



Title:

Intelligent Reflecting Surface for Communications and Sensing

Abstract:

In this talk, we present an emerging wireless technology, called Intelligent Reflecting Surface (IRS), for enhancing the performance of wireless communication as well as radio-frequency (RF) based sensing. IRS is a digitally controlled metasurface which can be densely deployed in wireless networks to reconfigure the propagation channels among wireless nodes via dynamically tuning the signal reflections by a large number of passive elements. We first present the basic signal and channel models of IRS by taking into account its practical constraints. We then illustrate the main functions and applications of IRS in wireless networks, especially for achieving spectral and energy efficient wireless communication and high-performance RF sensing/localization. Next, we focus on the main design challenges in achieving the above goals, including IRS passive reflection optimization, IRS channel acquisition, IRS deployment, and IRS mode (communication/sensing) switching and integration, and present their promising solutions. We will also discuss open problems and promising directions for future work.

Bio:

Dr. Rui Zhang (Fellow of IEEE, Fellow of the Academy of Engineering Singapore) received the Ph.D. degree from Stanford University in electrical engineering. He is now a Provost's Chair Professor in the Department of Electrical and Computer Engineering, National University of Singapore. His current research interests include wireless information and power transfer, UAV/satellite communication, and reconfigurable MIMO. He has published over 450 papers, which have been cited more than 53,000 times with the h-index over 115. He has been listed as a Highly Cited Researcher by Thomson Reuters / Clarivate Analytics since 2015. He was the recipient of the IEEE Communications Society Asia-Pacific Region Best Young Researcher Award in 2011, the Young Researcher Award of National University of Singapore in 2015, the Wireless Communications Technical Committee Recognition Award in 2020, and the IEEE Signal Processing and Computing for Communications (SPCC) Technical Recognition Award in 2021. He received 11 IEEE Best Paper Awards, including the IEEE Marconi Prize Paper Award in Wireless

Communications (twice), the IEEE Communications Society Heinrich Hertz Prize Paper Award (twice), the IEEE Communications Society Stephen O. Rice Prize, the IEEE Signal Processing Society Best Paper Award and Donald G. Fink Overview Paper Award, etc. He has served as an Editor for several IEEE journals, including TWC, TCOM, JSAC, TSP, TGCN, etc., and as TPC co-chair or organizing committee member for over 30 international conferences. He served as an IEEE Distinguished Lecturer of IEEE Communications Society and IEEE Signal Processing Society in 2019-2020.