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Extending the Lifetime of Wireless Sensor Networks

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Abstract:
It is notable that energy is amongst the most basic resource for battery-powered WSNs. To enhance the system lifetime as far as might be possible, energy efficiency becomes one of the essential standards in the WSN protocol design. In order to utilize the restricted energy which is used at sensor nodes more proficiently, most available routing schemes try to find the minimum energy routing path to the sink to optimize energy usage at nodes. Be that as it may, the question emerges whether it is adequate to concentrate just on the energy effectiveness when planning protocol design for WSNs or on different objectives, for example, network lifetime and coverage to be considered. In WSNs the network layer is for the most part used to implement the routing of the incoming data. It is realized that for the most part in multi-hop organizes the source hub can't associate the sink straightforwardly. Thus, mediator sensor node needs to relay their parcels. The usage of routing tables gives the solution. This research work emphases on energy preservation in each sensor node by using AODV protocol with PSO-based clustering and cluster head selection energy optimization algorithm. AODV provides a route for communication while the cluster head is selected using PSO, based on the distance from the cluster member node to mobile sink node and the remaining energy in that node. Due to which the proposed work not only find the route but also optimize the route as well with PSO on AODV protocol. AODV finds the route efficiently then further the route is optimized with PSO protocol.

Keywords: Wireless Sensor Network, Why wireless networks, Limitations of WSN, Advantages of Clustering WSN,

1. INTRODUCTION

A wireless sensor network (WSN) as the name proposes is a wireless system with spatially distributed autonomous gadgets making utilization of sensors for checking physical and also natural conditions. WSNs was at first motivated by military applications like battlefield surveillance, however now it discovers its applications in fields like medicinal services applications, environmental monitoring, region monitoring, home robotization, movement control and so on. Every node in a sensor network is outfitted with a microcontroller, a radio handset, detecting gadget and a energy source (normally battery). Sensor hubs having requirements on resources like memory, vitality, computational speed and transmission capacity [1].

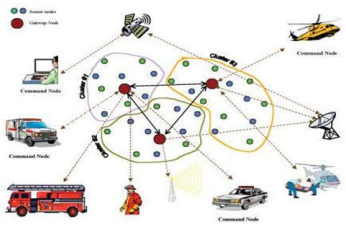

Figure. 1.1 Wireless Sensor Network [1]

1.2 WORKING OF WSN:

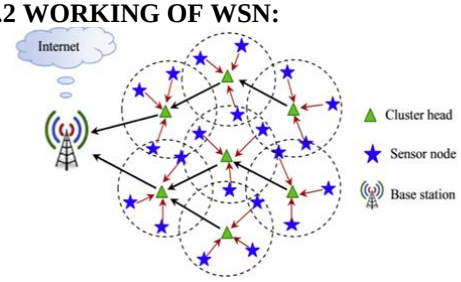

Figure.1.2 A model of wireless sensor network. [5]

In a group based WSN (given in Fig. 1.2), the sensor hubs are composed into various groups, called clusters. Each gathering has a pioneer, called cluster head (CH) and every sensor hub belongs with one and just a single cluster.

1.2.1 Advantages of Clustering WSN:

a)It empowers information aggregation at cluster head to dispose of the uncorrelated information and redundant, in this manner diminishing energy usage of the sensor nodes.
b) Routing can be all the more effectively managed in light of the fact that only CHs need to keep up the nearby course setup of different CHs and accordingly requiring little routing information. This in turn upgrades the versatility of the system significantly. It additionally protects correspondence transfer speed as the sensor hubs speak with their CHs just and in this manner maintain a strategic distance from the exchange of duplicate messages among themselves [5, 11].

1.3 WHY WIRELESS NETWORKS?

In this day and age where the technology comes within seconds, and everybody want to change themselves with the tip of their finger whenever - anyplace along these lines require to the establishment of a wireless system i.e. a system without links [1].

1.3.1 Advantages The fundamental explanations behind the acknowledgment of wireless systems are as per the following:
a) Convenience Wireless Networks help connecting to the internet more effectively. Presently there is no major reason to pull an Ethernet connection through roofs and walls. Individuals can associate anyplace with a sufficiently solid marker (signal) and a wireless system.
b) Availability Wireless Networks WLANs are accessible anyplace on the earth at a moderate charge.
c) Easy organization: The situation of the sensor hubs require not be built or foreordained. They can be mounted all around,

especially in hazardous areas where cabling may not be achievable [15].

1.4 LIMITATIONS OF WSN

WSNs are an uncommon kind of system which has numerous limitations, for example, low data transfer capacity, restricted power supplies and little memory estimate.

1. Sensor hubs are worked on constrained power sources [2]
2. Little memory estimate [12]
3. Packet loss because of transmission blunders
4 .Variable limit joins
5. Frequent disconnection/parcels
6. Restricted correspondence data transfer capacity [14]
7. Broadcast nature of the correspondences
8. Powerfully changing topologies/routes because of portability
9. Absence of portability awareness by system/application

2. RELATED WORK

A number of journals and research papers published have been studied. The various aspects of the problem were studied. **Vandana Jindal [2011**, examined different reasons to switch over between a wired system to a wireless network are distributing web access, alongside the files and printers, playing games, not any more messy wires required. For a more transportable clarification where a client needs to get to arrange resource progressing, radio innovation is the main normal decision. Besides, individuals utilizing their cell phones to get to online news and other data once a day are rising rapidly. As indicated by a report issued by promoting research firm comScore in March 16 between the time of January 2008 to January 2009, the quantity of individuals who utilized their gadgets consistently dramatically increased, from 10.8 million to 22.4 million [1].

Sartajvir Singh et al. (2014) this paper incorporates a close relative investigation on CVA based change distinguishing proof strategies, for instance, CVA, MCVA, ICVA and CVAPS. The paper similarly traces the essential facilitated CVA frameworks close by their characteristics, features and downside Based on investigate comes about, it has been seen that CVAPS methodology has more unmistakable potential than other CVA techniques to evaluate the general changed information in excess of three particular MODerate assurance Imaging Spectro-radiometer (MODIS) satellite instructive accumulations of different district [4].

Md Azharuddin et al. [2014] provided conveyed bunching and steering calculations together alluded as DFCR. The calculation is exhibited to be vitality efficient and blame tolerant. The DFCR utilizes a disseminated run time recuperation of the sensor hubs because of startling breakdown of the group heads (CHs). It deals with the sensor hubs which have no CH inside their contact go. Performed broad analyses on the proposed calculation utilizing different system conditions. The new outcomes are contrasted with the current calculations with show the quality of the calculation as far as different execution criteria [5].

Ahmed E.A.A. Abdulla et al. [2012] presented an answer through a crossover approach that joins two routing procedures, progressive multihop directing and at multi-bounce directing. The previous endeavors to lessen the measure of movement by receiving information thickness, and the last intends to reduce the aggregate power utilization in the network. Deductively examine the power usage of gave calculation, and after that express through broad recreations that the proposed plan can amplify the network lifetime by removing the hotspot issue [6].

M. Emre Keskin et al. [2014] proposed a numerical model which incorporates WSN plan choice on sensor places, information routes, action plans, route of the portable sink(s) and after that present two heuristic strategies for the arrangement of the model. Shown the effectiveness and exactness of the heuristics on a few different haphazardly made issue cases based on broad numerical experimentations [14].

Muhammad Saleem et al. [2011] presented an unavoidable investigation of these protocols. Clarified the general theory of swarm insight and of its usage to routing. Presented a novel terminology for directing protocols in wireless sensor arranges and apply it to order the examined protocol. End up with a noteworthy examination of the status of the traits, bringing up various basic issues related with the utilization of scientific technique and appraisal measures, and perceive some future research rules [15].

3. PROPOSED WORK

This dissertation performs following tasks to actualize PSO on AODV protocol with PSO having cluster energy optimized.

. Study of PSO and AODV protocol.

•Implementation of PSO on AODV protocol.

•Compare the outcomes in NS2 utilizing PSO on AODV with AODV.

In this paper we have proposed a protocol in light of PSO with AODV protocol to improve the lifetime of a network. First of all AODV protocol finds the route for correspondence of nodes. The chosen route should be optimized. Since various routes utilize diverse energy as the nodes increments in the route of network, the more energy is required. Along these lines PSO protocol is utilized for optimization of route. The improved route uses less energy.

The algorithm of the procedure is as follows

For each particle
  Initialize particle 'pi'
END
Do
  For each particle
    Calculate fitness value F[pi]
    If the fitness value is better than the best fitness value i.e. pbest value
set [current value] =[new pBest]
  End
  Assign all the particles as the gBest by choosing the particle with the pbest
  For each particle
    Compute the particle velocity according to equation (a)
    Update particle position according to equation (b)
  End

4 RESULTS & ANALYSIS

The key parameter of study is the network lifetime. Energy consumption of AODV and AODV-PSO are compared below:

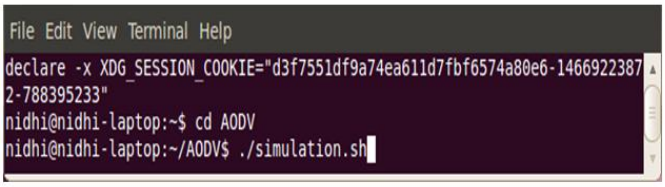

Figure 4.1 Simulation of AODV

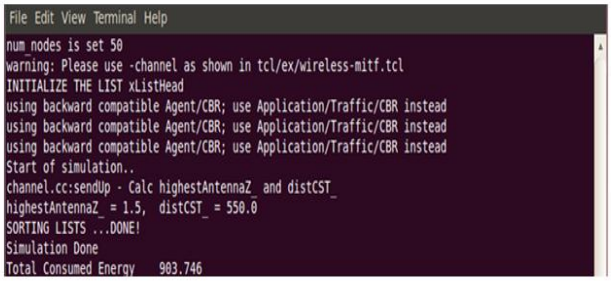

Figure 4.2 Consumed energy of AODV

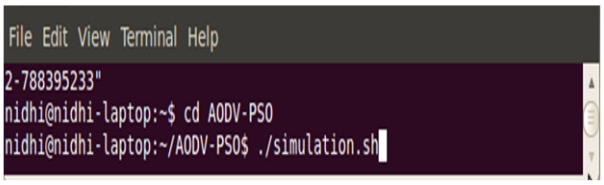

Figure.4.3 Simulation of AODV-PSO

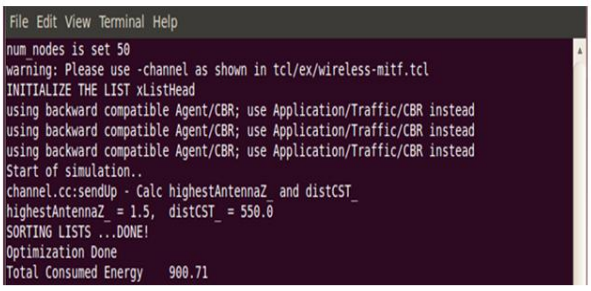

Figure 4.4 Consumed energy of AODV-PSO

Table 4.2 Energy consumption of AODV

	AODV
Total Consumed Energy	903.746

Table 4.2.1 Energy consumption o AODV-PSO

	AODV-PSO
Total Consumed Energy	900.71

In the tables 4.2 & 4.2.1 there is a comparison between the consumed energy of the simple AODV and the modified AODV-PSO. Table 4.2& 4.2.1 depicts that at simulation time 20s the Total consumed energy in AODV is 903.746 and in AODV-PSO is 900.71

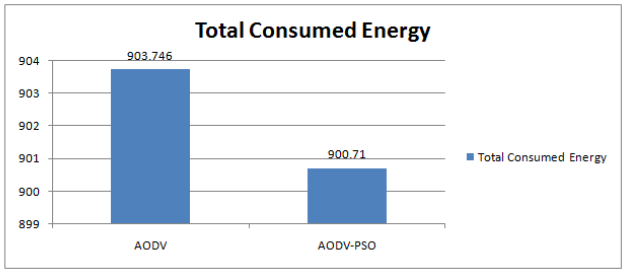

Figure 4.5 Total consumed energy of AODV & AODV-PSO

The figure 4.5 depicts the graphical view of comparing of total consumed energy of simple AODV and the modified AODV-PSO.

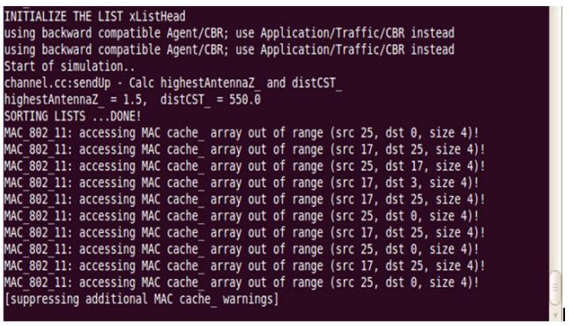

Figure 4.6 Lifetimes of AODV & AODV-PSO

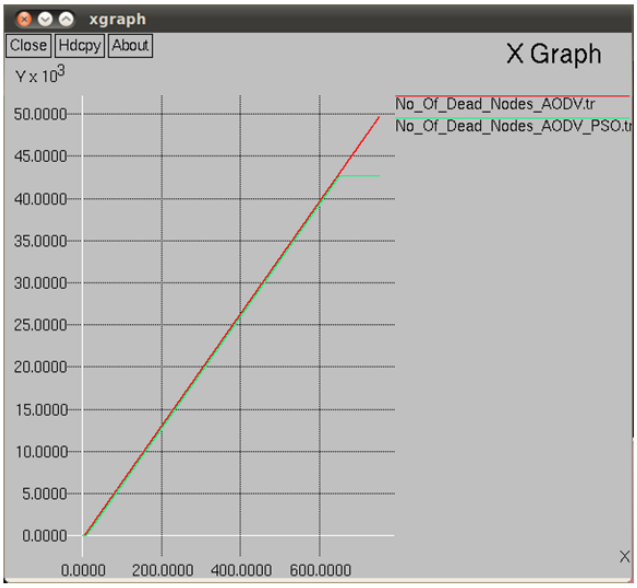

Figure 4.7 No. of Dead Nodes in AODV & AODV-PSO

The figure 4.7 depicts the graphical view of comparing of dead nodes in simple AODV and the modified AODV-PSO. At simulation time 750s AODV reported all the nodes dead while in AODV-PSO dead nodes are 42.

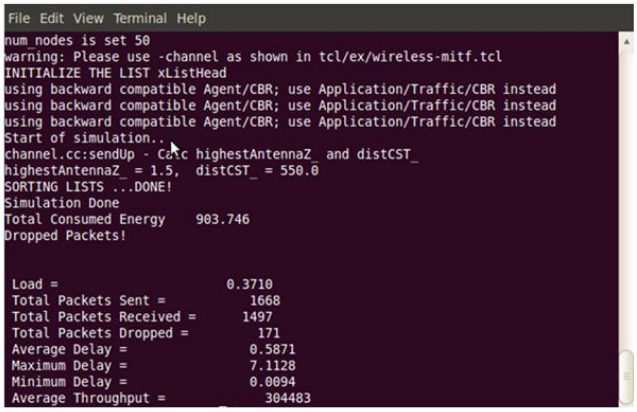

Figure 4.7 Performance evaluation of AODV

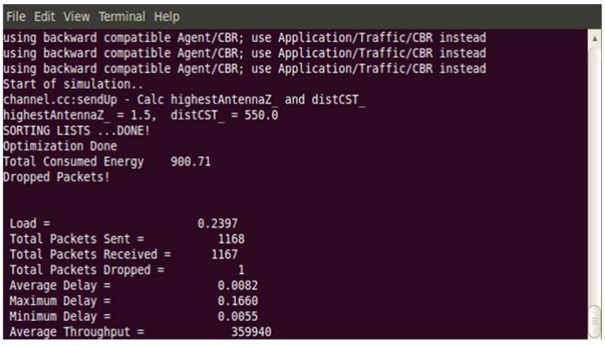

Figure 4.8 Performance evaluation of AODV-PSO

Table 4.3Performance metrics of AODV

Performance Metrics	AODV
Total Packets Sent	1668
Total Packets Received	1497
Total Packets Dropped	171
Packet Delivery Ratio	0.8974
Average Delay	0.5871
Maximum Delay	7.1128
Minimum Delay	0.0094
Average Throughput	304483

Table 4.3.1Performance 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

The tables 4.3 & 4.3.1 is about the evaluation of the modified AODV-PSO. The evaluation is performed on the basis of Total packets dropped, Packet Delivery Ratio, Average delay, Minimum delay, Maximum delay and Average throughput.

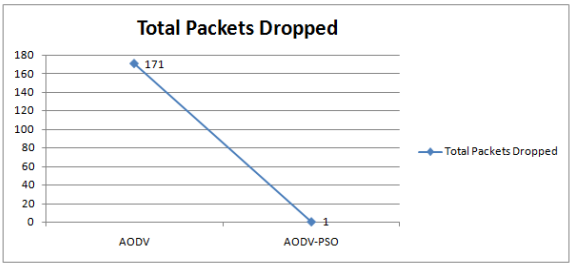

Figure 4.9 Packets dropped of AODV & AODV-PSO
The figure 4.9 depicts the graphical view of comparing of total packets dropped of simple AODV and the modified AODV-PSO.

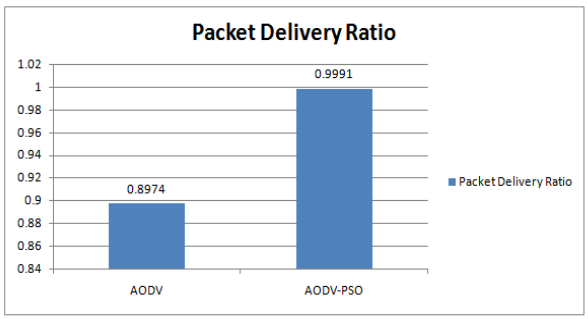

Figure 4.10 Packet Delivery Ratios of AODV & AODV-PSO

The figure 4.10 depicts the graphical view of comparing of Packet Delivery Ratios of simple AODV and the modified AODV-PSO.

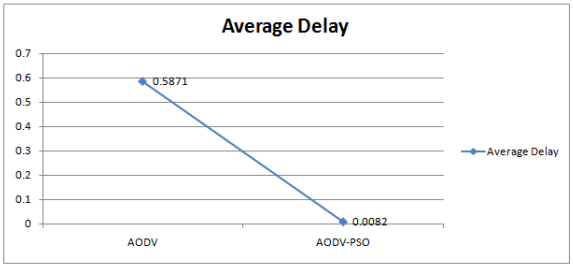

Figure 4.11 Average delays of AODV & AODV-PSO
The figure 4.11 depicts the graphical view of comparing of average delays of simple AODV and the modified AODV-PSO.

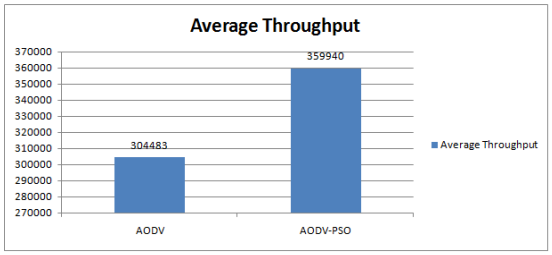

Figure 4.12 Average throughputs of AODV & AODV-PSO
The figure 4.12 depicts the graphical view of comparing of average throughputs of simple AODV and the modified AODV-PSO

5. CONCLUSION & FUTURE SCOE

This research work centers around energy preservation in every sensor node by utilizing AODV protocol with PSO-based clustering and cluster head choice energy improvement calculation. AODV gives a route to correspondence while the cluster head is chosen utilizing PSO, in view of the distance from the cluster member node to sink node and the remaining energy in that node. Simulation results showed that this work enhances the lifetime of the network exceptionally. The Performance of Wireless Sensor Network is improved by the proposed Algorithm in light of AODV with PSO protocol as far as increased Packet delivery ratio, diminishing the average delay, expanded normal throughput and diminishing average energy utilization in execution. The Proposed Algorithm initially figures the route and after that the route is enhanced with PSO. The execution measurements, for example, PDR, normal postponement, normal throughput, add up to energy utilization are assessed and contrasted and the competitive AODV. The assessment of work is done in the Network Simulator tool. The simulation result demonstrates this proposed scheme in the work gives enhanced execution to upgrade the lifetime of the wireless sensor network.

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