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Channel capacity maximization using NQHN approach at heterogeneous network

Savita Patil[1], A. M. Bhavikatti[2]
[1]AMC Engineering College, India
[2]Computer Science and Engineering, BKIT, India

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ABSTRACT

In present scenario, the high speed data transmission services has pushed limits for wireless communication network capacity, at same time multimedia transmission in real-time needs provision of QoS, therefore the network capacity and small cell coverage has comes with lots of challenges. Improving the channel capacity and coverage area within the available bandwidth is necessary to provide better QoS to users, and improved channel capacity for the FCUs and MCUs in network. In this paper, we are proposing an NQHN approach that incorporate with efficient power allocation, improving the channel capacity by optimized traffic scheduling process in a small cell HetNets scenario. This work efficiently handle the interference with maintaining the user QoS and the implemented power controller uses HeNB power as per the real time based approach for macro-cell and femto-cell. Moreover, we consider the real traffic scenario to check the performance of our proposed approach with respect to existing algorithm.

Corresponding Author:

Savita Patil,
AMC Engineering College,
Bangalore-83, India.
Email: sampatil949@gmail.com

1. INTRODUCTION

HetNets are a future generation WC networks that have been used to reduce the unsighted area of the mobile communication with improving the present network coverage area in compared with traditional WC networks. A WAN (Wide Area Network) can use macro-cell and, femto-cell or pico-cell to provide the wide coverage area in a wireless coverage environment such as; homes, office buildings, underground areas and an open outdoor area. The usage of mobile data are growing exponentially through several type of communication applications like as; multimedia phones and, Wi-Fi etc. It is not possible to satisfy the larger communication requirements like as coverage and throughput using the traditional WC network by macro-cell BSs (Base Stations).

Moreover, to provide the novel applicant methodology in LTE-A based WC networks, the HetNets has been propose in [1-3] that enhances the data rate and network area coverage. In HetNets, there are several low-energy and low-cost femto-cell are distributed around the macro-cell BSs, said to be as femto-cell users, which shares the same available spectrum bandwidth with the macro-cell users in order to get optimized spectral efficiency in a cellular network. Therefore, the interference from the users of femto-cell to macro-cell BSs should be monitor and control strictly, also the mitigation of interference is very necessary for the control power based 'resource allocation' and used as practical approach in wireless HetNets [4, 5]. The resource allocation approach for HetNets has concern from many researchers and its importance is growing extremely, the major aim in 'resource allocation' for existing femto-cell networks is to decrease the received interference at macro-cell users, simultaneously achieve the femto-cells performance from using power control approach that has been studied in [6-8].

In paper [6], they proposed an approach of interference mitigation in order to enhance the uplink throughput via providing a stable interference threshold value, also through regulating transmit power of femto-cell user. The two-tier femto-cell system has considered in [7], where resource allocation has provided in both uplink and downlink for enhancing the sensitivity capacity of femto-cells users, decreasing the delay timing at femto-cell users under macro-cell user interference constraint and quality service constraint for sensitive users. In paper [8], they proposed an energy efficient HetNets by using game theory at resource allocation process in a downlink transmission under a multichannel HetNets. It is point to be considered that the mostly approach related to resource allocation required perfect knowledge of CSI (i.e., channel state information) at transmitter side, however, it is generally considered that all system knowledge such as perfect-CSI are accessible to femto-users, due to arbitrary behavior of incorrect channel estimation, channel delays and wireless channels. Therefore, it is difficult for femto-users to acquire the desirable system parameter values such as; interference power and channel gains from different networks. In paper [9, 10], they proposed a robust optimization approach that exhibits robustifying resource allocation with imperfect-CSI, which has drawn significant attention in order to handle the uncertainty in HetNets. The major aim of power controller is to minimalize the power in transmission, therefore decrease the high power consumption and reducing the inter-cell interferences in necessary as we discussed previously. Through properly regulating the downlink power transmission as per resource block is necessary to get achievable bit-rate in femto-cells, all interference that generated in small cell network can be reduce significantly.

Therefore improving the channel capacity and coverage area within available bandwidth is necessary to provide better quality of service to users, though protecting macro-cell users in network through maintaining the interference under a threshold level. The effectiveness QoS at traffic users is also key factor and without any provision, the level of QoS can be mishandled in LTE-A (long-term evolution advanced) based small network. Moreover, the increment in mobile users causes the degradation in QoS, due to its more data usage (i.e., more bandwidth) applications. In this paper, we are proposing an NQHN approach that incorporate with efficient power allocation, improving the channel capacity by optimized traffic scheduling process in a small cell HetNets scenario. This work efficiently handle the interference with maintaining the user QoS, the implemented power controller uses HeNB power as per the real time based approach for macro-cell and femto-cell. Moreover, the power controller approach uses 3GPP [11] standard for dynamic representation of efficient 'power switching' points and optimized traffic scheduling (OTS) approach to perform QoS aware scheduling by considering traffic parameters with real-time HetNets condition. In result section, we consider the number of femto-cell user and macro-cell users in a traffic scenario to check the performance of our proposed approach and providing comparison analysis with existing algorithm.

2. LITERATURE SURVEY

In order to face the traffic related issues in WC networks, it is necessary to coordinate and utilize the several large throughput 'small-cell' like as wireless LAN (local area networks). Moreover, the number of large throughput 'small-cell' has considered in [12], where they constructed the small outdoor cells via access set up points at indoors. To validate the system performance, the indoor-outdoor field measurement has done in order to propagate in multiple direction; also, they focused on 3.5GHz that used in small-cell of LTE-A system. In this paper [13], they used tool such name as stochastic geometry, also designed a framework model for the downlink data-rate coverage probability in a small cell network with enabling MIMO at wireless backhaul. The small cell network is consist of several small cells, which can configured either in out-band and in-band types of backhaul under an assured probability. The user performance has consider in hierarchical network and limited through several interferences sources such as; small-cell BS interference, backhaul interfaces, etc. The effect of channel difficulty under MIMO and wireless backhaul faces long-term channel arrangement, where the access link involved in both long and short term of channel effects.

The general grid approach has become stubborn as per the increasing in network size, also it cannot handle the structure of outgeneral networks, therefore it is become challenging to compute the accurate performance of WC cellular network, because of propagation effect in path and network prototype complexity. Therefore, a way should be there in order to simulate the cellular networks and in [14], the several network model was compared by simulation. However, estimating the performance of network via simulation can deliver understanding on specific setting thus the outcome may not differ at other scenarios as well as the computational complexity, in [15] they also proposed the work based on cellular network enhancement with fixed approach. Their proposed approach has efficiently work to achieve the optimum result at a small-cell HetNets, while considering the large HetNets with this approach may create more complexity. Furthermore, the cooperation with sophisticated BS and local 'or' global CSI are required to get output of achievable performance under a communal network setting.

The application of WC dense devices and services access required high consumption of energy, due to real time processing, for that energy efficient design has consider for financial and environment cause. Therefore, it become trend to find out best energy efficient process and as per our information, generally OFDM is used in small cell HetNets to provide power allocation, higher energy efficiency, bandwidth allocation in wireless backhaul, and user QoS. Where the QoS is novel approach for this field, which investigated less and in paper [16], they proposed an energy efficient allocation technique for wireless backhaul network that based on OFDM access HetNets small cell. There are also some existing technique of resource allocation, which increases the throughput and increases the efficiency of energy through allocating dual transmit power level at individual small-cell BS to users and channel bandwidth, that based on circuit power ingestion and CSI. The present backhaul networks consist of statically resource allocation that result little allocations when the several small-cells are present in a cellular network with given resources, therefore, in [17] they proposed new access backhaul network design that based on Smart-GW (Gateway) in between BSs and small-cell. Specifically, they applied modest LTE protocol, which add the Smart-GW into advanced LTE HetNets.

In paper [18], they proposed a random spatial methodology where base stations are modified as spatial PPP (Poisson point process), these type of random network topology has widely used in wireless ad-hoc network [19-22] and it has performed well under small cell network scenario where the position of BS are in irregular form. In paper [23], they proposed LAA ('licensed-assisted access') for the investigation of small cell network and a framework called LTE with unlicensed incumbent model has introduced here, where they give expression for both transmission strategies; wireless fidelity (Wi-Fi) and LTE system under an unlicensed spectrum. In [24-26], the point process has consider with the stochastic geometry theory, this methodology shows the appropriate and tractable performance that can used to examine the throughput and probability in cellular networks. In addition, a random spatial network approach can be used in different type of network such as distributed antenna structures [27] and HetNets [28-31], but from the above study, we have adopted that still a lag in optimizing the HetNets performance with maintaining the user QoS.

3. PROPOSED METHODOLOGY

Here, we consider femto-cells that has ability to avoid the interference with different channel signals; also, deliver high quality data transmission to mobile users, therefore femto-cells enhances the spectral efficiency at number of user per unit coverage area. Moreover, the BS present at shorter distance, which help mobile terminals to get much energy efficiency through decreasing the transmission power and that, increases the battery life. The use of femto-cells at indoor location, the macro-cells can also provide much reliable service to outdoor users because of the overhead reduction. Figure 1 shows the proposed model block diagram, which shows two major part such as power controller approach and optimized traffic scheduling algorithm in a real-time streaming scenario with maintain users QoS, the QoS at heterogeneous network dynamically considered for the users. In HetNets scenario, femto-cells users and macro-cells users are makes request, for that acquired channel state and traffic information are forwarded to scheduling and power controller process, so that we can achieve optimized trans-receiver BS (TBS) and user throughput.

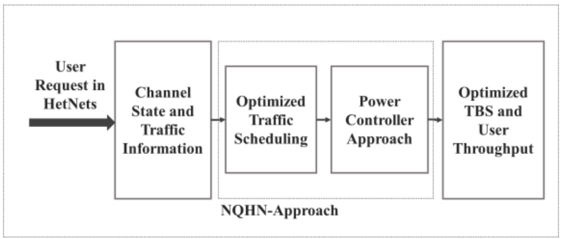

Figure 1. Block Diagram of Proposed NQHN Approach

3.1. Optimized traffic scheduling (OTS) algorithm

In this section, we describe the optimized scheduling algorithm in order to handle the traffic occurrence effectively in a small-cell HetNets, also provide acceptable capacity to a system. The acquired channel state and traffic information are given input to OTS algorithm to make the scheduling result at a period of time, which also based on utility computation function [32]. The utility function aim is obtain the standardized QoS objective that realized through user network scenario and in general, the packet holding time of a user are high so the requirement of QoS also become more for that user.

Algorithm for Optimized Traffic Scheduling (OTS)	
$Step1: -$	**for** in t time period
$Step2: -$	**for** traffic requested by individual user a
$Step3: -$	Computing average time utility based function $B[A_a(t)]$
$Step4: -$	Computing maximal utility threshold function $\mathrm{A_{th}}$
$Step5: -$	**if** $B[A_a(t)] < \mathrm{A_{th}}$
$Step6: -$	Anticipate a user request
$Step7: -$	**end**
$Step8: -$	**end**
$Step9: -$	**if** request from a novel user c comes
$Step10: -$	Instantly computing novel time utility fun $B[A_c(t)]$
$Step11: -$	**if** $B[A_c(t)] < \mathrm{A_{th}}$
$Step12: -$	New c user request has not responded yet
$Step13: -$	**else**
$Step14: -$	Proceed for user request, start from step 1 and activate power controller approach
$Step15: -$	**end**
$Step16: -$	**else**
$Step17: -$	Process continue
$Step18: -$	**end**
$Step19: -$	**end**

Moreover, the QoS has provided in controller multimedia transmission and, for real-time scenario, we can use any data transmission so that the delay in performance may occurs. The delay and throughput performance are major in lower priority users but it is not much critical, due to regulating the angle of delay bounds that can vary utility functional metric instantly. In addition it is found that the above OTS algorithm has achieve better performance in a period when the users number are not very large and the femto-cell users move closely towards BS in HetNets. The user movement and handover request distant from the femto-cell center needs more 'load balancing', which causes falls in system capacity and the performance services.

3.2. Robust user quality based power controller

A multiuser OFDM based HetNets is considered which contains D number of femto-cell users (FCUs) and communicating with associated femto-cell BSs (FCBSs) over E number of subcarrier. FCUs are used to utilize the macro-cell users (MCUs) via FC-BSs, where D and E are varies according to active user's number and available subcarrier, that can be indexed as;

$$d \in \mathfrak{D} \triangleq \{1, 2, 3 \ldots\ldots, D\} \tag{1}$$

$$e \in \mathcal{E} \triangleq \{1, 2, 3 \ldots\ldots, E\} \tag{2}$$

Here, we assumed that $\mathcal{E} \geq \mathfrak{D}$, the subcarrier bandwidth is assumed to be FHz that is very less compare to the wireless channel bandwidth, therefore applying Shannon Hartley Theorem (SHT) [33] corresponding FCU data rate d at subcarrier e is written as.

$$g_{d,e} = F h_{d,e} \log_2 \left(1 + {}^{I_{d,e} J_{d,e}}\!\big/_{K_{d,e}}\right) \tag{3}$$

Where, $K_{d,e}$ denotes the d FCU background noise at e subcarrier, $h_{d,e}$ denotes the d FCU subcarrier assignment at e subcarrier, $I_{d,e}$ denotes the d FCU transmit power at e subcarrier and $J_{d,e}$ denotes the d FCU direct channel gain at e subcarrier. The subcarrier assignment will be 0 or 1 that shows the e subcarrier is used by d FCU or not. The major constraint is battery capacity at mth FCU transmitter and the individual FCU can use limited amount of power, therefore the constraint is given as;

$$\sum_{e=1}^{E} h_{d,e}\ I_{d,e} \leq I_d^{max}, \forall d \in \mathfrak{D} \tag{4}$$

In (4), I_d^{max} denotes the maximal power transmit of FCU and the data-rate should fulfil the minimal requirement of d FCU QoS that written as;

$$\sum_{e=1}^{E} g_{d,e} \geq G_d^{min}, \forall d \in \mathfrak{D} \tag{5}$$

where, G_d^{min} shows the minimal requirement rate of d FCU and the interference constraint of total cross-tier under femtocell networks to the MCU receiver part can be described as;

$$\sum_{d=1}^{D}\sum_{e=1}^{E} h_{d,e}\, I_{d,e} N_{d,e} \leq M^{il} \tag{6}$$

where, the interference level at MCU receiver is denote by M^{il} and the maximization of sum rate via power controller at HetNets can be given as;

$$\max_{h_{d,e} I_{d,e}} \sum_{d=1}^{D}\sum_{e=1}^{E} g_{d,e}$$

$$\sum_{e=1}^{E} h_{d,e} = 1, \forall d \in \mathfrak{D},\ Z_1$$

$$\sum_{k=1}^{K} h_{d,e} I_{d,e} \leq I_d^{max}, \forall d \in \mathfrak{D}, Z_2 \tag{7}$$

where, Z_1 shows the individual e subcarrier that assigned to each FCU, $I_{d,e} = 1$ signify the eth-subcarrier that used by d FCU, and Z_2 shows the power transmission constraint of d FCU over the subcarrier.

$$\sum_{e=1}^{E} G_{d,e} \geq G_d^{min}, \forall d \in \mathfrak{D}, Z_3 \tag{8}$$

Equation (8) ensure the QoS for individual FCU,

$$\sum_{d=1}^{D}\sum_{e=1}^{E} h_{d,e} I_{d,e} N_{d,e} \leq M^{il}, Z_4$$

$$h_{d,e} \in \{0,1\}, \forall d \in \mathfrak{D},\ e \in \mathcal{E}, Z_5 \tag{9}$$

Where, Z_4 shows the total power interference at MCU receiver side, the major difficulty is $h_{d,e} = 1$ is mixed integer and non-convex programming difficulty and $N_{d,e}$ shows the channel gains feedback that provided by MCU to FCU. In current development, mostly of the researchers has focused on power allocation strategy in HetNets [34] that focus on enhancement power with considering perfect CSI [35]. In particle, the present of quantization errors and estimation error causes the channel uncertainty that is harmful for MCUs and, in order to decrease that, we should consider some advancement technique, which can deal with these uncertainties. Therefore, here we use robust user quality based power controller and, the (8) and (9) can be rewritten in the probability form such as;

$$\max_{h_{d,e} I_{d,e}} \sum_{d=1}^{D}\sum_{e=1}^{E} g_{d,e} \quad s.t. Z_1, Z_2, Z_5$$

$$\mathrm{P}\left\{\sum_{e=1}^{E} g_{d,e} \leq G_d^{min}\right\} \leq Q_d, \forall d \in \mathfrak{D}, Z_6 \tag{10}$$

$$\mathrm{P}\left\{\sum_{d=1}^{D}\sum_{e=1}^{E} h_{d,e} I_{d,e} N_{d,e} > M^{il}\right\} \leq \mathfrak{z} \tag{11}$$

where, both (10) and (11) ensure the MCU and FCU QoS via using the probability function and $\mathfrak{z}$ and Q_d shows the threshold value of outage probability. Here, OFDM feature technique has consider, so there the subcarrier are independent from each other and each FCU data are mutually independent from all subcarrier and the set of data-rate is defined as;

$$S^e = \left\{g_{d,e} \leq G_d^{min}\right\}, \tag{12}$$

$$S = \left\{\sum_{e=1}^{E} g_{d,e} \leq G_d^{min}\right\} \tag{13}$$

where, S set is an intersection subset of S^e such as;

$$\bar{S} \subset S = S^1 \cap S^2 \ldots S^e. \tag{14}$$

After applying the probability analysis, we got following relationship;

$$\{\bar{S}\} \leq \mathrm{P}\{S\} = \prod_{e=1}^{E} \mathrm{P}\{S^e\} \tag{15}$$

Further, it can be written as;

$$\mathrm{P}\left\{\sum_{e=1}^{E} g_{d,e} \leq G_d^{min}\right\} \leq \prod_{e=1}^{E} \mathrm{P}\left\{g_{d,e} \leq G_d^{min}\right\} \tag{16}$$

The probabilistic rate constraint for upper bound should satisfies the required outage probability during the worst scenario, therefore the (10) can be written as;

$$\mathrm{Max}\ \mathrm{P}\left\{\sum_{e=1}^{E} g_{d,e} \leq G_d^{min}\right\} \leq \prod_{e=1}^{E} \mathrm{P}\left\{g_{d,e} \leq G_d^{min}\right\} \leq Q_d \tag{17}$$

In order to provide deterministic outage probability the above (17) can be written as;

$$G_d^{min} \leq F h_{d,e} \log_2 \left(1 + \frac{I_{d,e}}{K_{d,e}} \mathrm{J}_{J_{d,e}}^{-1}(Q_d\ /E)\right), \forall d \in \mathfrak{D}. \tag{18}$$

The satisfaction of above (18) ensure the power transmission with the considered outage probability, similarly, the probabilistic interference (11) can be modified as;

$$h_{d,e} I_{d,e} \leq \frac{M^{il}}{E \mathrm{N}_{N_{d,e}}^{-1}\left(\sqrt[DE]{1-\mathfrak{z}}\right)}, , \forall d \in \mathfrak{D}, \forall e \in \mathcal{E}. \tag{19}$$

Therefore, the (19) equation said to be deterministic and it is require to keep it as presentable, moreover, the power controller difficulty without any information can be represented as;

$$\max_{h_{d,e} I_{d,e}} \sum_{d=1}^{D} \sum_{e=1}^{E} g_{d,e}\ \ s.t. Z_1, Z_2, Z_5 \tag{20}$$

$$F h_{d,e} \log_2 \left(1 + \frac{h_{d,e}}{K_{d,e}} \mathrm{J}_{J_{d,e}}^{-1}(Q_d\ /E)\right) \geq G_d^{min}, d \in \mathfrak{D}. \tag{21}$$

Here, we have applied the inverse collective distribution function at variable such as $J_{d,e}$ and $N_{d,e}$, and those can be written as $\mathrm{J}_{J_{d,e}}^{-1}$ and $\mathrm{N}_{N_{d,e}}^{-1}$.

$$E h_{d,e} I_{d,e} \mathrm{N}_{N_{d,e}}^{-1}\left(\sqrt[DE]{1-\mathfrak{z}}\right) \leq M^{il}. \tag{22}$$

Generally, the FCUs can acquire the CSI through the channel estimation in between FCUs and MCUs, so these can cause some difficulty at CSI acquisition. Therefore, here we consider the independent model of Gaussian distribution to handle the uncertainty parameters. Moreover, the channel gain from the FCUs transmitter to BS is acquire via a robust user-$quantizer$ and the feedback is given back to corresponding FCUs transmitter.

4. RESULT ANALYSIS

In this section, we presented the simulated results that is simulated in Matlab 2016b environment and the system configuration; Intel i5 processor, 2GB NVidia graphics-card, 8GB RAM and Windows 10 OS (Operating System). Moreover, we consider the several necessary parameters that generally used in traffic condition scenarios; gain of antenna 14dBi, maximum and minimum transmit power are 20dBm and 0dBm, transmit power of BS 43dBm, speed of users 3Km/h, Urban type channel model, correlation distance 40m, radius of cell 1Km, carrier and subcarrier bandwidth 2000Mhz and 375KHz, system bandwidth 10MHz and etc.

With considering these traffic parameters, we have taken 1 macro-cell, 10 femto-cell, 15 number of MCUs, 60 subcarrier and 100 number of FCUs, and the location of femto-cell, MCUs and FCUs are generated randomly. Here, Figure 2 represents the proposed network prototype and further we will focus on 4, 7, 8 and 10. The inputs of femto cells were selected arbitrary under real-time scenario such as video data [36] and audio [37] to provide realistic multimedia transmission. The increment of mobile users will trigger additional signal interference at FCUs and MCUs in small cells scenario.

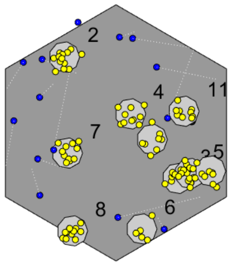

Figure 2. Proposed Network Prototype

Figure 3 shows the transmission power that used by different algorithm in cell 4, where the existing algorithm HARQ-CC [38] and HARQ-T1 [39] has used average power of 16.52dBm and 20dBm, where our propose model NQHN has used 14.33 dBm average power that is 28% lesser compare to HARQ-T1 [39] and 13.25% lesser compare to HARQ-CC [38].

Figure 4 shows the computed throughput by different algorithm in cell 4, where the existing algorithm HARQ-CC [38] and HARQ-T1 [39] has obtained average throughput of 124 Mbps and 88.69 Mbps, where our propose model NQHN has got 135 Mbps average throughput that is 7.9% more compare to HARQ-CC [38] and 34% more compare to HARQ-T1 [39].

Figure 5 shows the transmission power that used by different algorithm in cell 7, where the existing algorithm HARQ-CC [38] and HARQ-T1 [39] has used average power of 12.2dBm and 17.16dBm, where our propose model NQHN has used 10.35 dBm average power that is 39% lesser compare to HARQ-T1 [39] and 15.14% lesser compare to HARQ-CC [38].

Figure 6 shows the computed throughput by different algorithm in cell 7, where the existing algorithm HARQ-CC [38] and HARQ-T1 [39] has obtained average throughput of 120 Mbps and 99.7 Mbps, where our propose model NQHN has got 142 Mbps average throughput that is 15.4% more compare to HARQ-CC [38] and 29.8 % more compare to HARQ-T1 [39].

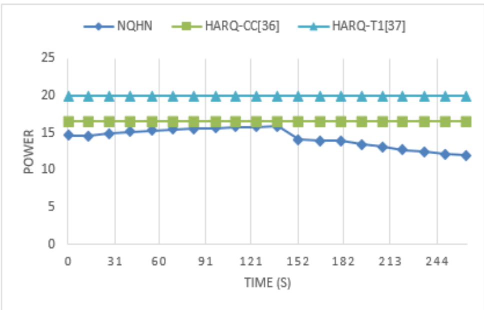

Figure 3. Power (dBm) in Cell 4

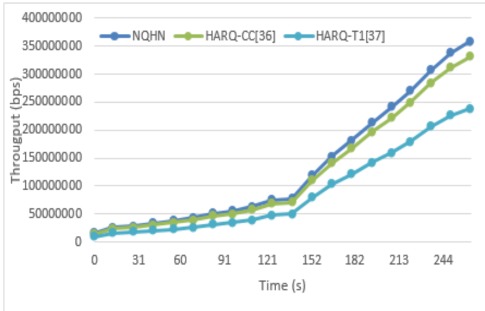

Figure 4. Throughput (bps) in Cell 4

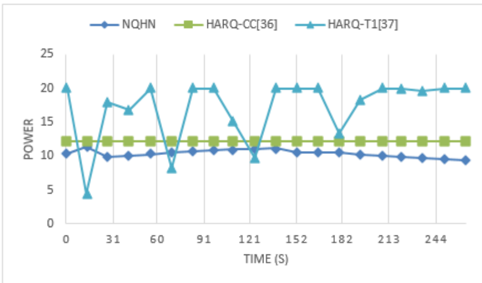

Figure 5. Power (dBm) in Cell 7

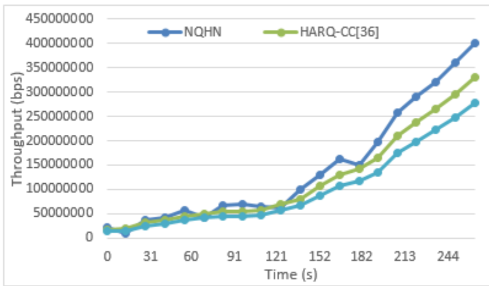

Figure 6. Throughput (bps) in Cell 7

The transmission power used in cell 8 by different algorithm has shown in Figure 7, where, the average power used by proposed NQHN is 8.44 dBm, which is 1 % more compare to HARQ-CC [38] and 46.5% less compare to HARQ-T1 [39]. Moreover, the throughput in Mbps are obtained by different algorithm in cell 8 has shown in Figure 8, where, the average throughput of our proposed approach is 142 Mbps that is 29 % more compare to HARQ-CC [38] and 27.6% more compare to HARQ-T1 [39].

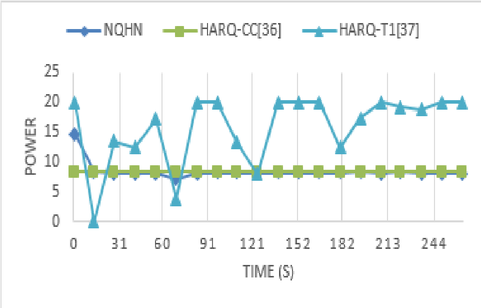

Figure 7. Power (dBm) in Cell 8

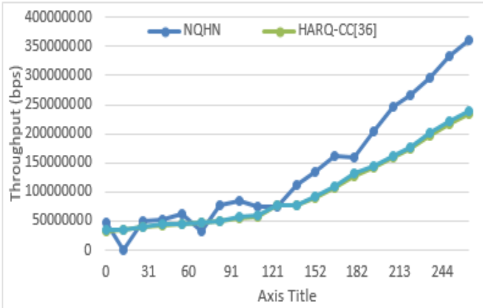

Figure 8. Throughput (bps) in Cell 8

Similarly, Figure 9 shows the transmission power that used by different algorithm in cell 10 where, the average power used by proposed NQHN is 12.43 dBm, which is 12.3 % lesser compare to HARQ-CC [38] and 32.66% less compare to HARQ-T1 [39]. Moreover, Figure 10 shows the computed throughput by different algorithm in cell 10 where, the average throughput of our proposed approach is 134 Mbps, which is 12 % more compare to HARQ-CC [38] and 32.7% more compare to HARQ-T1 [39].

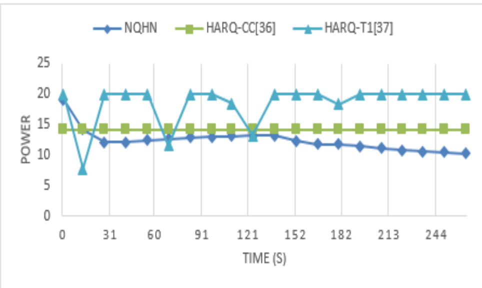

Figure 9. Power (dBm) in Cell 10

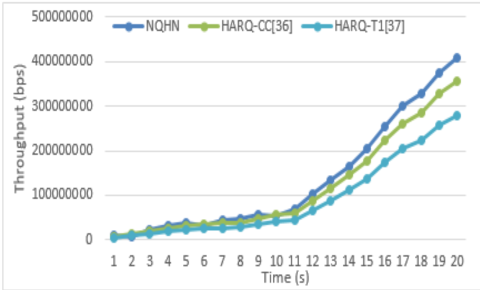

Figure 10. Throughput (bps) in Cell 10

Figure 11 shows the average throughput of considered HetNets, where our proposed approach got 25 Mbps, HARQ-CC [38] got 22 Mbps and HARQ-T1 [39] got 19 Mbps throughput rate. Moreover, Figure 12 shows the computed delay from different algorithm in end-to-end considered HetNets scenario, where NQHN got 0.5 sec of delay, which is 61% less delay compare to HARQ-CC [38] and 90% less compare to HARQ-T1 [39].

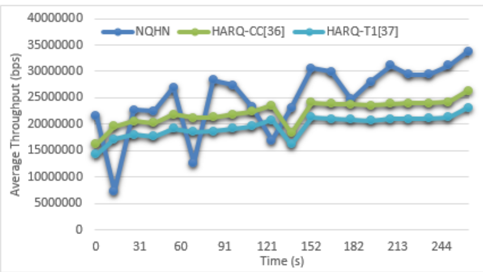

Figure 11. Average Throughput (bps)

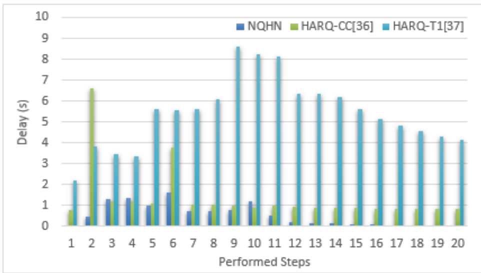

Figure 12. Computed Delay from different Algorithm

5. CONCLUSION

The traffic and QoS related issues in WC networks are growing continuously. Therefore, it is necessary build the small outdoor cells (i.e., macro-cell) by setup the access points (i.e., femto-cell). In this paper, we proposed Novel QoS aware HetNets (NQHN), which contains OTA and robust user quality based power controller in order to provide QoS of macro-cell HetNets and improve system capacity. The optimized scheduling algorithm has used in order to handle the traffic occurrence effectively in a small-cell HetNets that also provide acceptable capacity to a system. The acquired channel state and traffic information are given input to OTS algorithm to make the scheduling result at a period. Moreover, the quantization errors and estimation error causes the channel uncertainty that is harmful for MCUs and for that we consider the robust user quality based power controller. In result section, we have shown sum rate maximization for a two-tier HetNets with multiple femto-cells and one macro-cell, where our proposed approach has got 11% more throughput compare to HARQ-CC [38] and 22% more throughput compare to HARQ-T1 [39], which channel capacity enhancement by our proposed model.

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