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Research paper

Implementation and performance analysis of AODV-PSO with AODV-GA and AODV-ABC

Kavita [1]*, Prashant Sahai [2], Sonu Mittal [3]

[1] *Assistant Professor, School of Computer Science and Engineering, Lovely Professional University*
[2] *Professor and Joint Director, Dept. of Computer Science and Engineering, Jaipur National University, Jaipur*
[3] *Professor (Associate), Dept. of Computer Science and Engineering, Jaipur National University, Jaipur*
**Corresponding author E-mail: dhullkavita@yahoo.in*

Abstract

To upgrade the system lifetime fittingly many steering conventions and bunch based calculations are utilized to accomplish the execution need in WSN. From existing examination approaches, advancement of vitality in correspondence turns out to be extremely basic. Some portion of a vitality utilization of every sensor hub has a vital part while imparting among other sensor hubs for expanding lifetime of the WSN. This examination work concentrates on vitality protection in every sensor hub by utilizing AODV convention with PSO, GA and ABC based bunching and group head choice vitality enhancement calculation. AODV gives a course to correspondence while the group head is chosen utilizing PSO, GA, and ABC in view of the separation from the bunch part hub to sink hub and the leftover vitality in that hub. Reproduction comes about demonstrate that the inspiration of this work enhances the lifetime of the system exceptionally.

Keywords: *Wireless Sensor Network; Clustering; Routing Protocols.*

1. Introduction

In the contemporary period innovation is propelling step by step. It makes our life all the more simple, robotized and secure. Remote Sensor Networks (WSNs) is one such innovation which assumes a vital part in our everyday life. A remote sensor arrange (WSN) as the name proposes is a remote system with spatially dispersed self-ruling gadgets making utilization of sensors for checking physical and also ecological conditions. WSNs was at first spurred by military applications like combat zone observation, however now it discovers its applications in territories like medicinal services applications, ecological checking, range observing, home robotization, movement control and so on. Every hub in a sensor organize is furnished with a microcontroller, a radio handset, detecting gadget and a vitality source (generally battery). Sensor hubs having imperatives on assets like memory, vitality, computational speed and band width [1].

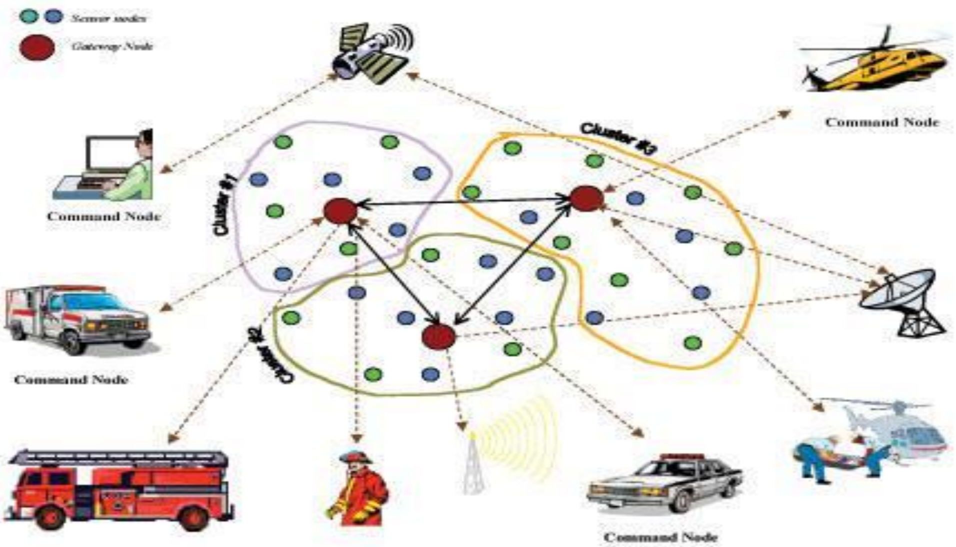

Fig. 1: Wireless Sensor Network.

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Lately WSN have been seen and looked into. These systems are made out of hundreds or thousands of sensor hubs which have a wide range of sorts of sensors. Utilizing their sensors, hubs gather data about their condition, for example, light, dampness, movement and temperature and so forth. Sensor hubs ought to send their gathered information to decided hubs called Sink. The sink hub forms information and performs fitting activities. A wide range of ways exist between every hub and sink. Utilizing directing convention, hubs decide a way to send information to sink. As in customary systems, steering conventions in WSNs consider diverse parameters in their directing procedure relied upon their application. WSNs have acquired and one of a kind attributes contrasted and conventional systems. These systems have numerous restrictions, for example, registering power, correspondence extend, storage room, vitality supply and so on. Hubs have lacking essential vitality sources and in the greater part of utilizations they are not rechargeable, accordingly vitality utilization is the most imperative issue in steering process for WSNs. Hub's vitality is diminished because of utilizing sensors, preparing data and speaking with different hubs. Interchanges are the primary component in vitality utilization [2].

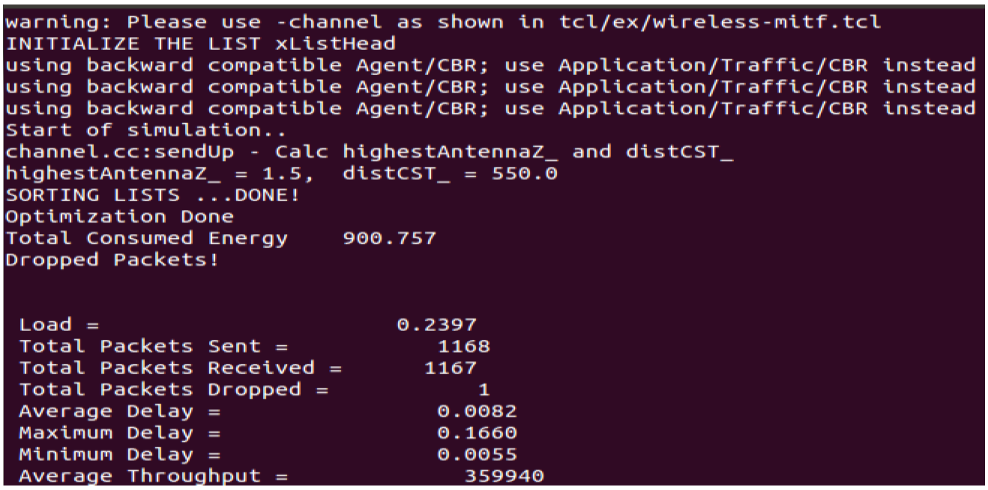
2. Literature survey

Md Azharuddin et al. [2014] gave conveyed grouping and steering calculations together alluded as DFCR. The calculation is shown to be vitality efficient and blame tolerant. The DFCR utilizes a disseminated run time recuperation of the sensor hubs because of surprising breakdown of the bunch heads (CHs). It deals with the sensor hubs which have no CH inside their contact extend. Performed broad examinations on the proposed calculation utilizing different system conditions. The new outcomes are contrasted with the current calculations with exhibit the quality of the calculation as far as different execution criteria [5]
M. Emre Keskin et al. [2016] proposed a numerical model which coordinates WSN plan choice on sensor places, information courses, action plans, course of the portable sink(s) and after that present two heuristic techniques for the arrangement of the model. Shown the proficiency and exactness of the heuristics on a few different arbitrarily made issue cases on the premise of broad numerical experimentations [14].
Hussein Mohammed Salman [2015] examines conventions into numerous classifications relying upon set of measurements like the level of protection and security, functionalities, framework, or the application which utilized for it. Analyzed the dependability and accessibility of each class of directing conventions, and the vitality use of every convention. [3].
Abdulaleem Ali Almazroi and Ma Ngadi [2013] presented an extensive survey and arrangement on the current directing sensor conventions, which are especially proposed for WSNs. The fundamental inspiration driving the advancement of each steering convention class and clear up the operation of various conventions in detail identified with vitality issues, with featuring their favorable circumstances and drawbacks. Besides, the current multipath steering approach is widely utilized as a part of WSNs keeping in mind the end goal to show signs of improvement arrange execution, for example, unwavering quality, stack adjusting, transfer speed conglomeration, adaptation to non-critical failure and QoS Improvement. Subsequently, underlined the idea of the multipath directing methodology and its basic difficulties, moreover the central inspirations for using this procedure in WSNs. Moreover, we think about and assess the cutting edge multipath directing conventions that in light of vitality mindful technique, QoS multipath steering and adaptation to non-critical failure [4].
Pratyay Kuila and Prasanta K. Jana [2014] arranged Linear/Nonlinear Programming (LP/NLP) details of these issues sought after by two proposed calculations for the same in view of molecule swarm improvement (PSO). The steering calculation is extended with a viable molecule encoding framework and multi-reason fitness work. The bunching calculation is exhibited by considering vitality protection of the hubs through load adjusting. The proposed calculations tried widely and the outcomes are assessed with the current calculations to show their predominance as far as system life, dead sensor hubs, vitality utilization and conveyance of aggregate information bundles to the base station [11].

3. Proposed work and results

3.1. Proposed Solution

Beforehand the work done on WSN for the most part centered around lessening vitality utilization in Enhanced PSO convention with bunch vitality streamlining calculation and contrast and GA, and ABC procedures. Be that as it may, delay presented and the parcel dropped in the correspondence expends a ton of vitality in the trade key which lessens the lifetime of system in wide sense. Henceforth lifetime of system lessens at the cost of vast parcel drops and more deferral with lesser throughput. Next to no consideration has been given to the reality of giving better execution measurements. There is a need to address for such confinements while devouring less vitality.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warning: Please use -channel as shown in tcl/ex/wireless-mitf.tcl
INITIALIZE THE LIST xListHead
using backward compatible Agent/CBR; use Application/Traffic/CBR instead
using backward compatible Agent/CBR; use Application/Traffic/CBR instead
using backward compatible Agent/CBR; use Application/Traffic/CBR instead
Start of simulation..
channel.cc:sendUp - Calc highestAntennaZ_ and distCST_
highestAntennaZ_ = 1.5,  distCST_ = 550.0
SORTING LISTS ...DONE!
Optimization Done
Total Consumed Energy    900.757
Dropped Packets!


 Load =                        0.2397
 Total Packets Sent =             1168
 Total Packets Received =        1167
 Total Packets Dropped =            1
 Average Delay =                0.0082
 Maximum Delay =                0.1660
 Minimum Delay =                0.0055
 Average Throughput =             359940
```
Fig. 2: Simulation of AODV-GA.

Figure 2 shows the performance evaluation of AODV with Genetic Algorithm for simulation time 20s. Total consumed energy is calculated.

Table 1: Energy Consumption of AODV-GA

	AODV-GA
Total Consumed Energy	900.757

Table 1 depicts that at simulation time 20s the Total consumed energy in AODV-GA is 900.757

Table 2: Performance Metrics of AODV-GA

Performance Metrics	AODV-GA
Total Packets Sent	1168
Total Packets Received	1167
Total Packets Dropped	1
Packet Delivery Ratio	0.9991
Average Delay	0.0082
Maximum Delay	0.1660
Minimum Delay	0.0055
Average Throughput	359940

The table 2 is about the evaluation of the modified AODV-GA. The evaluation is performed on the basis of Total packets dropped, Packet Delivery Ratio, Average delay, Minimum delay, Maximum delay and Average throughput.

Figure 3 shows the performance evaluation of AODV with Artificial bee colony optimization for simulation time 20s. Total consumed energy is calculated.

Table 3: Energy Consumption of AODV-ABC

	AODV-ABC
Total Consumed Energy	900.785

Table 3 depicts that at simulation time 20s the Total consumed energy in AODV-ABC is 900.785.

Table 4: Performance Metrics of AODV-ABC

Performance Metrics	AODV-ABC
Total Packets Sent	1168
Total Packets Received	1167
Total Packets Dropped	1
Packet Delivery Ratio	0.9991
Average Delay	0.0082
Maximum Delay	0.1660
Minimum Delay	0.0055
Average Throughput	359940

The table 4 is about the evaluation of the modified AODV-ABC. The evaluation is performed on the basis of Total packets dropped, Packet Delivery Ratio, Average delay, Minimum delay, Maximum delay and Average throughput.

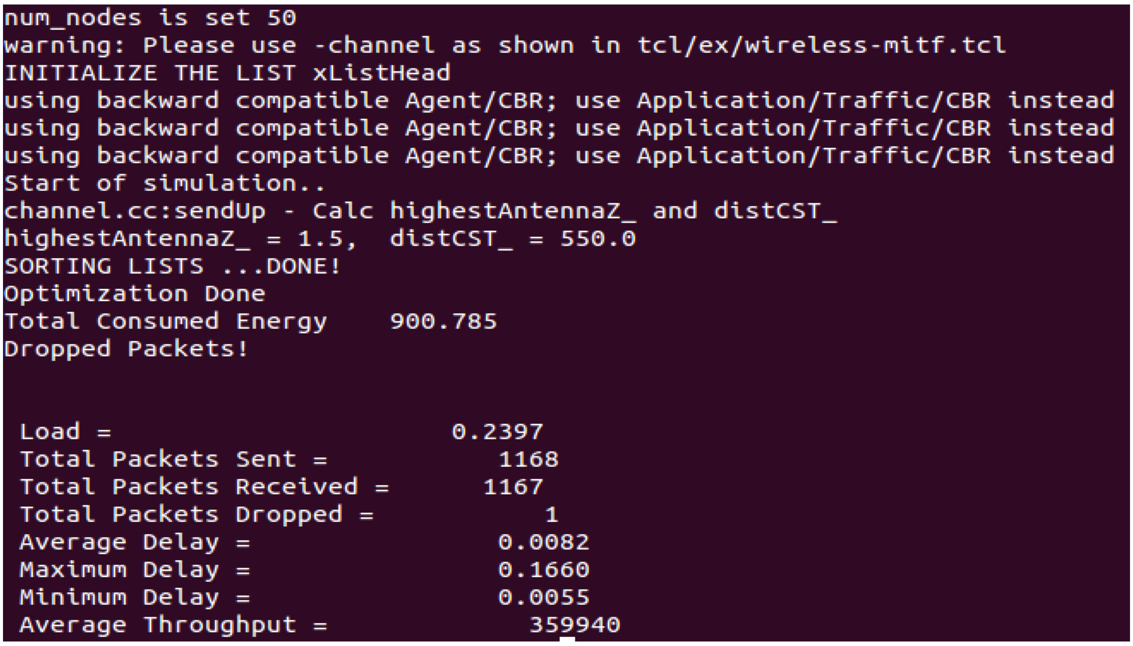

Fig. 3: Simulation of AODV-ABC.

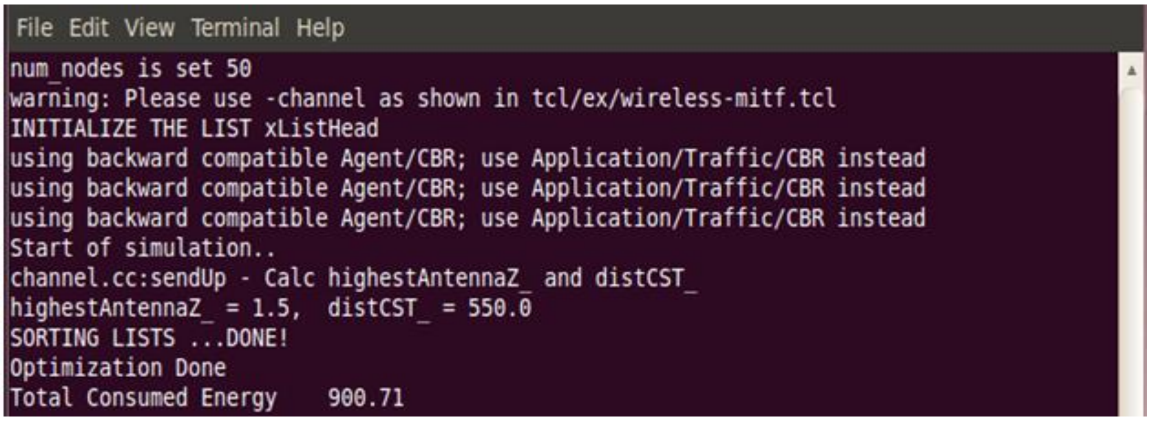

Fig. 4: Consumed Energy of AODV-PSO.

Table 5: Energy Consumption of AODV-PSO

	AODV-PSO
Total Consumed Energy	900.71

In the table 5 there is a comparison between the consumed energy of the modified AODV-PSO. Simulation time 20s the Total consumed energy in AODV-PSO is 900.71.

Table 6: Performance Metrics of AODV-PSO

Performance Metrics	AODV-PSO
Total Packets Sent	1168
Total Packets Received	1167
Total Packets Dropped	1
Packet Delivery Ratio	0.9991
Average Delay	0.0082
Maximum Delay	0.1660
Minimum Delay	0.0055
Average Throughput	359940

Table 7: Energy Consumption of AODV-PSO, AODV-GA, AODV-ABC

Optimization	Consumed Energy
PSO	900.71
GA	900.757
ABC	900.785

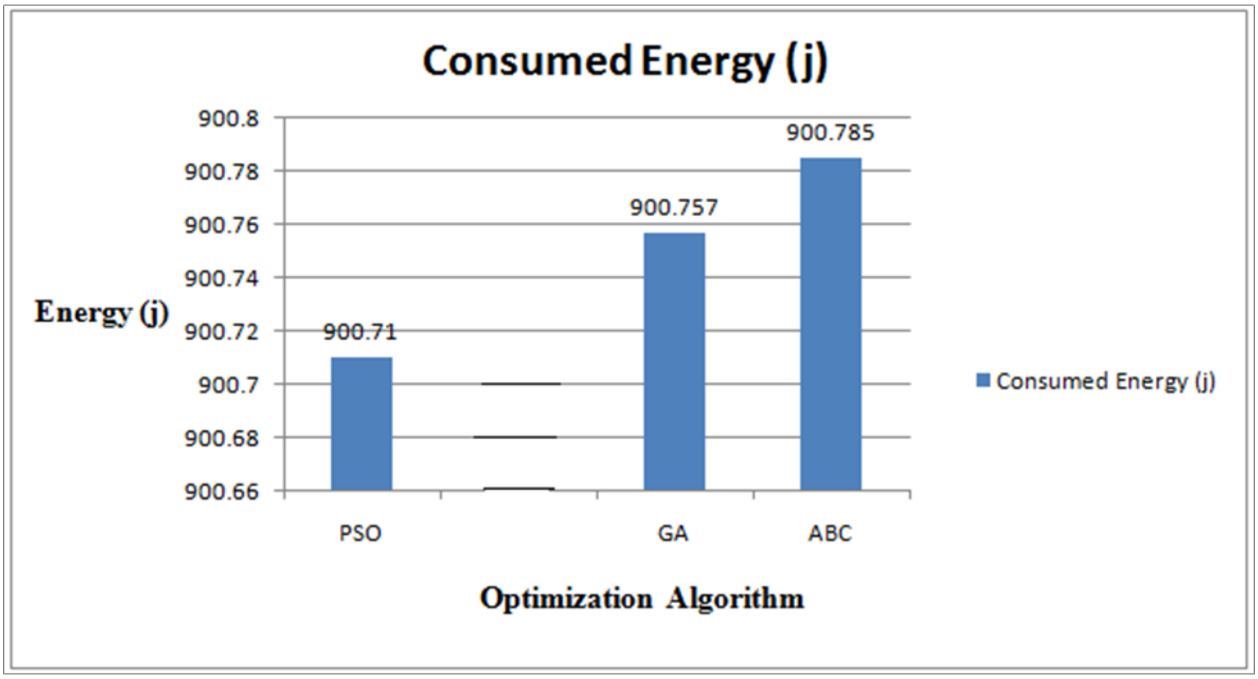

Fig. 5: Energy Consumption of Network by Various Optimization Algorithms.

Figure 5 shows PSO is more energy efficient as compared to other optimization algorithms. Artificial Bee Colony optimization gives worst performance among all the optimization Algorithms.

4. Conclusion

In WSNs the system layer is by and large used to actualize the directing of the approaching information. It is realized that normally in multi-jump arranges the source hub can't interface the sink specifically. In this way, middle person sensor hubs need to hand-off their bundles. The execution of directing tables gives the arrangement. This exploration work concentrates on vitality protection in every sensor hub by utilizing AODV convention with PSO , GA, ABC based bunching and group head choice vitality advancement calculation.

AODV gives a course to correspondence while the bunch head is chosen utilizing PSO ,GA , ABC, in light of the separation from the group part hub to sink hub and the remaining vitality in that hub. Reenactment comes about demonstrate that the inspiration of this work enhances the lifetime of the system exceptionally. The Performance of Wireless Sensor Network is upgraded by the proposed Algorithm in light of AODV with PSO, GA, ABC enhancement procedures regarding expanded Packet conveyance proportion, diminishing the normal deferral, expanded normal throughput and diminishing aggregate vitality utilization amid execution. The Proposed Algorithm initially ascertains the course and after that the course is advanced with PSO , GA, ABC. The execution measurements, for example, PDR, normal deferral, normal throughput, add up to vitality utilization are assessed and contrasted and the focused AODV. The assessment of work is done in the Network Simulator instrument. The reenactment result demonstrates this proposed plot in the work gives enhanced execution keeping in mind the end goal to upgrade the lifetime of the remote sensor organize.

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