Mode Selection and Resource Allocation in Device-to-Device Communications: A Matching Game Approach

ABSTRACT

- Device to device (D2D) communication is considered as an effective technology for enhancing the spectral efficiency and network throughput of existing cellular networks.
- However, enabling it in an underlay fashion poses a significant challenge pertaining to interference management. In this paper, mode selection and resource allocation for an underlay D2D network is studied while simultaneously providing interference management. The problem is formulated as a combinatorial optimization problem whose objective is to maximize the utility of all D2D pairs. To solve this problem, a learning framework is proposed based on a problem-specific Markov chain.
- From the local balance equation of the designed Markov chain, the transition probabilities are derived for distributed implementation. Then, a novel two phase algorithm is developed to perform mode selection and resource allocation in the respective phases. This algorithm is then shown to converge to a near optimal solution.

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- Moreover, to reduce the computation in the learning framework, two resource allocation algorithms based on matching theory are proposed to output a specific and deterministic solution. The first algorithm employs the one-to-one matching game approach whereas in the second algorithm, the one-to many matching game with externalities and dynamic quota is employed.
- Simulation results show that the proposed framework converges to a near optimal solution under all scenarios with probability one. Moreover, our results show that the proposed matching game with externalities achieves a performance gain of up to 35% in terms of the average utility compared to a classical matching scheme with no externalities.

EXISTING SYSTEM

- Resource allocation in D2D networks has attracted significant recent attention and a comprehensive survey can be found. In particular, there has been a number of recent works, that focused on underlay D2D networks. For instance, the authors optimize the throughput over the shared D2D resources while meeting prioritized cellular service constraints.
- However, this work is based on a centralized approach that requires significant overhead and is not tailored to the dense nature of D2D networks. In a practical and efficient interference-aware resource allocation scheme is presented for D2D enabled networks.

PROPOSED SYSTEM

- The main contribution of this paper is to introduce a distributed scalable solution for a dense D2D network by jointly addressing the problems of mode selection, resource allocation, and interference management aspects.
- We propose a novel learning framework based on Markov approximation to address these issues. Unsupervised learning is used for mode selection and a two-sided matching game is incorporated to address the resource allocation aspects.

HARDWARE REQUIREMENTS

- Processor - Pentium-IV
- Speed - 1.1 Ghz
- RAM - 256MB(min)
- Hard Disk - 20 GB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

SOFTWARE REQUIREMENTS

- Tool - Network Simulator-2
- Operating system - LINUX
- Front end - OTCL (Object Oriented Tool Command Language)

REFERENCES

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