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A Modified Algorithm for Improving Lifetime in WSN

[1]Osamah Ibrahim Khalaf, [2]Ghaida Muttashar Abdulsahib and [2]Muayed Sadik
[1]College of Information Engineering, Al-Nahrain University, Baghdad, Iraq
[2]Department of Computer Engineering, University of Technology, Iraq

Abstract: In recent years, the utilization of wireless sensor systems for modern applications has been quickly developing and wireless devices are for the most part battery worked devices which have restricted battery control. Since, sensor hops are little in estimate, cost-productive, low control devices and have constrained battery control supply. Remote Sensor Networks (WSNs) are used for a remote workplace, once sending is done it isn't conceivable to supplant the battery and vitality. And this study, also proposed a hybrid calculation algorithm which identifies with the system lifetime upgrade. The results have calculated by using NS2 programming show that the proposed algorithm has a considerable change as compared to previous algorithms.

Key words: Reliability, sensor hops, wireless sensor network, WSN lifetime, energy consuming, algorithms

INTRODUCTION

Inside the most recent decade, sensor networks and related advances and applications have increased impressive energy. This is because of the way that the innovation is developing and moving out of the simply investigate driven condition into business interests. Various variables have added to this impact: good chip innovation takes into consideration expanded stage modernity, higher incorporation and additionally bring down power utilization and cost. Moreover, progresses in low power radio innovations have made better remote conventions and usage suited for the sensor network showcase. This has prompted more solid activity which empowered believable pilot organizations in the business space. WSNs are a fundamental piece of the systems administration foundation for unavoidable figuring. Unavoidable registering and pervasive figuring are terms these days utilized conversely, despite the fact that they had distinctive implications in their beginning times (Orda and Yassour, 2005). Unavoidable registering mean immersive figuring though omnipresent processing portrayed methods for installed and imperceptible registering (Segal, 2008). With the advancement of the two figuring standards, individuals bit by bit utilize the two terms reciprocally to mean both and joined parts without bounds pattern of figuring advancements. Unavoidable figuring has been determined by Mark Weiser in 1990's as the processing worldview for the 21st century (Kalpakis *et al*., 2003). Unavoidable registering is a model of data preparing that enlarges PCs with detecting capacities and conveys them into nature. Numerous inescapable processing applications are responsive in nature in that they perform activities in reaction to occasions (i.e., changes in condition of the Earth) (Stanford and Tongngam, 2006). In any case, these applications are ordinarily intrigued by abnormal state complex occasions as opposed to the low-level crude occasions delivered by sensors. Be that as it may, these applications are ordinarily intrigued by abnormal state complex occasions as opposed to the low-level crude occasions created by sensors. Supporting complex occasion identification in inescapable registering situations is a testing issue. Sensors may have restricted handling, stockpiling and correspondence abilities. Also, battery controlled detecting gadgets have restricted vitality assets. Since, they are implanted in the earth, energizing might be troublesome or unimaginable (Garg and Konemann, 1998). The vitality utilization of each sensor hop is overwhelmed by the cost of transmitting and accepting messages. To delay the lifetime of the framework, it is fundamental that these vitality assets are utilized effectively (Elkin *et al*., 2008; Anastasi *et al*., 2009). Vitality compelled sensor systems have been conveyed broadly to monitor what's more, observation purposes. Information assembling in such systems is regularly a pervasive activity. Since, sensors have noteworthy power imperatives, since, battery life is constrained, vitality proficient techniques must be utilized for information social occasion to enhance arrange lifetime. In this study, we select the steering parameters that impact sensors control utilization amid directing (Peng *et al*., 2010). Reproduction shows the impact of these parameters on the organize life time. Utilizing fitting thought for these parameters in directing of the network life time.

Corresponding Author: Osamah Ibrahim Khalaf, College of Information Engineering, Al-Nahrain University, Baghdad, Iraq

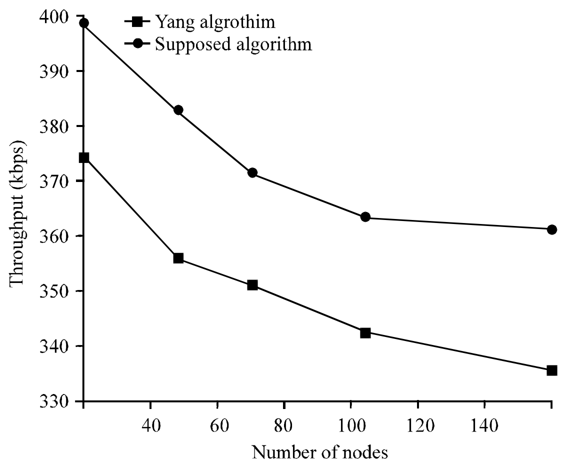

Fig. 1: Throughputs for Yang and proposed algorithms versus density

Wireless sensor network difficulties: The WSNs possesses the special system qualities. In this way, the outline of WSN presents numerous difficulties which covers the accompanying principle perspectives:

Power limitations: This is the significant test in WSN (Sharma *et al*., 2013), since, the sensor hops are battery fueled, subsequently have exceptionally restricted vitality limit. The vitality is required by the sensor hops for some, reasons like information gathering (Anisi *et al*., 2011), information handling, information correspondence, additionally consistent tuning in to the medium for bundle accepting and exchange requires substantial measure of vitality. The batteries providing vitality should be changed or revived after some time. This isn't conceivable much of the time where the sensor hops are sent remotely. The requirement of vitality presents numerous new difficulties in the improvement of equipment and programming conventions for WSNs. To delay the operational lifetime of a sensor organize, vitality proficiency ought to be considered in each part of sensor arrange plan, equipment and programming as well as system designs and routing algorithms.

Restricted hardware and software resources: The WSN comprises of thousands of sensor hops. So, it is wanted to be light weight and ease. It has constrained handling and capacity limits and in this way can just perform restricted computational functionalities (Crnjin, 2009). Subsequently, the glimmer memory is generally utilized in sensor hops. The focal preparing unit (Fig. 1) which comprises of microchip and microcontroller is in charge of determining the vitality utilization and calculations. For making the CPU all the more light weight and modest countless, microchip chips and Field Programmable Gate clusters (FPGA) are utilized A Field-Programmable entryway exhibit (FPGA) is a coordinated Circuit (IC) that can be modified in the field after produce. FPGAs are comparative on a basic level to, yet have immeasurably more extensive potential application than, Programmable Read-just Memory (PROM) chips. Promote the vitality utilization of FPGA is high which can't be diminished, the radio range must be high between 1-5 km. These offers adapt to present circumstances in creating calculations and conventions which must consider the vitality imperatives in sensor hops as well as the handling and capacity limits of sensor hops.

Massive and random deployment and repair independent from anyone else (Anastasi *et al*., 2009; Peng *et al*., 2010). Most sensor systems comprise of an extensive number of sensor hops, going from hundreds to even thousands or significantly more. These sensor hops are sent remotely and are required to work without human intervention. Node sending is normally application subordinate which can be either manual or arbitrary. The sensor hops should self-governing sort out, design, adjust and keep up and repair themselves (Sohrabi *et al*., 2000) in an antagonistic situation.

Dynamic and unreliable environment: A sensor organize normally works in a dynamic and untrustworthy condition. On one hand, the topology of a sensor system may change as often as possible because of hop disappointments, harms, increments or vitality consumption. Then again, sensor hops are connected by a remote medium which is uproarious, blunder inclined and time fluctuating. The availability of the system might be much of the time upset in view of channel blurring or flag lessening.

Operating system: OS outline for WSN veers off from customary OS design (Farooq and Kunz, 2011) operating system for WSN ought to be less intricate than the general working frameworks. It ought to have a simple programming strategy. Application engineers ought to have the capacity to focus on their application rationale as opposed to being worried about the low level equipment issues like planning, appropriating and organizing. Different operating systems created for sensor hops incorporate Tiny OS, Contiki, Mantis Nano-RK, litters operating system (Farooq and Kunz, 2011) and nano-plus.

Security: Remains an open issue for extra innovative work as of now proposed steering conventions for WSNs are shaky, however, indispensable. The writing audit of different security systems expresses that link layer encryption and verification instruments gives sensible barrier to bit class untouchable assaults, the Cryptography is wasteful in averting against PC class and insider assaults. They faces basic difficulties, since, the current framework is now starving for assets, for example, communication transfer speed, power supply, computational power and so forth. Building multi-bounce steering topology turns out to be the shelter for the to interlopers. Different security administrations has been given, for example, link-layer encryption and validation, identity confirmation bidirectional connection check, authenticated communicates. Prerequisites for WSN security mock, changed and replayed steering data (Mohanty *et al.*, 2010) selective forwarding Sinkhole assaults, the Sybil assault, Wormholes. Along these lines outlining the conventions for such a non prescient condition is extremely a major test (Jain, 2011; Mohanty *et al.*, 2010).

Diverse applications: The WSNs have an extensive variety of assorted applications (Zheng and Jamalipour, 2009) and the necessities for various applications fluctuates altogether. There is no such algorith or program or convention concocted, yet which can satisfy every one of the prerequisites of the considerable number of uses since, the outline of sensor systems is application particular. The new middleware for WSNs, called Motley middleware (Katona *et al.*, 2016) have made it conceivable to empower a mutual framework and multi-application bolster for WSNs. The Motley middleware accomplishes this by giving the administrations to the spread, establishment and planning of uses with various QoS necessities.

Previous studies: Numerous studies have contributed framework to give the approaches to build the lifetime of battery in wireless sensor network. Anyway sensor hops are ordinarily appropriated in difficult to reach districts relying upon the kind of use and the sink is situated far from sensor hops. For this reason, sensor hops with the restricted battery asset should be worked amid the allocated time without battery. Vitality collecting idea and grouping method connected for powerful utilization of vitality the reserchers Priyadarsini, Jen,. Sau clarified the framework where fundamental test of expanding the field lifetime of sensor nodesl. This builds the field lifetime of the sensor hops before their entire corruption. K. Das, D. Malek and Pahi (Das *et al.*, 2014) portrayed the framework where they diverse courses rather than a same course to forward the system movement, thus, the fluctuation of intensity utilization of all hops is less and it will expand the more life time of system (INLT) algorithm. For more use the hop which are less utilize give the possibility while picking the way in future. Because of sink hops multiple nodesremove between hop sink combine is decreased and vitality proficient steering maintains a strategic distance from the low vitality hop while directing bundles and keeps it from kicking the bucket early. So, together they save vitality which prompts drawing out the general system lifetime and additionally the lifetime of a sensor node (Chattopadhyay and Vijayalakshmi, 2014). Sarasweat, Rati, P. Bhattacharya portrayed where they utilized photovoltaic cell for productive power administration in remote sensor networks. Efficient battery use procedures and release attributes are then depicted which upgrade the operational battery lifetime (Saraswat *et al.*, 2012). A few scientists likewise centers around by killing excess hops to rest mode to save vitality while dynamic hops can give basic k-scope which enhances adaptation to internal failure for that they utilize diverse planning calculations. The booking calculations can be executed in unified or limited plans which have their own focal points and hindrances that kill excess hops in the wake of giving the required scope level k (Padmavathy and Chitra, 2010). Anasttasi, Contti, Mi Francessco (Anastasi, 2009) proposes the convention which progressively changes the hops to coordinate the system requests, even in time-differing working conditions. These convention utilized for effective power administration in remote sensor systems focused to occasional information securing. What's more, the framework does not require any from the earlier learning of the system topology or movement design. Under time shifting conditions the convention can adjust the obligation cycle of single hops to the new working conditions while keeping a reliable rest plan among sensor hops.

Pemg, Zei Li, W. Zhanng and D. Qiuao clarify the outline the such a framework which construct a proof-of-idea prototype to assess the attainability and execution in little scale systems and lead broad reproductions to consider its execution in substantial scale networks. The proposed framework can use the remote charging innovation viably to draw out the system lifetime through conveying vitality by a robot to where it is required.

MATERIALS AND METHODS

Proposed algorithm: Asset limitations and unwavering quality are two imperative difficulties progressively directing in remote sensor systems. With a specific end goal to delay arrange lifetime, vitality utilization must be adjusted in all of sensor hops and shouldn't be a subset of hops which expend more vitality. Thusly, arrange lifetime by adjusting vitality utilization increments. In this study an answer for directing procedure with adjusted vitality utilization to build unwavering quality is introduced. Proposed strategy is a blend of two calculations, one of them depends on hereditary and the other one recoveries past courses that have greater dependability. We give a weight for every parameter as per its significance and emphasize the calculation along different ages which identifies with acquiring a course that has close to nothing vitality utilization and greater dependability. At that point, we keep up the courses with little vitality utilization and then some unwavering quality which will be utilized in future routings. In the event that the ebb and flow courses flop later on routings, we will seek different courses by methods for hereditary calculation. Here, for accomplishing most loved vitality utilization and unwavering quality, we should give a weight to these administrations to pick up a course with specified conditions to send the totaled information to sink through hops and by diminishing vitality utilization, increment organize lifetime.

Here, it is accepted that all hops are static and have remarkable ID and distinctive chromosomes are utilized in hereditary calculation, here, a chromosome would be a course from source to goal and every chromosome comprises of qualities that make up the hops. Every hop's highlights incorporate unwavering quality and vitality utilization. First highlight demonstrates the unwavering quality of each connection and the second component relies upon the separation among hops, the most brief separation identifies with slightest vitality utilization which increment constant system lifetime. Hereditary calculation keeps up an extraordinary populace that demonstrates the viability of arrangement on the issue. This populace continues imitating until look task end. In every age, utilized activities are remarkable to change age and all the underlying populace is haphazardly created and we utilize hybrid and transformation as hereditary administrators. As said previously, our underlying populace is arbitrarily created and after that, we perform hybrid and transformation administrator on the underlying populace. For this, we utilize two parent's chromosomes for hybrid administrator and after that, we play out the administrator and 4 chromosomes will be gotten. We get the wellness capacity and utilize two chromosomes which have the most wellness work as people to come. Likewise, for transformation administrator we utilize two chromosomes. The quantity of next populace will be twice introductory populace. We ought to diminish the quantity of new populace to be equivalent of starting populace by computing the wellness work for every chromosome and after that sort them in dropping request and we pick the main portion of new discovery for next generations. We give a calculated value for each every hop, calculated value will be found using Eq. 1 as following:

$$\text{Weight (N)} = \text{Weight of consumed power}^{*}\ \text{Consumed power} + \text{Weight of the robustness}^{*}\ \text{robustness (N)}$$

where the likelihood of successful data transferring over a route for the intermediate hops is given by:

$$\text{Robustness (N)} = \prod_{m}^{k} = 0\ (1\text{-Robustness}_{m})$$

where, the value of 0 and K indicates to the sender and the receiver hops, respectively. Some of the time, on account of hybrid and transformation administrators, wellness capacity might be more than limit, so, we should utilize punishment research. We utilize 70 hubs as introductory populace and hybrid and change rating 9 and 75% separately and 7% of the underlying populace is utilized to keep away from the choppiness of age. To compare about with the algorithms, we utilize 80 hubs as the number of qualities from level with hubs that increment arrange lifetime because of vitality utilization diminishing. At that point, 0.1 of aggregate ideal courses are spared for future uses. At the point when there is an interest for course, we can utilize specified spared courses. Spared courses are in request to diminish vitality utilization and drag out system lifetime when past courses have interface disappointment or hub disappointment. For this situation when information is lost, we utilize cradle to reestablish it. Source sends information on the off chance that it is valid, the recipient hub stores it in its cushion generally if a connection fizzled and different courses are utilized. In such conditions there is no requirement for information sending from source which result to the vitality utilization diminishing.

RESULTS AND DISCUSSION

In this part, we assess the execution of our proposed algorithm in NS2 . The general reproduction condition is predominantly drawn from for reasonable correlation and outlined in Table 1. Where Yang algorithm is equipped for expanding the sensor organize life time fundamentally. And works well in expansive scale systems. Moreover, it presents an alternate point of view by taking the benefit of the portable charger. The acquired outcomes are contrasted and the displayed calculations in Yang study. Results show that crossover calculation as far as dependability and system lifetime is more productive. Figure 1 shows the robustness quality change in different cycles.

As presented in Table 2 and Fig. 1, the throughputs of two algorithms decrease as the number of nodes increases due to the highly connected cluster topology which reduces the quantum of received packets in the time unit. The maximum throughput observed in all three routing protocols was greater than 370 kbps. The proposed algorithm had the highest throughput, followed by Yang algorithm. The difference between them was 7-24 kbps which increased to 18-30 as the node number

Table 1: Simulation parameters

Parameters	Values
Range of radio	50 (m)
Simulation area	300×300 (m)
Number of nodes	120
Node movement	Random
Payload	40 bytes

Table 2: Throughputs for Yang and proposed algorithms versus density

No. of nodes	Yang algorithm	Supposed algorithm
25	374.25	398.25
50	356.23	382.87
70	351.02	371.25
100	342.65	363.35
150	335.79	361.24

Table 3: PDR for Yang algorithm and proposed algorithm versus density

No. of nodes	Yang algorithm	Proposed algorithm
25	96.89	99.78
50	96.55	99.52
70	95.79	99.32
100	95.33	99.16
150	94.98	99.08

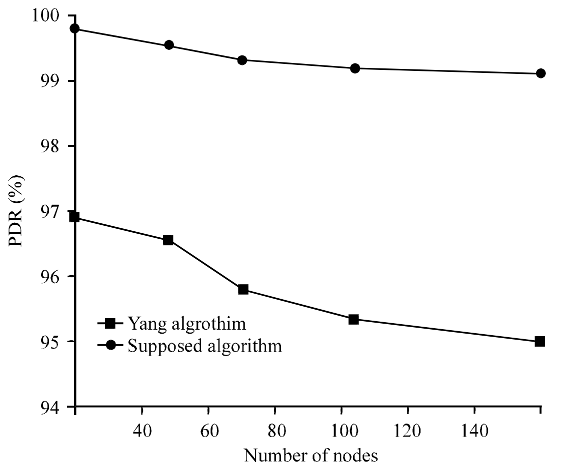

Fig. 2: PDR for Yang algorithm and proposed algorithm versus density

increased. These results prove that accurate location information reduces the loop free for sending packets and packet loss.

Packet delivery ratio: As shown in Table 3 and Fig. 2, PDR values decrease as the number of nodes increases, because the increased density results in high network traffic. At the beginning of the simulation, all algorithms had a high PDR ratio which exceeded 96%. The variation between the compared algorithms is very small (1-2%). The maximum packet delivery ratio was obtained with proposed algorithm which implies that the proposed calculation process can enhance the route stability.

Table 4 : Delay for Yang algorithm and supposed algorithm versus density

No. of nodes	Yang algorithm	Proposed algorithm
25	111.23	101.02
50	115.20	105.25
70	119.02	106.32
100	124.23	107.25
150	128.88	110.25

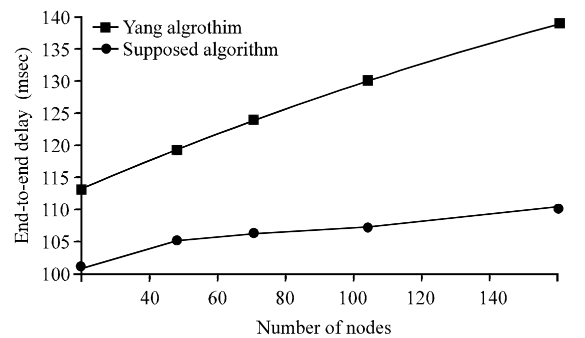

Fig. 3: Delay for Yang algorithm and supposed algorithm versus density

Delay: As indicated in Table 4 and Fig. 3, delay increases with the number of nodes in both algorithms. The high density means a great number of intermediate hops that extends the delay between sending and receiving packets. The suggested algorithm reports a shorter delay than Yang algorithm. The difference between the supposed algorithm and Yang algorithm is (0.010-0.018 sec). The primary cause for the low end-to-end value in ECRP is its strategic route selection which results in minimizing the potential of link failure errors and congestion.

CONCLUSION

This research studied by using NS2 simulation the sensor network lifetime problem and proposed a steering algorithm for remote sensor systems utilizing a modified algorithm that can expand robustness quality and system lifetime models. The outcomes are contrasted and the exhibited algorithm by Yang *et al*. applying similar conditions. Results show that the proposed algorithm as far as dependability and system lifetime is more effective the other algorithm and can enhance the performance of WSN with high ratio.

REFERENCES

Anastasi, G., M. Conti and M.D. Francesco, 2009. Extending the lifetime of wireless sensor networks through adaptive sleep. IEEE Trans. Ind. Inf., 5: 351-365.

Anisi, M.H., A.H. Abdullah and S.A. Razak, 2011. Energy-efficient data collection in wireless sensor networks. Wirel. Sens. Netw., 3: 329-333.

Chattopadhyay, S. and G. Vijayalakshmi, 2014. Improving the lifetime of wireless sensor network through energy conservation. Intl. J. Comput. Sci. Inf. Technol., 5: 2345-2347.

Crnjin, A., 2009. Software Issues in Wireless Sensor Networks. In: Wireless Sensor Networks: Concepts, Multidisciplinary Issues and Case Studies, Gavrilovska, L., S. Krco, V. Milutinovic and I. Stojmenovic (Eds.). University of Belgrade, Belgrade, Serbia, pp: 1-9.

Das, K., D.K. Mallik, S. Sahoo and J. Padhi, 2014. Increased network life time algorithm in wireless sensor network. Intl. J. Innovative Res. Adv. Eng., 3: 14-17.

Elkin, M., Y. Lando, Z. Nutov, M. Segal and H. Shpungin, 2008. Novel algorithms for the network lifetime problem in wireless settings. Proceedings of the International Conference on Ad-Hoc Networks and Wireless, September 8-10, 2008, Springer, Berlin, Germany, ISBN:978-3-540-85208-7, pp: 425-438.

Farooq, M.O. and T. Kunz, 2011. Operating systems for wireless sensor networks: A survey. Sens., 11: 5900-5930.

Garg, N. and J. Konemann, 1998. Faster and simpler algorithms for multicommodity flow and other fractional packing problems. Proceedings of the 39th Annual Symposium on Foundations of Computer Science (Cat. No.98CB36280), November 8-11, 1998, IEEE, Palo Alto, California, ISBN:0-8186-9172-7, pp: 300-309.

Jain, M.K., 2011. Wireless sensor networks: Security issues and challenges. Intl. J. Comput. Inf. Technol., 2: 62-67.

Kalpakis, K., K. Dasgupta and P. Namjoshi, 2003. Efficient algorithms for maximum lifetime data gathering and aggregation in wireless sensor networks. Comput. Networks, 42: 697-716.

Katona, R., D. O'Shea, V. Cionca and D. Pesch, 2016. Challenges in supporting diverse applications in a shared WSN: The motley middleware. Proceedings of the 2016 27th Irish Conference on Signals and Systems (ISSC), June 21-22, 2016, IEEE, Londonderry, UK., ISBN:978-1-5090-3410-9, pp: 1-6.

Mohanty, P., S. Panigrahi, N. Sarma and S.S. Satapathy, 2010. Security issues in wireless sensor network data gathering protocols: A survey. J. Theor. Appl. Inf. Technol., 13: 14-27.

Orda, A. and B.A. Yassour, 2005. Maximum-lifetime routing algorithms for networks with Omnidirectional and directional antennas. Proceedings of the 6th ACM International Symposium on Mobile Ad Hoc Networking and Computing, May 25-27, 2005, ACM, New York, USA., pp: 426-437.

Padmavathy, T.V. and M. Chitra, 2010. Extending the network lifetime of wireless sensor networks using residual energy extraction-hybrid scheduling algorithm. Intl. J. Commun. Network Syst. Sci., 3: 98-106.

Peng, Y., Z. Li, W. Zhang and D. Qiao, 2010. Prolonging sensor network lifetime through wireless charging. Proceedings of the 2010 31st IEEE Symposium On Real-Time Systems (RTSS), November 30- December 3, 2010, IEEE, San Diego, California, USA., ISBN:978-0-7695-4298-0, pp: 129-139.

Saraswat, J., N. Rathi and P.P. Bhattacharya, 2012. Techniques to enhance lifetime of wireless sensor networks: A survey. Global J. Comput. Sci. Technol., 12: 1-13.

Segal, M., 2008. Fast algorithm for multicast and data gathering in wireless networks. Inf. Process. Lett., 107: 29-33.

Sharma, S., R.K. Bansal and S. Bansal, 2013. Issues and challenges in wireless sensor networks. Proceedings of the 2013 International Conference on Machine Intelligence and Research Advancement, December 21-23, 2013, IEEE, Katra, India, ISBN:978-0-7695-5013-8, pp: 58-62.

Sohrabi, K., J. Gao, V. Ailawadhi and G.J. Pottie, 2000. Protocols for self-organization of a wireless sensor network. IEEE. Pers. Commun., 7: 16-27.

Stanford, J. and S. Tongngam, 2006. Approximation algorithm for maximum lifetime in wireless sensor networks with data aggregation. Proceedings of the 7th ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD'06), June 19-20, 2006, IEEE, Las Vegas, Nevada, ISBN:0-7695-2611-X, pp: 273-277.

Zheng, J. and A. Jamalipour, 2009. Wireless Sensor Networks: A Networking Perspective. John Wiley & Sons, Hoboken, New Jersey, USA., ISBN:978-0-470-16763-2, Pages: 489.