Enhanced Emergency Message Routing For WBANS Using AI Models

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Abstract

WBSN aims to distinguish ideal optimal deployment areas of the given sensor nodes with a pre-decided sensing range, and to schedule them to such that the network lifetime is maximum with the required coverage level. Since the upper bound of the network lifetime for a given network can be computed mathematically, WBSN learning is utilized to compute locations of deployment such that the network lifetime is maximum paper. In this paper ultimate objective is to realize an automated monitoring network so that detection applications of various emergency events can be practically implemented. Further, the nodes are scheduled to achieve this upper bound. This proposed framework used for artificial bee colony algorithm and particle swarm optimization for sensor deployment problem followed by a heuristic for scheduling. In exaction, ANT colony optimization technique is utilized to provide maximum network lifetime use. The comparative study demonstrates that artificial ACO performs better than bee colony algorithm for sensor deployment problem. The proposed heuristic was able to achieve the theoretical upper bound in all the tested cases.

Keywords—*WBSN, Sensor Deployment, Sensor scheduling, ABC algorithm, ANT Colony algorithm, PSO algorithm.*

1.INTRODUCTION

A. Wireless Body Sensor Network

Wireless Body sensor networks (WBSN), are spatially dispersed self-ruling sensors to monitor physical or ecological conditions, for example, temperature, sound, weight, and so forth and to helpfully go their information through the system to a principle area. With the fast improvement of system based innovations for example, Internet and pervasive registering, PC organizing turns out to be progressively unavoidable and imperative. As the center gadget, switches are in charge of associating diverse systems and sending information contents. In expansion to committed switch devices, end hubs in systems such as specially appointed systems likewise execute as switches. The more current systems are bi-directional, likewise empowering control of sensor action. The improvement of wireless sensor systems was roused by military applications, for example, war zone observation; today such systems are utilized as a part of numerous mechanical and shopper applications, for example, modern process checking and control, machine wellbeing observing. Wireless sensor systems (WSNs) comprise of hundreds or even a huge number of smaller devices each with detecting, preparing, and correspondence abilities to screen this present reality condition. In these systems, an extensive number of sensor hubs are conveyed to screen an immense field, where the operational conditions are regularly brutal or even unfriendly. Nonetheless, the hubs in WSNs have serious asset limitations because of their absence of preparing power, constrained memory and vitality. Since these systems are typically sent in remote places and left unattended, they ought to be outfitted with security components to protect against assaults, for example, hub catch, physical altering, listening stealthily, dissent of administration, and so on. Lamentably, customary security instruments with high overhead are not practical for asset obliged sensor hubs.

B. Routing Sensor deployment

Routing is major to how the Internet functions. Routing conventions coordinate the development of parcels between your PC and some other PCs it is communicating with. The Internet's routing convention, Border Gateway Protocol (BGP) is known to be vulnerable to mistakes and assaults. These issues can actually thump whole systems off the Internet or redirect movement to a unintended gathering. Routing is another very challenging design issue for WSNs. A properly designed routing protocol should not only ensure a high message delivery ratio and low energy consumption for message delivery, but also balance the entire sensor network energy consumption, and thereby extend the sensor network lifetime. Since the upper bound of network lifetime can be computed, we have to find the deployment locations such that the network lifetime is maximum. First use a heuristic to compute the deployment locations and then we use ABC and PSO algorithms to compute the locations.

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Wireless sensor networks share similarities with ad-hoc wireless networks. The dominant communication method in both is multi-hop networking, but several important distinctions can be drawn between the two. Ad-hoc networks typically support routing between any pair of nodes whereas sensor networks have a more specialized communication pattern.

2.SYSTEM MODELS

This proposed framework utilizes artificial bee colony algorithm and particle swarm optimization for sensor deployment problem followed by a heuristic for scheduling. In addition, ANT colony optimization technique is utilized to provide maximum network lifetime utilization. The relative investigation demonstrates that artificial ACO performs better than bee colony algorithm for sensor deployment problem. The proposed heuristic could accomplish the hypothetical upper bound in all the tested cases.

2.1 ABC algorithm

Artificial Bee Colony (EABC) Algorithm is an optimization algorithm based on the intelligent behavior of honey bee swarm. The colony of bees contains three groups: employed bees, onlookers and scouts. The employed bee takes a load of nectar from the source and returns to the hive and unloads the nectar to a food store.

After unloading the food, the bee performs a special form of dance called waggle dance which contains information about the direction in which the food will be found, its distance from the hive and its quality rating.

2.2 Heuristic For Sensor Deployment:

If any sensor node is idle (without monitoring any target), the node is moved to the least monitored targets' location. This is to ensure that all sensor nodes play their part in monitoring the targets. The sensor nodes are then sorted based on the number of targets it cover. The sensor node is placed at the middle of all the targets it covers. The next nearest target is identified and the sensor node is placed at the middle of all these targets. If it can cover this new target along with targets it was already monitoring, allow this move, and else discard the move.

This is done till the sensor node cannot cover any new target. At the end, upper bound is computed. The drawback of this approach is that it depends on the initial position of the sensor nodes. Though it may perform well for dense deployments, consistency cannot always be guaranteed.

2.3 PSO Based Sensor Deployment:

Particle Swarm Optimization (PSO) consists of a swarm of particles moving in a search space of possible solutions for a problem. Every particle has a position vector representing a candidate solution to the problem and a velocity vector. Moreover, each particle contains a small memory that stores its own best position seen so far and a global best position obtained through communication with its neighbor particles.

2.4 ACO For Sensor Scheduling:

As mentioned earlier, another objective of this paper is to schedule the sensor nodes such that the theoretical upper bound of network lifetime can be achieved.

3.ALGORITHMS

3.1 ABC Algorithm

1: Initialize the solution population BS

2: Evaluate fitness value

3: cycle_loop = 1

4: repeat

5: Search for new solutions in the neighborhood location

6: if new solution is better than old solution then

7: Memorize new solution and discard old solution

8: end if

9: Replace the discarded solution with a new randomly generated solution

10: Memorize the best solution

11: cycle_loop = cycle_loop + 1

12: until cycle = maximumcycles

3.2A heuristic for Sensor Deployment

1: Place sensor nodes randomly

2: for i = 1 to m do

3: if Si does not monitor any target then

4: Move Si to the least monitored target

5: Recompute sensor-target coverage matrix

6: end if

7: end for

8: S = Sensor nodes sorted in ascending order of number of targets it covers

9: for i = 1 to m do

10: repeat

11: Place Si at the center of all targets it covers

12: Move Si to the center of all targets it covers and its next nearest target

13: if Si can cover a new target then

14: Recompute sensor-target matrix

15: else

16: Discard move

17: end if

18: until Si can cover another target

19: end for

20: Compute upper bound of network lifetime using

3.3Algorithm PSO Algorithm

1: Initialize particles

2: repeat

3: for each particle do

4: Calculate the fitness value

5: if fitness value is better than the best fitness value (pbest) in history then

6: Set current value as the new pbest

7: end if

8: end for

9: Choose the particle with the best fitness value of all the particles as the gbest

10: for each particle do

11: Calculate particle velocity according to velocity update

12: Update particle position according to position update

13: end for

14: until maximum iterations or minimum error criteria is attained.

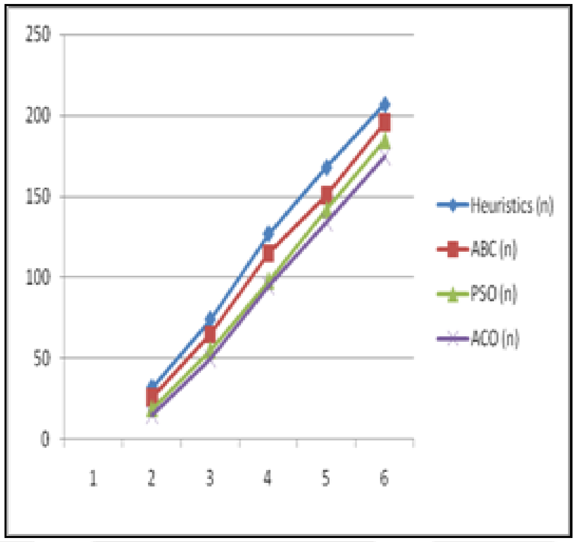
3.RESULTS

The following tables and describes experimental result for Heuristics, ABC, PSO algorithm and ACO algorithm in sensor deployment energy detection analysis. The table contains total number of wireless sensor node deployment and number of node count energy detection for Heuristics algorithm, number of node count energy detection for ABC algorithm, number of node count energy detection for PSO algorithm, number of node count energy detection for ACO algorithm details are shown.

Table.1 Sensor Deployments Scheduling

(Node Energy Detection)

S.NO	NUMBER OF WSN NODE (n)	Heuristics (n)	ABC (n)	PSO (n)	ACO (n)
1	50	32	26	19	15
2	100	74	65	55	50
3	150	127	115	98	95
4	200	168	151	142	134
5	250	207	196	185	175



Sensor Deployments Scheduling
(Node Energy Detection)

The following figure describes experimental result for Heuristics, ABC, PSO algorithm and ACO algorithm in sensor deployment energy detection analysis. The figure contains total number of wireless sensor node deployment and number of node count energy detection for Heuristics algorithm, number of node count energy detection for ABC algorithm, number of node count energy detection for PSO algorithm, number of node count energy detection for ACO algorithm details are shown.

The following Table.2 describes experimental result for Heuristics, ABC, PSO algorithm and ACO algorithm in sensor deployment time interval analysis. The table contains total number of wireless sensor node deployment and number of node time taken for Heuristics algorithm, number of node time taken for ABC algorithm, number of node time taken for PSO algorithm, number of node time taken for ACO algorithm details are shown.

Table 2. Sensor Deployments Scheduling
(Time Interval Analysis)

S.NO	NUMBER OF WSN NODE DEPLOYMENTS(n)	Heuristics (ms)	ABC (ms)	PSO (ms)	ACO (ms)
1	50	0.025	0.022	0.018	0.015
2	100	0.036	0.032	0.029	0.024
3	150	0.046	0.042	0.038	0.032
4	200	0.056	0.050	0.044	0.039
5	250	0.072	0.068	0.065	0.061

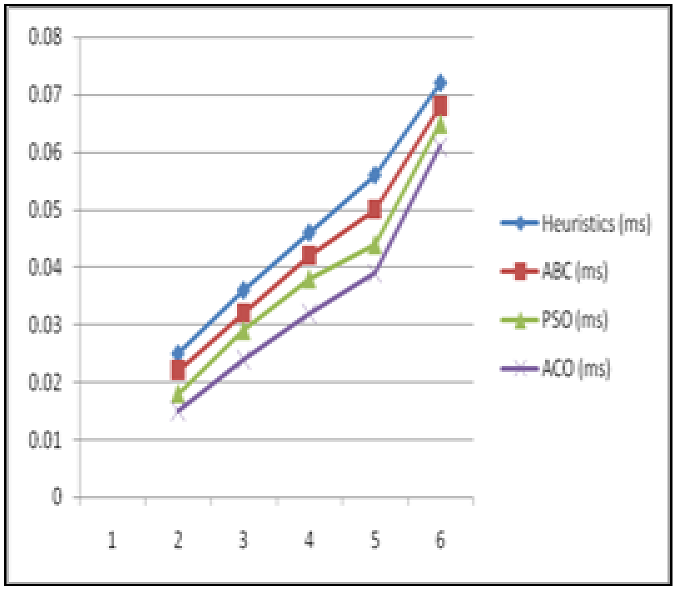


Fig 2 Sensor Deployments Scheduling (Time Interval Analysis

6.CONCLUSION

A heuristic calculation is sufficiently capable to plan the sensor hubs such that the system lifetime coordinates the hypothetical upper bound of system lifetime. System lifetime is stretched out by utilizing this technique for conveying at ideal areas with the end goal that it accomplishes most extreme hypothetical upper bound and afterward booking them in order to accomplish the hypothetical upper bound. In future, ponder identified with build up a complex blending model for the broadened sensor organization with better shading quality will be considered. For future work, plan to expand this strategy for arrangement and booking for probabilistic scope in remote sensor systems.

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8.REFERENCES

[1] Nan Zhao, Aifeng Ren, Fangming Hu, Zhiya Zhang, Masood Ur Rehman, Tianqiao Zhu, Xiaodong Yang and Akram Alomainy" Double Threshold Authentication Using Body Area Radio Channel Characteristics",JOURNAL OF LATEX CLASS FILES, VOL. 14, NO. 8, AUGUST 2015

[2] Chunqiang Hu, Student Member, IEEE, Hongjuan Li, Xiuzhen Cheng, Fellow, IEEE,Xiaofeng Liao, Senior Member, IEEE,"Secure and Efficient data communication protocol for Wireless Body Area Networks" IEEE TRANSACTIONS ON MULTI-SCALE COMPUTING SYSTEMS, VOL. , NO. , 11. 2015

[3] E.Kańtoch1-EMBS Member, P.Augustyniak1 -EMBS Member, M.Markiewicz2, D.Prusak,"Monitoring activities of daily living based on wearable wireless body sensor network"AGH University of Science and Technology in year 2014 as a research project No. 11.11.120.612.

[4] Mrudula Sarvabhatla, Chandra Sekhar Vorugunti,"An Energy Efficient Mutual Authentication Scheme for Secure Data Exchange in Health-Care Applications Using Wireless Body Sensor Network",Future Information Security Workshop, COMSNETS 2015

[5] Xin Huang1, Bangdao Chen2, Andrew Markham1, Qinghua Wang3, Zheng Yan3,4, Andrew William Roscoe1,"Human interactive secure key and identity exchange protocols in body sensor networks " Published in IET Information Security Received on 15th February 2012 Accepted on 5th June 2012 doi: 10.1049/iet-ifs.2012.0080

[6] Daojing He, Member, IEEE, Sammy Chan, Member, IEEE, Yan Zhang, Senior Member, IEEE and Haomiao Yang, Member, IEEE,"Lightweight and Confidential Data Discovery andDissemination for Wireless Body Area Networks",IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS, VOL. 18, NO. 2, MARCH 2014

[7] Syed Taha Ali, Vijay Sivaraman, and Diethelm Ostry,"Eliminating Reconciliation Cost in Secret Key Generation for Body-Worn Health Monitoring",IEEE TRANSACTIONS ON MOBILE COMPUTING, VOL. 13, NO. 12, DECEMBER 2014

[8] Wassim Drira, ´ Eric Renault and Djamal Zeghlache,"A Hybrid Authentication and Key EstablishmentScheme for WBAN",2012 IEEE 11th International Conference on Trust, Security and Privacy in Computing and Communications

[9] Ming Li∗ , Shucheng Yu∗ ,Wenjing Lou∗ and Kui Ren†, "Group Device Pairing based Secure Sensor Association and Key Management for Body Area Networks" ,This paper was presented as part of the main Technical Program at IEEE INFOCOM 2010.

[10] R.Latha, P.Vetrivelan∗ ,M.Jayannoth,"Balancing emergency message dissemination and network lifetime in wireless body area network using ant colony optimization and Bayesian game formulation",Please cite this article as: Latha, R., Informatics in Medicine Unlocked (2017), http://dx.doi.org/10.1016/j.imu.2017.01.001