IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

# Efficient Wireless Network in Intercell Interferenceusing Resource Allocation Energy Aware Routing

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**Abstract**: Now a days, WSN face the problem of spectrumunderutilization, cognitive radio is one of the technique whichused for solving these problem in WSN. It can be achieve byopportunistically exploiting portions of the spectrum temporarilyby vacating licensed primary users. First we focus on how CRSNsare different from other wireless networks and then list out thenumber of challenges and main issue of routing in Cognitive Radio Networks (CRNs). In WSN, Multimedia applications arerepresented as delay sensitive and high bandwidth stipulatingtraffic sources. Other auxiliary multimedia applications based on Cognitive Radio Sensor Networks (CRSNs) with energy and spectrum constraints is a highly derivative task. In the existingsystem the users which are close to the cluster heads (cell centerusers) have higher frequency range than the users which are farfrom the cluster head (cell edge users). So cell center users get maximum resources and cell edge users get limited resources.We propose an algorithm in which we calculate a weighted SNRvalue for each user and based on that value cluster head assignsresources to the users.

**Keywords**: Energy Spectrum Rank, Cluster head, SNRPRB, CRSN.

## I. INTRODUCTION

The need of Cognitive Radio Sensor Networks (CRSNs) is arises for efficient spectrum utilization. Meanwhile, as the World gradually develops into an Internet of Things, the ubiquity of Wireless Sensor Networks (WSNs) is accordingly becoming imperative. There is a problem of spectrum utilization problem in WSNs. The concept of CRSN is helpful to address this spectrum utilization challenge. The CRSN is a distributed network of wireless cognitive radio sensor nodes that senses an event signal. It can collaboratively communicate readings dynamically in available spectrum bands in a multi-hop manner. It satises application-specie requirements. The problem of spectrum utilization is solve by temporary usage of vacant Primary User (PU) spectra using Dynamic Spectrum Access (DSA) but there is a condition that the user will leave that spectrum once the presence
of the incumbent is detected.

Cognitive radio (CR) technology has been proposed as a promising solution to address the increasing congestion in the unlicensed band by using the vacant spectrum of licensed band opportunistically while avoiding disruptions to the legacy users, such as, TV broad-cast stations, public safety broadcast stations, wireless microphones, etc. The CR user or secondary user (SU) is allowed to use only locally unused spectrum opportunistically; so that it does not cause any interferences or collisions to the incumbent or Primary Users (PUs). When CR users detect the presence of PU on the operating band, they must switch to other spectrum band.

Main Features of a CRSN is that, it adopt the intrinsic characteristics of WSNs to gain any rational meaning, but still performing CR functions. The nature of throughput is expected to be burst due to opportunistic channel usage. It reduce the problem of
an increased probability of collision in densely deployed WSN environments. Because of the low throughput in traditional WSNs, congestion and overloading are not sign cant design issues. However, with the burst nature of throughput in CRSNs, these issues must be addressed, especially in real-time applications that consider Quality of Service (QoS).

The multi-hop cognitive radio networks having some challenging problems of routing in utilizing multiple channels like traditional multi-channel networks. In this network the set of channels available for each node are not static. A unique challenge is the route selection and the spectrum decision. The spectrum information is required when route is selected because of spectrum bands are dynamically changing. To accept this variation, routing in multi-hop CRNs must be spectrum aware. Second challenging task is the lacks of axed Common Control Channel (CCC). Because of a Cognitive radio user has to vacate the spectrum band as soon as a PU begins to use the network, the implementation of axed CCC becomes infeasible for CRNs. Thirdly, the spectrum-adaptive route recovery process. In addition to node mobility, link failure in multi-hop CRNs may happen when PU activities are detected. How to vacate the current spectrum band and to move to another available spectrum band quickly is still an unexplored problem. Fourthly, the evaluation metrics for routing with channel assignment are still open issues. This makes how to deal with channel switching is a debatable question. Finally, the route maintenance/reparation.

## II. RELATED WORK

Christian et al. presents energy and cognitive radio aware routing (ECR) [1], which is a rout-ing protocol designed for CRSNs. It adopts the same hierarchical network architectures, which can coordinates the clustering operations and the route search algorithm. The implementation of cluster formation is impossible in ECR. In route request phase, the route request (RREQ) packet is sent as a broadcast towards the sink through a common control channel. Intermediate nodes forward the RREQ. Route maintenance is only performed locally if the a ected node is in close proximity to the sink. Otherwise, a message must be sent back to the source to initiate a new route request, which can be costly.
The Spectrum-aware Cluster based Energy Efficient Multimedia (SCEEM) routing protocol for CRSNs [2], which can support the Quality of Service (QoS) and energy efficient routing by limiting the participating nodes in route establishment. The proposed protocol in the literature is thus a cross layer routing protocol and only suitable for Wireless Multimedia Sensor Networks (WMSNs) application scenario, which comprised of sensor devices equipped with audio and visual information collection modules, can have the ability to retrieve multimedia data, store or process data in real-time, correlate and fuse multimedia data originated from heterogeneous sources, and wirelessly transmit collected data to desired destinations.
The virtual cluster-based Reliable Opportunistic Routing (ROR) approach for routing in CRSN is proposed in [3]. It is like all on-demand routing protocols, where a path is only sought when it is required, and the same is maintained to the end of the transmission process. This protocol provides a very robust routing framework that fuses a reactive geographical forwarding scheme into AODV to create a robust scheme that considers the link quality of communicating nodes for data forwarding in ROR, all control signalling is done through CC and the route request phase is used to search for all possible routes from the source node to the sink. The sink selects the best route that offerscertain quality of service (QoS) guarantee levels, basically based on.
The low-energy adaptive uneven clustering hierarchy (LEAUCH) is proposed in [4] for CRSN. It can not only consider the advantage of channel resources brought by cognitive function in CRSN but also exploit the uneven clustering method based on the channel resources. More specially, in the proposed algorithm, the number of idle channels of each node is taken as its weight and the nodes with more idle channels are elected as candidate cluster head (CH) nodes. Based on the idea of the uneven clustering method, there are fewer members in the clusters near the sink. In this way, the energy of CHs near sink can be saved, and further more energy can be used for forwarding data, which can balance energy consumption among CHs under multiple hops transmission means in CRSN.
The literature [5] proposed a cognitive LEACH (CogLEACH) for CRSN that uses the number of vacant channels as a weight in the probability of each node to become a CH and that can prolong the network lifetime compared with LEACH algorithm. However, the algorithm does not consider the balance of energy consumption among CHs under multiple hops transmission means, which may lead to the premature death of the nodes near the sink because of their excessive energy consumption.

The literature [6] proposed an event-driven clustering algorithm. The qualied nodes are determined based on the distance from sensor nodes to the event occurrence point and the sink. CHs are selected among the qualied nodes according to node degree, available channels, and the distance to the sink in their neighbourhood. The clusters in the scenario are immediately dismissed after noshing data transmission, and all nodes enter the sleeping state again in order to save the energy. Therefore, the proposed algorithm in the literature is only conned to event-driven CRSN, which cannot be suitable for other scenarios such as the time-triggered CRSN scenario.

Zhou et al. [7] propose a distributed scheduling algorithm (DMDS) for video streaming over multichannel multi radio devices in wireless networks, aiming to preserve the QoS for each individual stream. DMDS does not employ a CR for dynamic spectrum access and assumes that the set of given channels are always available to the nodes, i.e., xed channels. Second, the nodes employ a single radio in this paper, whereas DMDS assumes multiple interfaces on a single node and schedules them accordingly.In contrast, this paper implements dynamic spectrum utilization, which is achieved by CR through dynamic spectrum management functions. Moreover, a single radio device will be cheap and energy efficient for low-cost and low-power multimedia devices in sensor networks. Third, the routing protocol in DMDS does not incorporate the energy metric in its routing decision and is therefore unsuitable for low-power devices.
Yu et al. [8] propose application-layer QoS optimization for multimedia transmission over CRNs in which SUs adopt their intraframe refreshing rate based on the sensed channel conditions. The proposed work is a joint source and physical layer solution that does not incorporate the network support for QoS constrained multimedia delivery. Multimedia transmission over CRNs is also investigated in [9], which uses priority queues to model both the PU tra c and the SU tra c.

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*A . System Architecture*

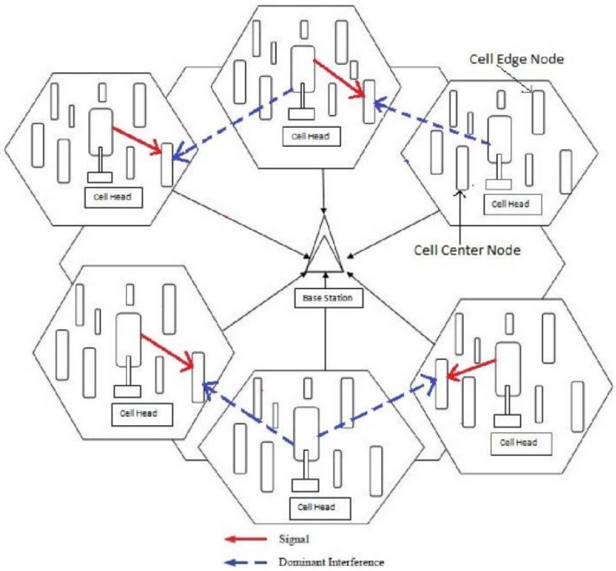


figure 1 shows the architectural view

A Spectrum Aware Clustering Based Energy Efficient Multimedia (SCEEM) routing protocol for CRSNs that jointly overcomes the formidable limitations of energy and spectrum. This system having multiple clusters with cell edge cluster members and cell centres cluster members also a cluster head. Cell edge members are far away from cluster head whereas cell center members are near to cell head. All these clusters are communicated through base station that is shares multimedia data through base station. For this communication frequency is allocated by cluster head to cluster members one by one. But there is a problem of equivalent frequency distributions within multiple members. Cell center members are near to cluster head therefore they have immediate resource allocation but where same case is not happen with cell edge center because of large distance. This is result into more waiting time for resource allocation to the cell edge members. This problem is overcome by our proposed system. The main aim of this system is that, to provide equal resource allocation within all cluster members to achieve the routing. This optimal clustering provides energy-efficient multimedia delivery with the desired QoS support also Reduce delay with a higher delivery ratio.

*CSystem Overview*

The following figure 1 shows the architectural view of the proposed system. The description is as follows:
1) Network Generation -: Initially the network is generated by using the basic concept of graph, in which it contains vertices which is nodes and edges. Nodes are connected with the edges.
2) Clustering -: The process of clustering is performed on the generated network. The nodes are divided into different clusters. Groups are formed in which it contain number of nodes.
3) Cluster Head Selection -: For selecting the cluster head, energy spectrum rank of each node is evaluated for each cluster. The node with highest energy spectrum value is considered as cluster head. Because the cluster head required more energy, and on the basis of energy value efficient cluster head is selected.
4) Allocating Weighting Factor -: In each cluster cell center and cell edge user are identified from each cluster. Weighting factor is assign to each node on the basis of node whether it is cell center and cell edge user.
5) Greedy PRB Algorithm -: Greedy PRB algorithm is implemented and SNR value is evaluated, the value is evaluated on the basis of weight assign to each node. PRB resource is allocated to the appropriate nodes.
6) Send Data-: Finally the data is send to the base station from each node through the resources which have allocated in the last step.

*D ALGORITHM*

Algorithm 1: Proposed Algorithm
1) Generate a network graph as Graph G(V,E) where; V are vertices/nodes and E are edges.

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2) Perform the clustering on the number of nodes and divide the nodes into number of clusters.
3) Calculate the Energy Spectrum Rank at each node in each cluster.
4) On The basis of energy spectrum rank select the efficient Cluster Head.
5) Identify Cell Center as well as Cell Edge Users.
6) Assign the weighting Factor to each nodeon the basis of whether it is Cell Center And Cell Edge User.
7) Run the PRB Allocation Algorithm and calculate the SNR value with respect to weight of each node.
8) Allocate the available PRB resource to the appropriate nodes.
9) Send the data to the base station from each node who have the resource.

Algorithm 2: PRB Allocation Algorithm-:
Input: G (V, E)
Output:$jMj*N for j \epsilon J$
Initialization:$jMj$ = 0, $\forall j \epsilon J$;
For n=1 to N do % PRB loop
$k$ = 1; $\Delta kn = v$
While $K \leqslant J and \vartriangle k$
$n \neq \emptyset do$
$m* = argmax m\epsilon \ \Delta k$
$n\ (WmSNRmn)amn$
$j*$ = 1;
$j*$is the servicing cell of the user $m*$
$Rm* = \emptyset$

5. Mathematical Model

1) Relative Energy Spectrum Rank-Consider System
S ={N, Cm, Ch }
N {j1, j2, j3… jn}
Cm ϵ {i1,i2,i3… in}
Ni =Set of neighbors of node i
i(t) =Energy spectrum rank of node i
ei =Energy of node i
ek =Energy of node k
$Yi(t) = Yij$
$j\epsilon Nit\ [eimax \forall k \epsilon Ni\{ek\}]$

2) Physical Resource Block Allocation-
A] User request to Base Station
R = {r1,r2 ,r3}
Where R = set of request
And r1,r2,r3 are the number of requests.

B] Check for user cell location
L = {c1, c2 ,c3}
Where L = Set for user cell location
And c1,c2,c3 are the number cell location

C] Channel Availability
Ca= {ca1, ca2, ca3}
Where Ca = set of channel availability
And ca1,ca2, ca3 are the number of channels available

D] Greedy PRB allocation based on weighted SNR
P = {p1, p2 , p3}
Where P = set of sub carriers

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And p1 ,p2 ,p3 are number of sub-carriers.
Resource allocations:
For a cell j where j ϵ J let AjMj * N = [aJmn] and
PjMj * N = [pJmn]
be PRB and power allocation matrices, respectively ,with
lements.

$A^j mn$ and$p^j mn$ defined as-

$$a^j_{mn} = \begin{cases} 1, & \text{if PRB } n \text{ is allocated to user } m \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

$$p^j_{mn} = \begin{cases} p \in (0, P_{\max}], & \text{if } a^j_{mn} = 1 \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

*E Results*

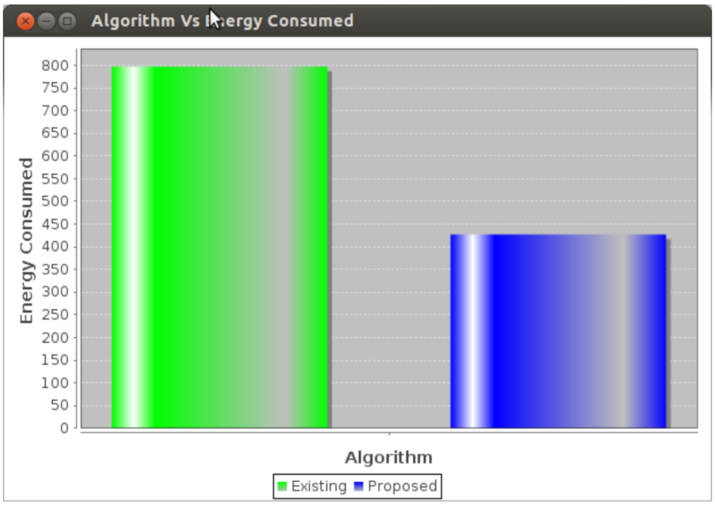


Figure 2: Energy graph

Figure 2 show the energy comparison graph which compares the energy utilized by the proposed system and existing system. Form graph we can say that the proposed system is preferable due to its low power consumption.

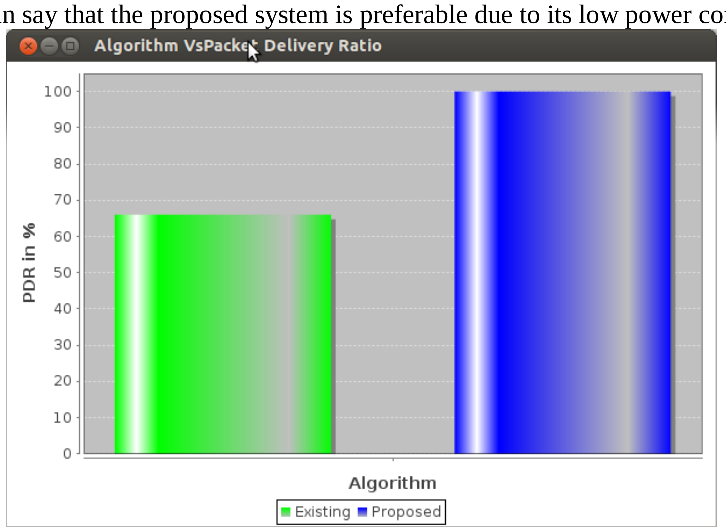


Figure 3: Packet delivery ratio

Figure 3 shows the graph which compares the packet delivery ratio of the proposed and existing system. Here from graph we can see the packet delivery ratio is increased in proposed system.

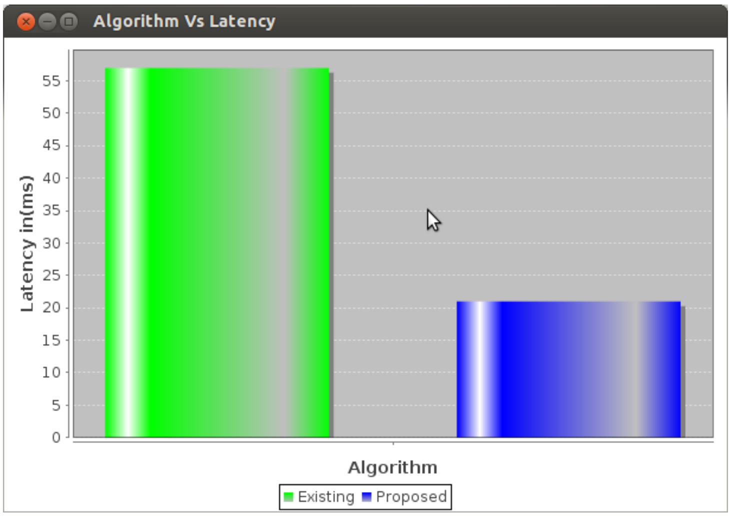


Figure 4: Latency graph

Figure 4 shows the latency graph in which we have compared the time to send the packet/data in the system. In the above graph the comparison of existing and proposed system is done and from figure we will see that the latency in proposed system is very less.

## III.CONCLUSION

For radio resource allocation, the fine-scale PRB assignment algorithm is developed to effectively manage ICI as well as maximizing performance of the network in a centralized manner. The proposed system achieves significantly balanced performance improvement in cell-edge and cell-center users in multi-cell networks compared with other systems. Optimal clustering gives energy-efficient multimedia delivery with the desired quality of service that minimizes delay with a higher delivery ratio.

## ACKNOWLEDGMENT

First and foremost, I would like to thank my guide, Prof. J.V.Shinde, for his guidance and support. I will forever remain grateful for the constant support and guidance extended by my guide, in making this project. Through our many discussions, he helped me to form and solidify ideas. The invaluable discussions I had with him, the penetrating questions he has put to me and the constant motivation, has all led to the development of the ideas presented in this project work.I wish to express my thanks to our HOD, Prof N.R.Wankhade for encouraging and providing me with best facilities for my project work.

I would also like to thank my friends for listening my ideas .

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IJARCCE

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## BIOGRAPHIES

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