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Mobile Sink Based Data Assemblage in Wireless Sensor Networks

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***Abstract:** A mobile sink, which is used to fetch data from various sensors to prevent the energy-hole problem or hotspot in WSN. To avoid the delay sustained by calling on the sensors a mobile sink is allowed to visit which is called as meeting points and the remaining nodes deliver their data to nearest rendezvous point. The improvement of sink's data collecting method as well as the maximization of lifespan of the network is done by discovering a most favorable set of meeting points. However, it is very difficult to discover the assigned meeting points and moving way of mobile sink when the sensor produces data roughly. We propose an ultra-modern ACO based mobile sink data gathering in WSN. The important aims of the suggested algorithm are to elongate the existence of network and to reduce the delay in fetching data from sensor nodes. The algorithm also follows to again select the rendezvous points in order to stable the energy utilization of the sensor nodes.*

***Keywords:** WSN, Energy-hole problem, rendezvous point, ACOA WSN, Energy-hole problem, rendezvous point, ACOA*

I. INTRODUCTION

In modern megalopolis air pollution is a significant issue, where most of the people live, and attaching industrial discharges to the outcome of heavy urbanization with traffic jams and cooling or heating of buildings. The purpose of air quality monitoring includes collecting of real data from the atmosphere and to provide the necessary information to the professionals in order to monitor the consequences, assessing compliance about the targeted area. Most of the air quality observing is equipped with multiple lab quality sensors. These systems are huge priced and difficult to maintain. An alternative approach would be to use WSN which is less complex devices and with compact size [1]. The foremost advantage of a WSN infrastructure is of self-organization and healing as well as energetic autonomy of the nodes for air pollution observing which is to acquire an excellent spatiotemporal granularity of measurements.

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A WSN consists of small size and less complex devices known as nodes that senses the channel and collect all the data from each observing field and liaise via wireless links. The details gathered are forwarded via many hops to a sink. In WSN, the sensors are deployed arbitrarily in the sensing area.

Each sensor in WSN observes its environment and supplies some global data or an inference about the environment to base station which could be located arbitrarily in the network [2]. So, it gathers the local details, which will process them and then send it to a remote base station. By using GPS technology, the details about the environment are gathered and lend to the application Web server for data communication. In the proposed system, two important facts are extracted into account for energy efficient transmission and to have a prolonged network existence. We propose a Power- aware scheduling and clustering based algorithm on Ant Colony Optimization (PASC-ACO) with energy efficient transmission using compressive sensing is deployed for large scale WSN multi hopping data distribution [10]. It progresses the energy of every sensors in clustered network as well as increases the real sensor network's lifetime [5].

II. RELATED WORKS

The wireless sensor networks are a fitting technology with substantial benefit including cheap and autonomy. Two integer linear programming creations based on actual pollutants dispersion modeling to give out with the least price WSN deployment for observing the air pollution. It also illustrates the idea by claiming models on existent world data, namely the Nottingham City street lights. It compares the execution time of the two models and reveals that the second flow based formulation is much better [1]. A complementary or approach alternative approach is proposed in [2] using an autonomic wireless sensors and a network of less cost, allowing for a finer spatiotemporal grainy of air quality sensing. It tackle the optimization issue of sensor deployment and suggest an integer programming model, which permits to discover the optimal network topology while conforming air quality observing with a high precision and the least financial cost. Most of surviving deployment models of WSN are common and presume that sensors have a specified detection range. This assumption does not suitable for pollutant concentrations sensing. In this paper model, interpolation methods are considered to place the sensors in one way that the pollution concentration is estimated with a bounded error at locations where no sensor is deployed [2]. A power aware algorithm is proposed as WSN to avoid redundancy and increase the network lifespan. The aim of the paper is to realize dynamic clustering and to define the scheduling of sensors in the same cell [3].

In [4] the authors introduce that Power Aware Scheduling & Clustering algorithm based on Ant Colony Optimization (PASC-ACO). To reach the base station ACO scheme can play a remarkable role in the enhancement of network lifetime by choosing the optimum path.

PASC-ACO achieves better performances in terms of existence by stabilizing the energy load amongst all the nodes [4]. The deployment issue have assumed that two nodes are able to contact each other when the distance between two nodes is less than a radius called the communication range [5].The novel grid coverage strategies for effective observation and target position is introduced in dispersed sensor networks. In this paper, the sensor field are used as a network (two dimensional or three-dimensional) of coordinates (points) and use target position refers to the issue of positioning a target at any instant of time at a grid point. An integer linear programming result is presented for reducing the sensors cost for absolute coverage area of sensor field. It also deals with solving the ILP model by using a typical public-domain resolver and presents a divide-and defeat approach for resolving huge problem instances field. It also dealt about the grid-based sensor positioning for solitary targets provides asymptotically unambiguous position of many targets [6]. In [7] the authors provide an energy efficient self-healing mechanism for WSN. This mechanism uses incorporation of node and link adaptation techniques to minimize energy consumption while prolonging good connectivity between the sentinel nodes. A novel algorithm is suggested to increase the lifespan of wireless sensor network. This algorithm uses compressive sensing together Particle Swarm Optimization (PSO) to reduce the transmission rate and to construct the data gathering of trees respectively. It constructs the data totality of the tree to increase the efficiency by correcting delay and to enhance life duration of network [8]. Compressive Sampling (CS) is very useful for energy-efficient transmission in WSN. In this paper, two important facts for energy consumption is verified: 1) Different from the view of previous literature, the cost of measure processing is not trivial. It is a considerable percentage contrasted to transmission cost when the number of measurement increases. 2) The cost jump in a specific location is caused due to the value of measurement constantly changes along the routing [9]. The scribblers are inspired by Ant Colony Optimization presented an algorithm to pick up the cluster head and good energy management. It also finds maximum disjoint connected cover sets that satisfy network coverage and connectivity between nodes within a set cover and prolong network lifetime [10]. The writers presented a pivotal biologically inspired process and the related techniques for solving vanquishing in the wireless sensor networks, comprising Ant-based and genetic approaches [11]. A recently developed algorithm was used to select the cluster head that can better handle the diversified energy circumstances. After the cluster development phase one spanning tree is built over all the cluster head by CBRP. By single-hop communication only the origin node of this tree can liaise with the sink node. The protocol used is purely based on the remaining energy of node and average energy of network [12]. The paper [13] depicts an air and atmosphere real-time quality monitoring system. It comprises of several distributed observing stations with back end server that transmits wirelessly, by using machine-to-machine communication. Each station is provided with meteorological and gaseous sensors also wireless communication capabilities and data logging. The backend server gathers the real data from all the stations and transforms it into information supplied to users through mobile applications and web portals. A Low-energy adaptive clustering hierarchy (LEACH) is a popular clustering protocol. It introduces a two-phase functioning based on the single-tier network by using clusters. The protocol randomly creates cluster heads and performs data aggregation processes in the clusters [14]. A WSN which is built of sensor nodes capable of sensing and communication, relay nodes are efficient of communication, and base stations are in charge for gathering data generated by sensor nodes, to be deployed in sensor field. It address the difficulty in placing the relay nodes, sensor nodes and base radio stations in sensor area such that (i) every point in sensor area is protected through subsets of sensor of preferred cardinality (ii) the obtained sensor network is attached (iii) the sensors network has sufficient bandwidth. The placement problems for reliable and unreliable/probabilistic detection models are formulated as Integer Linear Programs (ILPs) [15]. Essayist propose a biological inspired self-organized secure autonomous routing protocol (BIOSARP) with an autonomous s routing mechanism. In this paper, they suggest a secure real-time load distribution (SRTLD) which utilizes broadcast packets to discharge neighbor discovery and computation at every hop [16]. An efficient routing algorithm for large scale cluster-based wireless sensor networks is used. ACO approach consider the path delay, node energy, the frequency a node portrayed as a one of the routers to attain a adaptive and dynamic routing, which can balance the WSNs node power consumption and increases the network lifetime as long as possible. Simulation results have exhibited the ACO routing protocol importantly enhances the network lifetime [17]. This paper [18] suggests an ACO-based approach that can increase the lifespan of sensors. This method is primarily aimed at discovering the highest number of disjoint attached covers. Based on the pheromone and heuristic details, each ants to find out the optimum path on the construction graph to increase the number of attached covers. The pheromone value serves as an analogy for seeking experiences in constructing connected covers. The suggested approach has been registered to a diversity of heterogeneous WSNs. The solution shows that this approach is an efficient and effective in discovering high-quality results for increasing the heterogeneous WSNs lifetime. WSN uses battery powered sensors to sense the channel, therefore an energy efficiency is evaluative to expand the lifespan. The obtained ACO is used to enhance the span of life of sensors with energy constraints. Every sensor is modeled as a synthetic ant. Similarly the active routing is modeled as searching. The channel of energy efficient between source and sink is acquired when pheromone of ant is released. Data aggregation, route discovery, loss of the information are modeled as procedure of pheromone diffusion, accumulation, evaporation. Each sensor node finds the remaining energy and computes probability to select an optimum sensing channel to maximize the WSNs lifetime.

III. PROPOSED SYSTEM METHODOLOGY

We propose two important facts that are considered for energy consumption in the actual sensor network.

The first work elaborates the PASC-ACO for the multi hopping data delivery of the huge scale WSN. It combines the techniques of clustering and the scheduling with ACO approach to enlarge the network existence and to enhance performance of the sensing nodes in the sensor network.

Another work is strictly depends upon the compressive sensing, an optimum transmission approach, and ECS is to get an effective transmission by minimizing the battery utilization of the sensor nodes.

A. Block diagram description

The flow of the proposed system is explained in the block diagram. The main objective of this work is to observe the air quality in the environment using WSN by effective deployment of sensor nodes. Pollution observing may target to achieve two objectives: (i) Sampling of the air quality (ii) Sensing of the threshold crossings to trigger adequate alerts.

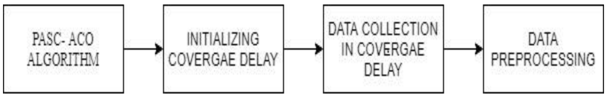

Fig. 1 Block diagram of the proposed system

Sensor nodes are situated to rule the concentrations of pollutants which are released by sources of pollution. In this paper we propose, Clustering algorithm and Power aware scheduling are being used to establish the sensors node to enhance the network's existence and also to lessen the energy misspend while relocate the unnecessary data. An ACO approach is executed to avoid link failure by finding the shortest path. Further, this design methodology enhances the data packet for efficient transmission in the finest path. Temperature sensors and multi gas sensors are used to sense the pollutant gas under any weather condition. An equal slots are allocated to the sensing nodes using TDMA scheduling. For the data communication phase, an ACO algorithm is implemented to find the optimal path to the sink or base station. Using GPS technology, data from the base radio station is specifically designated to data base from where the fusion information is updated in the application server. Here the concentration of pollutant sources is being recorded periodically.

B. Network model

A WSN is consisting of huge number of inexpensive nodes which is randomly established to monitor the conditions. Sensors are liaise with each other by using multi hop approach and the stream of data completed at the special node called base station (sink). Sensor networks are linked with each other by base station as an entrance to circulate the sensed data for additional processing. They have sufficient memory, storage and computational power. Generally, the nodes are being placed very closely for successful sensing. Therefore they are organized as clusters where the data communication is proceeded via the group head to the transmit information. Multiple group heads are carrying the data packets to the base radio station using ACO approach.

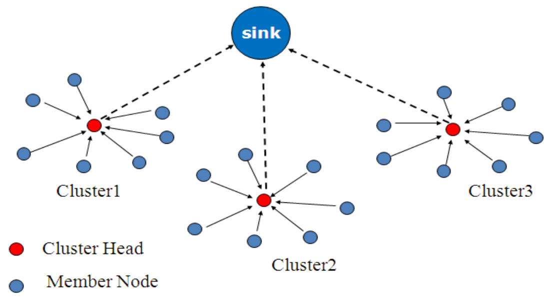

Fig. 2 Network Model

C. Energy model

Dissipation of the data of transmission and reception in the radio model is adopted. 'n' bit messages are transmitted over a space 'd' in this energy dissipation model, Therefore the energy consumption is computed during the data transmission is given by,

$$E_{tx} = \{n^* E_{el} + n * E_{am} * d^{\wedge}2 \ , d \leq d_o \quad n^* E_{el} + n * E_{mp} * d^{\wedge}4 \ , d \geq d_o\} \qquad (1)$$

Where E_{el} is the energy devoured by transmitter or receiver to transfer one bit of data, E_{am} and E_{mp} are the energy utilization parameters in amplifier. d_o is a boundary condition to metamorphose both space transmission E_{am} and multi path transmission E_{mp}.

The energy devoured during the reception is:

$$E_{rx} = \{n * E_{el}\} \qquad (2)$$

Therefore the energy cost of transmitting and receiving an n bit data packets between the nodes is calculated as:

$$E = E_{tx} + E_{rx} \qquad (3)$$

D. PASC-ACO Techniques

PASC-ACO Algorithms is an efficient approach to equilibrium the energy load amongst the sensing nodes. Air quality observing is classified into three different phases. They are grouping technique, finding optimum path and ECS based transmission approach.

E. Setup phase technique

Nodes can be geographically located according to the two – dimensional location information to form the clusters. This information is being tracked out using (GPS) globally positioning systems. The network lifetime is divided into rounds. Each round initiates the selection of group head amidst the nodes. Usually, every node is in active state and the nodes which possess highest energy will be appointed as cluster head.

All the data transmitted from each node is collected by cluster head and forward it to base radio station. Each CH setup TDMA schedule among the cluster member for broadcasting the data. This is achieved depends on the wattage energy of sensing nodes in the clusters. The nodes with high wastage energy are kept in alive state for data transfer and the other nodes are at sleep mode. Alternatively, at the next round the consequences will be changed to improve the sensing performance accordingly due to the pre – defined scheduling. Active nodes are responsible for net coverage and connectivity effective data packet transmission and the remaining nodes area kept at sleep mode. PASC algorithm is make use of to make equilibrium between the energy loads amidst all the nodes which in turn enhance the duration of life of the network.

This is attained by TDMA scheduling by assigning equal number of space to every single one of the nodes which are the fellow of the same cluster. The main assignment in TDMA designing is to assign time periods depends on generation rates of design packets and the topology. A good schedule reduces the latency by minimizing number of time slots. It is also avoids collision by quiet the intruders of every receiver: The higher data rate requires higher latency (and so there will be higher energy utilization) to satisfy a deadline. After the TDMA scheduling is assigned to all nodes in the clusters, the setup phase is completed.

F. Ant Colony Optimization in WSN

ACO approach is implemented to reduce the squander of energy amongst the nodes and to find the shortest path between the group head to base station for making the best use of lifetime of network. Ant agents are divided into two types,

- FANT (Forward Ants)
- BANT (Backward Ants)

There are many steps to find how the agents are streaming the routing data information to one another are as follows: Each network node introduces FANT to every destinations at consistent time intervals. Depending upon current routing tables the so called ants searches and find a way to destination randomly. And also the FANT creates stack, by shoving in trip times for each and every node as the node has reached whereas the BANT possess the stack if the destination is reached. Depends on the trip times each node's routing table nodes which is already visited are updated. The forward Ant's format is given by,

Source Address (4 Bytes)	Sequence Number (2 Bytes)	Destination Address (4 Bytes)	Stack	Stack Pointer (2 Bytes)	Fwd (Value = 0 or 1)

Fig. 3 The forward Ant's format

The fields of forward ants are defined as follows. Source address has 4 bytes field contains the source node address which is found through route discovery phase. In fact, the sequence number has 2 bytes field which is prolonged by every node and also every time it is incremented. Destination address consists of four bytes field, which has node address where to transmit the information data from source. Stack is the memory region in which information data gathered via FANTs is being stored. The stack pointer is of two bytes field, which can keep tracking the nodes visited. Fwd has only one bit field is set to 0 if an ant agent is BANT and set to 1 if an ant agent is BANT.

G. Routing in WSN using ant-like agents

The network is keep sending the ant agents to selected destination randomly and the ant agents travels through the same path in which they have travelled to reach the destination. When Ant Agents are going towards the source node they are updating nodes of the routing table. The Three Phases of Ant Based Algorithm are

- Discovery phase
- Maintenance phase
- Failure handling phase

H. Route discovery phase

To find route from source to the destination the route finding phase uses the control packet. Route discovery make use of two ant agents. They are Backward Ant (BA) and Forward Ant (FA). A FA institutes track to the source node, likewise BA forms track to the node of destination. This FA is relayed and also transmits through sender until it arrives the destination. A node, when receives the FA for the maiden time, it will generate a record in the routing table and that record incorporates next hop, destination address and pheromone value. Source address of FA is interpreted by the node as the destination node address, preceding node address as next hop and calculates the value of pheromone which will be depending upon number of hops that FA required to arrive at the node. The node will forward the FA to the neighbors around it. FA packet has unique sequence number. Duplicate FA is detected via sequence number. The nodes drop once the duplicate ants are detected. The information data is take out and it is destroyed, when the FA outreach at the destination. With the identical sequence number BA is created and it is sent in the direction of the source node. The BA stores the resources across the nodes in neighborhood of source and also it set ups the path to destination node.

I. Route maintenance phase

A Route Maintenance is most important phase in WSN's as the network is dynamically varying and the routes discover good during the discovery and it may be turned to be bad because of congestion, signal robustness etc. The destination node get a packet, and it sends a crowding update message to the source which will inform the source of the REM value for that route. This Congestion Update message also sends an acknowledgement to the source node.

J. Route failure handling phase

In case if the existing route fails, the route failure handling phase is responsible for generating alternative routes. Every packet is connected with acknowledgement, if any node does not obtain an acknowledgement, then it exhibits that the link is unsuccessful. By finding a link unsuccessful, the node dispatch route error message to last node and make inactive this path through keep the pheromone value as zero. Further, the last node tries to search another path to the destination. The packet is being forwarded to the path if another path exists. Otherwise the node tells its neighbors to make relay packet to source node. This will continue until it reached the source node.

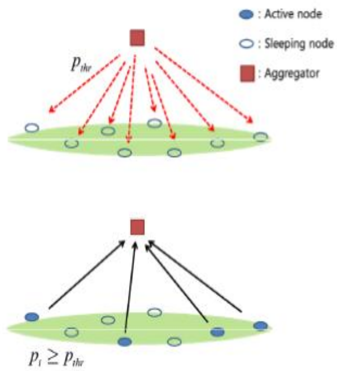

Fig. 4 Representation of route failure

A contemporary route discovery phase is initiated by the source on reaching the source.

Thus an ant algorithm does not breakdown by the optimal path's failure. It assists in load balancing i.e. the information data packets can be followed the next optimum paths, when the optimum path is heavily loaded.

K. An ant construction for wireless sensor networks

The execution of ACO can be described as follows.
The probability of the forward ant 'i' to select the adjacent node 'j' is given by:

$$P(i,j) = \frac{[T^{\alpha}(i,j)] * [E^{\beta}(i,j)]}{\sum S_k[t^{\alpha}(i,j)] * [E^{\beta}(S_k)]} \quad (3)$$

Where,
T(i,j) : Pheromone value of the path (i,j)
S_k : Each nodes memory storage
E (i,j) : Energy devoured by the node
α , β : Parameters to control trail & heuristic value

Source node pheromone value of the backward ant is given by

$$T_r(i,j) = (1-\rho)\, T_r(i,j) + \Delta T_r$$

Where
P : Parameter of the trail node evaporation
ΔT_r : A quantity of pheromone which an ant releases

L. Energy efficient compressing sensing based transmission approach

Compressive sensing is an emanate technology uses under sampled measurements to recover the signal depends on the signals from the sensor nodes. WSN collects data with a huge number of nodes. CS technique can compress with simple encoding process and save the information exchange among inter nodes. In conventional compression algorithms, each sensor nodes require to know the global correlation structure and perform complex computation in sensors. In this paper an ECS is combined with Wireless Sensor Network to evolve an adept transmission of data at the receiver. N sensors are placed over the pasture and gather data in the territory. CS recovery algorithm is used for reconstructing the original power signal. Depending on the channel condition from each sensor to aggregator, efficient scheduling may have potential to improve performance for CS based WSN. In practice, channel gains can be different due to various reasons, such as path-loss and short term fading. So, reconstruction performance may be significantly affected by scheduling which exploits knowledge of channel condition. Thus it is obvious that reconstruction performance will be better, if we design a proper scheduling scheme which considers knowledge on channel state information. We consider a sensing architecture as shown in fig.4 where N is sensor nodes which are spread over the field area and accumulate data. To characterize the proposed methods, we make an easiest assumption that each sensor node makes perfect measurement of information without noise. An aggregator receives these data sets from active sensor nodes and by CS recovery algorithm it reconstructs the authenticated signal.
The received signal at the group head is given by

$$R_s = \Phi W + n_s \quad (4)$$

Where
ΦW : Compressed signal
n_s : Noise fall in the signal

M. Merits of the proposed system

- It provides efficient way of communication in the network.
- ECS based Compressive sensing provides data transmission of energy efficiency between the nodes.
- The process is performed within the WSN nodes so not need of any processor system.
- Minimize the energy redundancy while transferring the wasted data.
- Intensify the network lifetime by selecting optimal path.

IV. EXPERIMENTAL RESULTS AND ANALYSIS

- *Simulation results:* Network simulator (NS2) is used here to simulate and to calculate the performance of proposed method. The table given below shows the simulation parameter settings.

Table- I : Simulation Parameters

Parameter	Value
Simulation tool	NS2
Simulation time	10 sec
Maximum nodes available in the network	32
Area of deployment	1000*1000 m^2
Initial energy in every node	100J
Transmission energy	0.025J
Receiving energy	0.025J

The wireless communication among the mobile nodes are done using the NS2. Fig.5 displays the deployment of nodes where PASC algorithm is to employ TDMA scheduling and grouping techniques for sensing the air quality. Cluster heads are selected by the nodes inside the same group of nodes. During the selection of group head, all nodes should be active and the head of the cluster is being elected that has maximum energy in it.

A. Cluster node formation

The below fig.5 displays Cluster head node that gathering the data from their cluster member and then transfer data to base station using relay node. For this reason the node can store the energy while producing the data packets.

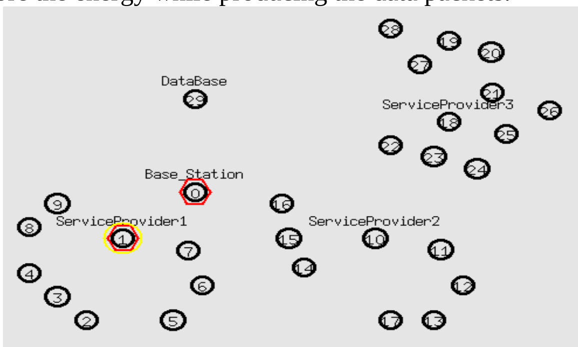

Fig. 5 Cluster node formation

B. PASC Algorithm formation

The figure given below (fig.6) indicates the shortest path is identified by ACO is used to route the data packets to reduce the wasted energy in transmission of redundant data via sensor nodes in the heavy densely network which enhances lifetime of given network by selecting the optimum path to outstretch the destination.

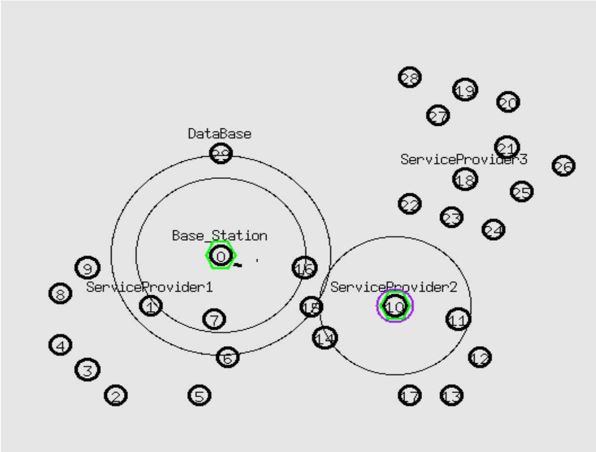

Fig. 6 PASC Algorithm formation

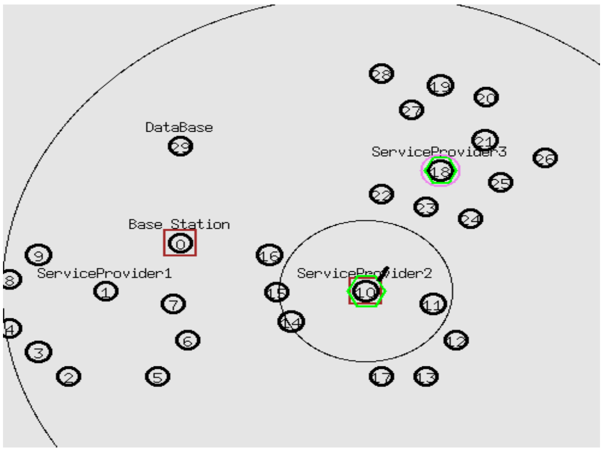

Fig. 7 PASC-ACO formations

Various algorithms are mainly used to compare based upon the following parameters.

C. End to end delay

It refers to the packets to be transmitted crosswise from source to destination in the network. This will be altered according to the change in the routing path. From fig 8 it is crystal clear that PASC-ACO provides the better performance rather than other protocols during end to end delay of sensing nodes to distribute the packets.

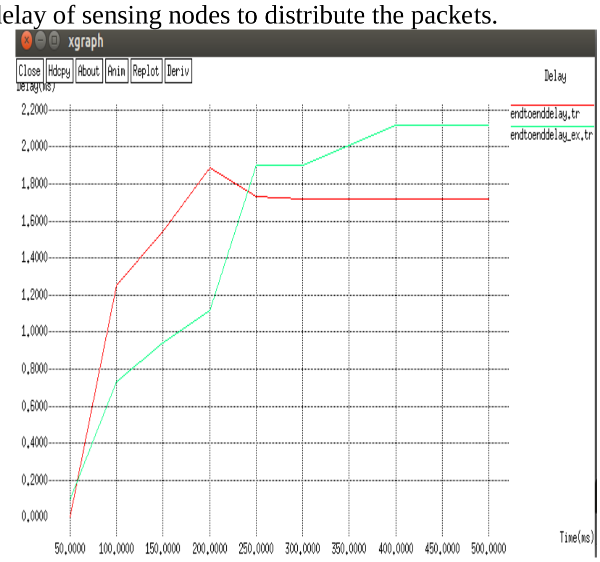

Fig. 8 An end to end delay of nodes

D. Packet delivery ratio

It is determined based on the packet received at the destination and the generated packets by the source. Fig.8 shows the efficient delivery of the data packets at the specified time by the proposed algorithm than the others. In the figure, it exhibits the packet delivery ratio's percentage of proposed system to the other algorithms. For PASC-ACO percentage of packet delivery ratio is 90% for 16sec and 85% for PASC.

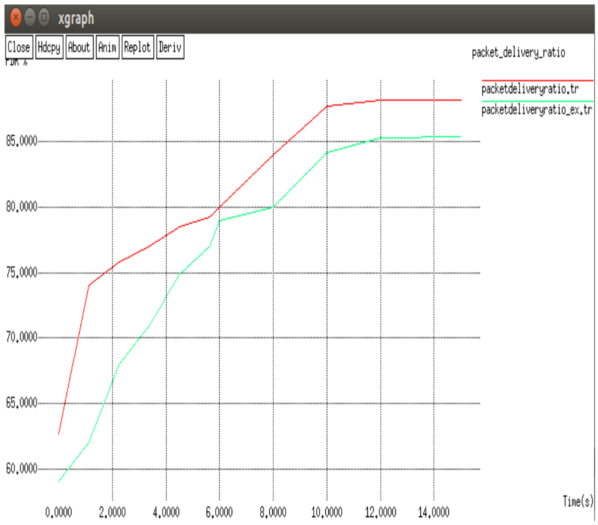

Fig. 8 Packet delivery ratio

E. Packet loss ratio

It is caused by network congestion which is evaluated as a percentage of packets lost corresponding to the packet sent. Fig.9. represents the packet loss ratio as a result of dynamic changes in coverage area. The figure demonstrates that the percentage of loss (POL) is 0.09 for PASC-ACO. This is better result than other system where the POL is 0.11 at the specific period.

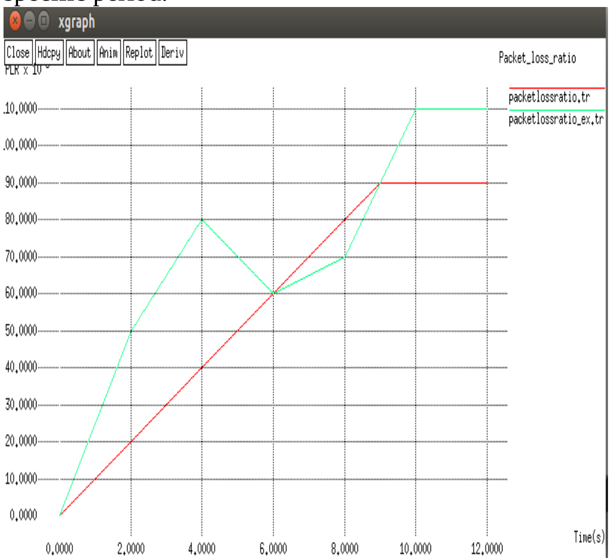

Fig. 9 Packet loss ratio

F. Network throughput

It is a rate of data transported successfully from source node to destination node in a stipulated period. Fig.10 shows the network's throughput which indicates the network's lifetime during periodic transmission of data packets. The figure shows for PASC-ACO the peak throughput is achieved at 16 sec is 317 Kb/s which surpasses PASC algorithm which acquires the ultimate throughput of 267 Kb/s.

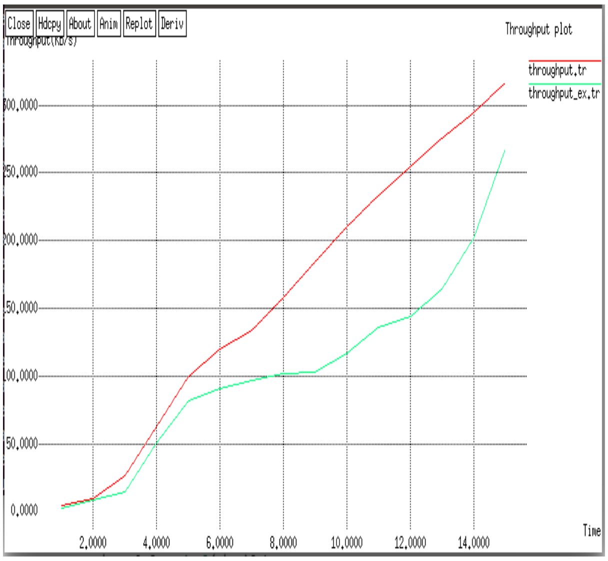

Fig.10 Throughput of the network

G. Residual energy rate

It is a rate of the energy being saved by the nodes for increasing the life period of the network. This is calculated in order to view the energy usage of the nodes. High energy consumption is most important factor for WSN for deploying

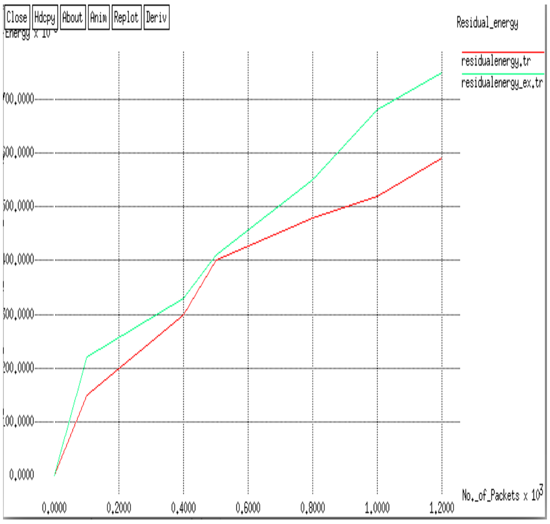

Fig.11 Residual energy of the nodes

Nodes in the densely environment. Figure.11 shows that the total energy remains within the system even when the number of packets are delivered is increased from 1000 to 1200. Our proposed system have ensures lower energy consumption correlated to other protocols. The figure apparently characterizes that the number of data packets categorizes from 1000 to 1200 and the percent of the energy obsesses after the data transmission is 0.59 for PASC-ACO and which is analogously better than PASC where data transmission is 0.75. We propose the distributed routing approach saves more energy than other existing network algorithm which ensures maximum lifespan and minimum wastage of energy absorbed among all nodes. The comparison between two algorithms with respect to the nodes performance at described time are given below in the table II. It is obvious that compared with other protocols PASC-ACO has better stability.

Table- II : Protocols Comparison

Parameters	PASC-ACO	PASC
Delay(ms)	1.72	2.12
Packet delivery ratio	90%	85%
Packet loss ratio	0.09	0.11
Throughput(Kb/s)	317	267
Energy consumption by the network (J)	0.59	0.75

V. CONCLUSION AND FUTURE ENHANCEMENT

In this paper we exhibits wireless sensor network are used for observing the Air pollution and in particular the deployment of sensor nodes using scheduling and clustering algorithm. Energy Efficiency is the major criteria of WSN as the nodes of the sensor are running on the battery power which is hard to recharge once it is deployed. Therefore to enhance the network's life duration and also to reduce the energy redundancy absorbed by the redundant data, we use Power Aware Scheduling algorithm and clustering approach based on ACO and energy efficient compressive sensing. PASC-ACO is to discover the best path for data transmission and TDMA scheduling is slotted to each node for stabilizing the load among all nodes. ECS is used to restore the signal for effective data packets transmission. From this work, the overall network lifetime is increased and power utilization is minimized. In the phase I, deployment of sensors and the transmission between them is simulated using NS2 software. The nodes transmit among themselves through PASC-ACO in order to increase the network's lifespan and to decrease energy utilization of the network. The delay for packet transmission is reduced and the cost for deployment of sensors is also reduced. In future, diverse wireless sensor network are constructed in a large scale for environmental application using the proposed PASC –ACO algorithm.

REFERENCES

1. Boubrima.A, Bechkit.W, and Rivano.H, "Error-bounded air quality mapping using wireless sensor networks," in Local Computer Networks (LCN), 2016 IEEE 41st Conference on IEEE, 2016, pp. 380–388.
2. Boucetta.C, Idoudi.H, Azzouz Saidane.L, PASC: Power Aware Scheduled Clustering in Wireless Sensor Networks. International Symposium on Wireless Communication Systems (ISWCS), Spain, August 2014.
3. Boucetta.C, HanenIdoudi, ''Ant Colony Optimization Based Hierarchical Data Dissemination in WSN'', IEEE TRANSACTION ON WIRELESS COMMUNICATION, VOL.13, NO.12, PP.782-787, 2014.
4. Cardei.M ,Pervaiz, M. O. and Cardei.I "Energy-efficient range assignment in heterogeneous wireless sensor networks," in ICWMC'06. International Conference on. IEEE, 2006, pp. 11–11.
5. Chakrabarty.K ,Iyengar.S.S, Qi.H and Cho.E, "Grid coverage for surveillance and target location in distributed sensor networks," IEEE Transactions, vol. 51, no. 12, pp. 1448–1453, 2002.
6. Diongue.D, Thiare.O, An Energgy Efficient Self-healing Mechanism for Long Life Wireless Sensor Networks, Innovations and Advances in Computing, Informatics, Systems Sciences, Networking and Engineering Lecture Notes in Electrical Engineering Vol. 313, pp. 599-605, 2015.
7. Donoho.D.L, "Compressed sensing.IEEE Transaction. Information Theory", 2006, 52(4):1289-1306.
8. Hao Yang, Keming Tang, Hua Xu, Licai Zhu, Xiwei Wang, Kun Qian, "Energy Efficient Transmission based on compressive sensing in WSN", IEEE 2017.

9. Heinzelman. W. B., Chandrakasan. A. P., and Balakrishnan. H, An application-specific protocol architecture for wireless microsensor networks, IEEE Transactions on Wireless Communications, vol. 1, No. 4, pp. 660670, 2002.
10. Iyengar. S, Wu. H.-C., Balakrishnan. N. Chang. S.Y., Biologically Inspired Cooperative Routing for Wireless Mobile Sensor Networks, IEEE Systems. Journal. Vol. 1, No. 1, pp. 2937, 2007.
11. Javaid. N, Mohammad. S. N, Latif. K, Qasim. U, and Khan. Z. A.,. Khan, HEER. M. A: Hybrid Energy Efficient Reactive Protocol for Wireless Sensor Networks, 2nd IEEE Saudi International Electronics, Communications and Photonics Conference (SIECPC 13), 2013.
12. Kadri. A, Yaacoub. E, Mushtaha. M, and Abu-Dayya. A, "Wireless sensor network for real-time air pollution monitoring," in ICCSPA, 2013 1st International Conference on. IEEE, 2013, pp. 1–5.
13. Khediria. S. E.L, Nasria. N, Weic. A, Kachourid. A, A New Approach for Clustering in Wireless Sensors Networks Based on LEACH , The 5th International Conference on Ambient Systems, Networks and Technologies (ANT-2014), the 4th International Conference on Sustainable Energy Information, Vol. 32, pp. 11801185, 2014.
14. Patel. M, Chandrasekaran. R, and Venkatesan. S, "Energy efficient sensor, relay and base station placements for coverage, connectivity and routing," in IPCCC 2005. 24th IEEE International. IEEE, 2005, pp. 581–586.
15. Saleem. K, Fisal. N, Al-Muhtadi. J, Empirical Studies of Bio-Inspired Self-Organized Secure Autonomous Routing Protocol, IEEE Sensor journal, Vol. 14, No 7, JULY 2014.
16. XieHui, Leila Azouzsaidane, ''Ant Colony Optimization Based Hierarchical Data Dissemination in WSN'', IEEE TRANSACTIONS ON WIRELESS COMMUNICATION, VOL.8, NO.15, PP.728-786, 2015
17. Ying Lin , Jun Zhang,, Henry Shu-Hung Chung,Wai Hung Ip, Yun Li ,Yu-Hui Shi, ''An Ant Colony Optimization Approach for Maximizing the Lifetime of Heterogeneous Wireless Sensor Networks'', IEEE TRANSACTIONS ON SYSTEMS, VOL. 42, NO. 3, PP.408-420, 2012.
18. Zhengmao ye, Habib Mohamadian, ''Adaptive Clustering Based Dynamic Routing of Wireless Sensor Network Via Generalized Ant Colony Optimization'', ELSEVIER Journal on Computer Networks, VOL.10,NO.2,PP.2212-667, 2014.

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