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A NOVEL TECHNIQUE FOR ENHANCING THE ENERGY OF SENSOR NODE THROUGH EVOLUTION THEORY AND CBCR PROTOCOL

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ABSTRACT: A Evolution algorithm (EA) is used to create energy efficient clusters for data dissemination in wireless sensor networks. The simulation results show that the proposed intelligent hierarchical clustering technique can extend the network lifetime for different network deployment environments. Clustering the Wireless Sensor Networks (WSNs) is the major issue which determines the lifetime of the network. In this research, a new clustering algorithm, Evolution Algorithm based Energy efficient Clustering Hierarchy algorithm, is proposed to increase the network life time with a novel fitness function. The fitness function in proposed algorithm is modified forms of well-balanced clusters considering the core parameters of a cluster, which again increases both the stability period and lifetime of the network. The simulation result will clearly shown that energy dissipation, throughput and no of dead node occurrence in proposed work in comparison to earlier (LEACH) & Genetic comprises the good result.
KEYWORD: Evolution Theory, Genetic Algorithm, LEACH, WSN, Clustering, MATLAB

I. INTRODUCTION

1.1 Introduction to wireless sensor network

Wireless sensor networks (WSNs) constitute the foundation of a broad range of applications related to national security, surveillance, military, health care, and environmental monitoring. One important class of WSNs is wireless ad-hoc sensor networks, characterized by an ad-hoc or random sensor deployment method, where the sensor location is not known a priori. This feature is required when individual sensor placement is infeasible, such as battlefield or disaster areas. Generally, more sensors are deployed than required (compared with the optimal placement) to perform the proposed task; this compensates for the lack of exact positioning and improves fault tolerance. The characteristics of a sensor network include limited resources, large and dense networks, and a dynamic topology.

1.2 Clustering technique in WSN

Wireless sensor networks have plenty of advantages. The deployment of WSNs is easier and faster than the wired sensor networks or any other wireless networks because they do not need any fixed infrastructure . Since sensor nodes are densely deployed in most of the cases, they are able to tolerate the network failures. Wireless sensor networks do not require a central organization and they are self configuring.

1.3 Clique Technique in WSN

SNs used for monitoring applications have to be designed to meet the specific requirements and characteristics of the application environments. This fact is strongly reflected in the indoor systems where operating constraints can vary significantly from one application scenario to another. The particularly harsh environments, like tunnels, impose constraints on the possible network topology. For such long structures, the WSN represents a linear topology . This limits the usability of certain localization methods or reduces dramatically their accuracy. In fact, the public literature has few studies about methods dedicated to localization in tunnels and thus the challenges for accurate localization techniques remain to be addressed.

1.4 CBCR Technique

The CBCR (Clique Based Clustering and Routing) protocol to minimize the energy dissipation in sensor networks. It is a clustering based protocol that forms non-overlapping clusters of size where n is the maximum cluster size. By exchanging information of 1-hop neighbors, all sensor nodes in the network are grouped into a number of disjoint cliques, in which all the nodes can directly communicate with each other. Among all the nodes in a cluster, the node with maximum energy becomes cluster head. The key features of CBCR are: self-configuration and localized coordination, maximum energy cluster head, periodical rotation of cluster head, hierarchical forwarding, load balance, fault tolerance and scalability.

1.5 Routing Challenges faced during the implementation of WSN

One of the main design goals of WSNs is to carry out data communication while trying to prolong the lifetime of the network and prevent connectivity degradation by employing aggressive energy management techniques. The design of routing protocols in WSNs is influenced by many challenging factors. Some of the routing challenges and design issues that affect routing process in WSNs are as given below.

Node deployment: Node deployment in WSNs is application dependent and affects the performance of the routing protocol.

Energy consumption without losing accuracy: Sensor nodes can use their limited supply of energy performing

computations and transmitting information in a wireless environment. The malfunctioning of some sensor nodes due to power failure can cause significant topological changes and might require rerouting of packets and reorganization of the network.

Data Reporting Model: Data sensing and reporting in WSNs is dependent on the application and the time criticality of the data reporting. Data reporting can be categorized as either time-driven (continuous), event-driven, query-driven, and hybrid. The routing protocol is highly influenced by the data reporting model with regard to energy consumption and route stability.

Node/Link Heterogeneity: All sensor nodes were assumed to be homogeneous, i.e., having equal capacity in terms of computation, communication, and power. However, depending on the application a sensor node can have different role or capability. The existence of heterogeneous set of sensors raises many technical issues related to data routing.

Fault Tolerance: Some sensor nodes may fail or be blocked due to lack of power, physical damage, or environmental interference. The failure of sensor nodes should not affect the overall task of the sensor network. If many nodes fail, MAC and routing protocols must accommodate formation of new links and routes to the data collection base stations.

Scalability: The number of sensor nodes deployed in the sensing area may be in the order of hundreds or thousands, or more. Any routing scheme must be able to work with this huge number of sensor nodes. In addition, sensor network routing protocols should be scalable enough to respond to events in the environment. Until an event occurs, most of the sensors can remain in the sleep state, with data from the few remaining sensors providing a coarse quality.

Network Dynamics: Most of the network architectures assume that sensor nodes are stationary. However, mobility of both BS's and sensor nodes is sometimes necessary in many applications. Routing messages from or to moving nodes is more challenging since route stability becomes an important issue, in addition to energy, bandwidth etc.

Transmission Media: In a multi-hop sensor network, communicating nodes are linked by a wireless medium. The traditional problems associated with a wireless channel (e.g., fading, high error rate) may also affect the operation of the sensor network. In general, the required bandwidth of sensor data will be low, on the order of 1-100 kb/s.

Connectivity: High node density in sensor networks precludes them from being completely isolated from each other. Therefore, sensor nodes are expected to be highly connected. Connectivity depends on the, possibly random, distribution of nodes.

Coverage: In WSNs, each sensor node obtains a certain view of the environment. A given sensor's view of the environment is limited both in range and in accuracy; it can only cover a limited physical area of the environment. Hence, area coverage is also an important design parameter in WSNs

Quality of Service: In some applications, data should be delivered within a certain period of time from the moment it is sensed otherwise the data will be useless. Therefore bounded latency for data delivery is another condition for time-constrained applications.[9]

II. LITERATURE REVIEWS

Alain Bertrand Bomgni, Jean Frédéric Myoupo Proposed a hybrid clustering scheme: in the first phase we partition the network in cliques using an existing energy-efficient clustering protocol. Next the set of clusterheads of cliques are in their turn partitioned using an energy-efficient hierarchical clustering. Amandeep Kaur Rupinder Kaur CT Group of Institutions, Jalandhar1 CT Group of Institutions, Jalandhar Proposed a sensor nodes sense the data, process it, and send it to the base station, there are wide chances that the data generated from the neighboring sensors is often redundant and correlated. The unavoidable issue is that in large sensor networks, the amount of data generated is enormous for the base station to process. Kamanashis Biswas, Vallipuram Muthukkumarasamy, Elankayer Sithirasenan, Kalvinder Singh School of ICT, Griffith University, Australia Proposed an energy efficient routing protocol to find the forwarding path between source and destination node using heuristic function and A_ search algorithm. Simulation results with OMNET++ show that our proposed protocol is efficient in terms of network lifetime, total energy dissipation and message throughput. Kamanashis Biswas, Vallipuram Muthukkumarasamy, Elankayer Sithirasenan, Muhammad Usman School of Information and Communication Technology, Griffith University Gold Coast, Australia Proposed an energy efficient clique based routing scheme for wireless sensor networks. One of the major issues in wireless sensor networks is developing an energy efficient routing protocol. Since the sensor nodes are small-sized battery operated devices, energy conservation is considered a critical issue to maximize network lifetime. Sajid Hussain, Abdul Wasey Matin, Obidul Islam Jodrey School of Computer Science, Acadia University, Wolfville, Nova Scotia, Canada Proposed A genetic algorithm (GA) is used to create energy efficient clusters for data dissemination in wireless sensor networks. The simulation results show that the proposed intelligent hierarchical clustering technique can extend the network lifetime for different network deployment environments. Sunil Pariyani Vijay Ukani– CSE Institute of Technology, Institute of Technology, Institute of Technology, Nirma University, Nirma University, Nirma University, Gujarat proposed a several energy efficient hierarchical routing protocols among this LEACH is famous protocol, we have simulated LEACH in NS2 and analyzed performance of LEACH in terms of energy, throughput and lifetime Kapil Uraiya , ** Dilip Kumar Gandhi *M.Tech (EC), TIT, Bhopal ** Department of EC, TIT , Bhopal proposed a Genetic algorithm for optimization approach which tries to find the optimal location by satisfying both the criteria with minimal

error. The simulations results also show effectively outperform both the techniques. A Genetic Algorithm for wireless sensor network localization to solve the issue that the positioning accuracy is low with minimum anchor nodes.Ali Norouzi1, Faezeh Sadat Babamir2, Abdul Halim Zaim3 1Department of Computer Engineering, Istanbul University/Avcilar, Istanbul Commer University/Eminonu, Istanbul, Turkey proposed Genetic Algorithm (GA) as a dynamic technique to find optimum states. It is a simple framework that includes a proposed mathematical formula, which increasing in coverage is benchmarked against lifetime. Finally, the implementation of the proposed algorithm indicates a better efficiency compared to other simulated works. Amol P Bhondekar, C Ghanshyam, M L Singla and Pawan Kapur Central Scientific Instruments Organisation proposed The genetic algorithm optimizes the operational modes of the sensor nodes along with clustering schemes and transmission signal strengths. The algorithm has been implemented in MATLAB using its Genetic Algorithm toolbox along with custom codes. Rajesh Patel Sunil Pariyani Vijay Ukani M.Tech M.Tech Assistant Professor CSE Institute of Technology, Institute of Technology, Institute of Technology,Nirma University, Nirma University, Nirma University, Ahmedabad, Gujarat, India. Ahmedabad, Gujarat, India. Ahmedabad, Gujarat, India. Proposed as sensor nodes are generally battery-powered devices, the critical aspects to face concern how to reduce the energy consumption of nodes, so that the network lifetime can be extended to reasonable times.

2.1 Induction of problems

As per this study of above research papers. This Survey finds a lots of emerging area on which research has to be needed for the physical deployment and its authentication along with its longevity. Although these deep analyses find a great research problem find on energy containing this is very great problem in this scenario.

Energy dissipation is very critical issue for physically deployed node. The longevity depends upon the energy distribution as well as the utilization of energy by Individual nodes. Optimization of loss of energy must be all for sensor network but some time technique differs due to the condition & the demand it has to be decided on the time of its programming.

III. PROPOSED WORK

In artificial intelligence, an evolutionary algorithm (EA) is a subset of evolutionary computation, a generic population-based Meta heuristic optimization algorithm. An EA uses mechanisms inspired by biological evolution, such as reproduction, mutation, recombination, and selection. Evolution algorithm technique includes set of chromosomes known as population which improves by generation process. To put it another way, inspired by the nature, the algorithm receives input data which are randomly collected by the primary population. When generation process is completed, the final population/result represents the optimum solution for the main problem. In general, all improvements made by the generation process are comprised of crossover, scoring, selection, and mutation function. The term crossover refers to productive function at specific rate where two different chromosomes mate to produce new generation. Among different methods of crossover, single point is under focus here.

3.1 Simulation Parameters

PARAMETER	VALUE
NETWORK SIZE	[100 100];
NUMBER OF SENSOR NODES	80
SENSOR NODE DEPLOYMENT	RANDOM
PERCENTAGE OF CLUSTER HEAD	10
TRANSIMISSION_RANGE	=10 (IT WAS 20 IN EARLIER)

3.2 Evolutionary Programming

It is one of the four major evolutionary algorithm paradigms. It is similar to genetic programming, but the structure of the program to be optimized is fixed, while its numerical parameters are allowed to evolve. Evolutionary programming is a very powerful algorithm that uses mutation as the primary operator for evolution. Hence, mutation defines the quality and time consumed in the final solution computation. We have applied the self adaptive mutation strategy based on hybridization of Gaussian and Cauchy distributions to develop to develop a faster and better solution. One of the limitations associated with the evolutionary process is that it requires definition of the redundancy covers, and therefore, it is difficult to obtain the upper bound of a cover. To solve this problem, a redundancy removal operator that forces the evolution process to find a solution without redundancy is introduced. Through simulations, it is shown that the proposed method maximizes the lifespan of WSNs.

IV. SIMULATION RESULTS

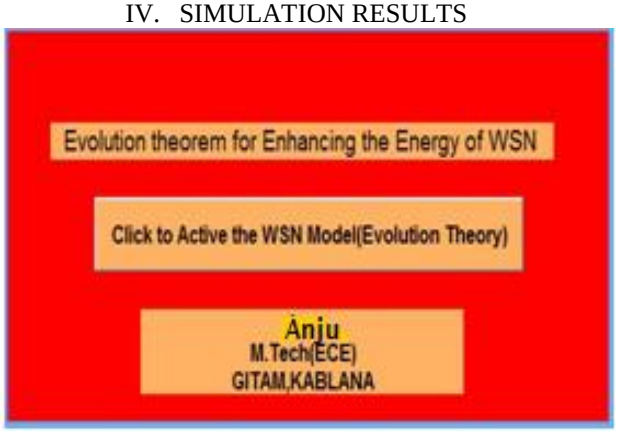

Fig 4.1: First layout made in MATLAB for running the code

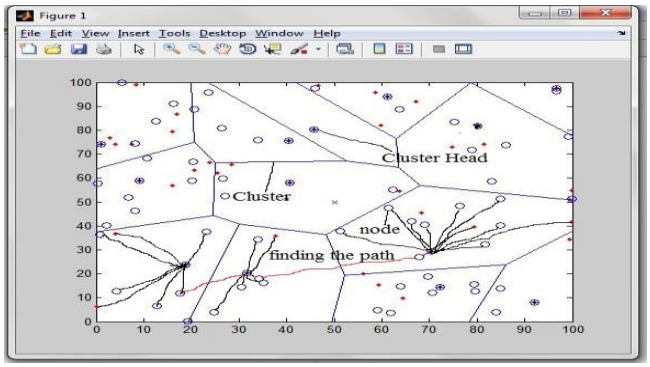

Fig 4.2: Generalized figure of WSN and its nodes

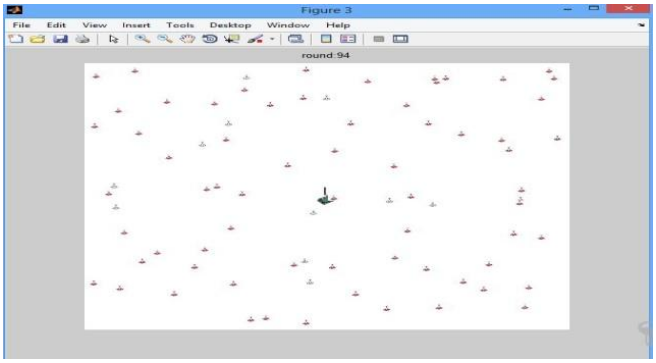

Fig 4.3: Placement of 80 nodes

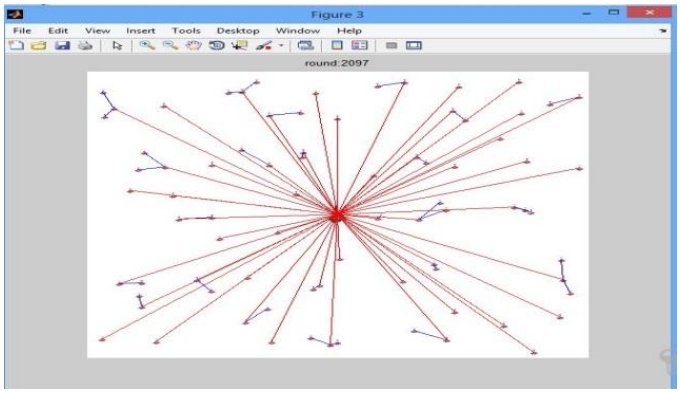

Fig 4.4: During the run time of simulation (Communication between nodes)

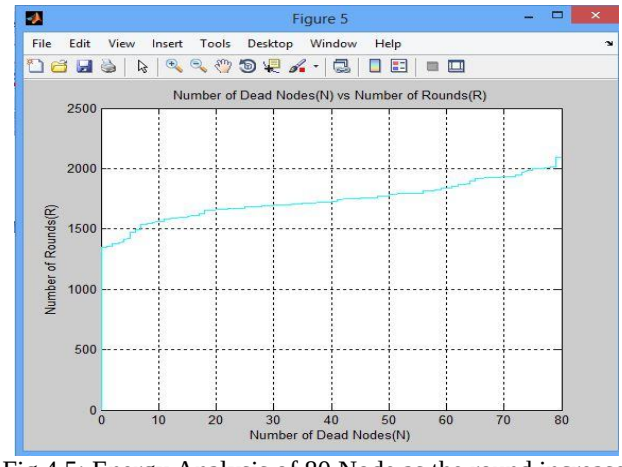

Fig 4.5: Energy Analysis of 80 Node as the round increase

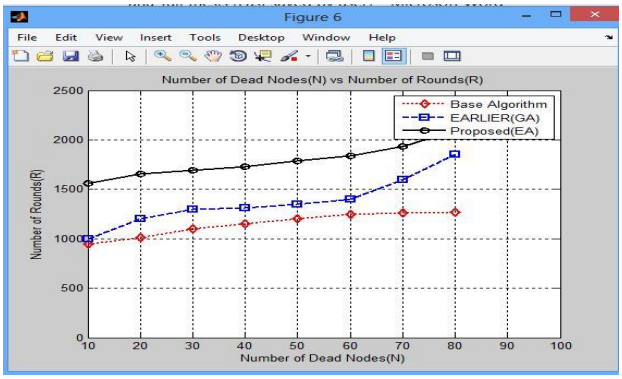

Fig 4.6: Formation of dead nodes as no of round increase with comparison of Base Algorithm, Earlier (Genetic Algo), Proposed (Evolutionary Algo)

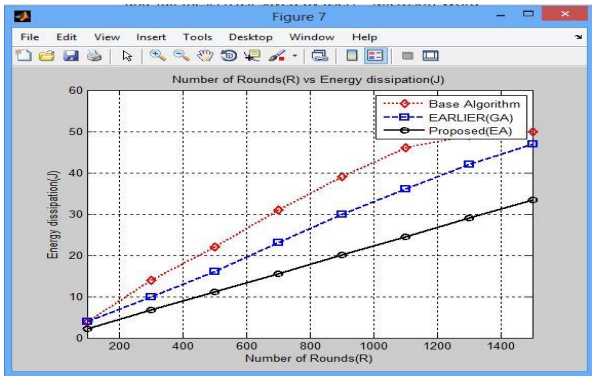

Fig 4.7: Energy Analysis of Network with increment of round in x-axis. It shows the energy dissipation of netwok is being increases as the round increases.

This research shows after applying the genetic algorithm, less energy dissipation in network appears after increasing number of rounds. Proposed work uses genetic algorithm to improve the network lifetime (dead node) and energy dissipation value of the wireless sensor networks by finding the optimum number of cluster heads and their locations based on minimizing the energy consumption of the sensor nodes. MATLAB simulation results showed that the proposed work is less energy dissipation, less number of dead nodes. After comparing the existing work as this simulative result found very good result.

V. CONCLUSION AND FUTURE WORK

WSNs are comprised of a set of wireless sensors with variety of capabilities and limitations, which make them suitable for specific applications. There are several imaginable applications for WSNs in military, commercial, and medical fields. Taking into consideration the recent technological advances, utilization of these networks in daily life is increasing. Of the main limitations of WSNs is energy consumption and lifetime of the network, which are common concerns almost for any WSN application. In general, the operational stages of WSNs include node placement, network coverage, clustering, data aggregation, and routing. A technical survey was conducted on these operational stages. By finding the drawbacks and optimizing them, ideal parameters of the network were achieved. Finally, using

evolution algorithm, a fitness function with optimum formula was obtained and the present protocols were optimized. The results of simulations in JPAC, MATLAB, and NS were compared with are of the present protocols and optimization of the two parameters confirmed. It is also noticeable that the diagrams obtained from the simulations showed an improvement in energy consumption parameters and lifetime of the network; this means more ideal WSNs. An application based protocol without specific limitation regarding its application suitable for military, medical, and commercial applications will be subject of our future studies. After applying the genetic algorithm, less energy dissipation in network appears after increasing number of rounds. Proposed work uses genetic algorithm to improve the network lifetime (dead node) and energy dissipation value of the wireless sensor networks by finding the optimum number of cluster heads and their locations based on minimizing the energy consumption of the sensor nodes. MATLAB simulation results showed that the proposed work is less energy dissipation, less number of dead nodes. After comparing the existing work as Genetic theorem, this simulative result found very good result. Moreover, it outperforms the previous protocols in terms of energy dissipation rate, network lifetime and stability period in both homogeneous and heterogeneous cases.

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