Sensitive and Nonlinear Far Field RF Energy Harvesting in Wireless Communications

ABSTRACT

This work studies both limited sensitivity and nonlinearity of far field RF energy harvesting observed in reality and quantifies their effect, attempting to fill a major hole in the simultaneous wireless information and power transfer (SWIPT) literature. RF harvested power is modeled as an arbitrary nonlinear, continuous, and non-decreasing function of received power, taking into account limited sensitivity and saturation effects. Limited number of datapoints are needed and accuracy analysis is also provided. Case studies include duty-cycled (non-continuous), as well as continuous SWIPT, comparing with industry-level, RF harvesting. The proposed approximation, even though simple, offers accurate performance for all studied metrics. On the other hand, linear models or nonlinear-unlimited sensitivity harvesting models deviate from reality, especially in the low-input-power regime. The proposed methodology can be utilized in current and future SWIPT research

EXISTING SYSTEM

- In existing system, resource allocation algorithms for wideband RF harvesting Systems was proposed.
- However, the adopted nonlinear RF harvested power models do not account for the harvester's limited sensitivity, i.e., sensitivity threshold is assumed zero and the harvester can output power for any non-negative input power value.
- Convex optimization techniques were employed, with channel state information (CSI) at the transmitter, PAPR constraints and nonlinear, input-output circuit-based analysis of a singlediode or multiple-diode rectifiers.

PROPOSED SYTEM

- This methodology can be applied to any type of RF energy harvesting system, provided that system level datapoint pairs of the harvested output power and the input power are provided.
- However, the focus in this work is to assess important RF harvesting performance evaluation metrics in nonlinear RF harvesting, and thus, the computational cost is not a critical issue.
- One important benefit of the piecewise linear approximation based on measured input-output datapoints, is its xflexibility to interpolate directly the harvested power values.
- Thus, one can directly assess important RF harvesting evaluation metrics without assuming a specific functional form for the harvested power function

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- Processor - Intel core i3
- RAM - 2B
- Hard Disk - 20 GB

SOFTWARE REQUIREMENTS

- Operating System : LINUX
- Tool : Network Simulator-2
- Front End : OTCL (Object Oriented Tool Command Language)

REFERENCE

[1] P. N. Alevizos, “Intelligent scatter radio, RF harvesting analysis, and resource allocation for ultra-low-power Internet-of-Things,” Ph.D. dissertation, Technical University of Crete, Chania, Greece, Dec. 2017.

[2] L. R. Varshney, “Transporting information and energy simultaneously,” in *Proc. IEEE Int. Symp. on Inform. Theory (ISIT), Toronto, Canada,* 2008, pp. 1612–1616.

[3] P. Grover and A. Sahai, “Shannon meets Tesla: Wireless information and power transfer,” in *Proc. IEEE Int. Symp. on Inform. Theory (ISIT),* Austin, TX, 2010, pp. 2363–2367.

[4] R. Zhang and C. K. Ho, “MIMO broadcasting for simultaneous wireless information and power transfer,” *IEEE Trans. Wireless Commun.,* vol. 12, no. 5, pp. 1989–2001, May 2013.

[5] A. A. Nasir, X. Zhou, S. Durrani, and R. A. Kennedy, “Relaying protocols for wireless energy harvesting and information processing,” *IEEE Trans. Wireless Commun., vol. 12, no. 7, pp. 3622–3636, Jul.* 2013.