Lifetime Enhancement of Nodes in Self Adaptive Sleep Wake-up Technique using Hybrid Algorithm in Wireless Sensor Network

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Abstract: -WSN sensors, for the most part sent in the non-open condition, are controlled utilizing little batteries alongside systems for power collecting where supplanting batteries are impossible. Depending on a battery confines the sensor's lifetime as well as makes effective plan and the executives of WSNs a genuine test. The vitality supply restriction incited many research on WSN all the convention layers. This undertaking center around productive sleep/wake-up scheduling, planning to limit inert listening time accordingly decreasing the vitality utilization, which is one of the major research issues in WSNs. The hubs or nodes are remembered in rest mode keeping the ultimate objective to save the imperativeness of each hub or node to the degree this would be conceivable without including on bundle conveyance adequacy and thus lifetime was expanded. In this paper, a hybrid combination algorithm is applied on self-adaptive sleep wake up technique for wireless sensor network nodes. The hybrid combination algorithm includes the Ant Colony Optimization technique in addition with genetic algorithm. These two optimization techniques select the path of data transfer in such a way that it improves the network lifetime of the WSN, the packet delivery ratio, the packet loss and routing overhead is improved in the proposed algorithm, as it consists of two different optimization techniques together, it has been named as hybrid optimization algorithm. The proposed algorithm performs better in terms of all performance metrics considered and is highly efficient as per results obtained.

Keywords: -ACO, genetic, hybrid, wsn, wireless, self-adaptive, sleep-wake up, scheduling.

I. INTRODUCTION

Sleep/wake self-adaptive scheduling technique for sensor networks has been widely explored in current research trends on wireless sensor network. The fundamental thought is to put the radio or base nodes to sleep during inert occasions, and wake it up just before message transmission/gathering. Existing sleep/wake booking plans for wireless sensor networks can be synchronization-based, where hubs synchronize each other to organize their wake-up timetables, or non-concurrent/irregular which don't include unequivocal synchronization. [2] For persistent checking frameworks, synchronization-based sleep/wake planning plans are regularly utilized on the grounds that the traffic example is occasional. Fine-grained synchronization is required between the sender and the recipient, with the goal that they can wake up in the meantime to impart. Earlier work either expect that the fundamental synchronization convention can give about flawless (e.g., miniaturized scale second dimension) synchronization, or accept an upper bound on the clock contradiction, and utilizations it as a gatekeeper time to make up for the synchronization mistake. [1]

A staggered of detecting inclusion and network availability is required in the functional usage of a WSN. In wireless networks with battery-worked gadgets, vitality sparing components is of fundamental significance so as to amplify network lifetime. [7] Vitality protection is important during periods with no movement and furthermore during event of occasions. It is basic to lessen traffic catching since the handset devours comparable vitality for inert tuning in as transmission. [3] In WSNs, a sleep-wake obligation cycling has been received for vitality productivity and protection, since every sensor hub is regularly outfitted with a battery which is control constrained.

The network sensors hubs can be overseen locally by a group head in a bunch – a hub chose to arrange the hubs inside the group and to be in charge of correspondence between the group and the base station or other bunch heads. Bunches give an advantageous system to asset the executives, information combination, and nearby basic leadership. [4] Since in a group every one of the hubs will be wake state to speak with the bunch head. At the point when this correspondence happens without thinking about the vitality of the hubs in the group. During this procedure every one of the hubs in the group expends vitality regardless of what the hubs are fit for transmitting information. [9]

Sleep / Wake scheduling is every strong operation where the most extreme degree of vitality of the network is avoided. Once the group development is completed in the network, each bunch starts applying the sleep / wake scheduling procedure. [5] In order to avoid vitality, only a few hubs with the most amazing remaining vitality in each bunch are needed to maintain dynamics, while others will remain in sleep mode. Each of the hubs in the group will be dynamic towards the beginning of this reservation in order to break down the remaining energies. This inquiry is performed in order to select a functioning hub with the most amazing vitality left in a group. Moreover, in a bunch, this vibrant hub will try to detect the job. [6] The hub attempting to detect the task will be selected by the head of the group. In addition, the bunch head sends a WORK message to arrange the selected hub to fulfill its obligation as a functioning hub, one of which is advised in the following time frame to be the head hub. And the group head is also sending a SLEEP signal to most of the remaining hubs. [8][10]

II. PROPOSED METHODOLOGY

The below table shows the model parameters used in A Bio-Inspired Mechanism based hybrid ACO and Genetic Algorithm approach on Sleep Wake Techniques for Wireless Sensor Networks. Here in figure below show the parameters and its values. The parameters are Chanel type, Radio mode, Wireless protocol, nodes, Traffic, Stop time, Initial energy, RX power, TX Power and Routing protocol.

```
set val(chan)        Channel/WirelessChannel    ;# Channel Type
set val(prop)        Propagation/TwoRayGround   ;# radio-propagation model
set val(netif)       Phy/WirelessPhy/802_15_4
set val(mac)         Mac/802_15_4
set val(ifq)         Queue/DropTail/PriQueue    ;# interface queue type
set val(ll)          LL                         ;# link layer type
set val(ant)         Antenna/OmniAntenna        ;# antenna model
set val(ifqlen)      50                         ;# max packet in ifq
set val(nn)          25                         ;# number of mobilenodes
set val(rp)          AODV                       ;# routing protocol
set val(x)           60
set val(y)           60

set val(nam)         main.nam
set val(traffic)     cbr                        ;# cbr/poisson/ftp
```

Figure 1: model parameters and simulation settings

The methodology includes a combination of the existing self-adaptive sleep wake up scheduling with hybrid optimization technique including, ant colony optimization and genetic optimization algorithms.

The algorithms are explained below:

ACO is a swarm intelligence algorithm devised bysimulating the schematic of ants foraging. Ants can leavea substance called pheromone on its path in the foragingprocess and it also can perceive the strength of this materialin the feeding process. By exploiting the degree ofpheromone, ants can guide their direction of action, theyalways moving toward the path with more pheromones.The implied optimal path will have more and more pheromoneafter certain iterations. This is a virtuous cycle andthe optimal implied path will emerge from a large number of ants' feedback.

Genetic Algorithm (GA) is a computational biologicalevolution model simulating the natural selection and genetictheories of Darwinian. Genetic operation containsthree basic genetic operators: selection, crossover and mutation [9]. As detailed in following:

1) Selection: The core idea is to select the winning individualsfrom the population and eliminate the inferiors.Selection is sometimes called reproduction operator. Thepurpose is to substitute the better individuals to the nextiteration or cross them to generate new individuals. Thisoperation is based on the evaluation of the whole population.

2) Crossover: Genetic recombinant organization playsa central role in the natural process of biological evolution.Similarly, the most important operation of the geneticalgorithm is crossover operation. The so-called crossoveris to exchange parts of the parents and reconstruct thenew individuals. Through this operation, the searchingcapability has an essential enhancement because it can letthe better parts of two parents get together and form anew individual, which superior to all before.

3) Mutation: The basic content of mutation operator isto change the values of some regions in an individual. Itcan be regard as an auxiliary for accelerating the crossoveroperation. It has two goals: first is to enhance thelocal search capability of GA; another is to maintain thediversity of population. Mutation operation can effectively prevent premature convergence.

III. RESULTS

In this section, simulation environment for the implementation will be discussed. The simulation settings consist of a grid of 25 nodes. These nodes are tested on three types of traffic data namely- CBR, FTP and Poisson random data. A few nodes are considered as source and a few of them are considered as destination. The final controller node controls all the sleep wake scheduling activities. On the schedule optimization techniques namely ant colony and genetic optimizations are implemented. In figure 2, simulation setup of nodes is shown. The network lifetime is increased as the nodes are not dead even at the end of simulation which was not seen in the existing techniques.

Figure 2: Simulation Setup Node Setup for test analysis

In Figure 3, 4 and 5, results for Packet drop, energy remaining which increases the network lifetime is shown.

```
[root@localhost phase2script]# awk -f analysis.awk main.tr
Data Analysis:

   Packets total:                               46142
   Packets RTR:                                 14053
   Packets MAC:                                 27700
   Packets Data AGT:                             0

   Packets sent by Agent:                       2196
   Packets received by Agent:                   2192
   Packets forwarded by Agent:                   0
   Packets dropped by Agent:                     0
   Packets lost by Agent:                        4

   Packets sent by Router:                      2385
   Packets received by Router:                  7254
   Packets forwarded by Routers:                4401
   Packets dropped by Routers:                   0
   Packets lost by Routers:                      4
```

Figure 3: Packet Lost Results

```
node 6 89.1084
node 7 89.1641
node 8 89.1603
node 9 89.1072
node 10 89.0575
node 11 89.1085
node 12 89.1376
node 13 89.1572
node 14 89.098
node 15 89.047
node 16 89.0716
node 17 89.1006
node 18 89.0983
node 19 89.0777
node 20 89.001
node 21 89.0014
node 22 89.0012
node 23 89.0232
node 24 89.0227
+===========+
average energy 92.674
+===========+
total energy 2316.85
```

Figure 4: Energy Remaining in Network

```
[root@localhost phase2script]# awk -f pdf.awk main.tr
cbr s:2196 r:2192, r/s Ratio:0.9982, f:4401
```

Figure 5: Packet Delivery Ratio Result

In figure 6 and7, packet drop result and packet delivery ratio result is shown.

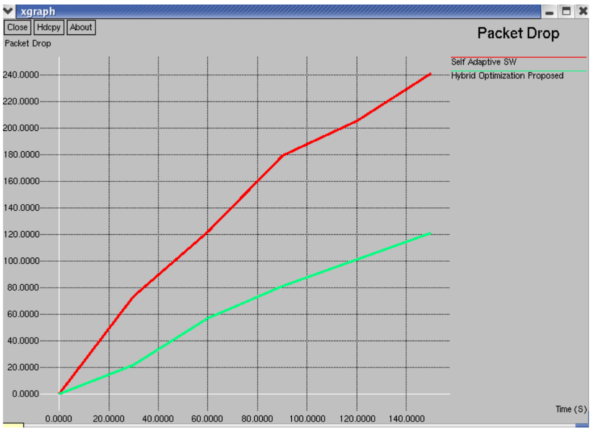

Figure 6: Output Comparison for Packet Drop

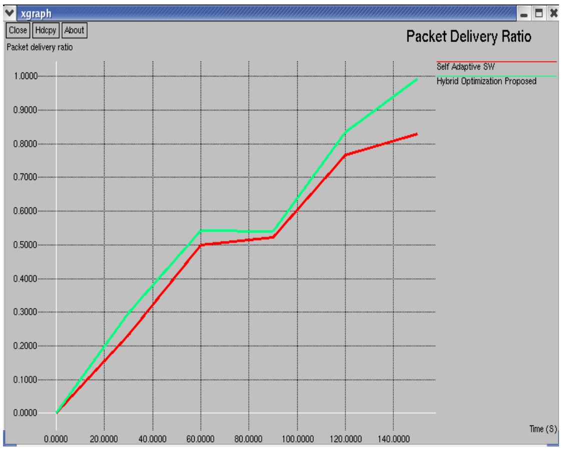

Figure 7: Output Comparison for Packet Delivery Ratio

The results clearly indicate that the packet delivery ratio is higher for proposed algorithm and thereby the packet loss is minimum in case of proposed hybrid optimization.

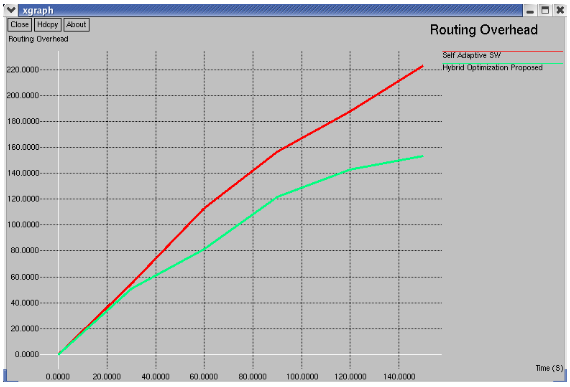

Figure 8: Output Graph for routing overhead

In figure 8 and Figure 9, both show result of delay and routing overhead, which shows that the proposed algorithm is nearly high speed and has a good routing overhead.

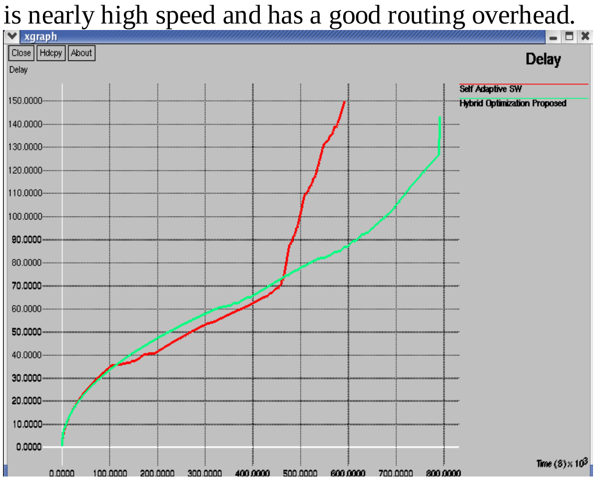

Figure 9: Output Graph for Delay Comparison

IV. CONCLUSION

In this paper, researched and simulated on ns2 software tool for a Hybrid Genetic and Ant Colony Optimization based

Wireless Sensor Network for Self-Adaptive Sleep Wake up Scheduling. Comparing the ant colony optimization and genetic algorithm is completed in this work. And these hybrid optimization Appling in self-adaptive sleep wake up scheduling. Here finding the packet drop, packet delay ratio, delay and routing overhead using Ns2. Here it can be seen that the packet delivery ratio and through put is high in Self-adaptive sleep wake with hybrid genetic algorithm and ACO and the parameters delay packet drop routing overhead these are high in SA sleep wake up. Getting these parameters value by comparing the Self-adaptive sleep wake with hybrid genetic algorithm and ACO and SA sleep wake up. Different graph diagram of these parameters that can easily be done by understanding the variations Self-adaptive sleep wake with hybrid genetic algorithm and ACO and SA sleep wake up in different time period. The proposed algorithm is successfully implemented and tested for the results.

V. REFERENCES

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