



Distinguished Lecture Series (Delivered in English)

Wireless AI: A New Sixth Sense to Deciphering our World

Wednesday, Dec. 06, 2023 10:30am
Auditorium 106, at IIS new Building

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Abstract

With more and more bandwidth readily available for the next generation of wireless applications, many intelligent products/services by leveraging the ambient radio waves unimaginable before are now possible. What impact will it bring to our lives? Many may wonder or even speculate if it is science fiction or real? In this talk, we will show that with more bandwidth, one can see many multi-paths, which can serve as hundreds of virtual sensors around us that can be readily leveraged as new degrees of freedom readily for our use (but we never realized that before!). We discovered for the first time that the time-reversal focusing spot is not a point but exhibiting a stationary power distribution of Bessel function which enabled accurate/reliable speed estimation under non-line-of-sight, severe multipath conditions, uncovering a new physical principle ideal for indoor applications. Together with the use of machine learning, a revolutionary wireless AI platform can be built to enable many IoT applications that have been dreamed for a long time but have never been possibly achieved.

Such a technology forms the core of a wireless sensing AI platform that can be applied to many device-free, non-obtrusive applications. We will show the world's first ever centimeter-accuracy wireless indoor positioning systems that can offer indoor tracking without any costly infrastructure, home/office monitoring and security, radio human biometrics, vital signs detection, sleep monitoring, gait recognition, and fall detection, without any wearable but solely relying on ubiquitous commodity Wi-Fi. In essence, now and in the future, it is the wireless sensing that will forever change Wi-Fi as we know it today, as well as future 5G/6G systems, allowing us to decipher our surrounding world with a new "sixth sense". Some products/services of Origin have been deployed worldwide and will be demonstrated to illustrate how such a fundamental discovery can make the world a better place.

Biography

K. J. Ray Liu is the founder of Origin Wireless that pioneers AI for wireless sensing and indoor tracking. The invention of wireless AI won three prestigious CES Innovation Awards, including CES Best of Innovation in 2021, and 2017 CEATEC Grand Prix. Dr. Liu was the 2022 IEEE President and CEO. He was IEEE Vice President, Technical Activities, Division IX Director of IEEE Board of Director, President of IEEE Signal Processing Society, where he has served as Vice President – Publications and Editor-in-Chief of IEEE Signal Processing Magazine. He was Distinguished University Professor and Christine Kim Eminent Professor of Information Technology of the University of Maryland, College Park, from where he retired after over three decades of career in education. His research contributions encompass broad aspects of signal processing and communications. He has trained over 70 doctoral/postdoctoral students, of which 10 are now IEEE fellows. According to Mathematics Genealogy Project, he has had over 200 doctoral descendants. Dr. Liu is a recipient of two IEEE Technical Field Awards: the 2021 IEEE Fourier Award for Signal Processing and the 2016 IEEE Leon K. Kirchmayer Graduate Teaching Award, and also IEEE Signal Processing Society 2014 Norbert Wiener Society Award, 2009 Claude Shannon-Harry Nyquist Technical Achievement Award, and more than a dozen best paper awards. Recognized by Web of Science as a Highly Cited Researcher, he is a Fellow of IEEE, AAAS, and US National Academy of Inventors.

