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**Energy Efficiency Maximization in Mobile Wireless Energy Harvesting Sensor Networks**

**Abstract:**

In mobile wireless sensor networks (MWSNs), scavenging energy from ambient radio frequency (RF) signals is a promising solution to prolonging the lifetime of energy-constrained relay nodes. In this paper, we apply the Simultaneous Wireless Information and Power Transfer (SWIPT) technique to a MWSN where the energy harvested by relay nodes can compensate their energy consumption on data forwarding. In such a network, how to maximize system energy efficiency (bits/Joule delivered to relays) by trading off energy harvesting and data forwarding is a critical issue. To this end, we design a resource allocation (ResAll) algorithm by considering different power splitting abilities of relays under two scenarios. In the first scenario, the power received by relays is split into a continuous set of power streams with arbitrary power splitting ratios. In the second scenario, the received power is only split into a discrete set of power streams with fixed power splitting ratios. For each scenario above, we formulate the ResAll problem in a MWSN with SWIPT as a non-convex energy efficiency maximization problem. By exploiting fractional programming and dual decomposition, we further propose a cross-layer ResAll algorithm consisting of subalgorithms for rate control, power allocation and power splitting to solve the problem efficiently and optimally. Simulation results reveal that the proposed ResAll algorithm converges within a small number of iterations, and achieves optimal system energy efficiency by balancing energy efficiency, data rate, transmit power and power splitting ratio.

**Existing System:**

Compared to strongly coupled magnetic resonances, radio frequency (RF) signal is regarded as a promising energy source of wireless energy transfer since it can be used for wireless information transmission along with energy harvesting, even in a hostile environment. Indeed, the RF signal carries both information and energy simultaneously.

Thus, the RF energy radiated by transmitter(s) can be recycled at receivers for prolonging the lifetime of the network. This has motivated much research interests on RF-based simultaneous wireless information and power transfer (SWIPT). At present, the research on SWIPT focuses on addressing its fundamental principle issues such as architecture design and dynamic power splitting, and its application in some systems, such as multipleinput multiple-output (MIMO) wireless broadcast systems and cooperative networks with spatially random relays. However, to the best of our knowledge, there is little work on applying the SWIPT technology to mobile WSNs to balance energy distribution and prolong the lifetime of WSNs.

**Proposed System:**

Based on the rule that the one who gains should be the one who pays. A sensor node that has data to transmit has to transfer the energy together with the data to its relay node, and then based on the scheme of dynamic power splitting (DPS), the relay node splits dynamically the received signals into two power streams in a continuous or discrete power splitting ratio for energy harvesting and data forwarding, respectively. This approach has two advantages: (i) the relay node can harvest the RF energy from transmitters as the compensation for forwarding their data so as to avoid rapidly depleting the energy; (ii) the harvested energy can be from either RF signals of transmitters, or interference signals and antenna noises so as to avoid lowering the Quality of Services (QoS).