



2023 IEEE CASS Korea-Japan Workshop at KAIST

Date: Monday, January 16, 2023

Location: Wooribyeol Conference Room (#2201), School of EE building (E3-2 building), KAIST

Organizer: Prof. Minkyu Je, School of Electrical Engineering, mkje@kaist.ac.kr

Program:

Time	Title	Speaker
14:30 – 14:40	Opening	Prof. Minkyu Je, KAIST
14:40 – 14:50	IEEE CASS Promotion Talk #1	Prof. Myung Hoon Sunwoo Ajou University, Korea IEEE CASS President-Elect
14:50 – 15:30	Technical Talk #1: A New Era of Deep Learning-Based Medical Diagnosis Using Big Data	
15:30 – 15:40	IEEE CASS Promotion Talk #2	Prof. Yoshifumi Nishio Tokushima University, Japan IEEE CASS Vice President on Financial Activities
15:40 – 16:20	Technical Talk #2: Frustrated Oscillatory Network with Stochastic Coupling	
16:20 – 17:00	Technical Talk #3: Advancing Power Management ICs Assisted by Switched-Capacitor Circuits	Prof. Hyun-Sik Kim KAIST, Korea

Technical Talk #1: A New Era of Deep Learning-Based Medical Diagnosis Using Big Data

Prof. Myung Hoon Sunwoo, Ajou University, Korea, IEEE CASS President-Elect

Abstract:

The advent of deep learning/artificial intelligence (DL/AI) technology has ushered in a new era in healthcare and disease diagnosis by discovering and developing many valuable and practical applications in the interdisciplinary field of information and communication technology (ICT) and medical applications. Medical big data makes it possible to apply newly developed ICT technologies to the increasingly popular medical fields. Additionally, the growing demand for non-face-to-face healthcare services has accelerated the development of deep learning-based healthcare solutions during COVID-19. The Medical Image-based Intelligent Diagnosis Solutions (MIIDS) Research Center is developing new interdisciplinary technology fields through joint research with universities, hospitals, and companies. In the end, ISP (Image Signal Processor) and FEC (Forward Error Correction) algorithms based on deep learning are briefly introduced.

Speaker's Bio:



Myung Hoon Sunwoo received a B.S. degree from Sogang University in 1980, an M.S. degree in EE from KAIST in 1982, and a Ph.D. degree in ECE from the University of Texas at Austin, U.S.A. in 1990. He worked for ETRI in Daejeon, Korea, from 1982 to 1985 and in Digital Signal Processor Operations at Motorola in Austin, Texas, from 1990 to 1992.

Since 1992, he has been with the School of Electrical and Computer Engineering at Ajou University in Suwon, Korea, where he is currently a Professor. He has authored over 470 papers, held more than 120 patents, and won over 60 awards. He has been an associate editor of IEEE Transactions on Very Large Scale Integration (VLSI) Systems (2002-2003) and a coeditor of several books, including "Selected Topics in Biomedical Circuits and Systems" (River Publishers Series in Circuits and Systems 2021). He served as the General Chair of the International Symposium on Circuits and Systems (ISCAS) in 2012, and as the General Co-chair of ISCAS in 2021. He also served as the Honorary Chair of the IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS) in 2022.

Currently, he is the director of the Medical Image-Based Intelligent Diagnostic Solutions (MIIDS) Research Center. He has been a Distinguished Lecturer at IEEE CASS (2009-2010) and has served on the CASS Board of Directors (BoG) (2011-2016) and as the IEEE CASS VP of Conferences (2018-2021). As VP of the IEEE CASS Conference, he launched IEEE AICAS in 2019, which the AICAS community has widely accepted. His current research interests include artificial intelligence circuits and systems, low-power algorithms and architectures, medical imaging diagnosis, and deep-learning-based channel coding. Recently, he was elected as IEEE CASS President-Elect (2022-2023) and is an IEEE Fellow.

Technical Talk #2: Frustrated Oscillatory Network with Stochastic Coupling

Prof. Yoshifumi Nishio, Tokushima University, Japan, IEEE CASS Vice President on Financial Activities

Abstract:

Coupled oscillatory circuits are excellent models for describing high-dimensional nonlinear phenomena occurring in our living world. In particular, synchronization is one of the most important functions that can be explained and explored with the help of an oscillator. This is because, when oscillators are coupled, a strong correlation rhythm between oscillators called a synchronized state appears. Hence, many different types of coupled oscillatory networks were proposed and many interesting synchronization phenomena have been discovered.

In our research group, we have been investigating synchronization phenomena in coupled polygonal oscillatory networks with frustration. Through computer simulations and theoretical analysis, we confirmed that the coupled oscillators tended to synchronize to minimize the power consumption of the whole system. However, many of the networks that have been studied so far are static models, and it is necessary to propose a model that changes the network topology like a network observed in the real world including environmental factors.

In this talk, I focus on the frustrated triangular oscillatory network with stochastic coupling. Frustration as an environmental factor is caused by the network topology which is composed of triangular structure. The effect of the stochastic coupling is investigated by simulations.

Speaker's Bio:



Yoshifumi Nishio received the B.E., M.E., and Ph.D. degrees in electrical engineering from Keio University, Yokohama, Japan, in 1988, 1990, and 1993, respectively. In 1993, he joined the Department of Electrical and Electronic Engineering, Tokushima University, Tokushima, Japan, where he is currently a Professor. His research interests are in the areas of nonlinear circuits engineering, including analysis and application of chaos in electrical circuits, analysis of synchronization in coupled oscillatory circuits, and complex networks.

He was the Chair of the IEEE CAS Society Technical Committee on Nonlinear Circuits and Systems (NCAS) (2004-2005), the Chair of the IEEE CAS Society Shikoku Chapter (2011-2014), a member of the IEEE CAS Society Board of Governors (2012-2017), and the Vice President on Regional Activities and Membership of the IEEE CAS Society (2018-2021). He is currently the Vice President on Financial Activities of the IEEE CAS Society (from 2023). He was an Associate Editor of IEEE Transactions on Circuits and Systems-I (2004-2005), IEEE Transactions on Circuits and Systems-II (2012-2013 and 2016-2019), and IEEE CAS Magazine (2008-2009). He has been serving as an Associate Editor for IEEE CAS Society Newsletter (since 2007).

Technical Talk #3: Advancing Power Management ICs Assisted by Switched-Capacitor Circuits

Prof. Hyun-Sik Kim, KAIST, Korea

Abstract:

Over the past three decades, power management technology has become more important as portable and wearable electronics have become part of our daily lives. Traditional power management circuits have been realized with low-dropout (LDO) regulators, switch-mode inductive DC-DC converters, and switched-capacitor (SC) circuits. However, each of the existing power topologies has its own technical drawbacks that are difficult to be overcome. In recent years, hybrid power converters combining different topologies have attracted growing interests to compensate for the shortcomings of each. A typical example of hybrid power conversion is the multi-level converter that combines front-end SC circuit and back-end inductive network. In this talk, after briefly reviewing the technological trends in the field of power management IC (PMIC), I will present our recent achievements on the design of PMICs assisted by SC circuits: 1) an SC-and-LDO cascaded converter enabling both low-noise output and high efficiency, simultaneously; 2) an inductive DC-DC converter paralleled with SC circuit for higher power-density while minimizing the power losses at the compact-volume inductor.

Speaker's Bio:



Hyun-Sik Kim received the B.S. degree with highest honors in electronic engineering from Hanyang University, Seoul, Korea, in 2009, and the M.S. and Ph.D. degrees in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, in 2011 and 2014, respectively.

In 2014, he joined Samsung Display Co., Ltd., Yongin, Korea, where he was involved in OLED display driving circuits and systems. From 2015 to 2019, he was an Assistant Professor in the Department of Display Engineering at Dankook University, Cheonan, Korea. Since 2019, he has been with the School of Electrical Engineering, KAIST, Daejeon, Korea, where he is currently an Associate Professor. His research interests include the CMOS analog integrated circuit designs with an emphasis on display drivers, power managements, and sensory readout chips. He has authored or co-authored +70 peer-reviewed journal and conference papers.

He was a recipient of the two Gold Prizes in the 18th and 19th Samsung Human-Tech Paper Awards in 2012 and 2013, the IEEE Solid-State Circuits Society (SSCS) Pre-Doctoral Achievement Award in 2014, and the IEEE SSCS Seoul Chapter Best Student JSSC Paper Award in 2014. From Dankook University in 2017, the IC Design Education Center (IDEC) in 2021, and the School of Electrical Engineering at KAIST in 2022, he was given recognition for his excellence in teaching. He is currently serving as a member of the Technical Program Committees of the *IEEE Asian Solid-State Circuits Conference (A-SSCC)* and the *IEEE Custom Integrated Circuits Conference (CICC)*.