

2023년 2월 16일(목)

좌장 : 홍원빈 교수 (포항공과대학교)

시간	발표제목	발표자
15:00~15:45	Radar Technology: Recent Systems and Future Trends	Dr. Seong Kim (Spartan Radar)
15:45~16:30	Microwave Earth Observation from Space	Dr. Junghyo Kim (Airbus Defence and Space)

2023년 2월 17일(금)

좌장 : 김영옥 교수 (서강대학교)

시간	발표제목	발표자
13:10~13:55	Inverse synthetic aperture radar imaging of automotive targets	Prof. Shobha Sundar Ram (Indraprastha Institute of Information Technology Delhi)
13:55~14:40	Utilization of Wireless Body Area Channels for Communication and Sensing	Prof. Yang Li (Baylor University, U.S.A.)

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15:00~15:45

## Radar Technology: Recent Systems and Future Trends

Dr. Seong Kim (Spartan Radar)

**Abstract** : Radar systems initially operated at low frequencies (kHz to MHz) because of available components but millimeter wave systems are becoming commonplace today. Chip and Wire transmit receive (T/R) modules on exotic substrates required large teams, millions of dollars and even larger infrastructure to develop only 20 years ago. But today, RF CMOS chips can be surface mounted on Rogers board material in fraction of the cost and time. Radar signal processing can be performed by autogenerated SW running on processors without the need for dedicated HW modules. These technology trends are amazing tools for the radar developer but designing a robust radar system still takes a depth and breadth of knowledge of the design and trade space. This paper presents some capabilities of radar systems from our recent past and presents some future challenges and trends.

**Bio** : Over his 35 years career, Seong-Hwoon Kim has served as design engineer, technical director, chief scientist and program executive for some of the most advanced US military and commercial radar systems while working at Lockheed Martin, Raytheon, General Atomics, L3 Technologies, and Spartan Radar. His radar expertise covers UHF ground penetrating and airborne early warning, S-band T/R module naval combat, Ka-band rotorcraft fire control and Tri-Mode missile seekers, Ku-band UAV synthetic aperture radar, W-band commercial automotive, and 235 GHz video SAR systems for US special forces. He is currently the Chief Engineer at Spartan Radar leading the development of the advanced algorithms for autonomous vehicles. He has issued patents, presented technical papers throughout the world and holds a PhD EE from Penn State University.

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15:45~16:30

## Microwave Earth Observation from Space

Dr. Junghyo Kim (Airbus Defence and Space)

**Abstract** : Synthetic Aperture Radar (SAR) plays a crucial role in Earth observation and is considered as a mandatory space asset for many civil applications as well as a strategic element for national security. Thanks to the coherent imaging principle of radar, precise measurement of physical changes on Earth surface is feasible in mm-range accuracy. Furthermore satellite SAR enables to monitor a global-scale dynamics of our planet from Space and provides accumulated long-term data base.

In this talk, a wide range of SAR programmes which Airbus is either leading or supporting are introduced, including extensive heritage. Key microwave technologies and techniques which are required for future satellite radar missions are highlighted as well.

**Bio** : Dr. Junghyo Kim was born in Seoul, Korea, in 1972. He received the Dr.-Ing. (Ph.D.) degrees in electrical engineering from the Karlsruhe Institute of Technology, Karlsruhe, Germany in 2011. From 2001 to 2003, he was an RF system engineer with LG Electronics, CDMA Laboratory in Korea. In 2004 he joined the Institute of High Frequency Techniques and Electronics (IHE), Universität Karlsruhe in Germany as a Research Scientist. From 2009 to 2012 he was with the Microwave and Radar Institute, German Aerospace Center (DLR), Oberpfaffenhofen, Germany. Since 2012 he has been a Chief Engineer and Export Product Manager with Airbus Defence and Space GmbH, Friedrichshafen, Germany.

His research interests include digital beamforming radar, Multiple-Input Multiple-Output (MIMO) SAR system and processing, and novel microwave imaging techniques for cognitive radar.

Dr. Kim was the recipient of governmental scholarship from National Research Foundation (former KOSEF) and also the second prize winner in the Student Paper Competition held during the IEEE International Geoscience and Remote Sensing Symposium 2008, Boston, MA. USA.

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13:10~13:55

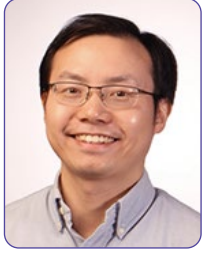
## Inverse synthetic aperture radar imaging of automotive targets

Prof. Shobha Sundar Ram (Indraprastha Institute of Information Technology Delhi)

**Abstract** : Automotive targets undergoing turns in road junctions offer large synthetic apertures over short dwell times to automotive radars that can be exploited for obtaining fine cross-range resolution. Likewise the wide bandwidths of the automotive radar signal yield high range resolution profiles. Together, they are exploited for generating inverse synthetic aperture radar (ISAR) images that offer rich information regarding the targets' shape, size and trajectory. In the talk, the speaker will present a simulation framework for generating large volumes of realistic ISAR images at millimeter wave frequencies for training classifiers. The model is subsequently used for classifying different types of vehicles using real data. Further, the speaker will discuss how the ISAR images can be fused with camera images for overcoming some of the limitations with respect to radar imaging. Finally, the speaker will discuss the causes of misclassification of the radar images through explainable artificial intelligence.

**Bio** : Shobha Sundar Ram is Associate Professor, Dept. of Electronics and Communications Engineering, Indraprastha Institute of Information Technology, Delhi. She did her Bachelor of Technology in ECE from the University of Madras, India in 2004 and then her Master of Science and Ph.D. in electrical engineering from the University of Texas at Austin, USA in 2006 and 2009 respectively. Before joining IIIT Delhi, she worked as a research and development electrical engineer at Baker Hughes Inc. USA. She is engaged in research and education principally in the areas of radar signal processing and electromagnetic sensor design and modeling. She is a Senior Member of IEEE, an active member of the Aerospace and Electronics Systems Society, an Associate Editor for the IEEE Transactions on Aerospace and Electronics Systems and a member of the Radar Systems Panel of IEEE Aerospace and Electronics System Society.

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13:55~14:40

## Utilization of Wireless Body Area Channels for Communication and Sensing

Prof. Yang Li (Baylor University, U.S.A.)

**Abstract** : A wireless body area network (WBAN) is a wireless network of devices that are worn on or implanted in the body, and that communicate with each other and with external devices to track various physiological parameters. In this talk we will discuss different types of on-body wireless propagation channels involved with the WBAN implementation, and the uses of them for power-efficient wireless communications and accurate classifications of human movement patterns. Electromagnetic theory, full-wave simulations and in-situ measurement results will be presented.

**Bio** : Dr. Yang Li received the B.S. degree in electrical engineering from University of Science and Technology of China, in 2005, and the M.S. and Ph.D. degrees in electrical and computer engineering from The University of Texas at Austin, in 2007 and 2011, respectively.

He is currently an Associate Professor of Electrical and Computer Engineering at Baylor University, U.S.A. His research interests include body area electromagnetic wave propagation and antenna radiation, wearable antenna analysis and design, e-textile antennas and circuits, and micro-doppler radar. He has authored 39 journal papers and 69 conference papers and abstracts. He serves as the general co-chair for the 2023 IEEE Texas Symposium on Wireless and Microwave Circuits and Systems and is an associate editor for the IEEE Journal of Electromagnetics, RF and Microwave in Medicine and Biology. He also serves on the Technical Activity Committee of USNC-URSI. He is an IEEE senior member and a full member of the USNC-URSI Commission B.