www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume 4 Issue 7 July 2015, Page No. 13499-13503

Using Genetic Algorithm For Optimization Of Mobile Agent In Wireless Sensor Network: A Survey

Harveen Kaur, Mandeep Singh Sra

Abstract - A wireless sensor network (WSN) is collection of sensor nodes located at unattended areas. To fetch the data from sensor nodes, static or dynamic agents can be used. The dynamic agent is used instead of a static agent by implementing the Genetic Algorithm. In this algorithm, a network is subdivided in N number of clusters and cluster head is elected for each cluster which directly communicates the information to sink. Mobile agent (i.e. dynamic agent) moves in random fashion and fetch data from cluster heads. By this algorithm, network can remain alive for longer period of time as power consumption and packet loss rate will decrease. In this paper, dynamic sink along with usage of Genetic algorithm is being proposed.

Key Words :- Mobile Agent, Wireless Sensor Network, Genetic algorithm.

I. INTRODUCTION

Wireless sensor network is bunch of sensor nodes which helps in gathering data from specified area and then transmit data to desired destination. A wireless sensor network contains self-directed sensors to communally examine environmental conditions like sound, pressure, temperature etcetera. A mobile agent is a node that is launched which can move through the network from node to node for performing various tasks. Mobile agents can minimize the bandwidth usage with help of routing by preceding the data at the source and sending only the proper results [1].

Initially, static sink is used for collection of data and position of sink is fixed to gather information from destination and sometimes distance between sink and node is more. To send data at longer distance results into energy dissipation and network lifetime also decreases [2]. Energy usage depends on communication cost so to overcome all factors multiple static sinks are used and to get better results, mobile sinks are used which reduces energy dissipation [3].

In consideration to mobile agents in WSNs, they are used to solve definite issues that are essential for appropriate performance of a WSN. Their mobility is helpful for assigned job which is completed on every node. MA moves among network nodes to fulfil task(s) freely, e.g., gathering sensory data from a count of source nodes in order to attain the particular needs of the agent dispatcher (i.e., the sink node). MA system has been verified to be a proficient approach to improve such capabilities of WSNs. Sensor node normally consists of sensors, actuators, memory, a processor and do have communication capability. All the sensor nodes can commune with a wireless intermediate. The wireless medium may be of radio frequencies, infrared or any other intermediate that is having no wired connection. These nodes are deployed in a haphazard manner and they can commune with each other to create an ad-hoc network.

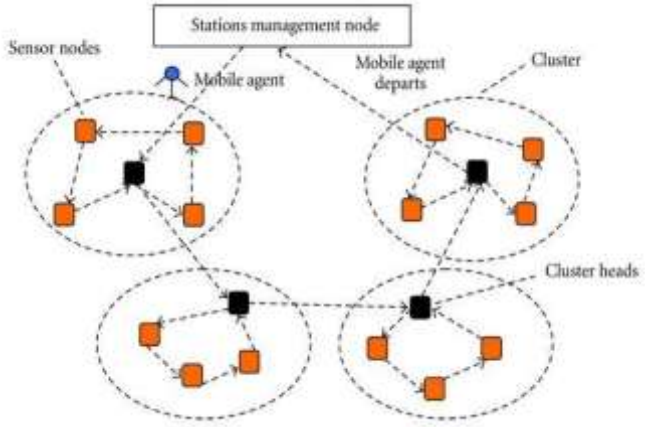

Fig.1 Clustering of network

If the node is not capable to commune with other direct link, i.e. they are not in range of each other, the data can be transmitted to other node by means of the nodes in between them. This process is called as multi -hopping. All sensor nodes work jointly to hand out the requests. Generally WSNs are decentralized because there is peer-to-peer communication between the nodes. So there is no necessity of former established infrastructure to arrange the network. WSN provides flexibility of adding up nodes and taking out the nodes as desired. But this may increase a lot of extreme changes to tackle with the network topology like updating the routing, or the network tree, etcetera. In a WSN, the node that fetches the data refers to sink. The sink can be accessed from any part of the world by connecting it to the internet, which will allow to access data within time constraints.

The main issue in using these networks is limited battery life as sensor node's size is normally tiny and all components are essential to be small. So, main focus of

these networks should be on optimizing the consumption of energy. Power losses can lead to the failure of Wireless Sensor Networks. For the reliable network service, the network should adjust by self and must have flexible properties as essential from time to time. A node may fail because of restricted battery life. In such scenario, the network protocol should be sharp adequately to control such failures.

Sensor nodes depend on a battery with restricted lifetime, and their alternative is not feasible due to physical constraints. Moreover the structural design and rule of sensor networks must be capable to increase any number of sensor nodes. Since the battery lifetime can be improved if we deal with the reduction of the amount of communication, caching the valuable data for each sensor either in its main so in the neighbourhood nodes can extend the network lifetime.

II. RELATED WORK

Techniques to save energy are required to increase lifetime of network in less budget of sensor nodes where network lifetime is depend on the number of nodes which are not dead. Battery powered nodes are essential to keep network alive for a longer period. Without energy efficient techniques, battery get wasted within a couple of days. Energy is wasted while sensing, transmission, reception and processing of data and reasons are when a node at same time fetches more number of packet then packets collide and for that packets are discarded and again transmission of these packets is needed which results in wastage. When sender sends packet in transmission range ,even though they are not the particular receiver but still all nodes try to fetch that particular packet. So, when a node fetch packets which are meant for other nodes, energy gets exhausted. Control packet overhead is needed to enable transmission of information. Idle listening is also main cause of energy wastage and occurs when node is trying to listen to an unused channel to fetch possible data. To achieve better performance, cluster head techniques are used in which nodes are arranged in clusters and cluster heads are liable of information aggregation. after that cluster heads directly commune with the sink. The initial effort was LEACH protocol and further PEGASIS results better than LEACH by arranging all nodes and the head keep varying in this protocol [3].

The usage of the mobile agent paradigm to and the projected design is known as mobile agent based wireless sensor network. Extensive simulation shows better performance of mobile agent based wireless sensor network than client/server communications in terms of energy consumption and the delivery of packets. However, mobile agent based wireless sensor network has a longer end-to-end latency than client/server communications in certain conditions [2].

In the constructed a joint mobility and routing algorithm which showed benefit of this algorithm and is that it only needs a less count of nodes in network to get attentive for the position of the dynamic sink. The mobile sink have more energy in comparison to the static sensors. They can move in the whole network and ease sensors that are greatly burdened by high network traffic, thus increasing the lifetime of network [5].

An Intelligent Agent-based Routing (IAR) is for mobile sinks in wireless sensor network and send data with greater efficiency to mobile sink. Signal overhead gets decreased and degraded route gets improved by this algorithm. IAR performance have been evaluated by both mathematical study as well as simulation experiments [14].

A new scheme sink mobility in wireless sensor network based on clustering and set Packing Techniques" proposed a new method based on the set packing algorithm and travelling salesman issue, to achieve this goal. The efficiency of our envisioned method is demonstrated through extensive computer-simulations [3].

A general MADC model in which they elaborated about different parameters like the number, velocity of mobile sink and the path travelled by mobile node. Then they created a comprehensive theoretical way to attain the possible throughput capacity and lifetime. With this approach, the behaviour of WSNs is investigated with one or more than one mobile sinks [4].

A novel routing scheme depends on the GA and have considered all paths to send data between nodes and found a new way of routing which is free from congestion and it results in more reliable sending of data. Genetic approach has given better results in routing over network [7].

Algorithm is discussed i.e. mobile agent based topology control which could resolve three troubles in data gathering and transmission in WSN and that are routing void, isolated node and sleeping control. Simulation results prove that MATC could able to save energy and extend network lifetime efficiently, and reduce the network traffic load [1].

A new approach for MANET by using small population size of nodes is used in route computation. By an optimization process using a genetic algorithm, the finest parameters of this controller are computed. The Genetic Algorithm find multiple paths and arrange them according to their status. So the first preference is the best path but the other routes can be used as the back-up routes. This algorithm can be used for small and medium scale networks [8].

III. OVERVIEW OF ALGORITHM

A. Genetic Algorithm

GA is the procedure of selection that is done naturally. It is generally used to get optimal results to overcome problems. For that, ways of natural evolutions are used such as inheritance, mutation and selection. GA make better population of individual solutions. At every stage, GA selects individuals from population and makes use of them to give birth to child for the upcoming generation. From following generations, the population tries to give best result. A range of troubles of optimization can be explained that are insuitable for standard optimization algorithms can be applied by GA

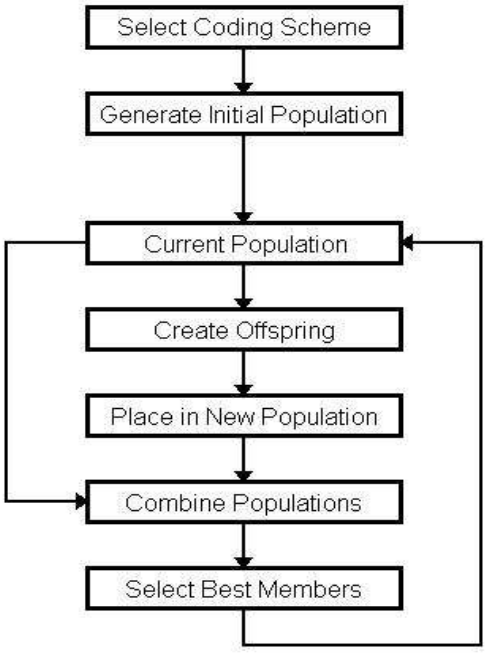

Fig.2 Genetic Algorithm

The genetic algorithm makes use of three rules to generate the new generation from the existing population:

- First is selection in which chromosomes are chosen which gives contribution to the upcoming generation.
- Second is crossover which give rise to new chromosome from set of parents for the next generation.
- Third is mutation which apply non uniform variation to parents to give birth to new offspring.

So, GA generates population which depends on fitness function of chromosome which increases survival chances.

IV. PROPOSED METHODOLOGY

In Wireless Sensor Network, nodes are divided into various clusters and cluster head is chosen first and then nodes which are near to it, comes under that cluster head and communicate to their cluster head while sending data. Cluster head fetches data from all nodes which are assigned to that particular cluster head. Consider a scenario where more than one cluster head communicate to mobile sink in the Wireless Sensor Network. For such a scene, each cluster head will have its own path developed to the sink. Consider a tree of multiple levels and assume leaf nodes i.e. nodes in particular cluster are communicating to their child internal node i.e. cluster head rather than the sink directly. Means we can store the results in some intermediate nodes such that each sink will not have to commune directly to the source node. This clearly saves time and avoids outdated data traffic in the network. Basically, cluster head compresses the data while sending to the mobile sink. Its operation starts by checking sufficient energy of cluster head and if that requirement is met then it will broadcast data. On the other hand, if energy of cluster head is not sufficient then stop message is sent to corresponding normal cluster head. After that quit message is forwarded to mobile agent and from network, it is deleted by itself and further TDMA schedule for cluster head is updated. Further, other advanced cluster head which is near to normal cluster head is detected then new path is built with the advanced cluster head. If no advanced cluster head is detected then node will directly communicate to mobile agent i.e. direct connection is established between node and mobile sink so that data can be transferred.

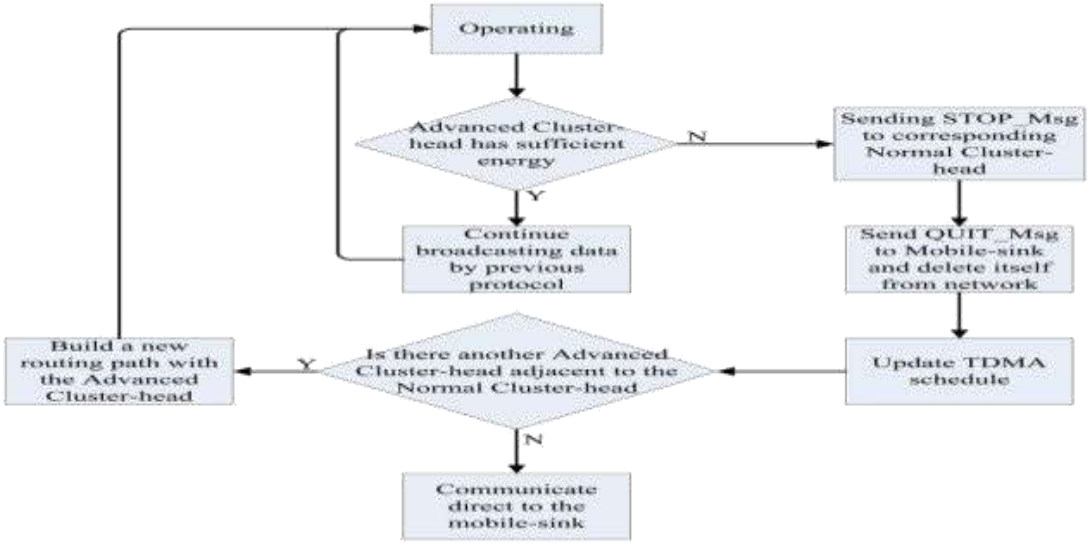

Fig.3 Operation of mobile agent using Genetic algorithm

V. Conclusion

The distributed computing environments of WSN are quite suitable for mobile agent. Current research on WSN topology control pays attention to mobile agent technology. In this paper, MATC - a mobile agent based topology control algorithm for WSN is proposed. MATC could resolve three main issues at the same time in WSN topology control: routing void, isolated node and sleeping control. Simulation results show that, compared with the algorithm with no agent, MATC could save more energy, improve transmission efficiency and reduce packet loss rate.

REFERENCES

[1] Lu Hong,. "Mobile agent based topology control algorithms for wireless sensor networks." *In Wireless Communications and Networking Conference Workshops (WCNCW), 2013 IEEE, pp. 195-199. IEEE, 2013.*

[2] Neethu M.Nair, A.Felix Arokya Jose, "Survey on data collection in wireless sensors networks*," International JOURNAL OF Engineering Research &Technology(IJERT), ISSN:2278-0181,VOL.2 Issue 12, December 2013*.

[3] Majid I. Khan a, Wilfried N. Gansterer b,, Guenter Haring." Static vs. mobile sink: The influence of basic parameters on energy efficiency in wireless sensor networks." *Computer Communications 36, 965–978 0140-3664_ 2012 Elsevier B.V,2013.*

[4] Liu, Wang, Kejie Lu, Jianping Wang, Guoliang Xing, and Liusheng Huang. "Performance analysis of wireless sensor networks with mobile sinks."*Vehicular Technology, IEEE Transactions on* 61, no. 6 (2012): 2777-2788.

[5] Wang, Wei, Vikram Srinivasan, and Kee-Chaing Chua. "Extending the lifetime of wireless sensor networks through mobile relays." *IEEE/ACM Transactions on Networking (TON) 16, no. 5: 1108-1120,2008*.

[6] Ganesh, Subramanian, and Ramachandran Amutha. "Efficient and secure routing protocol for wireless sensor networks through SNR based dynamic clustering mechanisms." *Communications and Networks, Journal of 15, no. 4 : 422-429,2013.*

[7] Vikas Siwach, Dr. Yudhvir Singh, Seema, Dheer Dhwaj Barak. "An Approach to Optimize QOS Routing Protocol Using Genetic Algorithm in MANET," *IJCSMS International Journal of Computer Science and Management Studies, Vol. 12, Issue 03, Sept 2012.*

[8] Sujeet more, umarfarooque jahagirdar, "an intelligent optimization technique for manet using genetic algorithm," International Journal of Communication Network Security, ISSN: 2231 – 1882, Volume-2, Issue-2, 2013.

[9] Sankalp Bahadur Singh, Asha Ambhaikar, "Optimization of routing protocol in MANET using GA*,"* International- Journal of Science and Research (IJSR), India Online ISSN: 2319 7064.

[10] Yun Zou, Huazhong Zhang ,Xibei Jia. " *Zone-Divided and ENERGY-balanced clustering routing protocol for wireless sensor networks*." *Proceedings of IEEE IC-BNMT2011.*

[11] Ridha soua, "A survey on energy efficient techniques in wireless sensor network". *WNNC 2011 - 4th Joint IFIP Wireless and Mobile Networking Conference, Toulouse,France. IEEE, pp.1,4,5,7, Oct 2011.*

[12] Min Chen, Taekyoung Kwon, Yong Yuan**,** and Victor C.M. Leung, "Mobile agent based wireless sensors networks*," Journal of computers, VOL. 1, NO. 1, APRIL 2006.*

[13] Nakayama, Hidehisa, Zubair Md Fadlullah, Nirwan Ansari, and Nei Kato. "A novel scheme for WSAN sink mobility based on clustering and set packing techniques." *Automatic Control, IEEE Transactions on* 56, no. 10: 2381-2389, 2011.

[14] im, Jae-Wan, Jeong-Sik In, Kyeong Hur, Jin-Woo Kim, and Doo-Seop Eom. "An intelligent agent-based routing structure for mobile sinks in WSNs."*Consumer Electronics, IEEE Transactions on* 56, no. 4: 2310-2316, (201