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RELAY-AIDED D2D COMMUNICATION ON LEARNING BASED ENERGY-EFFICIENT AND POWER ALLOCATION

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Abstract: Device-to-device (D2D) communication is a promising paradigm to meet the requirement of ultra-dense, low-latency and high-rate in the fifth-generation networks. However, energy consumption is a critical issue for the D2D communication, especially for D2D relay networks. To make the best use of D2D communication, the problem of optimizing energy efficiency (EE) must be addressed. Here propose a joint power allocation and relay selection (JPARS) scheme for the improvement of energy efficiency in relay-aided D2D communications underlaying cellular network. A mixed integer nonlinear fractional programming (MINLP) problem of the total EE for D2D pairs is formulated. While ensuring the quality of service (QoS) of cellular users and D2D links, here solve the power allocation problem by Dinkelbach method and Lagrange dual decomposition. After that, Q-learning, one of the reinforcement learning algorithms, is employed to solve the relay selection problem. Finally, we provide in-depth theoretical analysis of the proposed scheme in terms of complexity and signaling overhead. Simulation results verify that the proposed scheme not only overcomes the bottleneck effect, but also nearly reaches the theoretical maximum in terms of the total EE of D2D pairs.

Index Terms – D2D,power allocation,Dinkelbach effect,reinforcement.

Introduction :

An indispensable driving force for further economic growth and development predicted which can be produced by the end of2014 and in the number of mobile-connected devices (including machine-to-machine modules completely) will exceed the number of
people on the earth today and by tomorrow, and by 2018 there will be more than 10 billion mobile-connected devices throughout the world . However, the frequency spectrum needed for broadband cellular networks in existing frameworks is not so sufficient, and there is a need to introduce novel schemes for more efficient use of available resources recently. Device-to-device (D2D) communications
as an underlay of a LTE-A cellular network can alleviate the need for more resources to some extent while increasing the users' aggregate capacity latency and people.In cellular networks, adjacent users may be able to set up adirect D2D link using the cellular interface, and subsequently exchange data via the D2D link without traversing a base station (BS) or the core network [4]. In doing so, thetransmitter of a D2D pair (D_Tx)transmitter utilizes the spectrum of thecellular network to transmit to its receiver (D_Rx) via theD2D link in allocation. Since cellular users (CUs) and D2D pairssimultaneously use the same

spectrum, they may interfere witheach other, and hence, there is a need for interference management-[9].Furthermore, energy efficiency in cellular networks is a growing concern [10] D2D communication can reduce
power consumption in base stations and cellular users so that it will make mobile users easier to develop and work [11].the base station first checks if admitting aD2D pair as an underlay of the cellular network would not
violate the QoS requirements in both the D2D pair and itspotential Control unit partners, and subsequently determine theirminimum required transmit power levels. Then, a matching
CU partner is identified for which the overall power consumption in the network is minimized.The rest of this paper is not organized as follows. Thesystem model with integrated D2D links is given in Section II,
followed by the formulation of the optimization problem forinimizing the total uplink transmit power in SectionIII. The optimal resource allocation algorithm is proposed and
analyzed in Section IV. Simulation results are in Section V,
and conclusions are in Section VI.

II. System Model

We suppose that D2D pair $m = (s, d), m \in P, s \in S, d \in D$ is assisted by relay $r \in R$ with reusing the uplink spectrum of CU $c \in C$. In the first-hop D2D link, the signal to interference plus noise ratio (SINR) at relay r and the base station (BS) can be expressed as

$$\mathrm{SINR}_{D}^{(r1)} = \frac{P_s G_{sr}}{P_c G_{cr} + N_0} \quad (3.1)$$

and

$$\mathrm{SINR}_{BS}^{(r1)} = \frac{P_c G_{cb}}{P_s G_{sb} + N_0}$$

(3.2)

where Ps and Pc are the transmit power of D2D-TX s and CU c, respectively. G_{sr}, G_{sb}, G_{cr} and G_{cb} represent the channel gain between D2D-TX s and relay r, the channel gain between D2D-TX s and the BS, the channel gain between CU c and relay r, and the channel gain between

3.PROBLEM FORMULATION

The paper aims to maximize the total energy efficiency of D2D pairs while guaranteeing the QoS of D2D and CU links. Thus, joint power allocation and relay selection optimization are modeled as

$$\max_{X, P^S, P^R, P^C} x_{mr} \sum_{m \in P} \sum_{r \in R} \mathrm{EE}(P_s, P_r, P_c)$$

$xmr \in \{0, 1\}, \forall m \in P, \forall r \in R$

$0 \le Ps \le Pmax, \forall s \in S$

$0 \le Pr \le Pmax, \forall r \in R$

$U^{(r1)}(P_s, P_c) \ge U_{min}, \forall s \in S, \forall c \in C$

$U^{(r2)}(P_r, P_c) \ge U_{min}, \forall r \in R, \forall c \in C$

where the element at the m-th row and the r-th column of the matrix X is defined as xmr, and xmr = 1 denotes that relay r aides D2D

CU c and the BS, respectively. N_0 is the additive white Gaussian noise

4.MATLABSOFTWARE REQUIREMENTS

MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. You can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

Set Operations

The two basic operations in mathematical morphology are erosion and dilation. Both of these operators take two pieces of data as input: an image to be eroded or dilated, and a structuring element. The two pieces of input data are each treated as representing set of coordinates in a way that is slightly different for a binary or gray scale images.

pair m, otherwise xmr = 0. The power vectors are defined as PS = {Ps}s∈S, PR = {P

Desktop Basics

When you start MATLAB, the desktop appears in its default layout.

The desktop includes these panels:

Current Folder — Access your files.

Command Window — Enter commands at the command line, indicated by the prompt (>>).

Workspace — Explore data that you create or import from files.

Command History — View or rerun commands that you entered at the command line.

5.MATLAB MORPHOLOGY

Mathematical morphology (MM) is a tool for extracting image components that are useful for representation and description. The technique was originally developed by Matheron and Serra at the Ecole des Mines in Paris. Mathematical morphology uses concepts from set theory, geometry and topology.

Erosion

Erosion is one of the two basic operators in the area of mathematical

Both morphology closing and opening leave the features larger than SE unchanged. However, the main drawback of conventional opening and closing is that they do not preserve edge information perfectly.

Dilation

The dilation operator takes two pieces of data as inputs.

The first is the image which is to be dilated. The second is a set of coordinate points known as a structuring element. It is this structuring element determines the precise effect of the dilation on the input image. The basic effect of the operator on a binary image is to gradually enlarge the boundaries of regions of foreground pixels.

morphology, the other being dilation. It is typically applied to binary images, but there are versions that work on gray

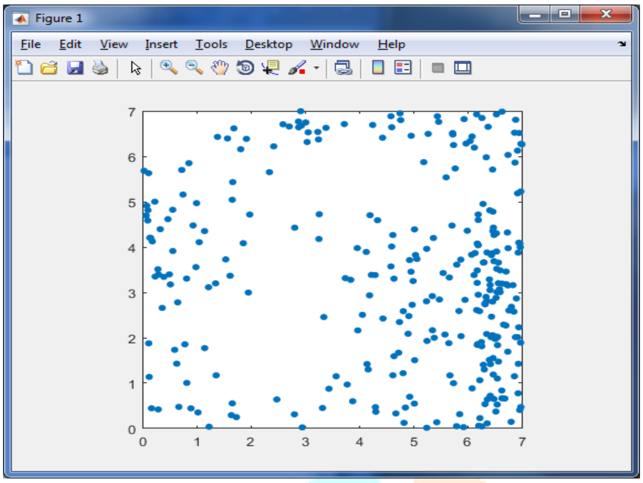
scale images. The basic effect of the operator on a binary image is to erode away the boundaries of the regions of foreground pixels. Thus areas of foreground pixels shrink in size, and holes within those areas become larger.

Opening

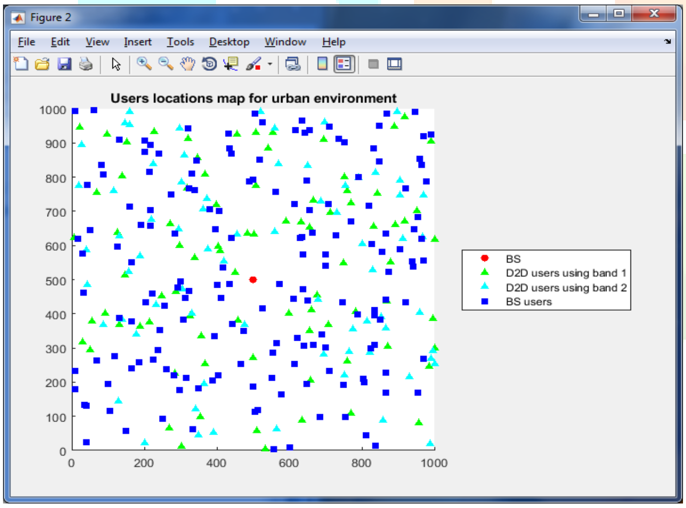
Opening and closing are two important operators from mathematical morphology. They are both derived from fundamental operations of erosion dilations. Like those operators they are normally applied to binary images, although there are also gray level versions. The basic effect of an opening is somewhat like erosion in that it tends to remove some of the foreground pixels from the edges of regions of foreground pixels. However it is less destructive than erosion in general.

5.RESULTS AND DISCUSSION

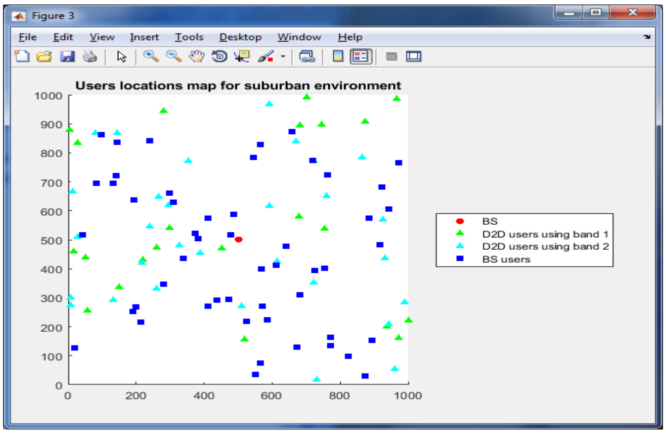
5.1 CHANNEL MODEL



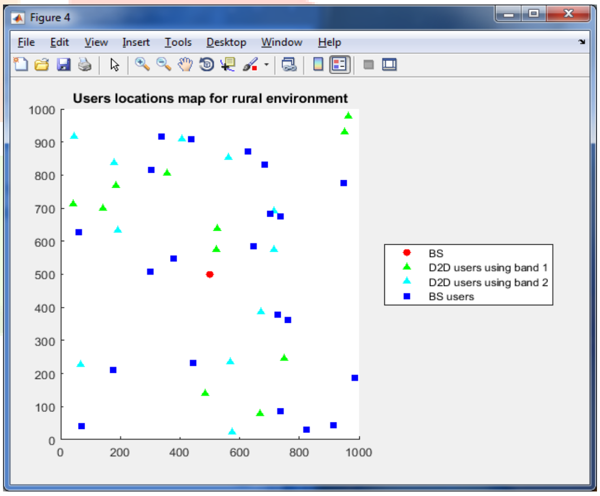
5.2USERS LOCATIONS MAP FOR URBAN ENVIRONMENT



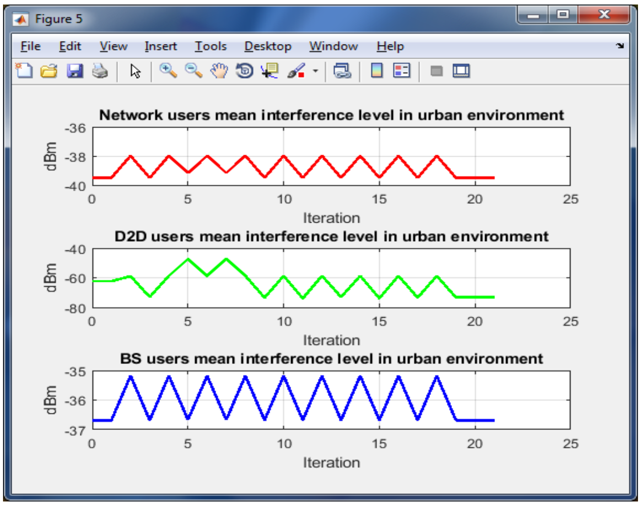
USERS LOCATIONS MAP FOR SUBURBAN ENVIRONMENT



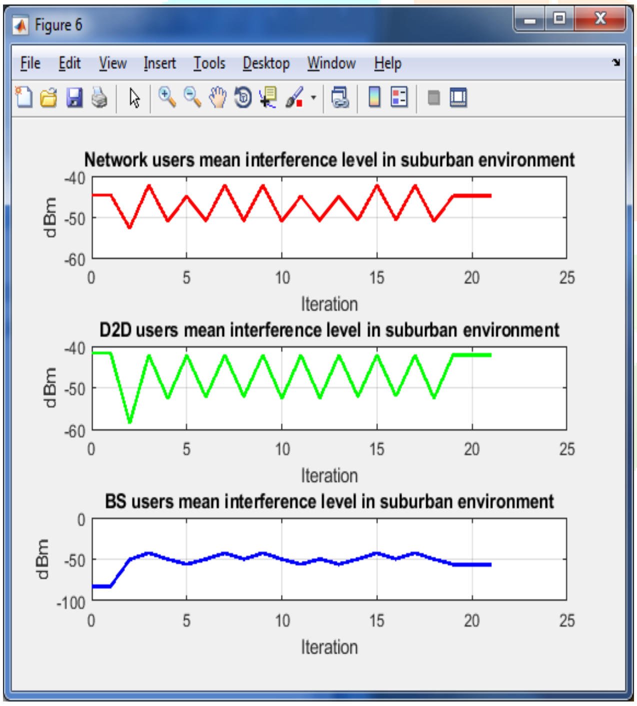
5.4 USERS LOCATIONS MAP FOR RURAL ENVIRONMENT



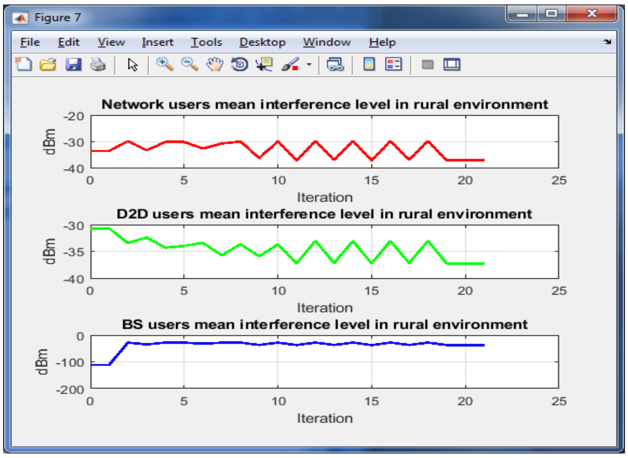
5.5 INTERFERENCE LEVEL IN URBAN ENVIRONMENT



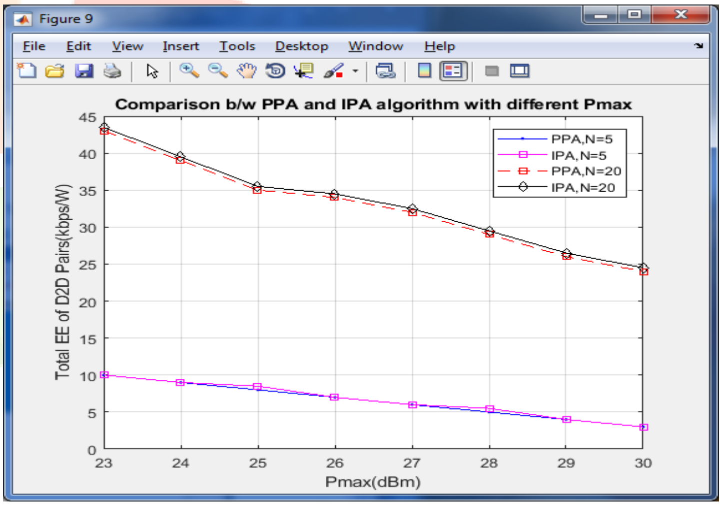
5.6 INTERFERENCE LEVEL IN SUBURBAN ENVIRONMENT



5.7 INTERFERENCE LEVEL IN RURAL ENVIRONMENT



5.7 COMPARISON B/W PPA AND IPA ALGORITHM WITH DIFFERENT PMAX



CONCLUSION:

Thus, the joint power allocation and relay selection scheme for D2D communication underlaying cellular network. The total energy efficiency of D2D pairs is maximized while guaranteeing the QoS of D2D and cellular links. With a random relay, the optimal power allocation scheme has been characterized. Then, according to the resulted transmit power from power allocation, a novel relay selection scheme based on Q-learning is proposed. Simulation results demonstrate that the proposed scheme can significantly improve the energy efficiency performance.

REFERENCES:

[1] C. Tian, Z. Qian, X. Wang, and L. Hu, "Analysis of Joint Relay Selection and Resource Allocation Scheme for Relay-Aided D2D Communication Networks," IEEE Access, vol. 7, pp. 142715-142725, Sep. 2019.

[2] C. Xu, L. Song, Z. Han, Q. Zhao, X. Wang, X. Cheng, and B. Jiao, "Efficiency Resource Allocation for Device-to-Device Underlay Communication Systems: A Reverse Iterative Combinatorial Auction Based Approach," IEEE J. Sel. Areas Commun., vol. 31, no. 9, pp. 348- 358, Sep. 2013.

[3] D. Sui, F. Hu, W. Zhou, M. Shao, and M. Chen, "Relay Selection for Radio Frequency Energy-Harvesting Wireless Body Area Network With Buffer," IEEE Internet Things J., vol. 5, no. 2, pp. 1100-1107, Apr. 2018.

[4] F. Tang, Z. M. Fadlullah, N. Kato, F. Ono, and R. Miura, "AC-POCA: Anti-Coordination Game based Partially Overlapping Channels Assignment in Combined UAV and D2D based Networks", IEEE Trans. Veh. Technol., vol. 67, no. 2, pp. 1672-1683, Feb. 2018.

F. Wang, C. Xu, L. Song and Z. Han, "Energy-Efficient Resource Allocation for Device-to-Device Underlay Communication," IEEE Trans. Wireless Commun., vol. 14, no. 4, pp. 2082