

An Interruption Free Routing In 5G Heterogeneous Spectrum Sharing Network

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ABSTRACT: The interest for range assets has expanded significantly with the appearance of present day remote applications. Range sharing, considered as a basic component for 5G systems, is imagined to address range shortage issue, accomplish high information rate get to, and ensured nature of-administration. From the authorized system's viewpoint, the obstruction brought about by every auxiliary client ought to be limited. From optional systems perspective, there is a need to dole out systems to SUs in a manner that general impedance is diminished, empowering the convenience of a developing number of SUs. This paper displays a system choice and divert portion instrument keeping in mind the end goal to expand income by pleasing more SUs and taking into account their inclinations, while in the meantime, regarding the essential system administrator's strategies. A streamlining issue is figured with a specific end goal to limit amassed obstruction caused to authorized clients and the sum that SUs need to pay for utilizing the essential system. The point is to give SUs a particular nature of administration at a lower value, subject to the impedance imperatives of each accessible system with sit out of gear channels. Molecule swarm advancement and a changed adaptation of the hereditary calculation are utilized to tackle the enhancement issue. At long last, the paper is upheld by broad reproduction comes about which represent the viability of the proposed strategies in finding a close ideal arrangement.

KEYWORDS: Channel Allocation, Network Selection, 5G Heterogeneous Networks, Optimization.

I. INTRODUCTION

The last decade has seen the dramatic increase in the demand of mobile data due to the increase in mobile devices and versatile applications. It is forecast that the data traffic will increase 10-fold between 2014 and 2019. This explosive demand of mobile data results in several challenges which shifted the research directions to fifth generation (5G) networks. 5G networks are intended to provide significantly high data rate access and guaranteed quality-of-service (QoS). Thus, the demand of spectrum resources is expected to increase significantly in 5G networks.

This requires wireless system designers to propose efficient spectrum management schemes. Different views on 5G architecture are presented with key technologies such as massive MIMO, energy efficient communications, cognitive radios, visible light communication, small cells, etc. In nutshell, 5G is visualized as heterogeneous networks which can provide access to a range of wireless networks and access technologies. The 5G heterogeneous networks will mainly consist of network densification, i.e., densification over space and frequency. The dense deployment of small cells is called the densification over space whereas utilizing radio spectrum in diverse bands is called densification over frequency.

Network densification can meet the demand of high capacity in 5G networks. However, opportunistic spectrum sharing is important in order to achieve stringent goals of 5G in heterogeneous environment. Spectrum sharing ensures the coverage of 5G heterogeneous networks everywhere and all the time. It can support a large number of connected devices and diverse applications. In addition, it is spectrum efficient as it can use all non-contiguous spectrum, can

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achieve better system capacity, reduce energy consumption, and increase cell throughput. Dynamic spectrum access (DSA) has emerged as key for spectrum sharing in an opportunistic way.

A radio network employing DSA to coexist with a licensed network (primary network) is known as a cognitive radio network (CRN). The users who subscribe to any of these primary networks are known as primary users (PUs). On the other hand, users who do not belong to any of these primary networks and contend for the unused portion of the spectrum in these networks are known as secondary users (SUs). SUs may face a problem in choosing which primary network to join because a 5G heterogeneous network incorporates multiple primary networks with different characteristics in terms of bandwidth, price, and capacity; this is known as the network selection problem.

Price is a key factor while leasing/selecting the network of a specific operator for spectrum access. In a joint price based spectrum sharing and power allocation scheme is proposed for interference management. Author presented a price based spectrum sharing algorithm. The optimization problem is formulated to minimize the price incurred by the SUs and solved using the particle swarm optimization (PSO). However, the algorithm is based on assumption that there exists an interaction between PU and SUs which is practically not a feasible option. A price-based spectrum sharing and rate allocation scheme is proposed to address the problem of subcarrier sharing with discrete rate allocation, the PSO approach is used to solve the problem of network selection. However, due to the intractable nature of the network selection problem in 5G heterogeneous networks, it is desirable to explore other avenues to develop better algorithms for solving the network selection problem. Therefore, it is required to study network selection problem in order to enhance the previous work.

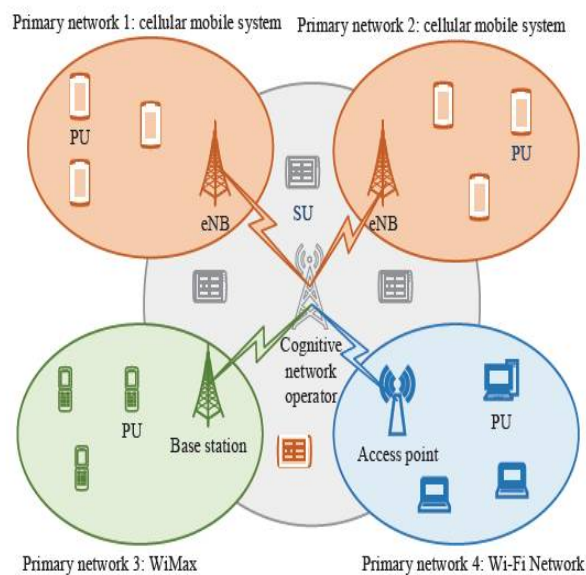


Fig. 1. An illustration of cognitive network operator-based 5G heterogeneous network.

II. EARLIER APPROACHES AND RESEARCHES

A media independent handover and software-defined network (SDN)-based framework for network selection in 5G heterogeneous network is proposed. The concept of SDN is used to propose a pre-selection mechanism and two dimensional cost functions in order to reduce the network selection latency. An effective network selection algorithm for 5G heterogeneous networks is proposed that can efficiently choose the network with guaranteed data rate and user performance. The network is selected based on a parameter which considers various metrics associated with users, system, base station transmitted power, traffic load, and spectral efficiency. In authors considered realistic approaches

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based on network-centric and user-centric for intelligent network selection. However, none of them considered price based network selection approach.

A uniform framework to investigate and evaluate network selection strategies is presented. Authors proposed a gradient-based optimal network selection strategy and discuss several existing strategies. Authors studied a single network selection scheme to maximize the mutual information over all secondary networks while satisfying the constraint of availability of the primary service. Spectrum band selection scheme is presented while satisfying the constraint on delay. The aim is to select a band with highest secondary channel power gain and lowest interference channel power gain to PUs. Authors formulated a problem to maximize effective capacity by optimizing transmit power allocation with both band selection criteria. A game-theoretic framework for network selection is proposed.

The network selection problem is formulated as a non-cooperative game (ordinal potential game) with SUs as players. To solve this problem, a decentralized stochastic learning-based algorithm was proposed in which Nash equilibrium is achieved without cooperation with other SUs. A cross-layer framework is designed while jointly considering spectrum sensing, access decision, physical-layer adaptive modulation and coding scheme, and frame size. The throughput of SUs is maximized for which problem is formulated as Markov decision process. The genetic algorithm (GA) and the PSO are derived from natural phenomena and are commonly used for solving the optimization problem.

They belong to the class of evolutionary algorithms. The GA is inspired from the concepts in evolutionary biology, such as inheritance, mutation, selection, and crossover. Whereas the PSO relies on the social behavior of the particles. In every generation, each particle adjusts its trajectory based on its own best position and the position of the best particle in the entire population. More specifically, regarding evolutionary computing in CRNs, a number of efforts have been reported so far, such as spectrum sensing using the PSO, resource allocation using the PSO and the GA, dynamic parameter adaptation using the GA, the GA aided transmit power control, energy efficient scheduling based on the PSO.

III. SYSTEM CONTRIBUTIONS

In this approach, we consider a 5G heterogeneous network that incorporates multiple primary networks. At any given instant, each primary network has a different number of channels available for the SUs, and each channel has a different capacity. Each network has some constraints in terms of interference, subscription fees, and capacity. SUs specify their requirements in terms of the minimum data rate and the maximum subscription fee that they are willing to pay. Based on SU requirements and primary network constraints, we employ the PSO and the modified GA algorithms to find a near-optimal solution. The goal of this paper is to find a solution such that the overall cost for all SUs is minimized and the overall interference incurred to the PUs of different primary networks is also reduced.

Our work differs from previous efforts in the following ways:

- ✓ The proposed model respects the perspectives of the SUs as well as the PUs, and seeks to create a balance between SU requirements and constraints of primary networks.
- ✓ The metrics on which the proposed model is built are interference to PU and the price SU has to pay to achieve a desired quality of service.
- ✓ To solve the model, a modified version of the GA algorithm is proposed and compared with the PSO based network selection.

IV. PROBLEM FORMULATION

We consider a 5G heterogeneous network which is composed of N primary networks, where each primary network can have any number of subscribed users (PUs). Each primary network has maximum number of channels denoted by p_m , however, the number of channels available for SU communication depends on the PU behavior. For each particular primary network, the PU behavior is modeled using Poisson process with two states, i.e., ON-OFF state model. Most publications in this field modeled PU traffic as independent and identically distributed ON-OFF process. For example, authors proposed a Super Wi-Fi using an ON-OFF model based PU activity. A Super WiFi uses spectrum holes and is operated by a wireless service provider which leases a licensed spectrum band.

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Algorithm: Generale description of PSO

- 1: Randomly initialize the position x_k and velocity v_k of each k th particle
 - 2: Calculate the fitness of k th particle
 - 3: Calculate $pbest_k$ for k th particle
 - 4: Calculate $nbest_k$ for the swarm
 - 5: Update the velocity v_k of k th particle using (2)
 - 6: Update the position x_k of k th particle using (3)
 - 7: Calculate fitness of k th particle
 - 8: Update $pbest_k$ of k th particle
 - 9: Update $gbest_k$ of the swarm
 - 10: Terminate the algorithm if the stopping condition is reached, otherwise go to step 5
-

The maximum possible rate of transmission on i th channel of m th network is $C_{max\ i\ m}$. The value of C_{im} depends on the i th channel condition in network m . It is assumed that there is a cognitive network operator (CNO) that manages all the incoming SUs and collects the network status information of all the available primary networks, as shown in Fig. 1.

V. EXISTING SYSTEM

- ✚ Price based Network Selection Approach - Not sufficient for all cases of network transmission explicitly it is not suitable for Multiple Location accessing.
- ✚ Spectrum Band Selection - Supports SU strategies but fails to provide the uninterrupted service.
- ✚ Network Selection and Transmission Problem is high in the past approaches.
- ✚ Performance is low and the Cost is high to implement the scenario.

VI. PROPOSED METHODOLOGY

- ✚ The proposed model respects the perspectives of the SUs as well as the PUs, and seeks to create a balance between SU requirements and constraints of primary networks.
- ✚ The metrics on which the proposed model is built are interference to PU and the price SU has to pay to achieve a desired quality of service.
- ✚ To solve the model, a modified version of the GA algorithm is proposed and compared with the Particle swarm optimization (PSO) based network selection.

Advantages of Proposed System

- ✓ Secondary Users can communicate parallelly without depending on Primary Users without any bandwidth interruptions.
- ✓ Security Level is higher compared to the existing approaches; we can achieve this via powerful crypto schemes.
- ✓ Interruption free service provider is presented, even the destination/receiver can move from one place to other after communication begins.
- ✓ Cost effective methodology and the performance is comparatively high.

VII. LITERATURE SURVEY

In this system, we summarize the 5G mobile communication requirements and challenges. First, essential requirements for 5G are pointed out, including higher traffic volume, indoor or hotspot traffic, and spectrum, energy, and cost efficiency. Along with these changes of requirements, we present a potential step change for the evolution toward 5G,

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which shows that macro-local coexisting and coordinating paths will replace one macro-dominated path as in 4G and before. We hereafter discuss emerging technologies for 5G within international mobile telecommunications. Challenges and directions in hardware, including integrated circuits and passive components, are also discussed. Finally, a whole picture for the evolution to 5G is predicted and presented.

The fifth generation of mobile technology (5G) will address the socio-economic demands and business contexts of 2020 and beyond. Leading operators from around the globe have defined their vision for 5G, considering customer and business contexts as well as potential technologies and migration issues in an initiative set up by the NGMN Alliance. While their concrete vision is described in the NGMN 5G whitepaper, this paper describes the key points, such as 5G design principles, 5G components, network slicing, 5G radio access technology and 5G interfacing options that have implications to the 5G architecture design.

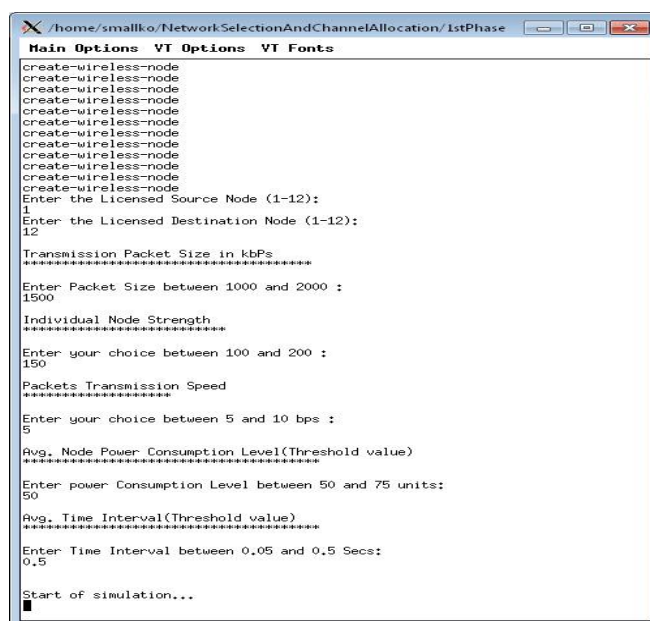
During the last two years, the METIS project ("Mobile and wireless communications Enablers for the Twenty-twenty Information Society") has been conducting research on 5G-enabling technology components. This paper provides a summary of METIS work on 5G architectures. The architecture description is presented from different viewpoints. First, a functional architecture is presented that may lay a foundation for development of first novel 5G network functions. It is based on functional decomposition of most relevant 5G technology components provided by METIS. The logical orchestration & control architecture depicts the realization of flexibility, scalability and service orientation needed to fulfil diverse 5G requirements. Finally, a third viewpoint reveals deployment aspects and function placement options for 5G.

This paper presents an architecture vision to address the challenges placed on 5G mobile networks. A two-layer architecture is proposed, consisting of a radio network and a network cloud, integrating various enablers such as small cells, massive MIMO, control/user plane split, NFV, and SDN.

Three main concepts are integrated: ultra-dense small cell deployments on licensed and unlicensed spectrum, under control/user plane split architecture, to address capacity and data rate challenges; NFV and SDN to provide flexible network deployment and operation; and intelligent use of network data to facilitate optimal use of network resources for QoE provisioning and planning. An initial proof of concept evaluation is presented to demonstrate the potential of the proposal.

Finally, other issues that must be addressed to realize a complete 5G architecture vision are discussed.

VIII. EXPERIMENTAL RESULTS



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1
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12
Transmission Packet Size in kbps
*****
Enter Packet Size between 1000 and 2000 :
1500
Individual Node Strength
*****
Enter your choice between 100 and 200 :
150
Packets Transmission Speed
*****
Enter your choice between 5 and 10 bps :
5
Avg. Node Power Consumption Level(Threshold value)
*****
Enter power Consumption Level between 50 and 75 units:
50
Avg. Time Interval(Threshold value)
*****
Enter Time Interval between 0,05 and 0,5 Secs:
0,5
Start of simulation...

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Fig.2 Input Paameters

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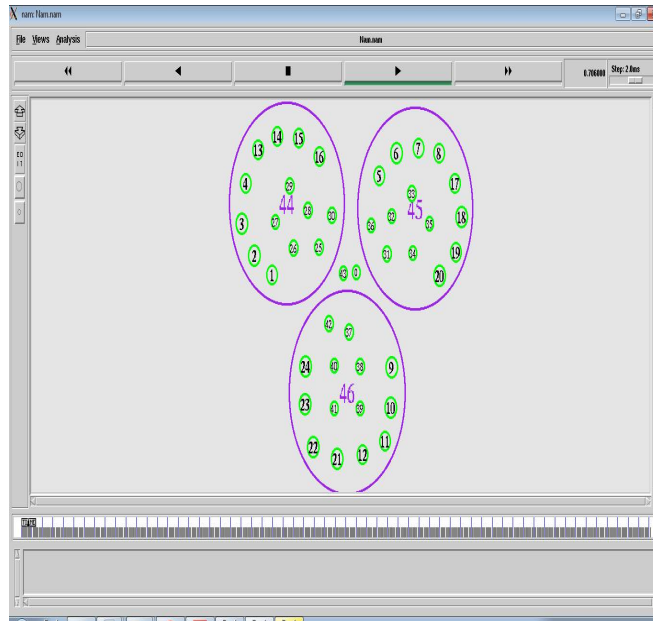


Fig.3 Network Initialization

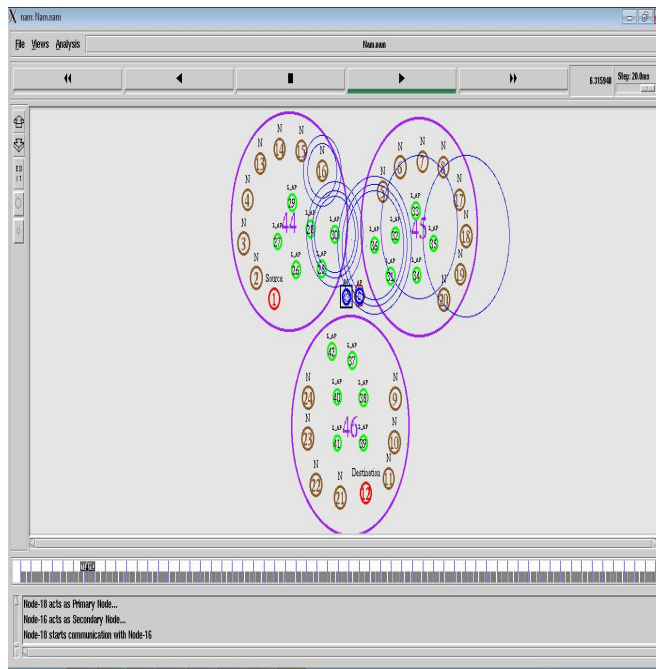


Fig.4 Wireless Communication

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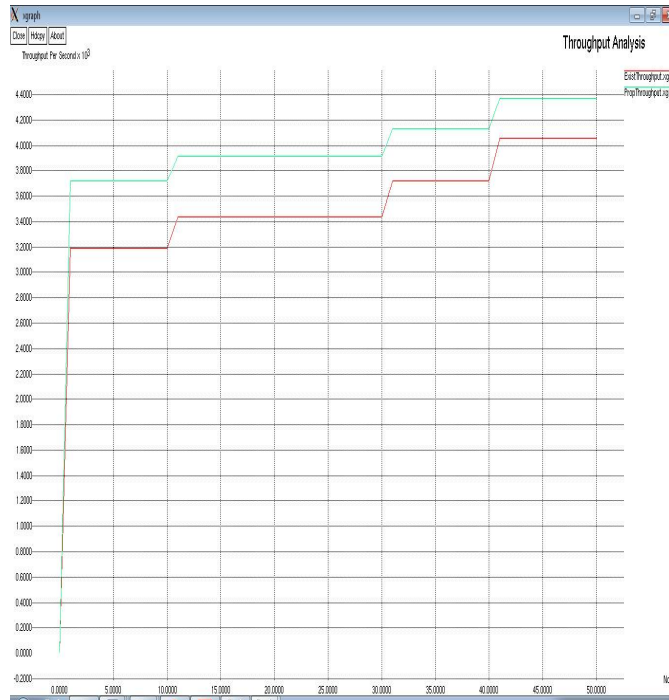


Fig.5 Analysis of Throughput

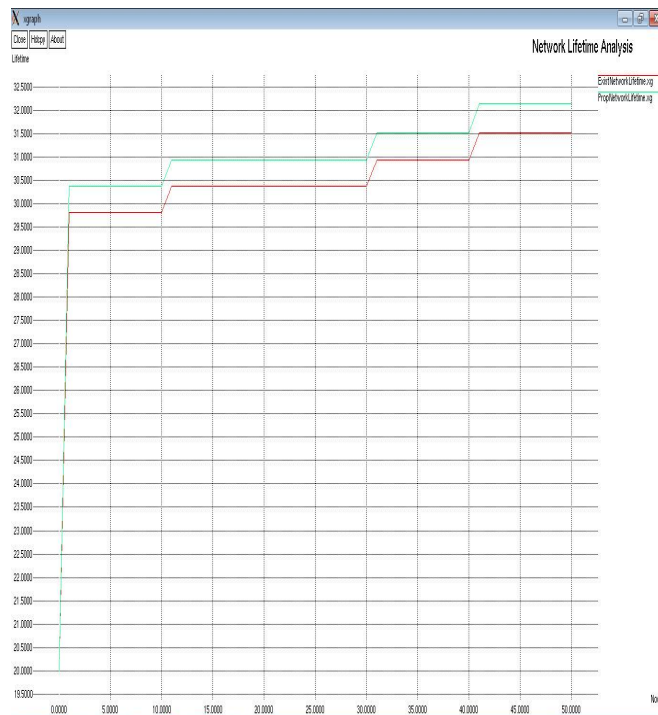


Fig.6 Analysis of Network Lifetime

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IX. CONCLUSION AND FUTURE SCOPE

The emerging wireless applications with stringent QoS requirements continue to demand more spectrum resources. Spectrum sharing is the key solution to deal with the problem of spectrum scarcity. In this paper, we have studied the network selection problem in 5G heterogeneous networks. We have proposed a network selection mechanism and formulated an optimization problem for network selection to minimize the interference to primary networks and cost paid by SUs. We then solved the optimization problem with the PSO and modified GA in order to find near-optimal solution. We have also designed two scenarios for performance evaluation with different system settings, SU data rate demands, and price preferences. Then the performance of proposed mechanism for network selection was evaluated under these scenarios. The simulation results showed that the modified GA outperforms the PSO and achieves a higher fitness value with less iteration in terms of both interference reduction and SU price requirement.

REFERENCES

- [1] C. V. N. Index, "Global mobile data traffic forecast update 2014–2019. white paper c11-520862," Available on <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-520862.html>.
- [2] S. Chen and J. Zhao, "The requirements, challenges, and technologies for 5G of terrestrial mobile telecommunication," *IEEE Communications Magazine*, vol. 52, no. 5, pp. 36–43, May 2014.
- [3] M. Iwamura, "NGMN View on 5G Architecture," in *Proc. of IEEE Vehicular Technology Conference (VTC Spring)*, Glasgow, Scotland, May 2015, pp. 1–5.
- [4] H. Droste, G. Zimmermann, M. Stamatiatos, N. Lindqvist, O. Bulacki, J. Eichinger, V. Venkatasubramanian, U. Dotsch, and H. Tullberg, "The METIS 5G Architecture: A Summary of METIS Work on 5G Architectures," in *Proc. of IEEE Vehicular Technology Conference (VTC Spring)*, Glasgow, Scotland, May 2015, pp. 1–5.
- [5] P. Agyapong, M. Iwamura, D. Staehle, W. Kiess, and A. Benjebbour, "Design considerations for a 5G network architecture," *IEEE Communications Magazine*, vol. 52, no. 11, pp. 65–75, Nov. 2014.
- [6] A. M. Akhtar, X. Wang, and L. Hanzo, "Synergistic Spectrum Sharing in 5G HetNets: A Harmonized SDN-Enabled Approach," *IEEE Communications Magazine*, vol. 54, no. 1, pp. 40–47, Jan. 2016.
- [7] N. Bhushan, J. Li, D. Malladi, R. Gilmore, D. Brenner, A. Damnjanovic, R. Sukhvasi, C. Patel, and S. Geirhofer, "Network densification: the dominant theme for wireless evolution into 5G," *IEEE Communications Magazine*, vol. 52, no. 2, pp. 82–89, Feb. 2014.
- [8] W. Ejaz and M. Ibnkahla, "Machine-to-Machine Communications in Cognitive Cellular Systems," in *Proc. of IEEE International Conference on Ubiquitous Wireless Broadband (ICUWB)*, Montreal, QC, pp. 1–5.
- [9] C. Rattaro, L. Aspirot, and P. Belzarena, "Analysis and characterization of dynamic spectrum sharing in Cognitive Radio Networks," in *Proc. of IEEE Wireless Communications and Mobile Computing Conference (IWCMC)*, Dubrovnik, Croatia, pp. 166–171.
- [10] W. Ejaz, N. ul Hasan, S. Lee, and H. S. Kim, "I3s: Intelligent spectrum sensing scheme for cognitive radio networks," *EURASIP Journal on Wireless Communications and Networking*, vol. 2013, no. 1, pp. 1–10, Dec. 2013.
- [11] W. Ejaz, N. Ul Hasan, and H. S. Kim, "Distributed cooperative spectrum sensing in cognitive radio for ad hoc networks," *Computer Communications*, vol. 36, no. 12, pp. 1341–1349, Jul. 2013.
- [12] M. Ju and K. Kang, "Cognitive Radio Networks with Secondary Network Selection," *IEEE Transactions on Vehicular Technology* (Early access), Feb. 2015.
- [13] S. Andreev, M. Gerasimenko, O. Galinina, Y. Koucheryavy, N. Himayat, S.-P. Yeh, and S. Talwar, "Intelligent access network selection in converged multi-radio heterogeneous networks," *IEEE Wireless Communications*, vol. 21, no. 6, pp. 86–96, Jan. 2015. [14] I. Ahmad, S. Liu, Z. Feng, Q. Zhang, and P. Zhang, "Price based spectrum sharing and power allocation in cognitive femtocell network," in *Proc. of IEEE Vehicular Technology Conference (VTC Fall)*, Las Vegas, NV, pp. 1–5.
- [15] M.-D. Weng, B.-H. Lee, and J.-M. Chen, "Two novel price-based algorithms for spectrum sharing in cognitive radio networks," *EURASIP Journal on Wireless Communications and Networking*, pp. 1–16, Nov. 2013.

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