision, finally leading to successful preliminary implant tests in blind patients. He has published more than 250 technical papers and is a co-author of *Wave Pipelining: Theory and CMOS Implementation* (Kluwer Academic). He received the 2010 Breakthrough Award (Popular Mechanics), 2009 R&D-100 Editor's Choice Award, Outstanding Paper Awards from IEEE-CVPR (1986) and ACCV (2009) Conferences, Alcoa Foundation's Distinguished Engineering Research Award, NASA Group Achievement Award, and Outstanding Alumni Award from National Chiao-Tung University, where he also holds a Chair Professorship. He has served as an Associate Editor for IEEE Trans. on Biomedical Engineering, a Guest Editor for both IEEE Proceedings special issue of Biomimetic Systems and IEEE-MTT special issue of Wireless IC for Biomedical Applications. He is the founder of the International Conference on Neuroprosthetic Devices (ICNPD) with the first one held at Hsinchu, Taiwan, and the second one at Beijing, China.

Registration

Pre-registration is required. Closing date is 1st November 2010. To register, please log on:
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