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A Detailed Analysis on Present Routing, Clustering Trends & Neglected QOSin WSN for IOTs

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ABSTRACT

In present scenario WSN are serving like a back bone to IoT devices. Because IoT's having tiny sensors with tiny batteries in them. So energy saving & lifetime of N/w are always remain under scanner for research work. No doubt Energy and lifetime are very important aspects, but there are many more inter-related QOS factors that can affect the performance of WSN algorithms developed for IoT's. By considering all those factors like Load, communication requests to one CH, fault tolerance,uniform sensor deployment etc., an effective set of parameters can be created which can boost the performance of routing & clustering algorithms developing for IoT's.

KEYWORDS

Clustering, Routing,Clustering, IoT, QOS Factorsetc.

Introduction

As a well-known fact about WSN everyone knows that after the deployment of sensors its next to impossible, replacement of batteries such a tiny sensor. So saving & well utilization of energy is always remain the eye catching area for researchers in WSN.WSN field now emerged in every day's social life by providing the spine to IOT devices.IOT devices comes under existence only because of smart sensors providing sensing capabilities to them.

Now adays, as IoT has taken growth of sensors technology to a totally high level. Wireless sensor networks provides special technology devices named as sensors those provide sensing services to IoT with less energy consumption and also with storage capacity. As from literature study in field of these sensornetworks, the major concern is to increase the network lifetime, as replacement and recharging of these sensors is very hard almost impossible. Due to this from a long time this problem becomes a special field of research. Most of researchers are working on developing effective Clustering Algorithms. The main concern in these algorithms is selection of CHs in the network, so that they can handle data more appropriately and maintain network stability.

As per literature study it is concluded that the previous CH head selection approaches are mainly focusing on selection algorithm having main factors as distance, energy only. But is some of the researches another important factors as load, fault tolerance, buffer overflow factors are also included those are providing effective results not only in maintaining the network lifetime but also the quality of network. Also clustering algorithms with nature inspired algorithms are much attracting researchers. Use of different optimization algorithms also leads this field to a successive track. Except CH selection, let's have a look to other areas of improvement. Inter cluster and intra cluster communication involves research in Communication between nodes within cluster and routing protocols for communication from nodes to sink. Other than selection of effective head an efficient communication model can affect the network lifetime.

WSN's have many application areas and IOT is one of the most popular one now a days. One can't say IOT is all about WSN only, but WSN is working as an integral part of IOT. When any IOT scenario use the sensors which are not able to process the data& have not direct communication with internet, in that situation WSN used for IOT applications. In that case WSN provide sensing and processing capabilities to IOT and support TOT's as a spine.

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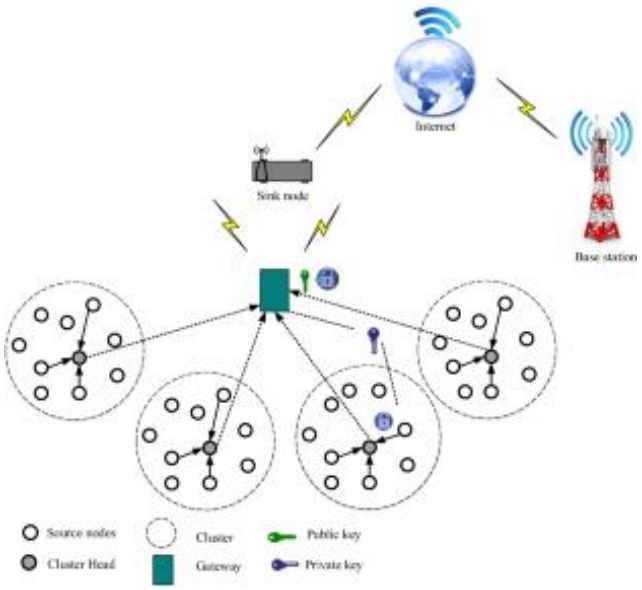

Figure 1. Showing the scenario of independent WSN

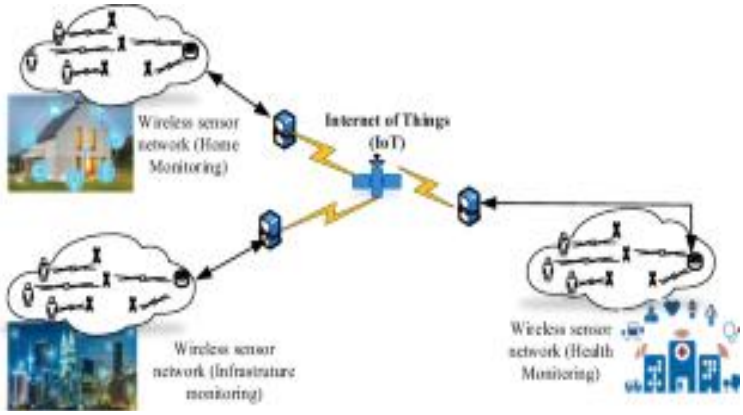

Figure 2. Showing the scenario where WSN is working as a part of IOT

Related Work

INTERNET of things (IoT) is an infrastructure that helps you to transmit and retrieve data from interlinked devices and objects via the Internet. It is an invisible but intelligent network that senses, controls and can be programmed by using embedded technology to communicate with each other. The IoT offers direct access to knowledge about every high-performance and secure system **(D. Bandyopadhyay and J. Sen).[1]**

Approximately 5 billion intelligent devices have already been connected, and nearly 50 billion devices will be joined by 2020. The numbers of people actively talking will virtually surpass the number of devices/machines attached to them. This creates massive traffic in which people will be the minority drivers and traffic receivers. Therefore, due to its threats and opportunities, IoT is investigated for different areas of study. **(Trupti Mayee Behera *et al.*)[2]** WSN serves as a medium for linking the physical world to digital media. The sensing and communication of values through the networks was carried out by small sensors or actuators attached. WSN contains sensor nodes used for tracking different physical and environmental parameters in a network area. The routing path of data from the sensing node to the sink node or base station **(BS)** would be energy efficient because it is nearly difficult to refresh the sensor battery **(W.B. Heinzelman*et al.*)[3].**

The IoT has become a hot question in how to optimize the limiting capacity of network nodes and to prolong the network life cycle. Most research into WSN wireless layer routing

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protocols currently focuses on energy management use, builds energy-efficient routes and offers a reliable data transfer mechanism. The primary goal of routing protocol architecture **(S.M.A. El-Kader *et al*.)** is equalizing network energy utilization **(I. Khan *et a*l**.). The routing infrastructure is a hotspot in the study of the wireless communication network and central infrastructure. Due to low power batteries typically power nodes, research has been the subject on how the energy usage can be maximized to prolong the network life cycle. Clustering protocols have been the hot path of study, since the actual result of the implementation is better than the planar protocol of routing.

A. John and K. V. Babu (2017): author proposed a Dynamic CH selection method (DCHSM) technique to enhance the energy consumption of the sensor nodes. The method proposed in this article having the algorithm where CHs were chosen in two phases. This algorithm enabled large-scale energy efficiency and could be used for IoT applications. The Voronoi diagram was initially used to divide the monitoring region into polygonal-shaped clusters. CH election was implemented in two phases. First Class selection of CH was based on expected likelihood, and the Second Class selection was based on projected survival time. Analysis of the simulation showed that DCHSM outperforms traditional network lifetime approaches.

A. John, et al. (2017):A method of energy-saving CH selection (ESCHS) was proposed by the author to improve the network lifetime of the systems designed for IoT applications. The principle of uniform clustering for cluster forming was used in this process. The selection of CH was based on each sensor node's residual capacity. In terms of energy conservation and network lives, the node with residual energy above the average residual energy of the corresponding cluster was eligible as CH. The results indicated that the proposed strategy was superior to the current methods.

Adhisa and Wibisono(2018): as per author there were some problems with the presence of multiple CHs and nodes when sensor nodes receive no messages from CH adversarial because the radio range of the selected CH nodes became small. Thus in his algorithm, this task was performed on two parameters to pick the best node, the available CH energy and the distance from the CH node to the sink node to tackle many CH appearance problems. The results of the experiment revealed that the use of energy as CH-selection decision-making factor contributes to a more excellent network life, more packets sent and received by PDR but network latency was considerably longer than using a lowering distance to pick the best CH node for multiple CH appearances.

Behera, et al. (2019):author in his article focused on an effective method for selection of cluster heads, rotating the cluster head position between nodes that were higher than other energy levels. The algorithm takes the initial energy, residual energy, an optimum value of the group heads into consideration to pick the next group of network cluster heads appropriate for IoT applications like environmental monitoring, cities and systems. The simulation study showed a better performance of the updated version than the LEACH protocol by increasing the throughput by 60%, 66%, and 64%.

Murugaanandam and Ganapathy (2019): In this research, the author suggested a technique called the 'Reliability Enhanced Preference Ordering Technique (RE-TOPSIS)' combining with the fuzzy logic of using a Multi-Criteria Decision-Making (MCDM) approach, which helps to select CHs efficiently and reliably. The standard LEACH protocol had also applied to allow single CH selection or scheduled based on the RE-TOPSIS index value in each cluster. In each round of the LEACH Setup State loop, this process fully removes the requirement of the CH process selection. A variety of parameters had been considered by the author (1) residual energy, 2) distance between adjacent nodes, 3) energy usage rate, 4) neighbouring node availability, 5) platform-to-platform-compatible distance from the HTTP, and CHs from the member nodes and 6) the new scheme's reliability index. The simulations were carried out to assess or to suggest the achievements of the proposed RETOPSIS and to compare its efficiency with the current protocols. The results showed that the proposed system enhanced network life, conserves resources and implemented a significant reduction in the frequency of CH selection per cycle about contemporary fumigation Topsis and Leach protocols by about 20 per cent to 25 per cent and eventually highlighted the measurements of the proposed RE-TOPSIS.

T. Kaur and D.Kumar, (2018): author in the article introduced an unequal and faulty tolerant clustering protocol called PSO-UFC for particle swarm optimization (PSO). The proposed protocol examines imbalanced clustering and fault tolerance problems in the current energy-balanced unequal clustering (EBUC) protocol for long-term network operation. The PSO-UFC protocol used unequal clustering mechanisms in order to align the energy consumption

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between the cluster heads (MCHs) intra-cluster and inter-cluster. In addition, the network compatibility in the PSO-UFC protocol was restored by selecting a supplementary CH called the Surrogate cluster head (SCH). The simulation results showed that the protocol PSO-UFC extended the network's existence against protocols EBUC, PSO-C and LEACH-C.

Hamidouche, et al. (2019): the technique proposed in this research was designed through the latest technique of heterogeneous networks two algorithms. WOA (Whale Optimization Algorithm) and GWO (Grey Wolf Optimizer), were integrated with the ICA (Imperialist Competitive Algorithm) which relied on the CH (Cluster Head). According to author, such algorithms allowed the data sharing through a heterogeneous WSN, with the buffer overflow issue being considered.

Battar and Kumar (2019): For data transmission between nodes, the route or connection that used less energy or load was selected, and the shortest protocol for the routing path was used. An algorithm was designed by the author where a hybrid method of optimization was used to minimize network capacity. In his research, a hybrid approach was suggested to maximize energy using the PSO and firefly algorithm. The network strength was saved by this hybrid solution, thus improving the network life.

S. Anthony Jesudurai and A.Senthilkumar, (2019): Author proposed an Improved Energy Efficient Cluster Selection Head Selection Protocol (IEECHS-WSN) to transmit information through an energy-efficient routing protocol. In the CH election system, two heads of clusters were selected in a separate cluster, and their work was to extend the service life of the network and reduce the power consumption of IoT applications. The proposed technique in the data fusion system for data entropy was defined as the clustering of dual CHs. The fusion and classification results were accurate and sufficient for data transmission, as the information entropy was used for the fusion and classification. Compared to the current technique, the proposed IEECHS protocol offered better efficiency, network life and energy consumption.

Nageswara Rao Malisetti and Vinay KumarPamulain this article, a protocol for CH selection based on the quasi-opposition algorithm of butterfly optimization (QOBOA) was presented. The proposed approach was contrasted with the original optimization of the butterfly, along with other current algorithms regarding the lifetime and energy efficiency of the networks. The findings of the simulation showed that the CH classification scheme dependent on the QOBOA outperforms those present ones.

Pawan Singh Mehra, et al In the article, an approach considering the remaining energy, distance from the sink and the density of the node nearby were proposed with a fuzzy balanced cost selection algorithm (FBECS). The protocol guaranteed the load balance by choosing the best candidate to serve as cluster coordinator, taking into account each sensor node. Based on better stability time, extended lifetime, and load balance and large information forwarding to sinks, the experimental results confirmed the FBECS efficiency of the BCSA and LEACH counterparts.

Richa Sharma, et al. the author stated that the most challenging problems like energy management, appropriate selection of cluster heads, safe data transmission and enhancement of network life require much consideration to enhance the WSNs. Thus a protected and energy-conscious clustering algorithm called energy-efficient trusted moth flame optimization and a genetic algorithm (eeTMFO / GA) was proposed to solve the issue. The most deserving trusted head node (also known as cluster head) was selected using moth flame optimization in the clustered WSN system. Fitness function had been evaluated in eeTMFO / GA based on five key parameters involving direct fiduciary metrics like the progression of the packet, residual node capacity, connected node width, average cluster distance and average transmission time. Simulation results showed a substantial increase in energy efficiency and network reliability for eeTMFO / GA compared to the current clustering schemes by 60 per cent in comparison to the LEACH protocol, by 56.09 per cent when compared to the HEED protocol, and an increase by the ABC and QABC protocols of 42,22% and 16,36 per cent, respectively.

Turki Ali Alghamdi Author's paper aims to create a new clustering model with optimal cluster head selection under this scenario by considering four main parameters such as energy, time, distance and stability. However, this paper introduced a new hybrid algorithm for selecting the best CHs, which hybridizes the idea of dragonfly and firefly algorithms, called firefly replaced location update in dragonfly. Finally, the efficiency of the proposed research was achieved by contrasting the number of alive nodes, network capacity, delay and risk probability with other traditional models.

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Conclusion

Merger of IOT & WSN field provides the new opportunities to the researcher in this field. From the detailed analysis it is not a hidden secret now that if we need more smart IOT devices, we need moresmart & energy efficient sensors with more efficient N/W & routing algorithm. But the analysis show that only energy, CH selection & network lifetime are taken under consideration during development of new algorithms. During analysis many factors are found that can be the important part of QOS to improve the overall performance of algorithms. Number of issues that are much more important for IoT's and WSN are still not getting required focus. The area of security of N/W, data delivery rate of N/w, LoadBalancing of N/w, Delay due to traffic, Repeating information filtering issues also take under consideration during algorithm design in WSN for IOT. Now a days we need to govern research by taking these background factors because it can increase the overall performance of the network by a large extent.

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