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Energy Harvest and Information Transmission Design in Internet-of-Things Wireless Communication Systems

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Abstract

Wireless energy transmission is considered in the Internet-of-Things (IoT) dual-hop communication systems. The power splitting method is employed at the relay node to receive the wireless energy and the wireless information simultaneously from the source to the relay node in the first resource block. With the harvested energy at the relay node, one wireless information node and one wireless energy harvest node are served simultaneously by the relay node in the second resource block. The optimization problem is formulated to maximize the energy efficiency defined as the ratio of the wireless information throughput of the first destination node over the power consumed by the whole IoT systems, which is subject to the required minimum energy harvested at the second destination node of the energy transfer. To tackle the non-convex problem, the exact expression of the wireless information throughput is approximated by the high signal to noise ratio (SNR) approximation method, which is shown very tight to the exact expression. Hence, the asymptotically optimal solution is derived in analytical expression by employing the Lagrangian method. Numerical simulations verify the performance of the proposed scheme.

Index Terms

Internet-of-Things (IoT), energy harvest, dual-hop, wireless energy and information transmission.

I. Introduction

The principle of the Internet-of-Things (IoT) was proposed over two decades ago [1], which becomes very hot since the past five years [2]. IoT is one important part of the 5th generation (5G) of mobile communications since IoT can support massive objects as

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