



Allow an useful interference of authenticated secondary user in Cognitive Radio Networks

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Abstract

Cognitive radio network moves to next level of facility that the unauthenticated user has the access to avail the licenced spectrum under some condition of agreement . Most of the time it will make disturbance to the licenced user by means of interference . Hence it is must to vacate the unlicensed user from the spectrum range where the primary user access the spectrum . To move the unlicensed user to other accessible channel takes some time , so up to that transmission of data in that range of channel must stop . It makes so many delays constrains for cognitive radio network . We refine some new ideas to reduce the total cost and delay constrain . For to fulfil to our objective we introduce a special algorithm named as polynomial reduction algorithm.Using this algorithm the secondary user can get the authentication to access the channel.This technique makes uninterrupted access may get by secondary user otherwise the connected channel will end without intimation

Keywords:Cognitive Networks, Dynamic Network,
Wireless Sensor Nodes.

1 Introduction

To minimize the total cost of multihop network, apply cache placement problem it makes some delay constraint in this system [1]. Increase of unauthorised wireless devices increase the unauthorized spectrum too congested, and also the some licensed spectrum is very low level of usage. Because of some independent concern give authentication to unauthorized one with dynamic configuration of the operating of that spectrum[2]. To move the unauthorized user to alternative accessible channel takes it slow, therefore up thereto transmission of data in this way of channel should stop . It makes such a large amount of transmission delays constraint for cognitive radio network [3]. Various application of this environment is to show some delay constrain because of the user can compelled out towards the accommodate the resource from the restricted resource. On other hand Federal Communication Commission(FCC) is the authenticated usage of spectrum expected limit[4]. even the FCC report said that negative result of spectrum usage, it is a promising problem to boost up the spectrum usage considerably augmented[5]. To give the access permission of spectrum to SU without interference with PU without affecting the quality of the service. In spectrum range, sharing of spectrum for SU may be imposing to transmit power of PU [6]. To avoid this transmits power imposes, Gaspar 1st formulated Additive White Mathematician Noise (AWGN) channels concern with constraint of transmit power [7]. The case would be quite thoroughly different when, within the presence of channel enervating. Many authors[8] found out the way of interference from SU, with a PU subject to interference constraint in ordinary condition it give better result in transmission and power allocation even in abnormal environment. But for time period application, it takes substantial delay hence performance also limits. Thusly, it's a considerable measure of pertinent to think about the blackout capacity[9], [10] that is laid out on the grounds that the most consistent rate which will be kept up all through all the debilitating pieces with a specified blackout possibility, once the SU gives holdup delay facilities. Some biographers describe that secondary users can exist on spectrum range and access the spectrum with out authentication but cannot interfere with primary users [11]-[15]. In later case, CR operators can lonely to activate the vacant frequency band of spectrum(specially called as white spaces) [16]. In some other cases SU user also permit on frequency band allocated for primary user because the total interference power remains below the expected threshold[17]-[20]. Many researchers find out the tolerable interference level at the PU, hence with in that range the secondary user also interference

with allocated frequency band of primary user. This is specially called as optimum power management in CR System. In CDMA technologies, the optimum power management technique leads some new challenges because of the interference not allowed for unlicensed user when the primary user communication will meet some impact. The recent activities in CR system, find out cannot affect the optimum power management in CR network by the interference impact of secondary user because, the environment can limit the user from outside the threshold range cannot interfere with licenced user spectrum. By applying the caching knowledge at right places and time, we able to control the data access delay inside delay constriction . It means we limit the data access delay was means of statistical approach. Finally say that for the simplest data, we can apply caching mechanism to the cognitive radio network because for smaller data can statically limit all delay parameters.

2. System Model

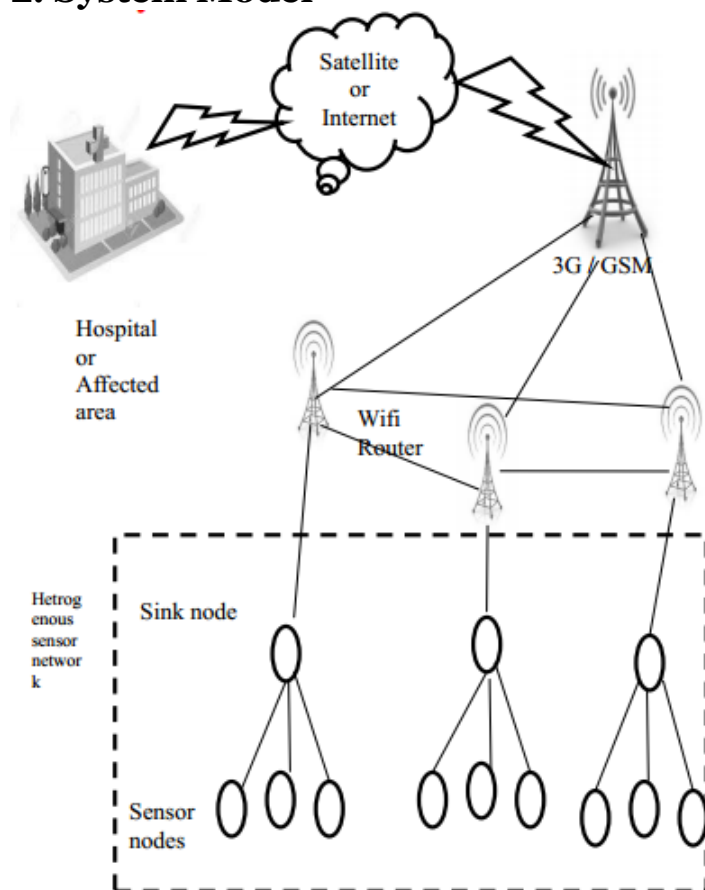


Figure 1:Real time implementation scenario of polynomial reduction algorithm

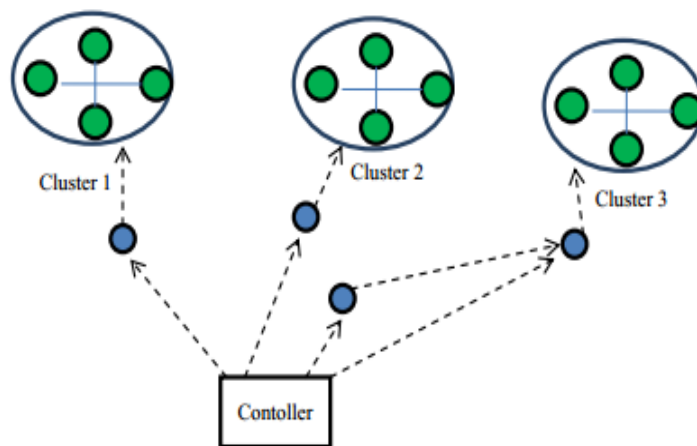


Figure 2: **Spectrum usage optimization by polynomial reduction algorithm**

In this system, we use three different clusters and to maintain the cluster 1, cluster 2, cluster 3. In which we assumed that cluster 1 is primary user. Cluster 2 and cluster 3 is in range of the spectrum. Hence we consider the Cluster 2 and Cluster 3 as secondary user and Cluster 1 is primary user. Each cluster having the cluster head. All cluster head communicate with the controller for getting key. Using that key each cluster head generate one verification and authentication key. But primary user (Cluster 1 user no need to key authenticate). If any one primary user go away from the range, then secondary user can access the spectrum using the key authentication. No vacancy in limited nodes from the primary user, there is no need of polynomial reduction algorithm. The mechanism is explained by using Fig 2 and application is depicted in Fig 1.

3. Polynomial Reduction Algorithm

1. $AP(q,r) = \mu_{gi}(s,q,r)$ // user s in Cluster C_i Authentication polynomial for key generation.
2. $VP_j(p,r) = \delta_{gj}(p,s,r)$ // computed the check polynomial $VP_j(p,q)$ with a probability P for each cluster $j(j = i)$, and stores in node s .
3. $MC_i = GC(MC | C_{Bi})$ // the cluster key of cluster C_i in node s_i is
4. $C_{Bi} \rightarrow s : (C_{Bi} | s | c_{ji})$ // Cluster-head C_{Bi} sends the ID assignment message to every nodes s in same cluster,
5. $s \rightarrow C_{Bi} : (s | c_{ji})$ // After receiving the message, node s get and store the ID and sends the response message like given below
6. $r = B((D)MC_i)$ // consider, node s first calculate the report r by hash function to the encrypted measurement, which has been encrypted by the key MC_i .
7. $MAP = AP(q,r) = \mu_{gi}(s,q,B((D)MC_i))$ // $B(\bullet)$ is the hash function stored in node s
8. // MC_i is the cluster key for the cluster, to which s belongs. Then node s generates MAP .
9. $mx = ((D)MC_i | s | c_{ji} | MAP)$ // every sensing node sends the report(x) to the cluster-head C_{Bi} . The report x is.
10. $X = ((D)MC_i | C_i | s_1 | \dots | s_T | c_{j1} | \dots | c_{jT} | AP_i(q, B((D)MC_i)) | \dots | APT_i(y, B((D)MC_i)) | Time)$ // After receiving all sensing reports, the cluster head arbitrarily picks T

reports v from them and unions these T estimation reports to a integrated values report X and sends it to the controller. The estimation report X is shaped by

11. $L_{sn,vi} = AP_{ni} (q, B(D)MC_i) = \mu_{gi}(sn, v, B(D)MC_i)$ // the intermediate node first calculates the values of $L_{sn,vi}$ and $V_{v,sn}$ with the value of r calculated by

12. $V_{v,sn} = VP(sn, r) = \delta_{gi}(sn, v, r) = \delta_{gi}(sn, v, B(D)MC_i)$.

3.1 System implementation and Results:

DSIBC sensor network consists of N nodes and K predetermined number of clusters[11], can be clustered as follows

1) Initial phase

- i) We take (20) 30 increases nodes for simulation. (Constant)
 - ii) All nodes are randomly grouped as 3 cluster according to their position
 - iii) Each cluster has one cluster head. (randomly selected which has minimum movement weight)
 - iv) All nodes get key from base station for data communication
 - v) Each node has unique ip address.
 - vi) For movement, they can select any one mobility model(Set prediction for each mobility model, according to nodes, and cluster condition it choose the mobility model)
- Choose any mobility.

2) Steady Phase

- i. Randomly selected source and destination in the network environment.
- ii. (Which routing protocols going to use?) (DSDV) more than one protocols to be considered for comparison.
- iii. Find the shortest path from source to destination.
- iv. Then send the data from source to destination as hop by hop.
- v. Randomly six node act as impersonate attacker.
- vi. By using polynomial reduction algorithm, we find the secondary users(formula).

4. Results and Implementation

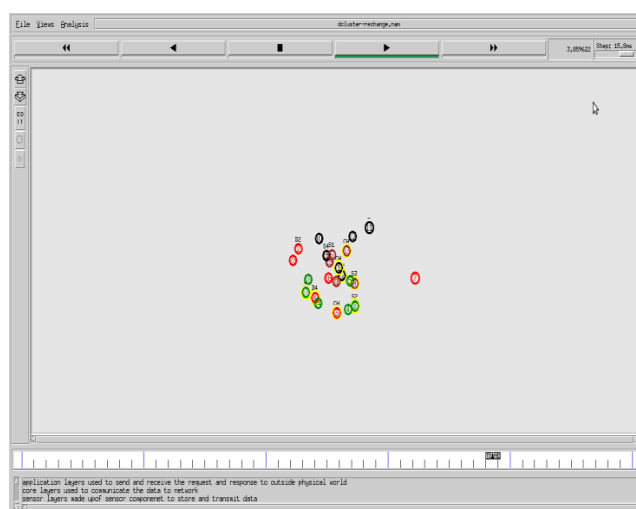


Figure3: Network Simulation of proposed polynomial Reduction method

Let us implement this under the consideration. Node 2 is secondary user. Node 11 is primary user. Node 18 is primary user and node20 is secondary user after some time it gets the

authentication to data transmission. Node 2 never participate in data transmission. Node 11, 18, 20 participate in datatransmission after few seconds. The datas are recorded then plot with time. As per the position of the node the data transmission will increase or decrease.The recorded value in the Table 1. For plotting time in x axis and number of packet in y axis.

Table 1Time Vs Packet Received

Time	No.of packets received (n2)	No.of packets received (n11)	No.of packets received (n18)	No.of packets received (n20)
0	0	0	0	0
0.5	0	0	0	0
1	0	6	0	0
1.5	0	18	0	0
2	0	30	0	0
2.5	0	43	0	0
3	0	52	0	0
3.5	0	52	11	0
4	0	52	22	2
4.5	0	52	22	14
4.9	0	52	22	25

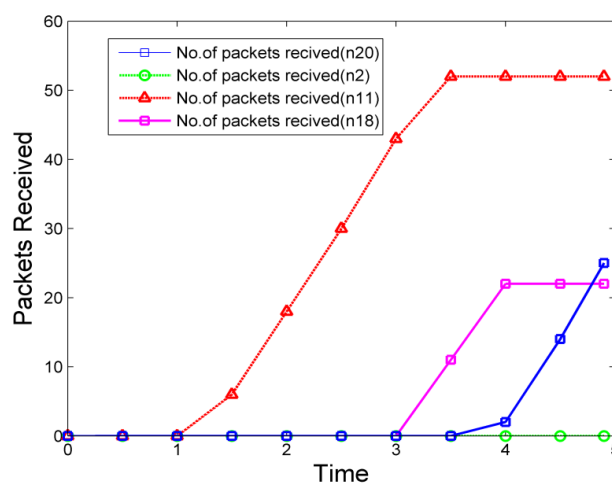


Figure 4: Time Vs Packet Received

Node 2 never participate in data transmission. Node 11, 18, 20 participate in datatransmission after few seconds. The datas are recorded then plot with time. As per the position of the node the data transmission will increase or decrease.The recorded value in the Table 2. For plotting time in x axis and number of packet delivered in y axis

Table 2Time Vs Packets Delivered Ratio

Time	No.of packets delivered ratio (n2)	No.of packets delivered ratio (n11)	No.of packets delivered ratio (n18)	No.of packets delivered ratio (n20)
0	0	0	0	0
0.5	0	0	0	0
1	0	9.23	0	0

1.5	0	27.69	0	0
2	0	46.1	0	0
2.5	0	64.61	0	0
3	0	80	0	8
3.5	0	80	0	44
4	0	80	7.69	88
4.5	0	80	50	88
4.9	0	80	96.15	88

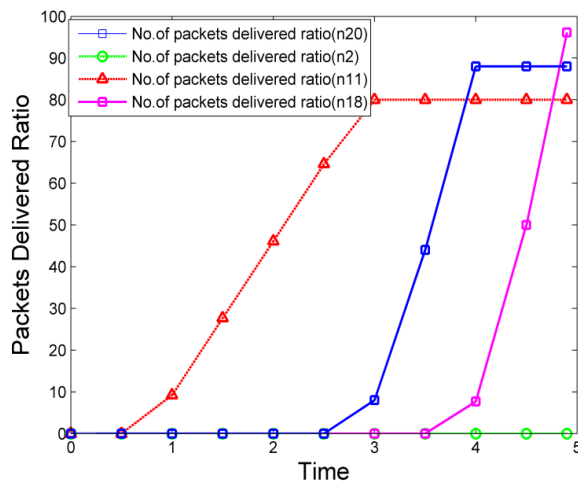


Figure 5: Time Vs Packets Delivered Ratio

Node 2 never participate in data transmission. So no power utilized by the node. Node 11, 18, 20 participate in data transmission after few seconds. Node 11 participate long time in the data transmission so more power utilized by the node 11. The datas are recorded then plot with time. As per the position of the node the data transmission will increase or decrease. The recorded value in the Table 3. For plotting time in x axis and energy utilized by the node is in y.

Table3Time Vs Energy

Time	Energy (n2)	Energy (n11)	Energy (n18)	Energy (n20)
0	0	0	0	0
0.5	0	0	0	0
1	0	1125	0	0
1.5	0	3375	0	0
2	0	5625	0	0
2.5	0	8062	0	0
3	0	9750	0	340
3.5	0	9750	0	2215
4	0	9750	312	3750
4.5	0	9750	2343	3750
4.9	0	9750	3906	3750

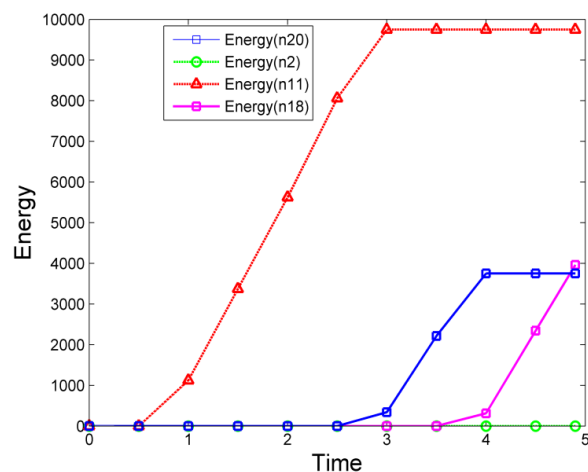


Figure 6:Time Vs Energy

Node 2 never participate in data transmission. So no power utilized by the node. Node 11, 18, 20 participate in data transmission after few seconds. Node 11 participate long time in the data transmission so more energy consumed by the node 11. The datas are recorded then plot with time. As per the position of the node the data transmission will increase or decrease. The recorded value in the Table 4. For plotting time in x axis and energy consumed by the node is in y.

Table 4 Time Vs Energy Consumed

Time	Energy consumed (n2)	Energy consumed (n11)	Energy consumed (n18)	Energy consumed (n20)
0	0	0	3900	0
0.5	0	0	3900	0
1	0	900	3900	0
1.5	0	2700	3900	0
2	0	4500	3900	0
2.5	0	6450	3900	0
3	0	7800	3900	0
3.5	0	7800	3900	1650
4	0	7800	3900	3300
4.5	0	7800	1800	3300
4.9	0	7800	3750	3300

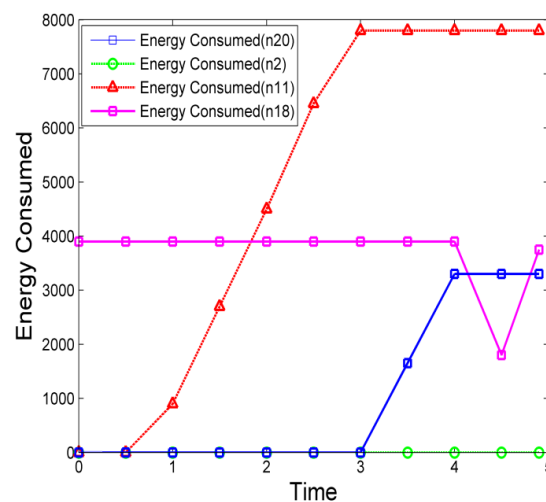


Figure 7: Time Vs Energy Consumed

Node 2 never participate in data transmission. So no power utilized by the node. Node 11, 18, 20 participate in data transmission after few seconds. Node 11 participate long time in the data transmission so more power utilized by the node 11. The datas are recorded then plot with time. As per the position of the node the data transmission will increase or decrease. The recorded value in the Table 5. For plotting time in x axis and energy dissipated by the node is in y axis. This is just opposite direction of energy consumed.

Table 5Time Vs Total Energy Dissipated

Time	Energy dissipated (n2)	Energy dissipated (n11)	Energy dissipated (n18)	Energy dissipated (n20)
0	0	9750	3900	3750
0.5	0	9750	3900	3750
1	0	8850	3900	3750
1.5	0	7050	3900	3750
2	0	5250	3900	3750
2.5	0	3300	3900	3750
3	0	1950	3900	3750
3.5	0	1950	3900	2100
4	0	1950	3900	450
4.5	0	1950	1800	450
4.9	0	1950	150	450

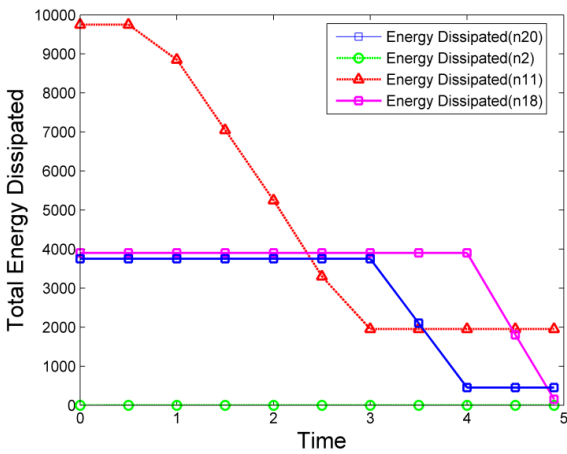


Figure 8:Time Vs Total Energy Dissipated

5 Conclusion

The proposed system clearly explains that within the short range environment the algorithm works very perfectly. For long period some of the key management problem and range complexities are also interfering to achieve better performance than the previous existing network environment. Even we will implement heterogeneous sensor nodes in the implementation part. The authentication will take more time different types of sensor nodes. Another big problem, is a channel which we send the data. The authentication and verification polynomial authentication makes some kind of data delay. Because of movement of cluster head from one cluster to another cluster. Even the data reached in the safe hands due to polynomial reduction algorithm the implemented environment will raise the questions of delay. Because it is implemented for the purpose of avoid the traffic from the secondary nodes. So delay will make serious big bottleneck problem. For resolving this problem in future work we will follow base station based key recognition scheme.

References

- [1] R. Ganesh Babu, V. Amudha, Cluster Technique Based Channel Sensing in Cognitive Radio Networks, *International Journal of Control Theory and Applications*, **23(23)**, 2016, 50-55.
- [2] R. Ganesh Babu, V. Amudha, Spectrum Sensing Cluster Techniques in Cognitive Radio Networks, *Fourth International Conference on Recent Trends in Computer Science & Engineering (ICRTCSE) in association with Elsevier-Procedia Computer Science*, **87**, 2016, 258-263.
- [3] R. Ganesh Babu, V. Amudha, Spectrum Sensing Techniques in Cognitive Radio Networks: A Survey, *International Journal of Scientific and Engineering Research*, **5(4)**, 2014, 23-32.
- [4] J. Zhao, W. Gao, Y. Wang, C. Cao, Delay-Constrained Caching in Cognitive Radio Networks, *IEEE Transactions on Mobile Computing*, **15(3)**, 2016, 627-640.
- [5] I. F. Akyildiz, W.-Y. Lee, and K. R. Chowdhury, CRAHNS: Cognitive radio ad hoc networks, *Ad Hoc Networks*, **7(5)**, 2009, 810-836.
- [6] L. Yin, G. Cao, Supporting cooperative caching in ad hoc networks, *IEEE Transactions on Mobile Computing*, **5(1)**, 2006, 77-89.
- [7] R. Ganesh Babu, V. Amudha, Performance Analysis of Distributed Coordinated Spectrum Sensing in Cognitive Radio Networks, *Middle*

East Journal of Scientific Research, **23**, 2015, 50-55.

- [8] R. Ganesh Babu, V. Amudha, Analysis of Distributed Coordinated Spectrum Sensing in Cognitive Radio Networks, *International Journal of Applied Engineering Research*, **10(6)**, 2015, 5547-5552.
- [9] R. Ganesh Babu, V. Amudha, A Study of Particle Swarm Optimization Algorithms For Clustering In Dynamic Cooperative Spectrum Sensing Techniques, *Fourth National Conference on Green Technologies for Power Generation, Communication and Instrumentation*, 2018, 103.
- [10] J. Mitola, G. Q. Maguire, Cognitive radio: Making software radios more personal, *IEEE Personal Communications*, **6(6)**, 1999, 13-18.
- [11] S. Haykin, Cognitive radio: brain-empowered wireless communications, *IEEE Journal on Selected Areas in Communications*, **23(2)**, 2005, 201-220.
- [12] M. Gastpar, On capacity under receive and spatial spectrum-sharing constraints, *IEEE Transactions on Information Theory*, **53(2)**, 2007, 471-487.
- [13] A. Ghasemi, E. S. Sousa, Fundamental limits of spectrum-sharing in fading environments, *IEEE Transactions on Wireless Communications*, **6(2)**, 2007, 649-658.
- [14] G. Caire, G. Taricco, E. Biglieri, Optimum power control over fading channels, *IEEE Transactions on Information Theory*, **45(5)**, 1999, 1468-1489.
- [15] L. Li, A. J. Goldsmith, Capacity and optimal resource allocation for fading broadcast channels-part ii: Outage capacity, *IEEE Transactions on Information Theory*, **47(3)**, 2001, 1103-1127.
- [16] S. A. Jafar, S. Srinivasa, Capacity limits of cognitive radio with distributed and dynamic spectral activity, *IEEE Journal on Selected Areas in Communications*, Istanbul, Turkey, 2006, 5742-5747.
- [17] T. A. Weiss, F. K. Jondral, Spectrum pooling: an innovative strategy for the enhancement of spectrum efficiency, *IEEE Communications Magazine*, **42(3)**, 2004, 8-14.
- [18] S. Mangold, A. Jarosch, C. Monney, Operator assisted cognitive radio and dynamic spectrum assignment with dual beacons - detailed evaluation, *First International Conference on Communication Systems Software & Middleware*, Delhi, India, 2006, 1-6.

- [19] D. Ugarte, A. B. McDonald, On the capacity of dynamic spectrum access enable networks, *First IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks*, Baltimore, USA, 2005, 630–633.
- [20] M. Gastpar, On capacity under received-signal constraints, *42th Annual Allerton Conference on Communication, Control, and Computing*, 2004, 1322–1331.

