Power-Rate-Slot Control Scheme for Energy Harvesting-Powered Wireless Body Area Networks

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***Abstract*—this is abstract**

***Index Terms*—energy harvesting, resource allocation, wireless body area network (WBAN).**

I. Introduction

this is introduction

A. Related works

Some related researches

B. Motivation

C. Contributions

In this study, we investigate the resource allocation schemes in terms of the spectrum resource matching and the power allocation under a single EH-DCCN. In the EH-DCCN, D2D pairs powered by EH module are allowed to reuse the CUs' uplink spectrum resource to transmit their local data. Thus, the key contributions of this paper can be expressed as three aspects:

- Firstly, this work is the first to .
- Subsequently, two algorithms .
- As a consequence, we provide .

II. Network Model and Problem Statement

In this section,

A. Scenario, node and transmission model

B. Energy model

In this scenario, each EH-DP uses the harvested energy to transmit their local data. For the d_j-th EH-DP, $E_{d_j}^t$ units of energy can be harvested in the t-th time slot where $E_{d_j}^t \geq 0$. $\left\{E_{d_j}^1, E_{d_j}^2, \ldots, E_{d_j}^t, \ldots, E_{d_j}^T\right\}$ is the time sequence of harvested energy in T time slots.

C. Mathematic model

optimization problem

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D. Problem analysis

III. Algorithms design

In this section, two algorithms are explained at first, and the computational complexity of the two algorithms is elaborated in the later.

A. Outer approximation algorithm

B. Energy-aware space matching algorithm

Corollary 1:

Proof: The proof of this corollary is provided in Appendix A.

With the convexity of *log-exp-sum*, the problem (**??**) can be easily proved to be a concave maximization problem about relevant power parameters of CU and EH-DPs. The pseudo code of ESM can be detailedly expressed by Algorithm 1.

Algorithm 1: ESM

for d_j = *1 to* N_D **do**
  for c_i = *1 to* N_C **do**
    if c_i *and* d_j *satisfy the two matching rules* **then**
      $\hat{x}_{c_i,d_j} = 1;$
      return;
    else
      $\hat{x}_{c_i,d_j} = 0;$
    end
  end
end
for c_i = *1 to* N_C **do**
  $\left\{\hat{p}_{c_i}, \hat{P}_D\right\} \leftarrow \arg \mathrm{Problem}(\mathbf{??})$
end
Update: R_{sum}^{ESM} by (**??**):
  $R_{sum}^{ESM} = R_{sum}\left(\hat{X}, \exp\left(\hat{P}_C\right), \exp\left(\hat{P}_D\right)\right).$

IV. Simulation results

In this section, the performance of the two proposed algorithms and the characteristics of the EH-DCCN are investigated in the performance of the average achievable system rate and the matching probability of EH-DPs. The matching probability of EH-DPs represents the ratio of the matched EH-DPs in N_D.

A. Simulation setup

B. The influence of different EH efficiencies on performance

V. Conclusion

In this paper,

Appendix A
Proof of Corollary ??

According to the reusing rules of the ESM, the distance among EH-DPs reusing the same spectrum of one CU is enough far away from each other. Hence, the interference among EH-DPs can be approximately ignored. Based on this, the minimum reusing radius d_{EH} is approximately determined by the CU and the EH-DP reusing the same spectrum resource. Hence, according to the transmission rate requirement, the matched CU c_i and EH-DP d_j must satisfy the following constraints:

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References

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