A Review on Max Flow Improvement with Improved Sleep Awake Scheduling in WSN

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***Abstract*- Energy is a scarce resource in wireless sensor networks and conservation of energy has been the subject of extensive research. The main objective is to provide energy efficiency in network & also reduce delay. This work proposes an optimal routing mechanism under sleep scheduling in wireless sensor networks. Duty cycling is a technique that increases energy efficiency by allowing a node to turn off part or all of its systems for periods of time. These sensor networks have certain characteristics such as limited power and battery driven. In this work, an on demand routing under asynchronous sleep scheduling is proposed for each sensor. The aim of this work is to improve network lifetime by minimizing the energy consumption by nodes. The proposed mechanism is implemented with MATLAB.**

***Keywords*-Sleep Awake Cycle, shortest path in Networks, wireless sensor networks, sleep scheduling.**

I. INTRODUCTION

Wireless Sensor Network (WSN) has become an important topic in the entrenched field. WSN is a term used to initiate a class of embedded communication devices that provide consistent wireless connections between sensors, processors and actuators. This presents a brief introduction about the Wireless Sensor Networks (WSNs). Figure 1 provides pictorial overview of WSNs. In Wireless Sensor Network, there is hundreds or thousands of sensor nodes. Sensing method is used for information gathering about a physical object in which occurrence of events include such as changes in state like drop in temperature or pressure etc. Sensing task is performed by Sensor.

Likely, the human body is prepared with sensors like eyes which are capable to capture optical content from the atmosphere, acoustic data such as sounds and smells capture by ears and nose respectively. These are examples of remote sensors, in which to gather information they do not need to touch the monitor. From a technical point of view, a sensor is a device that are used to converts parameters or events into signals. These signals can be used for measurement and analysis [1]. A wireless sensor network can establish using sensor nodes. In geographical area.The Sensor nodes are deployed to monitor physical activity like humidity, temperature, seismic events, vibrations etc. Devices like milli-meter-scale and micro-electro-mechanical are containing sensors, wireless receiver and transmitter, computational processing unit (i.e. CPU) and a power supply. Sensor applications are used in much area like as mining, petroleum exploration, battle operations and even in weather operations.

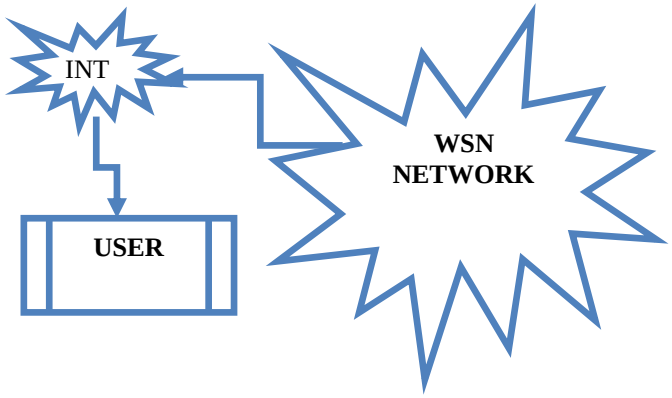

Figure 1: Wireless Sensor Network [1]

Wireless network form by these sensor node and they are work together to gather data from each other and send information to the base station. Data are gathered from the sensor and send to the base station for additional investigation and processing. A WSN is wireless networks that consist of nodes that are spatially distributed in geographical area. These sensors are used to monitor the physical or environmental conditions. Routers and gateways are combining used to create a WSN system. The sensor nodes can also be applicable for location finding system, mobilize and power generator. The star and mesh topology are used to form the WSNs. It can be vary from network to network. The routing or flooding methods are used for broadcasting information among the nodes of the network. Wireless sensor networks have the capability to categorized large number of small nodes that bring together and arrange themselves. WSN have the capability to reducing in the installation costs, by adapt the change in environments.

Sensing units are consists of two sub-units. One is sensors and another is ADCs (analog to digital converters). In Sensor, a physical phenomenon is converting into electrical signals by using transducer. Large variety of sensors are available that are used to measure environmental factors such as image, sound, temperature, light intensity and magnetic fields. An analog signal is observed by sensor and it converted into digital signals by ADC using a particular phenomenon and then sends to the processing unit.

The paper is ordered as follows. In section II, we discuss correlated work with sleep awake cycling in wireless sensor networks. In Section III, It defines sleep scheduling in WSN. In section IV, it describes the proposed work related to sleep awake cycling in WSN. Finally, conclusion is explained in Section V.

II. LITERATURE REVIEW

K. Sun et. al. [1] exhibited a model in which all hubs were synchronized with a typical source and likewise with outside clock. This work gave different approaches to hub synchronization with regular source. There were two kinds of techniques level based and dispersion based clock synchronization. The two strategies can endure up to s flawed hubs among its neighbours where s was framework parameter. The outcomes indicated that level based strategy had high accuracy however less inclusion than dispersion based technique. The presentation can be expanded by sending many source hubs.

G. Lukachan et. al. [2] proposed the vitality proficient convention which was area helped in WSN as a vitality productive arrangement. In this, the sensor hubs utilized vitality data and area of neighbour hubs. In this, sink hub was moved during activity for expanding lifetime. This convention was assessed with re-enactments and contrasted and existing LEACH convention. The outcomes demonstrated that this convention conveyed more parcels.

M. Ilyas et. Al. [3] introduced a strategy for joint minimization of system lifetime parameter for describing level of life span in WSN. In this, it utilized the k most limited way calculation and dynamic programming. This strategy was utilized to increment operational lifetime of WSN. Creator presented a strategy for decreasing the intricacy of framework and for finding ideal course in arrange by limiting mean and change of intensity rates. K.

Lorincz et. al. [4] created Code Blue which was a typical programming foundation to deal with certain difficulties in WSN. This product gave reconciliation between hubs and different remote gadgets for shaping a system and its disclosure and in-organize conglomeration of sensor information. This product was intended for quickly evolving situations. Its bit of leeway was that it didn't require a controlled framework to a system for following areas and powerful to disappointment.

Y. Lan et. al. [5] displayed a safe steering convention that made powerful keys. This system was executed on MICAz set. The presentation of proposed convention was contrasted and other secure conventions. The proposed convention was a Certainty-Based Secure Routing Protocol (CBSRP). It depended on the grouping directing and has the capacity to modify the dynamic key. The proposed convention accomplished the objectives of the security prerequisites. It additionally decreased the transmission volume that was expended in encryption. J.

Kautz et. al. [6] proposed the strategy that altered existing convention which was increasingly versatile and vitality effective. The AMAC is the vitality productive technique that had the option to adjust traffic which gave higher vitality reserve funds. The proposed technique performed better with a 22% decline in vitality/byte and 15% abatement in control. These came at the expense of 7% less streams. The technique gave an answer for improving lifetime for applications which were not time delicate.

K. Lu et. al. [7] proposed a system for scattered key administration plots in arranged remote sensor systems. The exhibition was assessed by different diagnostic models. The outcomes demonstrated that, even with few shifted hubs, the presentation can be improved in arrange. These models can be utilized to precisely foresee the presentation of remote sensor arranges under differing conditions. It was likewise indicated that the proposed logical models can be utilized to anticipate the exhibition precisely under fluctuating operational conditions.

F. Ren et. al. [8] built up a Self-Correcting Time Synchronization convention which was another time synchronization convention. It changed over the time synchronization trouble into an online dynamic and self-modifying improving methodology that make the float pay and counterbalance pay. The complexities of these calculations were low. This convention abused the communicate property of WSN with the goal that overhead was low. They approved on Berkeley exploratory stage and execution was assessed. The estimation results on Berkeley bits indicated that the proposed calculation was extensible to arrange wide time synchronization.

K. Chowdhary et. al. [9] proposed a system that has consent to permit sensor hubs for distinguishing sort of interferer and its channel. The proposed technique contained Offline estimation of qualities of Wireless LAN to acquire a reference shape spectra. It likewise contained watched phantom example during activity. The outcomes indicated that the methodology gave 50-70% sparing in vitality by diminishing parcel misfortune.

R. Albu et. al. [10] proposed the synchronization convention dependent on the IEEE 1588 standard which was intended for wired systems. The principle objective was to guarantee the precision of neighbourhood timekeepers up to a tenth of a microsecond and gave vitality sparing. The Results indicated that the exhibition of arrangement coordinated application gave a huge improvement in vitality sparing. The proposed outcomes demonstrated that this arrangement had the option to get synchronization exactness at a degree of a tenth of microsecond with efficient vitality reserve funds at same time.

M. Leng et. al. [11] proposed check synchronization technique in WSN. In this, defer was examined which depended on two way message trade plot. They determined the probability estimator for joint estimation of clock balance and clock slant. The outcomes indicated that the proposed estimation gave improved execution when contrasted with genuine calculation. The proposed outcomes demonstrated that joint estimation determined by regarding fixed postponement as parameter.

Y. Chen et.al. [12] exhibited the separation vector based calculations for the most part jump check based limitation and explored the different issues like connection between number of dozing hubs and restriction exactness. They likewise explored the connection between level of inconsistency and area exactness. The tests indicated that there was an ideal number of waking hubs and grapple hub thickness that causes decline in vitality utilization. The waking hubs expanded limitation exactness at untouched.

L. Oliveira et. al. [13] executed a strategy in which enormous number of expendable sensor hubs was conveyed in arrange. These hubs were outfitted with sensors with a lesser measure of accuracy, in any case, the framework all in all gives better spatial goals of the region. The clients can approach the information right away. This paper overviewed a comprehensive survey of the reachable

answers for bear remote sensor arrange natural checking applications.

III. SLEEP SCHEDULING IN WSN

In this work, the main objective is to improve network lifetime by using improved On demand sleep scheduling algorithm in WSN. The proposed algorithm is based on energy balancing concept in network. Then, finding the route in each wireless communication. Time slot to maximize network lifetime is equivalent to finding the maximum flow from source node to sink node. The general scheme for the sleep &wakeup procedure is that each sensor node selects a starting time between 0 and Tperiod randomly and each node follows its own wakeup schedule for the succeeding periods. For ease let's assume that Tperiod is equal to 1. The duty cycle is defined as the percentage of time a node is active compared the time for one period Tperiod. The ratio between the preamble lengths P over one period of time Tperiod is denoted as p, since Tperiod is assumed equal to 1, therefore p is equal to P in this work. The preamble length in this work is expressed as "preamble p" due to the Tperiod equal to 1.

The reach ability is defined as the number of the received packets by the sensor nodes *Nr* over the total number of sensor nodes *N* within the area. Thus the reach ability is can be written as R =*Nr*/*N*. The number of the received packets can be attained both directly via the source node and indirectly via the retransmitting of other sensor nodes in the area.

1. On-demand Sleep Scheduling Protocol

This type of protocol is based on the power management type protocol. The protocol is based on a reality that sensing nodes must be in sleep mode or in off condition when there are no data packets to transmit or receive purpose. The sensor node will become active only there some data packets that wants to be transmitted or received. After that the sensor nodes exchange between sleep & active periods according to the network act. The benefit of this action is that sensor nodes do not waste power by avoidable transmissions and avoidable sensing & therefore the energy utilization is minimized. The main disadvantage of this scheme is that if a different sensor node wants to commune with them then it is hard to notify the sleeping nodes. To overcome this shortcoming use of several radios is required. This methodology is a combination of two channels working at a same time. On demand protocol is a high performance energy efficient sleep awake protocol for WSNs.

2. The Scheduled Rendezvous Protocol

The other energy efficient protocol is known as scheduled rendezvous protocol. It is a type of synchronous protocol in this all sensing nodes is simultaneously wake up. In this, a scheduled rendezvous protocol is used for the sleep scheduling of sensor nodes. In this type of protocol according to the wakeup schedule sensor nodes wake up and remain alert for a small time interval to correspond with their neighbours. The senor nodes will become inactive after the communication of the data is completed. The main benefit of this protocol is that it's crystal-clear that all neighbouring sensor nodes are awake as a sensor node is awake. It is very suitable for data aggregation and allows transmit messages to all neighbours.

The main drawback of this protocol it is a synchronized protocol. To coordinate their clocks this protocol needs all the neighbouring nodes switch the synchronization information. A synchronous protocol having a property that it is equalizing the local times for all the sensor nodes in WSN. This is the most energy consuming protocol due to time synchronization required for all sensor nodes at all time in many application. It is hard to achieve rather than it is a luxurious protocol. Many other applications want only time management of some sensor nodes at a time.

3. Proposed Improved Protocol

For improving network lifetime, this proposed is preferred. The first tier consists of battery-powered sensor nodes that are densely deployed in the monitored area. Their role is to sense and relay data to a set of sink nodes. The second tier consists of sink nodes, which are grid-powered and are deployed at the two ends of the line. They collect data from the sensor nodes, and transmit the data to a remote monitoring center. Due to the length of the monitored area and the comparative small communication range of the sensor nodes, a multi-hop communication path from the sensor nodes to the sink node has to be established.

IV. DESCRIPTION OF PROPOSED WORK

In WSN, energy is consumed by all nodes during data transmission. So that maximum of nodes goes into dead state after some time. It produces less throughput and increase energy consumption. Sleep awake cycle in WSN is used for energy efficiency. In synchronous sleep protocol, all nodes gets awake at a same time so that it affect amount of energy is consumed. Demand sleep scheduling routing algorithm is for energy conservation in WSN using MATLAB. The lifetime of the network is enhanced using energy preservation. The main objective in wireless sensor networks is to reduce energy consumption and to improve the throughput of sensor node for enhancing the lifetime of sensor network. In this process, the data is to be transmitted to the first node that wakes up and makes a progress in the performance for minimizing the delay policy. They demonstrated that the when nodes are densely deployed in environment, the usual energy utilization keeps near to the lower bound. Since each node has restricted energy, these nodes are generally put to sleep to preserve energy and it helps to extend the network lifetime. Sleep scheduling technique is always used to reduce the energy consumption so that nodes will active for a long duration without recharge their batteries. There are two main schemes for sensor nodes in sleep scheduling are, random and synchronized. Sleep scheduling algorithm has responsible for data route from source to sink node.

Short-path algorithms generally have polynomial complexity and generally only produce a single path between a source and destination. In shortest path routing, the topology network is represented using a directed weighted graph. The nodes in the graph represent switching elements and the directed arcs in the graph represent communication links between switching elements. Each arc

has a weight that represents the cost of sending a packet between two nodes in a particular direction. This cost is generally a positive value that can inculcates such factors as delay, throughput, and error rate, monetary cost etc. A path between two nodes may go through several intermediary nodes and arc. The objective in shortest path routing is to find a path between two nodes that has the smallest total cost, where the total cost of a path is the sum of the arc costs in that path.

V. CONCLUSION

In a WSN it is not necessary for each sensor node to be active all the time so in this work a sleep scheduling is proposed by using an adapted duty cycle. It also proposes a routing mechanism under sleep awake cycling in WSN. All simulations will be done in MATLAB. The scope of the research was to develop an energy efficient and adaptive protocol stack for low data rate wireless connectivity with fixed devices and with very limited energy consumption requirements.

REFFERENCES

[1] Kun Sun, (2006) "*Secure and Resilient Clock Synchronization in Wireless Sensor Networks*", IEEE Journal on Selected Areas In Communications, Vol. 24, No. 2, pp. 395-408.

[2] G. Lukachan, (2006) "*Scalable and Energy-Efficient Routing for Large-scale Wireless Sensor Networks*", IEEE 6th International Caribbean Conference on Devices, Circuits and Systems, pp. 267-272.

[3] M. U. Ilyas and H. Radha, (2006) "*Increasing Network Lifetime of An IEEE 802.15.4 Wireless Sensor Network By Energy Efficient Routing*", IEEE International Conference on Communications, Vol. 9, pp. 3978 – 3983.

[4] Konrad Lorincz, (2006) "*Sensor Networks for Emergency Response: Challenges and Opportunities*", IEEE Pervasive Computing, Vol. 3, Issue 4, pp.16-23.

[5] Yao Lan, (2006) "*The Research on Certainty-Based Secure Routing Protocol in Wireless Sensor Networks*", International Conference on Wireless Communications, Networking and Mobile Computing, Wuhan, pp.1-5.

[6] Justin T. Kautz, (2007) "*An Adaptable Energy-Efficient Medium Access Control Protocol for Wireless Sensor Networks*", In Proceedings of the 40th Annual International Conference on System Sciences, pp. Hawaii.

[7] Kejie Lu, Yi Qian, (2008) "*A Framework for a Distributed Key Management Scheme in Heterogeneous Wireless Sensor Networks*", IEEE Transactions On Wireless Communications, Vol. 7, No. 2, pp. 639-647.

[8] Fengyu Ren, (2008) "*Self-Correcting Time Synchronization Using Reference Broadcast In Wireless Sensor Network*", IEEE Wireless Communications, pp.79-85.

[9] K. Chowdhury and Ian F. Akyildiz, (2009) "*Interferer Classification, Channel Selection and Transmission Adaptation for Wireless Sensor Networks*", IEEE International Conference on Communications, pp.297-301.

[10] Roxana Albu, (2010) "*An Energy-efficient Clock Synchronization Protocol for Wireless Sensor Networks*", IEEE International Conference on Communications, pp. 84-89.

[11] Mei Leng and Yik-Chung Wu, (2010) "*On joint synchronization of clock offset and skew for Wireless Sensor Networks under exponential delay*", IEEE International Symposium on Circuits and Systems Proceedings, pp.461-464.

[12] Yuanfang Chen, (2011) "*The Insights of DV-based Localization Algorithms in the Wireless Sensor Networks with Duty-cycled and Radio Irregular Sensors*", IEEE International Conference on Communications (ICC), Kyoto.

[13] Luís M. L. Oliveira and Joel J. P. C. Rodrigues, (2011) "*Wireless Sensor Networks: a Survey on Environmental Monitoring*", IEEE Journal of Communications, Vol. 6, No. 2, pp.143-151.

[14] Elma Zanaj, Blerina Zanaj, (2017) "Link Failure Impact on The Lifetime of WSN",International Conference on Modern Power Systems, IEEE, pp. 01-04.

[15] N. Hajiakhoond Bidoki, M. Baghbahari , (2018) "Joint Value of Information and Energy Aware Sleep Scheduling in Wireless Sensor Networks: A Linear Programming Approach", IEEE, pp. 3180-3185.

[16] J. Choe, D. Mas Montserrat, (2018) "Sleep Analysis Using Motion and Head Detection", IEEE, pp. 29-32.

[17] Rashi Srivastava, Muzammil Hasan, (2018) "Selective Sleep-Awake Scheduling in WSN-Cloud Integration", IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering, pp. 5002-5007.

[18] Jeehyun Choe, A. J. Schwichtenberg, (2019), "Classification of Sleep Videos Using Deep Learning", IEEE Conference on Multimedia Information Processing and Retrieval, pp. 115-120.