SELF-MOTIVATED PACKET SHIFTING IN MULTICHANNEL NETWORK

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Abstract The range admittance in Adhoc Network by allowing the inferior user nodes to use the channel as extended as the broadcast does not affect the main user. This paper involves a new Point squash based Precedence Development system with Self-motivated Packet Shifting which is planned for dispersed multichannel system to improve the system performance. It also presents the Channel Intelligence and essential Intelligence techniques before the progress of the channels. Based on biased queue-balancing and entropy flow control which might be suited for self motivated changing packets in Adhoc networks, this system proposes a Self motivated Packet Shifting algorithm for most favourable packet shifting between different channels during the packet broadcast. The projected protocol will directly observe the channel to make a decision where the packet is to be shifted within the n-channels for most favourable throughput. Factors of these projected systems are configured to sustain the network permanence. The results show that the proposed system improves the presentation in conditions of throughput and packet delivery ratio by borrowing the certified range and protects main users from interference.
Keywords Adhoc, Self-motivated, queue-balancin, entropy flow control, favourable.

1. Introduction

An Adhoc is a wireless communication method in which the transceiver is proficient of Intelligence and its neighbouring environment. Adapting its broadcast factors including transmit authority and occurrence as a result. The basic model about the cognitive network is that the approved users may not be using the scale always. Hence, this spectrum hole can be utilized by other users who are unlicensed (secondary). The secondary users are allowed to use the spectrum in such a way that they do not disturb the primary users. So it is necessary that the secondary users should have the spectrum Intelligence capabilities to sense the presence of the primary users in the channel.

An Adhoc Network is a decentralized wireless network where the set of nodes with equal priority are free to associate with any other devices within the range. In these types of networks, the nodes compete among themselves for access to shared wireless medium, often resulting in collisions, also termed as interference. Since the mobility is high in these networks, interferences are likely to occur. Using cooperative wireless communications, the immunity to interference can be improved by having the destination node combine self-interference and other node interference to improve decoding of the desired signal.

1.1 Spectrum Intelligence

Spectrum Intelligence is the process of identifying the spectrum space that is free from usage. The free spaces can be used opportunistically by the ADHOC users. This ensures the packet delivery and throughput of secondary users in a ADHOC environment. The Channel Intelligence technique is used where the secondary users sense the environment opportunistically and have the set of empty channels. This information is used by Imperative Intelligence technique, to select the channel with less Intelligence time. Based on the Intelligence results, the Instance Adhoc based Priority scheduling chooses the channel for source node and starts the packet broadcast. In case of any interference by the primary user or due to network overflow, the packets may be Adhoc resulting in data loss.

1.2 Self Motivated Packet Shifting Algorithm

The Self Motivated Packet Shifting algorithm (SPS), a low-overhead mechanism to avoid channel outage that can be cheaply incorporated within scheduling protocol is proposed to minimize data losses. This scheme has been proposed considering the network size that varies time to time and to balance the load instantaneously and avoid channel outage. Self Motivated Packet Shifting protocol will closely monitor the channel to find where the packet is to be shifted within the channels to obtain the optimal throughput. The results show that this scheme improves the performance in terms of throughput and packet delivery ratio by borrowing the licensed spectrum and protects primary users from interference. The SPS algorithm may cause slight delay in larger networks. Despite of the delay, the percentage of packet delivery ratio is more. The proposed scheme works fine for smaller networks where a slight delay is negligible.

A comparison is made between the normal scheduling and the scheduling incorporated with the SPS algorithm.

2. Literature Review

The works proposed in adhoc networks operate on multiple channels in order to fully utilize the spectrum access opportunity without a centralized controller. The concept of a centralized channel, which is used to coordinate nodes in different channels are used in this paper. This was based on single half-duplex radio. This paper also includes decentralized cognitive MAC protocols that opportunistically senses, when an ADHOC node needs to transmit traffic. A partially Observable Markov Decision Process is developed in the proposed. This work improves spectrum utilization while limiting the interference imposed on the licensed users.

Adaptive Intelligence cycle scheme was proposed to prioritize the multichannel Intelligence and access the channel based on interference estimation from packet statistics. This scheme has assumed and formulated under the constraint that the overall Intelligence rate is constant for all the nodes. Busy tone channel that was also proven to be collision free of data packets for a single channel. Similar tone channel where each channel to be sensed is granted immediately by the scheduler when availability is reported from a certain spectrum Intelligence algorithm every fixed time period. This scheme works well against internal interference but has significant performance degradation when there is time-varying interference from outside networks.

The multiple channel and "channel pool" concept is used in several works. A slotted CSMA-based multichannel MAC protocol is proposed under the assumption of time synchronization. There is a collaboration of secondary users by sharing this decision through a centralized fusion centre in the network. The Opportunistic Spectrum Access in Multiple-Primary-User Environments under the Packet Collision Constraint is also discussed. The Resource allocation for balancing the queue in multi-hop ADHOC networks is also mentioned. From the related works, this system has adopted the idea of Intelligence node, taking the responsibility of Intelligence the channel and collecting the list of empty channels before scheduling and the idea of resource sharing in a decentralized network.

The main contributions of this paper are:

1. A new Instance Adhoc based Priority Scheduling
2. Self - Motivated Packet Shifting algorithm.

3. System Model

The adhoc network is considered for using multiple channels. The general architecture of the proposed model is shown in Fig.1.

There are one control channel and N data channels within the network. It is assumed that the primary node is set with high transmission, it has the legal rights to the data channel and the secondary users can opportunistically use it. Before transmission, the secondary node senses the data channel for the presence of primary users and have a list of empty channels. The empty channel is the one in which the primary user's activities are absent. If the channel is empty then the secondary nodes are allowed to transmit the data.

In our scheduling scheme, once the packets arrive at the scheduler the data with the highest priority are transmitted first followed by the packets with the lowest priority. Here the packets along with priority, they are time stamped. Once the channel capacity and length are verified by the secondary user network the packet is moved to the queue which is empty. The application of Self - Motivated Packet Shifting algorithm to identify the performance of the each queue at the runtime and shift the packets based on the availability of channel bandwidth. This will ensure and reduce the packet delay.

With this model, a secondary node that has found the primary user's presence during the transmission does not need to crash the packets to avoid intervention, instead it shifts the channel, thereby increasing the packet delivery ratio and the throughput.

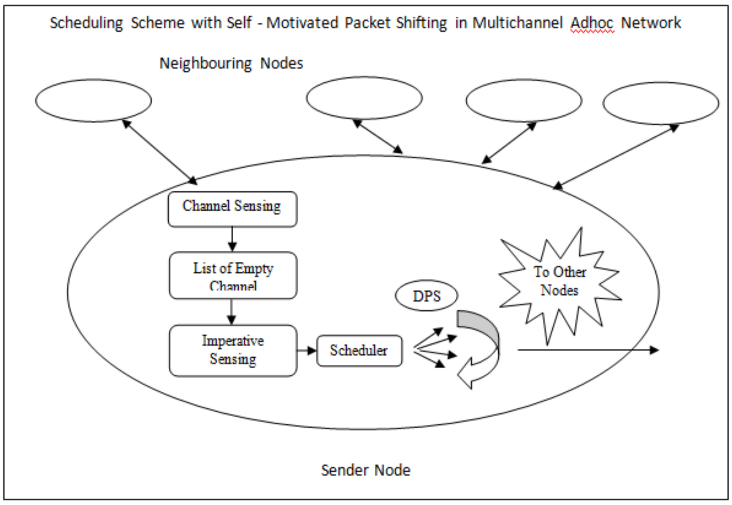

Fig.1 - Architecture of the proposed system

4. Intelligence and Scheduling Modules

There are five Intelligent and Scheduling modules.
They are as follows:

- Channel Intelligence
- Imperative Intelligence
- Instance crush based Priority
- Scheduling protocol
- Self - Motivated Packet Shifting

4.1 Channel Intelligence

This can also be termed as opportunistic intelligence, which is applied to idle channels can be performed only when the node does not have any data packets to transmit. Secondary node maintains the information required about each channel. When a channel is empty, all one-hop neighbours including itself regards the channel as neighbour-widely empty and, the node-only empty channel means the channel which is empty at the node but is not empty at any one-hop neighbour(s).When a node k detects the primary user signal on channel i through opportunistic intelligence, it becomes the responsible node of the channel by broadcasting the packet. When selecting the channel for opportunistic intelligence, the node should give preference to the idle channels for which the intelligence has been suspended. It uses round robin algorithm to select the channel.

Thus, if there are such one or more channels, the node selects the channel having the shortest remaining intelligence time. When there is no idle channel for which the intelligence has been suspended, the node chooses the channel with the highest opportunistic intelligence priority among the idle channels.

4.2 Imperative intelligence

In imperative intelligence, the secondary node first checks whether there is a channel for which the urgent intelligence is required. If there are one or more channels with the intelligence urgency request packet, the node should carry out the urgent intelligence although it has data packets waiting for transmission. The result of number of channels sensed is given as input to the scheduler.

4.3 Instance crush based priority scheduling protocol

A set of packets arrive at the scheduler and for each packet a channel is assigned. When the packet arrives at the scheduler, it checks whether the packet is from a primary node or secondary and accordingly they are moved to the transmission plan. For each node, a channel scheduling transmission plan is constructed, which specifies which data to be transmitted at that particular moment. The transmission plan is assumed as a queue and the proposal and implementation of this technique can be taken as future work. For each packet, based on channel availability (minimum weighted length and queue capacity), each node will add data for each period to its plan. The time is assigned in order to transmit packet from transmission plan. The assignment will rely on our preliminaries of Packet Labelling and Node priority. This phase is the key part for scheduling each packet.

Algorithm 1
Instance crush based priority packet scheduling protocol
Input: A set of Packets to the scheduler.
For each packet **do**
Construct a channel;
For i instance of each packet **do**
For each node **do**
If it is primary node **then**
Add the data to transmission plan;
Else If it is a secondary node **then**
Allocate priority low and adds data to s Transmission plan;
Else
Packet will be reviewed
For each channel (weight and length) **do**
For each packet at i (assign packet to channel) **do**
Include assign time;
Return Time to transmit for each packet will send to source of each node

4.4 Self - Motivated packet shifting

Self - Motivated Packet Shifting is initiated by primary user's activities and different queue sizes of the nodes. It accommodates the given link capacities passively. In this paper, the channel shifting is adjusted for better transmission by distributed resource allocation. When the packet comes inside the queue, it is generally processed by the scheduler and assigns a channel by using the scheduling algorithm. During packet transmission, if there is an unexpected interference by the primary user or due to any unavoidable circumstances like congestion in the channel, the packet may be crashed. By using the proposed algorithm we can avoid the packet crash and allow the packets to be shifted to some other channels which are free to transmit. The SPS algorithm checks the weight and length of the data available in each channel. If any channel is found to have the minimum entropy (K), that channel is assigned for transmission, the packets are shifted to the selected channel and the transmission continues. The figure 2.depicts the SPS model for optimal packet shifting between the channels.

When the scheduler receives a packet Pk, it checks the channel for minimum entropy (Weight Wo and Length Lo) of the data that already exists in the channel. If the queue in the channel is found to be empty or with minimum entropy, the packet is assigned to that channel or else it is kept to wait until the queue has minimum entropy. Both the weight and length of the data are considered because there are situations where a single packet can have more length. Before allocation of the channel each channel is checked for its minimum entropy. Packets are assigned to such channels which satisfies such conditions.

In multihop wireless networks, it is difficult to synchronously execute a distributed algorithm at different nodes. The parameters should be configured appropriately to guarantee the network stability while considering asynchronous scenarios. Additional coordination of nodes is needed because of the complex wireless environment, where the primary users moving in and out of channels. Scheduling Scheme with Self - Motivated Packet Shifting in Multichannel Adhoc Network

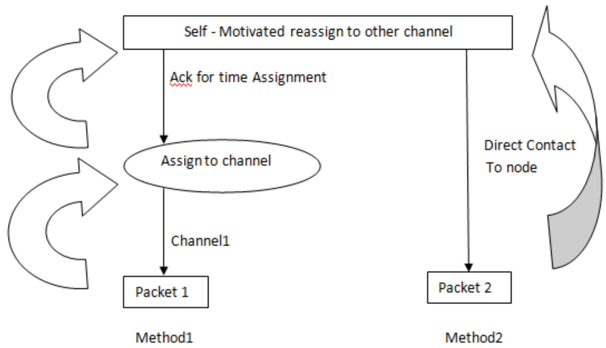

Fig.2- Self - Motivated packet shifting model

Algorithm 2:
Self - Motivated packet shifting
If WoLo –min **then**
Assign Pk to channel
Else if wait till queue to min capacity **then**
Assign Pk to channel
End if
For each (number of channels Ch) **do**
Set j as inAdhocement of I
If value i is 1 then set first minimum value
If Chi (WoLo) < Chj (WoLo) at the runtime channels are calculate **then**
Set channel Ki (Set Chj (WoLo = Min) as minimum value
End if
End if
Else if Chi (Wolo) < Ki (WoLo)
Set channel Ki (Set WoLo = Min) as minimum value
End Id

4.5 Throughput estimation

The approximate model to find the value of τ that maximizes the amount of information that is transferred over the channel is mentioned below. The data rate is assumed to be at constant rate. The relationship between the value of τavg = E[τ] that maximizes the throughput that is referred to as τ^{*}_{avg}, and the number of neighbours at any given node, n_v.

This system has the following assumptions:
1. Neglecting the delay as it has a negligible impact on the throughput performance.
2. Assume that there will be interruption by the primary users and the packets are crashed.
3. Assume that the nodes are unaware of location and the total number of neighbours within the transmission range. In order to obtain the information about the channels the intelligence techniques is used.

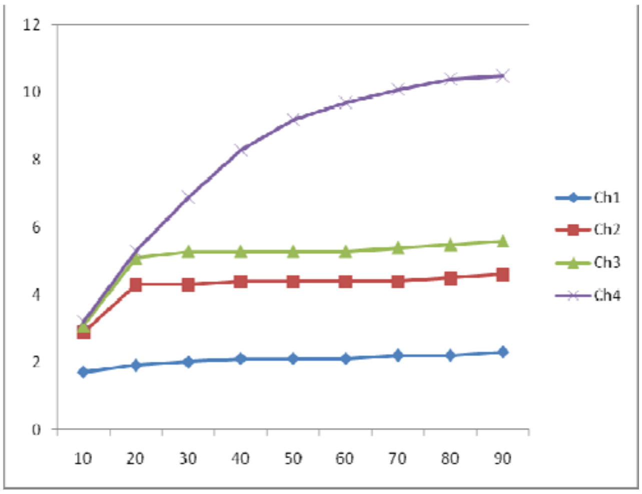

Fig. 3 - Self – Motivated shifting of packets between the channels

5. Experimentation and Results

This paper has assumed a smaller network with 90 numbers of nodes. By using the normal scheduling the success delivery ratio quickly crashes from 0.8 to 0.6. By using the Instance crush based Priority Scheduling with self - Motivated Packet Shifting the packet crash is minimized as there is shifting of channels when the interference is detected. The result shows that the success ratio is increased to 0.9.

The graph in Fig 3 represents the Self - Motivated Packet Shifting within the channels based on the channel availability at runtime. Here, the packets in channel will be reallocated to other channel based on availability. So, it will balance the load in the channel and avoid channel outage.

The graph in Fig 4(a) and (b) shows the packet delivery ratio, when the network is overflowed. Fig 4(a) Represent the normal scheduling flow, which shows decrease in the delivery ratio when the network is not stable or network overflows. Fig 4(b) represents the Self - Motivated Packet Shifting which will maintain the channel in and out flow and increase the packet delivery ratio.

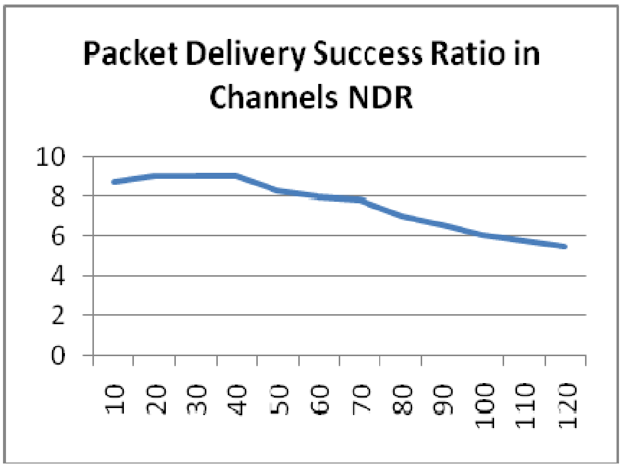

Fig4 - (a) Packet delivery ratio for normal scheduling

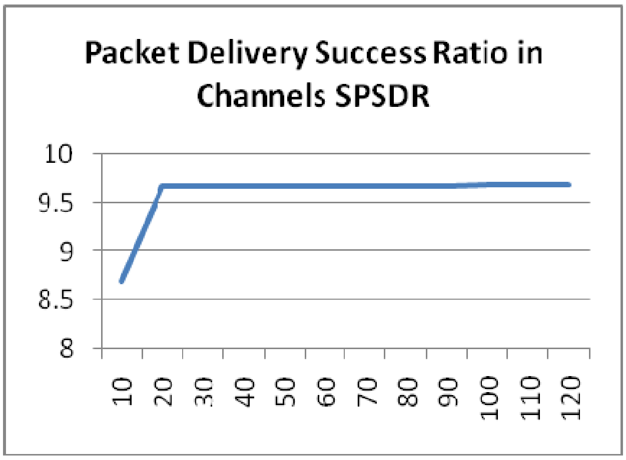

Fig4 - (b) Packet delivery ratio for self - Motivated packet shifting

Scheduling Scheme with Self - Motivated Packet Shifting in Multichannel Adhoc Network

Table1. Percentage of packet delivery ratio (Between the normal delivery and SPS delivery of packets)

Percentage of delivery ratio SPS delivery Packets			
No of Packets	Normal Delivery Ratio	SPS Delivery Ratio	Difference in the percentage of delivery ratio
10	8.7	8.7	0
20	9	9.67	0.67
30	9	9.67	0.67
40	9	9.67	0.67
50	8.3	9.68	1.38
60	8	9.68	1.68
70	7.8	9.68	1.88
80	7	9.68	2.68
90	6.6	9.68	3.08
100	6.1	9.69	3.59
110	5.8	9.69	3.89
120	5.5	9.69	4.19

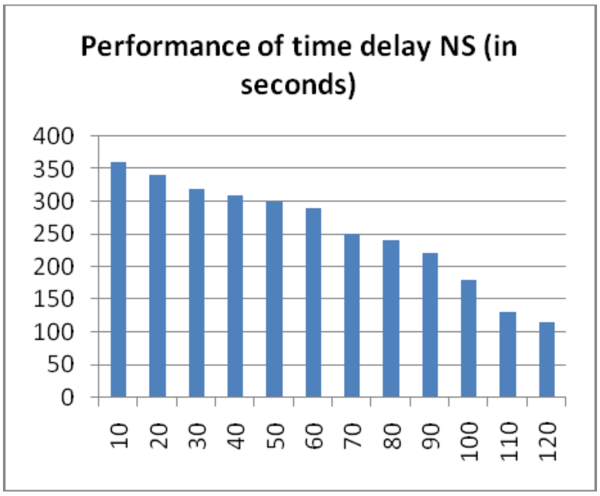

Fig.5 - (a) Throughput with respect to time delay in normal scheduling.

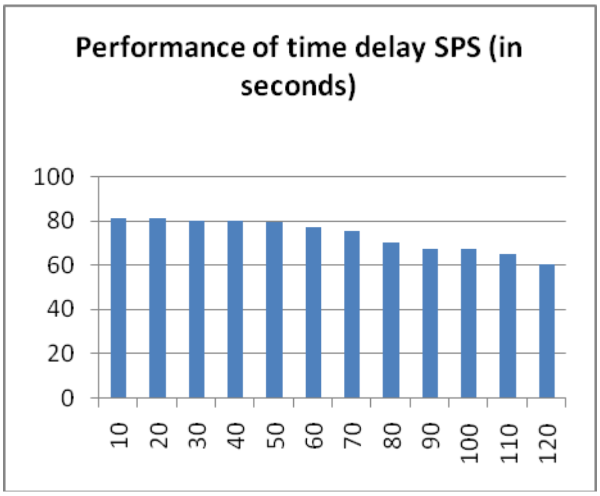

Fig.5 - (b) Throughput with respect to time delay in Instance crush based priority scheduling with SPS.

From the table we infer that the packet delivery ratio is the same for normal and proposed scheduling at the beginning. The packet delivery ratio is calculated as,

Packet Delivery Ratio = Number of packets delivered to the destination / Number of packets generated by the source

As the number of packets is increased the delivery ratio is gradually decreased in the normal scheduling as there may be congestion in the channels. It is noted that it is stable at the beginning and when the number of packets is increased the delivery ratio is also increased as this scheme involves packet shifting between the channels.

The graph in the Fig 5(a) shows the time delay with number of channels during the normal scheduling. Fig 5(b) show the time delay with the proposed scheme. From both the graph it is noted that in normal flow time delay may extend up to 300.0 seconds but SPS will maintain and improve the ratio as 75.0–100.0 seconds.

6. Conclusion

This paper considers the utilization of the spectrum access opportunity by allowing the secondary nodes to use the channel as long as the transmission does not disturb the primary user. This scheme uses the Channel and Imperative intelligence techniques to sense the environment, to have the list of empty channels and the Instance crush based Priority Scheduling allocates one of the channels from the empty list and the data are allowed to transmit. The Self - Motivated Packet Shifting is incorporated with the scheduling algorithm so as to minimize the packet crash during the interference with the primary user. The scheme proposed in this paper enhances the performance in terms of throughput and packet delivery ratio by minimizing the packet crash.

References

Rajesh M and Gnanasekar J.M. Congestion control in heterogeneous WANET using FRCC. Journal of Chemicaland Pharmaceutical Sciences.JCHPS 2015, Special Issue 9, Pages: 265 – 268.

Motta, N. Corke, P. Gonzalez, F. Development and integration of a solar powered unmanned aerial vehicle and a wireless sensor network to monitor greenhouse gases. Sensors 2015, 15, 4072–4096.

Hao, B. Tang, J. Xue, G. Error-LenientTransmit Node Assignment in Wireless Adhoc Networks: Formulation and Approximation. In Proceedings of the International Conference on High Performance Switching and Routing, Phoenix, AZ, USA, 19–21 April 2004 pp. 246–250.

Rajesh M and Gnanasekar J.M. A Systematic Review of Congestion Control in Ad Hoc Network. International Journal of Engineering Inventions, 2014, Volume 3, Issue 11, PP: 52-56,

Zhang, W. Xue, G. Misra, S. Error-LenientTransmit Node Assignment in Wireless Adhoc Networks: Problems and Algorithms. In Proceedings of the IEEE International Conference on Computer Communications, Anchorage, AK, USA, 6–12 May 2007 pp. 1649–1657.

Han, X. Cao, X. Lloyd, E.L. Shen, C. Error-LenientTransmit node assignment in heterogeneous Wireless Adhoc Networks. IEEE Trans. Mob. Comput. 2010, 9, 643–656.

Senel, F. Younis, M.F. Akkaya, K. Bio-inspired Transmit node assignment heuristics for repairing damaged Wireless Adhoc Networks. IEEE Trans. Veh. Technol. 2011, 60, 1835–1848.

Sitanayah, L. Brown, K.N. Sreenan, C.J. A Error-LenientTransmit assignment algorithm for ensuring k vertex-disjoint shortest paths in Wireless Adhoc Networks. Ad Hoc Netw. 2014, 23, 145–162.

Rajesh M and Gnanasekar J.M. An Optimized Congestion Control and Error Management System. Computer Engineering and Intelligent Systems, 2015, Vol.6, No.4, PP: 50-55 .

Lin, G.H. Xue, G. Steiner tree problem with Least number of Steiner points and bounded edge-length. Inf. Process. Lett. 1999, 69, 53–57.

Chen, D. Du, D.Z. Hu, X.D. Lin, G. Wang, L.S. Xue, G.L. Approximations for Steiner trees with Least number of Steiner points. J. Glob. Optim. 2000, 18, 17–33

Rajesh M and Gnanasekar J.M. Congestion Control in Heterogeneous Wireless Ad hoc Network Using FRCC. Australian Journal of Basic and Applied Sciences, 2015, 9(7) Pages: 698-702.

Lloyd, E.L. Xue, G. Transmit node assignment in Wireless Adhoc Networks. IEEE Trans. Comput. 2007, 56, 134–138.

Li, S. Chen, G. Ding, W. Transmit Node Assignment in Heterogeneous Wireless Adhoc Networks with Basestations. In Proceedings of the International Conference on Communications and Mobile Computing, Kunming, China, 6–8 January 2009 pp. 573–577.

Yang, D. Misra, S. Fang, X. Xue, G. Zhang, J. Two-tiered constrained Transmit node assignment in Wireless Adhoc Networks: Computational complexity and efficient approximations. IEEE Trans. Mob. Comput. 2012, 11, 1399–1411Senel,

F. Younis, M. Transmit node assignment in structurally damaged Wireless Adhoc Networks via triangular Steiner tree approximation. Comput. Commun. 2011, 34, 1932–1941

Bhattacharya, A. Kumar, A. A shortest path tree based algorithm for Transmit assignment in a wireless sensor network and its performance analysis. Comput. Netw. 2014, 71, 48–62.

Tang, J. Hao, B. Sen, A. Transmit node assignment in major range Wireless Adhoc Networks. Comput. Commun. 2006, 29, 490–501.

Misra, S. Hong, S.D. Xue, G. Tang, J. Constrained Transmit Node Assignment in Wireless Adhoc Networks to Meet Connectivity and Survivability Requirements. In Proceedings of the IEEE International Conference on Computer Communications, Phoenix, AZ, USA, 13–18 April 2008 pp. 281–285.

Kashyap, A. Khuller, S. Shayman, M.A. Transmit Assignment for Higher Order Connectivity in Wireless Adhoc Networks. In Proceedings of the IEEE International Conference on Computer Communications, Barcelona, Spain, 23–29 April 2006 p. 12.

Bredin, J. Demaine, E.D. Hajiaghayi, M.T. Rus, D. Deploying Sensor Networks with Guaranteed Capacity and Error Tolerance. In Proceedings of the 6th ACM International Symposium on Mobile Ad Hoc Networking and Computing, Cologne, Germany, 28 August–2 September 2005 pp. 309–319.

Lee, S. Younis, M. Lee, M. Connectivity Reinstallation in a partitioned wireless sensor network with assured Error tolerance. Ad Hoc Netw. 2015, 24, 1–19.

Pu, J. Xiong, Z. Lu, X. Error-Lenientdeployment with k-connectivity and biased k-connectivity in sensor networks. Wirel. Commun. Mob. Comput. 2009, 9, 909–919.

