Remote Sensing Using Hybrid Access Cognitive Femtocell Networks in Wireless Communication

R.Ramasamy, Reddilatha, Ravi Chandra Reddy, Balasubramaniyam

Abstract: ***Femto cells are miniature wireless telecommunications base stations that can be placed in different inhibited or industry surroundings moreover as single stand-alone substance or in clusters to afford enhanced cellular coverage inside a building. It is extensively known that cellular coverage, predominantly for data transmission where high quality signal strengths are desirable is not as superior within buildings. By using a miniature domestic base station Femto cell, the cellular routine can be enhanced beside with the promising provision of other services. A cognitive radio network time after time detects handy channels in cellular spectrum, and then frequently varies its transmission or receiving parameters to tolerate further synchronized cellular communications in a given cellular electromagnetic band. Conveying of the free channels among main and minor users, in a specific geographic province at the same time as minimizing infringement amongst all users also known as the Spectrum allotment in cognitive radio networks. In this work MBS, FAP and MUs are presented. Here FAP serves the provision of sub channels and provides power in order to maximize the network effectiveness. Finally achieved maximum throughput for the deployed Macro users (MU) and also the above mentioned problem is solved by dual disintegration method.***

Index Terms: cognitive radio network, Femto Access Point, Macro Base Station Macro users, wireless spectrum.

I. INTRODUCTION

In telecommunications, a Femto cell is a miniature, least amount of power in wireless base station, usually premeditated for use in a habitat otherwise tiny industry [1]. It bonds to the overhaul provider's set of connections by the use of broadband, modern designs classically sustain two to four vigorous mobile phones in a suburban setting and 8 to 16 energetic mobile phones in endeavor settings [2],[14]. It permits to the service holder to broaden exposure indoors or at the cell edge, principally where access would or else be restricted or engaged [3],[11]. While much awareness is paying attention on WCDMA, the perception is appropriate to all values, together with GSM, CDMA2000, TD-SCDMA, WiMAX and LTE solutions [4].

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R.Ramasamy, Faculty, UG Student, Department of ECE, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.

Reddilatha, UG Student, Department of ECE, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.

Ravi Chandra Reddy, UG Student, Department of ECE, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.

Balasubramaniyam, UG Student, Department of ECE, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.

For a mobile machinist, the attractions of a Femto cell are improvements to both exposure and facility, principally indoors. Customers promote as of better exposure with potentially superior voice eminence and succession life [5]. Femto cells are selling by a Mobile association Operator to its inhabited or venture patrons [10].

A Femto cell is on average size of a inhabited access or less significant, and connects to the user's broadband line [12]. On one occasion plugged in, the Femto cell connects to the MNO's mobile network and provides superfluous coverage [6]. From a user's perception, it is plug_and_play; there is no unambiguous installation or methodological knowledge mandatory any person be able to install a Femto cell at habitat [7],[13]. In the majority cases, the user ought to after that affirm which mobile phone numbers are permitted to connect the Femto cell, habitually by the use of a web edge provided MNO. Most MNOs afford a way for the client to know this happened for illustration by having a diverse network name come into view on the mobile phone[9]. On one occasion installed in a precise position, the majority Femto cells have fortification mechanisms so that localities revolutionize will be reported to the MNO [8]. Whether the MNO allows Femto cells to operate in a diverse position depends on the MNO's strategy[15].

II. PROPOSED TECHNIQUE

In this proposed work dual decomposition method is used. According to spectrum sharing and interference mitigation problem, here formulated and employed the dual decomposition scheme to originate the elucidation. The imitation outcome shows that both the wireless service contributor and the Femto cell may perhaps assistance from the projected work. To achieve throughput of the served macro users we implement dual decomposition method. Femto cell network utility provides promising service to the MU. The FAP apportion the source to MU and FU for instance sub channels and power. Here the wireless hand saves a fraction of associate channels and FAP establishes greater spectrum quality to become successful the routine of FU.

A protocol is planned to execute something in continuously changing spectrum allotment problem. As a resource allotment of FAP is formulated as most effective problem and it is engaged by dual decomposition process. The indoor user obtains the good quality of service. A continuously changing spectrum allotment technique is projected to encourage the cellular operator and the Femto Access Point to take up mixture admittance in the Femto cell.

This method, the cellular machinist saves a small amount of sub channels,

whereas promising the performance of the Macro Users. Alternatively, the FAP acquires further band allocation resource to progress the recital of the Femto Users. A rule is planned to carry out the projected continuously changing band allocation trouble. In addition, the allotment of resource of the FAP is specified as most effective issues in dual decomposition process is engaged to obtain the best possible result in our proposed method.

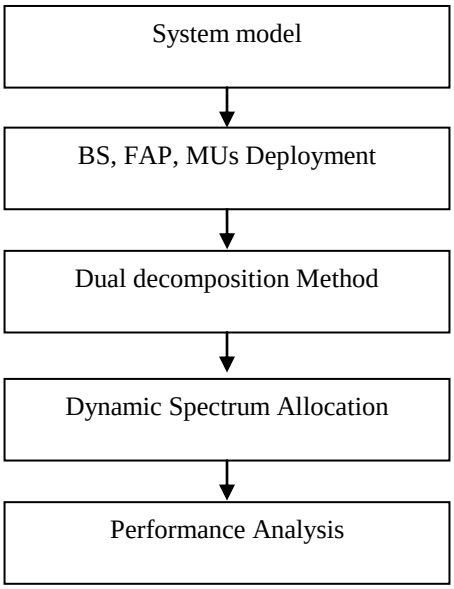
A. Femto Cell in Dual Decomposition Method:

According to spectrum sharing and interference mitigation problem, here formulated and employed the dual decomposition process to obtain the most favorable elucidation. To execute the optimization scheme via Dual decomposition technique. In addition, the allotment of resource of the FAP is specified as most effective issues in dual decomposition process is engaged to originate the optimal elucidation.

III. SYSTEM MODEL

A. System Model

System model consists of Orthogonal frequency-division multiple access based two-tier network that makes with a large-scale Base Station and a amount of Femto Access Point, the Femto Access Points are controlled by the inside users and associated to the large-scale Base Station by the energetic backhaul, called as connectors and fibre. Evaluated with Wi-Fi, the FAPs exertion on the accredited band allocation spectrum and use wireless set to effortlessly mixed in wireless area.



B. BS, FAP, MUs Deployment:

BS (Base Station), FAP (Femto Access Point), MU (Macro Users) are brought together for communication. The BS sends the signal to MU which is weak signal while the signal send through FAP, the signal becomes strong signal due to short distance. The deployed users have the frequency range which under the FAP coverage.

C. Dual Decomposition Method:

The time-sharing dual decomposition method stipulation is based on OFDMA systems with a huge amount of secondary carriers the duality opening is proved to be zero. The Dual function using Lagrange multiplier (θn, θm) is given as,

$$g(\theta) = \begin{cases} \max \sum_{n\in\Omega, m\in\phi} [U_n(d_n) + \theta_n(\lambda_n - d_n) + \theta_m(\lambda_m - d_m) \\ s.t \quad (2)-(3). \end{cases} \quad (1)$$

The dual function is based on set of variables. Changeable dn for higher level layer, and the variable of the lower layer. The problem in Dual Decomposition Method is divided into two problems. They are Rate variation predicament in application layer, Sub channel and power allotment predicament in physical layer.

Rate variation predicament in application layer

i) Dual function for application layer is given by λm and λn equal to zero

$$g_{appl}(\theta) = \max \sum_{n\in\Omega, m\in\phi} [U_n(d_n) - \theta_n d_n - \theta_m d_m] \quad (2)$$

ii) Solution of this problem is by sub gradient method is given as,

$$\theta_j^{(l+1)} = [\theta_j^{(l)} + v_j^{(l)}(d_j^* - \lambda_j^*)]^+ \quad (3)$$

iii) The higher price of θj will stimulate the application layer to condense traffic stipulate in the network.

Sub channel and power allotment predicament in physical layer:

i) Dual function for physical layer is given by dn and dm equal to zero.

$$a(\sigma) = \begin{cases} \max \sum_{j\in\psi} \theta_j \lambda_j + \sigma(P_{FAP} - \sum_{i\in\Upsilon}\sum_{j\in\psi} p_{i,j} \\ s.t \quad (2). \end{cases} \quad (4)$$

ii) Solution of this problem is by sub gradient method is given as,

$$a(\sigma) = \begin{cases} max \sum_{j\in\psi} \theta_j \lambda_j + \sigma(P_{FAP} - \sum_{i\in\Upsilon}\sum_{j\in\psi} p_{i,j}) \\ s.t. \quad (2) \end{cases} \quad (5)$$

iii) The superior price of σ will encourage the Physical layer to distribute more resources to the users.

D. Dynamic Spectrum Allocation Method:

FAP can afford an enhanced service to FUs to promote available sub channels; Macro BS can recover its band allocation competence by reduction a part of band allocation signal. Resource allotment tactic of FAP is formulated as,

$$\max \sum_{n\in\Omega} U_n(\lambda_n) \quad (6)$$

$$\text{s.t.} \quad \sum_{j\in\psi} \mu_{i,j} \leq 1 \qquad \forall\, i \in \Upsilon \quad (7)$$

$$\sum_{i\in\Upsilon}\sum_{j\in\psi} p_{i,j} \leq P_{FAP} \quad (8)$$

$$\lambda_m \geq D_m \quad (9)$$

Dynamic spectrum allotment technique is projected to encourage together the wireless operator and the FAP to take up mixture admittance in the cognitive Femto cell system. The utility function is given as,

$$U_n(\lambda_n) = \begin{cases} k_1\left(1 - e^{-k_2\lambda_n}\right), & if\ \lambda_n \geq 0 \\ -\infty, & if \lambda_n < 0 \end{cases} \quad (10)$$

E. Performance Analysis:

Utility function vs target rate graph is plotted, Performance with different schemes that are system utility, system throughput and equality are compared. Achievable rate also compared with the Femto users and micro users. Finally, network utility, network throughput and number of negotiation channels are plotted. Algorithm starts with initializing θ (0) and solves the physical layer problem using sub gradient method. Initializing the σ(0) to solve

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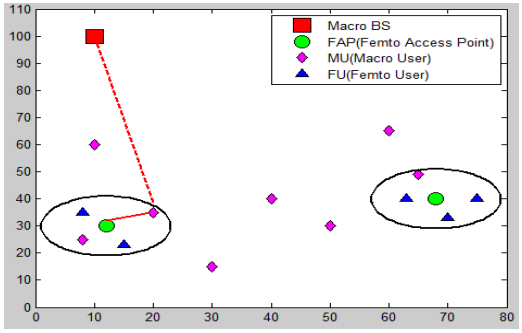
the higher level layer problem. The step size rule is used to perform the sub gradient method. The process continues till it convergence with the initial output of the method. The Utility, Throughput and Fairness of the method are estimated from dual decomposition method.

IV. RESULT AND DISCUSSION

The MATLAB output of our paper is explained with its respective content of the method. The result of our paper is established from the MATLAB software using respective coding for performance analysis. The algorithm of our paper is coded and the performance is discussed with other methods for clarification.

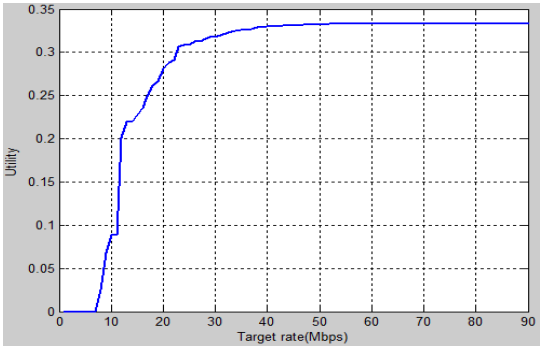
A. Simulation Results



The signal from the Macro BS to MU is a weak signal due to large distance, interferences, traffic, etc. The signal from FAP (Femto Access Point) to MU is a Strong signal due to short distance, less users, coverage area is high. If the user under the coverage of FAP, they are called as FU (Femto Users).

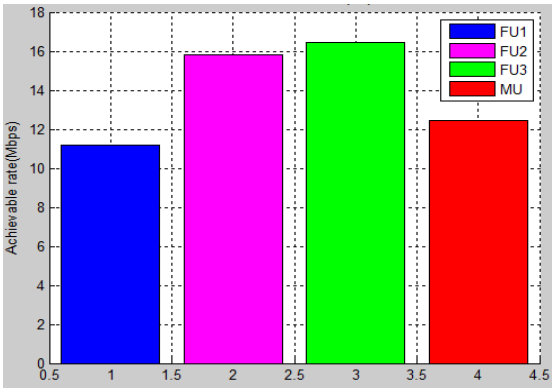
B. Utility Function

The Dynamic Spectrum allotment technique is used to find the utility function of the users under the coverage of FAP. The achievable rate of FUs is mentioned in the utility function.



C. Achievable Rate of Each User

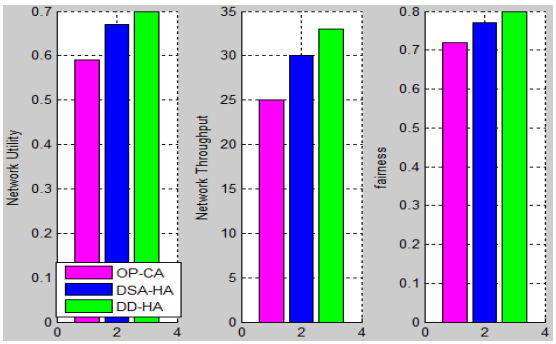
The sub channels allocated to each end user in the FAP coverage area provide the practicable rate of Femto users. Macro user can able to adapt to the FAP signal by achieving their sub channels.



Achievable rates of different Femto users are diverse due to channel circumstances. The Quality of Service of Macro User can be assured by FAP. Each and Every user of FAP should satisfy its demand by transferring the signal through the allocated channel. Here, we set the demand as D=10 Mb/s. The Femto user (FU3) has the high achievable rate due to the allocated sub channels are fulfilled by FAP coverage area.

D. Performance Analysis with other Methods (Parameters)

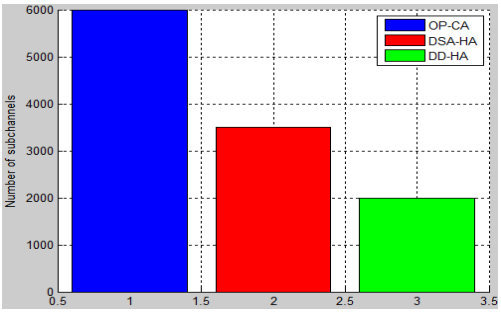
The performance of our paper is analyzed with the comparison of other two methods. The parameters like Network Utility, Network Throughput, Fairness of each method is determined. The Analyzed Methods are as follows.
OP-CA =Optimal Allocation for Closed Access
DSA-HA =Dynamic Spectrum Allocation for Hybrid Access
DD-HA =Dual Decomposition for Hybrid Access



The Parameters of each method is analyzed and compared with our method. The other methods are based due to the allocation of sub channels in respective achievable rate. Each method guaranteed their user requirements by allocating sub channels in access methods.

E. Performance Analysis with other Methods (Sub Channel Allocation):

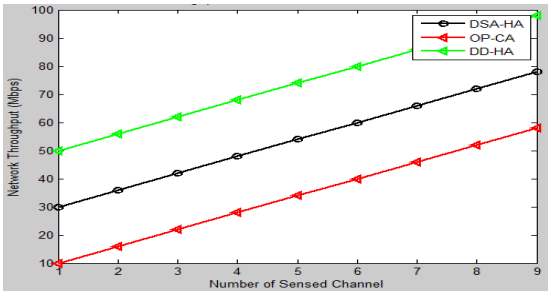
The Performance of our paper is compared with other two methods. The allocated sub channel by the macro BS has the respective achievable rate of each user (Macro Users and Femto Users).



The number of sub channels used by the users is allocated by the FAP with the guidance from BS. More Sub channels provide less QoS, interferences, busy traffic, etc. So our paper uses less number of sub channels for providing users demand.

F. Performance Analysis of Throughput (Sensed Channel):

The Network Throughput is maximized by implement of sub channels to their user requirements. Our paper has a high throughput by allocating fewer sub channels compared to other methods.



V. CONCLUSION

In this paper, the wireless machinist and FAP are set to take up the Hybrid admittance in Cognitive Femto cell system by Dynamic Spectrum Allocation Method. FAP serves the allocation of sub channels and provides power in order to exploit network area utility. The maximum successful data rate for deployed Macro Users and Femto Users are achieved by Dual Decomposition method. In this proposed work, to encourage both the cellular hand and Femto Access point to promote crossbreed way in the Femto cell by using the dynamic spectrum sharing technique. To progress the presentation of the FUs, it obtains more spectrum resource. In this proposed work MBS, FAP and MUs (Macro Users) be presented. Here FAP serves the allocation of sub channels and provides power in order to exploit the system utility. Finally achieved maximum throughput for the deployed Macro users (MU) and also the above mentioned problem is solved by dual decomposition method. The dual decomposition method was employed and the problems raised are solved through zero duality gaps for FAP.

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AUTHORS PROFILE

R.Ramasamy, is an Assistant professor in the Department of Electronics & Communication Engineering at Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India. He Received a Master of Engineering in Electronics & Communication Engineering from Anna University, Chennai. . He Received a Bachelor of Engineering in Electronics & Communication Engineering from Anna University, Chennai. His Research interests are in wireless communication domain.

Reddilatha, is a Student in the Department of Electronics & Communication Engineering at Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.

Ravi Chandra Reddy, is a Student in the Department of Electronics & Communication Engineering at Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.

Balasubramaniyam, is a Student in the Department of Electronics & Communication Engineering at Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology Chennai, India.