

## **Coding and modulation design for simultaneous wireless information and power transfer**

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**Statement of the Problem:** In order to satisfy the power-thirst of the IoT devices and thus extend their lifespan, the radio frequency (RF) signal aided wireless power transfer (WPT) is exploited for remotely charging. Carefully coordinating both the WPT and wireless information transfer (WIT) yields an emerging research trend in simultaneous wireless information and power transfer (SWIPT). However, the SWIPT system designed by assuming Gaussian distributed input signals may suffer from substantial performance degradation in practice, when the finite alphabetical input is considered. In this talk, we will provide a design guide of the coding controlled SWIPT and study the modulation design in both the single-user and multi-user SWIPT systems. We hope that this guide may push the SWIPT a step closer from theory to practice.

**Methodology & Theoretical Orientation:** By controlling the output code word of a unary coding based encoder and by controlling the output symbols of a modulator, we are capable of shaping the corresponding waveforms sent in air by a SWIPT transmitter. A theoretical performance analysis and the optimal design have been conducted for improving the SWIPT performance.

**Findings:** The impacts of both the coding and the modulation on SWIPT performance and the rationale behind have been firstly revealed. From the information theoretical perspective, the WIT and WPT are conflicted parties. Our design is capable of harmoniously coordinating both the WIT and WPT in the same spectrum.

**Conclusion & Significance:** Due to the divergent characteristics of hardware, WIT and WPT have different requirements on RF signals emitted by SWIPT transmitters. Efficient coding and modulation approaches are designed for shaping RF signals so as to improve attainable SWIPT performance.

### **Biography**

Jie Hu received his B.Eng. and M.Sc. degrees from Beijing University of Posts and Telecommunications, China, in 2008 and 2011, respectively, and received the Ph.D. degree from the School of Electronics and Computer Science, University of Southampton, U.K., in 2015. Since March 2016, he has been working with the School of Information and Communication Engineering, University of Electronic Science and Technology of China (UESTC), China. He is now a Research Professor. He has been elected into UESTC's Fundamental Research Program for Young Scientists since 2018. He also won UESTC's Academic Young Talent Award in 2019. Now he is supported by the "100 Talents" program of UESTC. His research now is mainly funded by National Natural Science Foundation of China (NSFC). He is an editor for both IEEE Wireless Communications Letters and IET Smart Cities. He serves for IEEE Communications Magazine, IEEE/CIC China Communications and ZTE communications as a guest editor. He is now an active member of IEEE Wireless Communications Technical Committee and IEEE Technical Committee on Green Communications and Computing (TCGCC). He is a program vice-chair for IEEE TrustCom 2020 and workshop chair for IEEE SustainCom 2020.