Global Journal of Computer Science and Technology: E
Network, Web & Security
Volume 18 Issue 2 Version 1.0 Year 2018
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

An ACO and Mobile Sink based Algorithm for Improvement of Ml-Mac for Wsns using Compressive Sensing

By Neha Sharma & Sandeep Sharma
Guru Nanak Dev University

Abstract- WSN is becoming key subject of research in computational basic principle because of its great deal of applications. ACO(Ant Colony Optimization) constructs the redirecting or routing tree via a method by which, for every single circular or round, Base Station (BS) chooses the root node in addition to shows the following substitute for every node. In order to prevail over the actual constraints with the sooner work a new increased method proposed in this research work. The proposed method has the capacity to prevail over the constraints of ACO routing protocol using the principle with reactivity, mobile sink and also the compressive sensing technique. In this paper we measure the main parameters that affect the wsn that are network lifetime, packets dropped, throughput, end to end delay and remaining energy for proposed algorithm and simulation results have shown that the proposed algorithm is highly effective.

Keywords: *mobile sink; ACO; compressive sensing; ML-MAC.*

GJCST-E Classification: *C.1.3, F.2.0*

ANACOANDMOBILESINKBASEDALGORITHMFORIMPROVEMENTOFMLMACFORWSNSUSINGCOMPRESSIVESENSING

Strictly as per the compliance and regulations of:

An ACO and Mobile Sink based Algorithm for Improvement of Ml-Mac for Wsns using Compressive Sensing

Neha Sharma [α] & Sandeep Sharma [σ]

Abstract- WSN is becoming key subject of research in computational basic principle because of its great deal of applications. ACO(Ant Colony Optimization) constructs the redirecting or routing tree via a method by which, for every single circular or round, Base Station (BS) chooses the root node in addition to shows the following substitute for every node. In order to prevail over the actual constraints with the sooner work a new increased method proposed in this research work. The proposed method has the capacity to prevail over the constraints of ACO routing protocol using the principle with reactivity, mobile sink and also the compressive sensing technique. In this paper we measure the main parameters that affect the wsn that are network lifetime, packets dropped, throughput, end to end delay and remaining energy for proposed algorithm and simulation results have shown that the proposed algorithm is highly effective.

Keywords: mobile sink; ACO; compressive sensing; ML-MAC.

I. Introduction

A Wireless Sensor Networks (WSN) is an arrangement of hundreds or many small scale sensor hubs that have capacities of detecting, building up remote correspondence between each other and doing computational and preparing operations. Wireless sensor networks are used in many applications.Multi-layer Mac Protocol is an effective technique used in WSNs. It is designed with two main features: less active time and lesser collisions. Sensor hubs in ML-MAC have a very short active time which would lessen the vitality required to communicate with other nodes. Eventually, the number of collisions in cases where two or more nodes try to send at the same time is minimized in ML-MAC. This spares the vitality required to re-send the corrupted packets along these lines expanding system lifetime.ML-MAC demonstrate much better execution of the vitality utilization contrasted and the current MAC conventions. In this paper we further try to optimize the ML-MAC protocol by applying the techniques of Compressive sensing and ACO(Ant Colony Optimization).

ACO: ACO calculation depends on the conduct of genuine ants. While moving a few ants discover food store pheromones while in transit to their homes, and alternate ants take after pheromones saved before by different ants. Over the long haul, pheromones dissipate, opening up new conceivable outcomes, and ants coordinate to pick a way with vigorously laid pheromones. Along these lines, ants meet to most optimum path from their home to a food deposits with just pheromone data [1]. ACO depends on swarm intelligence. In swarm knowledge complex aggregate conduct rises up out of the conduct of numerous basic specialists. ACO has taking after qualities.

1. ACO uses search encounters (spoke to by pheromones) and area learning (spoke to by jnheuristic data) to quicken the search procedure.
2. In ACO, ants are stochastic productive systems that construct arrangements while strolling on a graph.
3. Ants act simultaneously and freely.
4. Top notch arrangement develops through worldwide co-operation.
5. Roundabout correspondence by means of communication with environment
6. Diminish direct correspondence.
7. Pheromones vanish. Consequently abstains from being caught in nearby optima.
8. Can be utilized as a part of element application
9. Positive feedback prompts fast disclosure of good solutions
10. Circulated calculation maintains a strategic distance from untimely merging.

Mobile sink: The correspondences in the WSN have the many to-one property in that information from an extensive number of sensor hubs have a tendency to be amassed into a few sinks. Since multi-hop routing is by and large required for far off sensor hubs from the sinks to save energy, the hubs close to a sink can be loaded with transferring a lot of activity from other hubs. This problem is called the "crowded centre effect" [8] or the "energy hole problem" .It results in vitality consumption at the hubs close to the sink too early, prompting the partition of the sink from whatever is left of hubs that even now have a lot of vitality. In any case, by moving the sink in the sensor field, one can maintain a strategic distance from or moderate the energy hole problem and expect an expanded system lifetime.

Comptressive sensing: Compressive sensing (CS) is recent technique of simultaneously sensing and

Author α σ: Computer engineering and technology Department, Guru nanak dev university, Amritsar, India.
e-mails: nehasharmagndu@yahoo.com, sandeep.cse@gndu.ac.in

compressing that is highly appealing for fully distributed compression in wireless sensor networks (WSNs). WSNs observing ecological marvels over expansive geographic territories gather estimations from an extensive number of circulated sensors. Compressive Sensing gives a viable method for revelation and remaking of capacities with just a subset of tests. The issue of information examining and accumulation in remote sensor systems (WSNs) is getting to be basic as bigger systems are being sent. Expanding system size stances noteworthy information gathering challenges, for what concerns examining and transmission coordination and system lifetime. To handle these issues, in-system in-network compression techniques are getting to be vital answers for develop network lifetime.

II. Related Work

Manish Kumar Jha et al.[13] gives an enhanced time synchronized relay node based ML-MAC convention for WSNs. Manish Kumar Jha et al.[3] introduced a algorithm for enhanced time synchronization.

Tao [et.al] [2014] [14] present a innovative media access system characterized as Wireless Arbitration.

S. Singh et al. [2] proposed a ACO method and discovered the sink area for which the quantity of sensors is least among every accessible area in the matrix. In their calculation, they process aggregate of separations of the objectives from that sensor, which are in its reach. At that point they include these totals for all sensors in the network. This separation compares to the given sink area. Then rehash same procedure for registering the separation by changing the sink area in the lattice. That sink area for which the separation is least is picked and this sink area requires least number of sensors to cover all objectives.

Z. Li and Q. Shi [3] proposed another vitality successful QoS routing convention. The calculation is to speeds up the joining of ant colony algorithm by using SNGF to optimize routing candidate nodes; the pheromone is characterized as a blend of connection burden and transmission capacity delay.

S. Okdem and D. Karaboga[4] acquaints another methodology with routing operations in remote sensor systems (WSNs).

Compressive Sensing gives a powerful method for revelation and remaking of capacities with only a subset of samples. Customary CS depends on consistently circulated tests which limits reasonableness of CS based recuperation. To improve the adaptability of sampling and implementation, D. C. Dhanapala et.al [5] proposed approach utilizes irregular walk based examples.

W. Yan et.al [6] introduced a very simple deterministic measurement matrix design algorithm (SDMMDA), based on which the data gathering and reconstruction in wireless sensor networks (*WSNs*) are greatly enhanced. C.Caione et.al[7] compared Distributed compressed *sensing* (DCS) and Kronecker *compressive sensing* (KCS) two structures against a typical arrangement of artificial signals legitimately worked to typify the primary attributes of characteristic signs. J.Wang et.al [9] separates the system into a few groups and cluster heads are chosen inside every group. At that point, a mobile sink speaks with every cluster head to gather information specifically through short range correspondences. The ACO calculation has been used in this work keeping in mind the end goal to locate the ideal mobility direction for the mobile sink.B.Nazir and H.Hasbullah provide a mobile sink based routing protocol for prolonging network lifetime[10]. N.Vlajic and D.Stenvanoic performed analysis of zigbee-based wireless sensor networks with path constrained mobile sink[11]. Y.Nizhamudong et.al[12] evaluated the cost of route wireless sensor network with a mobile sink.

III. Proposed Alogithm

The proposed algorithm follows following steps:

i. Initialize ML-MAC based remote sensor system.

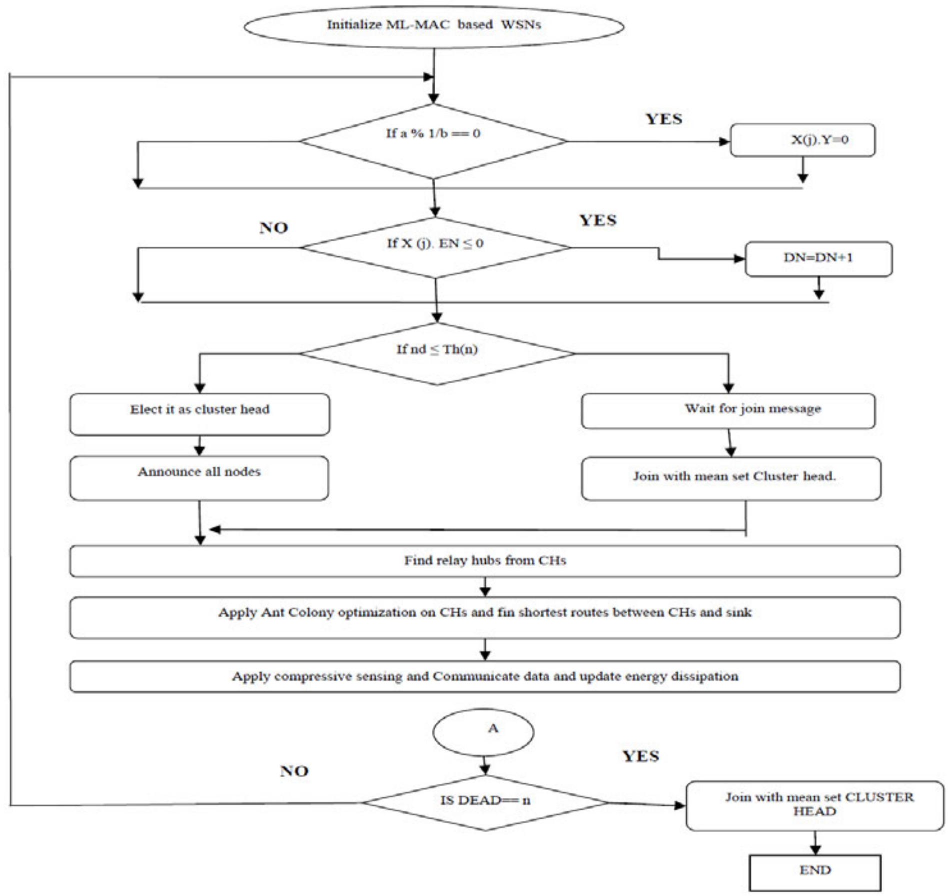
ii. Check if "a" every single current nodes '1/b' ideal percentages end up being dead if yes then exhibit no. of utilized bees speaking to any arrangement of hub equal to zero else proceed next stride.In the event that a % 1/b== 0 ……. (1)

iii. "X" is no. of appointed bees "j" is any hub that needs to end up the CH in that round "Y" is the set of hubs that previously chosen as CHs Cluster head in past '1/p' round.

$$X(j).Y=0 \qquad \text{.................. (2)}$$

iv. Check assuming no. of utilized bees speaking to any hub in remaining vitality is proportional to zero if yes then dead hub is dead +1 else keep on next node.

$$dead= dead + 1 \qquad \text{..........(3)}$$



FLOWCHART OF PROPOSED ALGORITHM

Figure 1

v. Check whether "rnd" is less than threshold value if yes than set as cluster head (CH) and report all hubs else wait and join with mean set cluster head.

$$\text{IF} \quad rnd \leq TH(n) \qquad \ldots\ldots\ldots(4)$$

vi. Find relay hub from Cluster Head.
vii. Apply Ant Colony Optimization (ACO) on CHs to discover short routes way amongst CHs and sink.
viii. Apply compressive sensing and Communicate information and update vitality dissemination.
ix. Check whether dead is equivalent to no. of hubs "n" if yes then Join with mean set (CH)cluster head else go to step 2. Is dead == n

IV. Experimental Setup

For performing the simulation we are using MATLAB 2010a version 7.10.0.499 32-bit.We are using windows 7 core i5 processor with 64 bit operating system and 4GB RAM.

V. Experimental Results

The main objective of simulation is to evaluate the performance of proposed algorithm .In the simulations we refer to network with nodes varying from 100 to 600.we get the following results which the effectiveness of algorithm.

Table 1: Network Lifetime

No. of nodes	Exiting	ACO based ml-mac	Mobile sink and aco baesd ML-mac
100	49	60	69
150	50	54	58
200	50	61	71
250	49	73	81
300	49	71	71
350	49	73	71
400	49	88	72
450	49	71	71
500	49	71	71
600	49	83	86

Table 2: Remaining Energy

No. of nodes	Exiting	ACO based ml-mac	Mobile sink and aco baesd ML-mac
100	19.4779	24.4513	24.4516
150	29.9045	37.7087	37.9928
200	40.6416	51.7361	51.9828
250	51.0113	65.2385	65.5300
300	62.0976	79.0836	79.2515
350	71.2310	92.5709	92.8383
400	83.0392	105.8739	106.5069
450	92.3126	120.0419	120.3627
500	103.9739	133.6166	133.9290
600	124.2635	160.6876	161.1973

Table 3: Throughput

No. of nodes	Exiting	ACO based ml-mac	Mobile sink and aco baesd ML-mac
100	3620	4980	4964
150	5565	7682	7790
200	7570	10586	10652
250	9509	13367	13419
300	11572	16803	16238
350	13226	19032	19028
400	15459	21801	21880
450	17206	24655	24733
500	19325	27435	27537
600	23144	32994	33127

Table 4: End To End Delay

No. of nodes	Exiting	ACO based ml-mac	Mobile sink and aco baesd ML-mac
100	0.6436	0.1084	0.1201
150	0.9438	0.1041	0.0984
200	1.2171	0.1371	0.7141
250	1.6492	0.1637	0.3470
300	1.7300	0.1816	0.1746
350	2.0176	0.1938	0.1898
400	2.1084	0.2368	0.2278
450	2.5062	0.2529	0.3223
500	2.8251	0.3051	0.3415
600	3.2361	0.4563	0.4070

Table 5: Packets Dropped

No. of nodes	Exiting	ACO based ml-mac	Mobile sink and aco baesd ML-mac
100	128	10.2000	19.3600
150	129	2.7867	6.0667
200	121.5000	8.0700	17.7400
250	109.6400	12.2800	27.3240
300	104.2667	17.0633	16.8733
350	112.1143	18.6229	16.6343
400	103.5250	33.4975	17.3000
450	107.6444	16.2111	16.0378
500	103.5000	16.1300	15.9260
600	104.2667	28.0100	30.7883

References Références Referencias

1. M. Dorigo and T. Stutzle, *Ant Colony Optimization*, A Bradfordbook, London, England, 2004
2. S. Singh, S. Chand and B. Kumar, "Optimum deployment of sensors in WSNs," *Information Systems and Computer Networks (ISCON), 2014 International Conference on*, Mathura, 2014, pp. 113-117. doi: 10.1109/ICISCON.2014.6965229
3. Z. Li and Q. Shi, "An QoS Algorithm Based on ACO for Wireless Sensor Network," *High Performance Computing and Communications & 2013 IEEE International Conference on Embedded and Ubiquitous Computing (HPCC_EUC), 2013 IEEE 10th International Conference on*, Zhangjiajie, 2013, pp. 1671-1674.
4. S. Okdem and D. Karaboga, "Routing in Wireless Sensor Networks Using Ant Colony Optimization," *First NASA/ESA Conference on Adaptive Hardware and Systems (AHS'06)*, Istanbul, 2006, pp. 401-404.doi: 10.1109/AHS.2006.63
5. D. C. Dhanapala, V. W. Bandara, A. Pezeshki and A. P. Jayasumana, "Phenomena discovery in WSNs: A compressive sensing based approach," *2013 IEEE International Conference on Communications (ICC)*, Budapest, 2013, pp. 1851-1856. doi: 10.1109/ICC.2013.6654790
6. W. Yan, Q. Wang, Y. Shen, Y. Wang and Q. Han, "An efficient data gathering and reconstruction method in WSNs based on compressive sensing,"*Instrumentation and Measurement Technology Conference (I2MTC), 2012 IEEE International*, Graz, 2012, pp. 2028-2033. doi: 10.1109/I2MTC.2012.6229316
7. C. Caione, D. Brunelli and L. Benini, "Compressive Sensing Optimization for Signal Ensembles in WSNs," in *IEEE Transactions on Industrial Informatics*, vol. 10, no. 1, pp. 382-392, Feb. 2014.doi: 10.1109/TII.2013.2266097
8. L. Popa, A. Rostamizadeh, R. M. Karp, and C. Papadimitriou, "Balancingtraffic load in wireless networks with curveball routing," in *MobiHoc07*, Sept 2007, pp. 170–179.
9. J. Wang, J. Cao, B. Li, S. Lee and R. S. Sherratt, "Bio-inspired ant colony optimization based clustering algorithm with mobile sinks for applications in consumer home automation networks," in *IEEE Transactions on Consumer Electronics*, vol. 61, no. 4, pp. 438-444, November 2015.
10. B. Nazir and H. Hasbullah, "Mobile Sink based Routing Protocol (MSRP) for Prolonging Network Lifetime in Clustered Wireless Sensor Network," *Computer Applications and Industrial Electronics (ICCAIE), 2010 International Conference on*, Kuala Lumpur, 2010, pp. 624-629.doi: 10.1109/ICCAIE.2010.5735010
11. N. Vlajic and D. Stevanovic, "Performance Analysis of ZigBee-Based Wireless Sensor Networks with Path-Constrained Mobile Sink(s)," *Sensor Technologies and Applications, 2009. SENSORCOMM '09. Third International Conference on*, Athens, Glyfada, 2009, pp. 61-68.doi: 10.1109/SENSORCOMM.2009.114
12. Y. Nizhamudong, N. Nakaya, Y. Hagihara and Y. Koui, "Performance evaluation of route cost for wireless sensor networks with a mobile sink," *SICE Annual Conference (SICE), 2011 Proceedings of*, Tokyo, 2011, pp. 2029-203
13. Khurana, Manju, Ranjana Thalore, Vikas Raina, and Manish Kumar Jha. "Improved time synchronization in ML-MAC for WSN using relay nodes." AEU-International Journal of Electronics and Communications 69, no. 11 (2015): 1622-1626
14. Tao Zheng; Gidlund, M.; Akerberg, J., "Medium access protocol design for time-critical applications in wireless sensor networks," in Factory Communication Systems (WFCS), 2014 10th IEEE Workshop on , vol., no., pp.1-7, 5-7 May 2014 doi: 0.1109/WFCS.2014.6837585