A Hybrid Genetic and Ant Colony Optimization based Wireless Sensor Network for Self-Adaptive Sleep Wake up Scheduling

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Abstract- Here we are doing the hybrid optimization combining the ant colony optimization and genetic algorithm. The hybrid optimization is applied to the self-adaptive sleep wakeup scheduling. Here we find the different parameters that is packet drop ratio packet delay, delay, routing overhead and throughput. The hybrid optimization is analyzing the transmission system using different methods. These algorithms combine two or more others algorithms that solve the same problems and produce better performance. This is generally done to combine desired features of each, so that the overall algorithm is better than the individual components.

Keywords- colony optimization, hybrid optimization, packet drop ratio, packet delay, delay, routing overhead and throughput.

I. INTRODUCTION

A wireless sensor network (WSN) consists of a large number of sensors which are densely deployed over a large area. Each sensor monitors a physical environment and communicates via wireless signals. With the advancements in hardware miniaturization and wireless communication technologies, WSNs have been used in various applications such as education, warfare, and traffic monitoring. Regardless of the applications, extending the network lifetime is a critical issue in WSNs. This is because the sensors are battery-powered and generally difficult to be recharged [1]. Optimization is everywhere in the life. Not only people but also other living things make an optimization to make life easier. In airline scheduling, finance, internet routing, navigation, robotic path planning and etc. Optimization is used almost all applications in engineering and industry. We optimize something to minimize the cost and energy consumption or to maximize the efficiency, performance, and profit etc. Optimization is very important in applications because energy sources, money, time is always limited [3].

Sensor network is highly acceptable in most of the real world and engineering application because of its limited battery power feature. But still the communication phase consumes more power in WSN than its data storage and data processing phases. Most of the applications of WSN expect the lifetime of the sensor network to be for few months to years because; it is almost impossible and expensive to recharge or to replace the batteries. So, the only way to improve energy efficiency in WSN is by reducing power consumption [6]. The recent advances in Wireless Sensor Network (WSN) have gained world-wide attention because of its minimized size, low cost and untethered nature. These sensor nodes have sensing unit to collect the data from physical environment, processing unit to process the data and communicating component to communicate sensory data to base station over wireless medium. WSN placement is very specific to applications such as environment monitoring, habitat monitoring, military applications, health monitoring, object tracking and smart grids. In most of these applications numerous sensors nodes are remotely deployed and they are set to operate autonomously. WSN designers face many issues that arise due to limited battery, harsh environment, communication failures, memory and bandwidth [8].Many of the algorithms used in optimization have been developed from nature. Genetic algorithm (GA), particle swarm optimization, ant colony optimization (ACO) monkeySearch, wolf pack search algorithm cuckoo search, fruit fly optimization algorithm dolphin echolocation [9], Whale optimization algorithm are some of the algorithms. Finding the best solution is the common goal of these algorithms. This can sometimes be found in an equation to find the most suitable parameters, to find the most suitable coefficients, to find the best shortest path, to make the least costly choice [10].

II. PROPOSED METHODOLOGY

In this research paper we are proposed the combine system of genetic algorithm and Ant colony optimization.

Genetic Algorithm: -

Genetic Algorithm (GA) is a computational biological evolution model simulating the naturalselection and genetic theories of Darwinian. Genetic operation contains three basic genetic operators:selection, crossover and mutation. Selection: The core idea is to select the winning individuals fromthe population and eliminate the inferiors. Selection is sometimes called reproduction operator.Crossover: Genetic recombinant organization plays a central role in the natural process of biologicalevolution. Similarly, the most important operation of the genetic algorithm is crossover operation.Mutation: The basic content of mutation operator is to change the values of some regions in anindividual. It can be regard as an auxiliary for accelerating the crossover operation.

Ant colony optimization (ACO): -

The ACO (Ant Colony Optimization) heuristic is motivated by the genuine ant conduct (figure 1). It solves the problem of finding optimal path from source to destination on basis of real ant behavior. In starting ants move randomly to find source. When food source found, ants move back to colony. Ants leaving pheromones while moving back to colony that shows path for food. Other ants follow the same path to reach on food source. Pheromone makes a stronger path as many ants move on samepath. The amount of pheromone is deposited, which may depend on the quantity and quality of thefood. After some time when food sources decrease, the path has no longer pheromones. It find soptimal and shortest path for data transmission in wireless sensor networks. Hybrid genetic algorithm and ACO applied only where source and destination are predefined. It not works well if paths are not symmetric.

Fig.2: Real ANT behavior in finding the path

The objective of this work is towards improving the Quality of service of the wireless sensor network by minimization of power consumption in wireless network which has been done by considering various different parameters. The power consumption problem has been reduced to a nonlinear problem with constraints.

III. RESULT

Table 1: Packet Drop Calculation of the network

TIME	Self-adaptive sleep wake	Self-adaptive sleep wake with hybrid-GA+ACO
50	105	43
100	185	35
150	240	121

The above table 1 show the Packet Drop Calculation of the network, here we can see the Self-adaptive sleep wake and Self-adaptive sleep wake with hybrid genetic algorithm and ACO. Here the packet drop calculation is increasing.it is high in Self-adaptive sleep wake.

Table 2: Packet Delivery Ratio Calculation of the network

TIME	Self-adaptive sleep wake	Self-adaptive sleep wake with hybrid-GA+ACO
50	.4000	.3100
100	.6000	.6600
150	.8300	1.000

The above table 2 show the Packet Delivery Ratio Calculation of the network, here we can see the Self-adaptive sleep wake and Self-adaptive sleep wake with hybrid genetic algorithm and ACO. Here the Packet Deliverycalculation is increasing.it is high in Self-adaptive sleep wake with hybrid-GA+ACO here we get one.

Table 3: Routing Overhead Calculation of the network

TIME	Self-adaptive sleep wake	Self-adaptive sleep wake with hybrid-GA+ACO
50	98	79
100	165	145
150	220	199

The above table 3 show the Routing OverheadRatio Calculation of the network, here we can see the Self-adaptive sleep wake and Self-adaptive sleep wake with hybrid genetic algorithm and ACO. Here the Routing Overheadcalculation is increasing.it is high in Self-adaptive sleep wake.

Table 4: Delay Calculation of the network

TIME	Self-adaptive sleep wake	Self-adaptive sleep wake with hybrid-GA+ACO
200	40	49
400	62	65
600	189	140

The above table 4 show the Delay Calculation of the network, here we can see the Self-adaptive sleep wake and Self-adaptive sleep wake with hybrid genetic algorithm and ACO. Here we can see the Self-adaptive sleep wake with hybrid genetic algorithm and ACO is high.

Table 5: Throughput Calculation of the network

TIME	Self-adaptive sleep wake	Self-adaptive sleep wake with hybrid-GA+ACO
50	29	28
100	41	55
150	1	63

The above table 5 show the Throughput Calculation of the network, here we can see the Self-adaptive sleep wake and Self-adaptive sleep wake with hybrid genetic algorithm and . ACO. Here we can see the Self-adaptive sleep wake with hybrid genetic algorithm and ACO is high

Fig.2: Packet Drop Calculation of the network (proposed)

The above figure 2 shows the packet drop calculation of the network, here shows packet drop calculation of self-adaptive sleep wake up and self-adaptive sleep wake hybrid genetic algorithm and ACO.

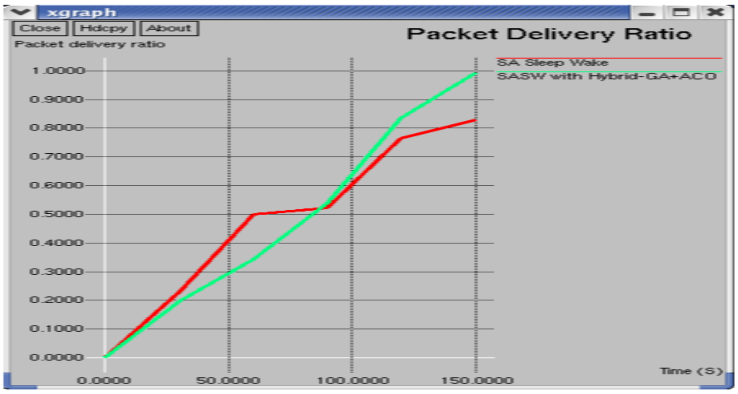

Fig.3: Packet Delivery Ratio Calculation of the network (proposed)

The figure 3 shows the packet delivery ratio calculation of the network. here also shows the Packet Delivery Ratio Calculation of the network in self-adaptive sleep wake up and self-adaptive sleep wake hybrid genetic algorithm and ACO and the packet delivery ratio is high in self-adaptive sleep wake hybrid genetic algorithm and ACO.

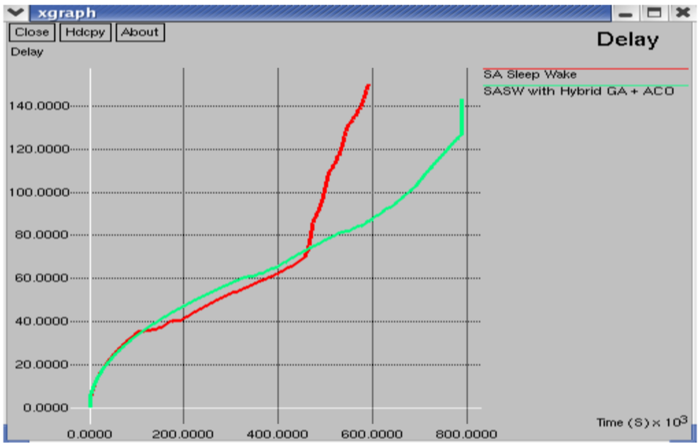

Fig.4: Delay Calculation of the network (proposed)

The above figure 4 shows the Delay Calculation of the network, here we can see the self-adaptive sleep wake hybrid genetic algorithm and ACO and self-adaptive sleep wake up. The self-adaptive sleep wakes up is high in less time.

Fig.5: Routing Overhead Calculation of the network (proposed)

The figure 5shows the Routing Overhead Calculation of the network, here the graph shows the routing overload calculation of the network of self-adaptive sleep wake up and Self-adaptive sleep wake with hybrid genetic algorithm and ACO.SA sleep high compare to Self-adaptive sleep wake with hybrid genetic algorithm and ACO.

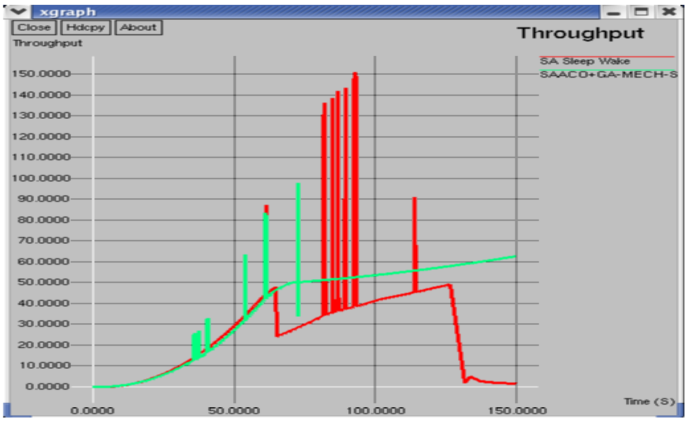

Fig.6: Throughput Calculation of the network (proposed)

The above figure shows the Throughput Calculation of the network. Here we can see the Self-adaptive sleep wake with hybrid genetic algorithm and ACO and SA sleep wake up. Here the throughput is clearly we get in SA sleep wake up and the high value get in SA sleep wake up.

IV. CONCLUSION

Here we are comparing the ant colony optimization and genetic algorithm. And these hybrid optimization Appling in self-adaptive sleep wake up scheduling. We are finding the packet drop, packet delay ratio, delay and routing overhead using MATLAB. Here we can see 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. Here we are getting these parameters value by comparing the Self-adaptive sleep wake with hybrid genetic algorithm and ACO and SA sleep wake up. Here we can see the different graph diagram of these parameters that we can easily understanding the variations Self-adaptive sleep wake with hybrid genetic algorithm and ACO and SA sleep wake up in different time period.

V. REFERENCES

[1]. Zeyu Zhang et al., "A Short Review on Sleep Scheduling Mechanism in Wireless Sensor Networks" vol. 38, no. 4, pp. 393–422, 2002.
[2]. Veronicah M et al., "Routing Optimization for Wireless Sensor Networks using Fuzzy Ant Colony" Volume 12, Number 21 (2017) pp. 11606-11613
[3]. D. Annie Selina et al., "An Energy Efficient Self-Healing Sleep/Wakeup Scheduling Against Denial of Service Attacks for Long Life Wireless Sensor Networks" Vol 2, Issue 12, December 2017
[4]. Yongfeng Cui et al., "Wireless Sensor Network Route Optimization Based on Improved Ant Colony-Genetic Algorithm" Volume 11, Issue 9, 2015:
[5]. Dayong Ye et al., "A Self-Adaptive Sleep/Wake-Up Scheduling Approach for Wireless Sensor Networks" 2168-2267 c 2017 IEEE
[6]. Sneha S. More et al. "Artificial Intelligence and Ant Colony Optimization Based Wireless Sensor Networks to Minimize Energy of Network" Vol. 8 No. 3 Jun-Jul 2017
[7]. Fei Jiang et al., "Application of hybrid ant colony algorithm in wireless sensor network coverage" 2014 18(12A) 161-166
[8]. Khushneet Kaur Batth et al., "Performance Evaluation of Ant Colony Optimization Based Routing Algorithms for Mobile Ad Hoc Networks" Accepted date: March 02, 2017; Publication date: March 15, 2017
[9]. Pallavi et al., "A Hybrid Ant Colony Optimization for Optimal Path Planning in Wireless Sensor Network" Volume 8, No. 7, July – August 2017
[10]. Jing-hui Zhong et al.,"Energy-Efficient Local Wake-up Scheduling in Wireless Sensor Networks"2011 IEEE