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Energy Efficient Management Approach For Wireless Sensor Networks

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Abstract: *This paper includes the survey of energy conservation in wireless sensor networks. Wireless sensornetworks(WSN) provides information from its surround-ing physical world to the base station. WSN consist of large number of static and mobile sensor nodes deployed in a sensor field, forward the sensed data towards static or mobile sink or base station. Sensor nodes are battery powered small devices, hence there is chance of quick depletion of battery due to the operational overhead and continuous sensing. Similarly increased data traffic concentration of the single-hop neighbors of sink lead to the creation of hotspot at these single-hop neighbors. Energy efficient routing protocols are the solution for reducing energy consumption in the networkby providing uniform energy distribution throughout thenetwork. This work deal with different routing protocols used in different scenario in order to enhance energyefficiency of the network.*

Keywords: Wireless sensor networks

REFERENCES

[1] Philo Juang, Hidekazu Oki, Yong Wang, Margaret Martonosi, Li Shiuan Peh, and Daniel Rubenstein. Energy-efficient computing for wildlife tracking: Design tradeoffs and early experiences with zebranet. In Proceedings of the 10th international conference on Architectural support for programming languages and operating systems, pages 96–107, 2002.
[2] T Srinidhi, G Sridhar, and V Sridhar. Topology management in ad hoc mobile wireless networks. In Proceedings of RealTime Systems Symposium, Work-in-Progress Session, 2003.
[3] Jamal N Al-Karaki and Ahmed E Kamal. Routing techniques in wireless sensor networks: a survey. IEEE wireless communications, 11(6):6–28, 2004.
[4] Guiling Wang, Guohong Cao, and Tom La Porta. Proxybased sensor deployment for mobile sensor networks. In 2004 IEEE International Conference on Mobile Ad-hoc and Sensor Systems (IEEE Cat. No. 04EX975), pages 493–502. IEEE, 2004.
[5] Haiyun Luo, Fan Ye, Jerry Cheng, Songwu Lu, and Lixia Zhang. Ttdd: Two-tier data dissemination in large-scale wireless sensor networks. Springer,Wireless networks, 11(12):161–175, 2005.
[6] Jeong-Hun Shin, Jaesub Kim, Keuntae Park, and Daeyeon Park. Railroad: virtual infrastructure for data dissemination in wireless sensor networks. In Proceedings of the 2nd ACM international workshop on Performance evaluation of wireless ad hoc, sensor, and ubiquitous networks, pages 168–174, 2005.
[7] Zeeshan Hameed Mir and Young-Bae Ko. A quadtree-based hierarchical data dissemination for mobile sensor networks. Springer,Telecommunication Systems, 36(1-3):117–128, 2007.
[8] Guojun Wang, Tian Wang, Weijia Jia, Minyi Guo, H-H Chen, and Mohsen Guizani. Local update-based routing protocol in wireless sensor networks with mobile sinks. In 2007 IEEE International Conference on Communications, pages 3094–3099. IEEE, 2007.
[9] Stefano Basagni, Alessio Carosi, Emanuel Melachrinoudis, Chiara Petrioli, and Z Maria Wang. Controlled sink mobility for prolonging wireless sensor networks lifetime. Springer,Wireless Networks, 14(6):831–858, 2008.
[10] Ioannis Chatzigiannakis, Athanasios Kinalis, and Sotiris Nikoletseas. Efficient data propagation strategies in wireless sensor networks using a single mobile sink. Elsevier,Computer Communications, 31(5):896–914, 2008.
[11] Elyes Ben Hamida and Guillaume Chelius. A line-based data dissemination protocol for wireless sensor networks with mobile sink. In 2008 IEEE international conference on communications, pages 2201–2205. IEEE, 2008.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
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[12] Yan Zhao, Qianping Wang, Dong Jiang, Wanrong Wu, Li Hao, and Ke Wang. An agent-based routing protocol with mobile sink for wsn in coal mine. In IEEE,2008 Third International Conference on Pervasive Computing and Applications, volume 2, pages 857–862. IEEE, 2008.
[13] Long Cheng, Yimin Chen, Canfeng Chen, and Jian Ma. Query-based data collection in wireless sensor networks with mobile sinks. In Proceedings of the 2009 international conference on wireless communications and mobile computing: connecting the World wirelessly, pages 1157–1162, 2009.
[14] Matthew Dunbabin, Alistair Grinham, and James Udy. An autonomous surface vehicle for water quality monitoring. In Citeseer,Australasian conference on robotics and automation (ACRA), pages 2–4. Citeseer, 2009.
[15] Ricklef Wohlers, Niki Trigoni, Rui Zhang, and Stephen Ellwood. Twinroute: Energy-efficient data collection in fixed sensor networks with mobile sinks. In 2009 Tenth International Conference on Mobile Data Management: Systems, Services and Middleware, pages 192–201. IEEE, 2009.
[16] Jae-Wan Kim, Jeong-Sik In, Kyeong Hur, Jin-Woo Kim, and Doo-Seop Eom. An intelligent agent-based routing structure for mobile sinks in wsns. IEEE Transactions on Consumer Electronics, 56(4):2310–2316, 2010.
[17] Babar Nazir and Halabi Hasbullah. Mobile sink based routing protocol (msrp) for prolonging network lifetime in clustered wireless sensor network. In IEEE,2010 International Conference on Computer Applications and Industrial Electronics, pages 624–629. IEEE, 2010.
[18] Uros˘ M Pes˘ovic´, Joz˘e J Mohorko, Karl Benkic˘, and Z˘ arko F C˘ uc˘ej. Single-hop vs. multi-hop–energy efficiency analysis in wireless sensor networks. In 18th Telecommunications Forum, TELFOR, 2010.
[19]Harshavardhan Sabbineni and Krishnendu Chakrabarty. Datacollection in event-driven wireless sensor networks with mobile sinks. International Journal of Distributed Sensor Networks, 6(1):402680, 2010.
[20]Ke Tian, Baoxian Zhang, Kui Huang, and Jian Ma. Data gathering protocols for wireless sensor networks with mobile sinks. In 2010 IEEE Global Telecommunications Conference GLOBECOM 2010, pages 1–6. IEEE, 2010.
[21]Thuy T Truong, Kenneth N Brown, and Cormac J Sreenan. Using mobile sinks in wireless sensor networks to improve building emergency response. In Royal Irish academy research colloquium on wireless as an enabling technology, pages 1–4. Royal Irish Academy, 2010.
[22]Massimo Vecchio, Aline Carneiro Viana, Artur Ziviani, and Roy Friedman. Deep: Density-based proactive data dissemination protocol for wireless sensor networks with uncontrolled sink mobility. Elsevier,Computer Communications, 33(8):929–939, 2010.
[23]Fucai Yu, Soochang Park, Euisin Lee, and S-H Kim. Elastic routing: a novel geographic routing for mobile sinks in wireless sensor networks. IET communications, 4(6):716–727, 2010.
[24]Feng Zhao, Chenglin Zhao, Yongxing Wang, Xuebin Sun, and Ting Jiang. An energy-saving cluster routing for wireless sensor networks with mobile sink. 2010.
[25]Giuseppe Anastasi, Eleonora Borgia, Marco Conti, and Enrico Gregori. A hybrid adaptive protocol for reliable data delivery in wsns with multiple mobile sinks. OUP,The Computer Journal, 54(2):213–229, 2011.
[26]Tzung-Cheng Chen, Tzung-Shi Chen, and Ping-Wen Wu. On data collection using mobile robot in wireless sensor networks. IEEE Transactions on Systems, Man, and CyberneticsPart A: Systems and Humans, 41(6):1213–1224, 2011.
[27]Charalampos Konstantopoulos, Grammati Pantziou, Damianos Gavalas, Aristides Mpitziopoulos, and Basilis Mamalis. A rendezvous-based approach enabling energy-efficient sensory data collection with mobile sinks. IEEE Transactions on parallel and distributed systems, 23(5):809–817, 2011.
[28]Euisin Lee, Soochang Park, Seungmin Oh, Sang-Ha Kim, and Ki-Dong Nam. Real-time routing protocol based on expect grids for mobile sinks in wireless sensor networks. In 2011 IEEE Vehicular Technology Conference (VTC Fall), pages 1– 5. IEEE, 2011.
[29]Xinxin Liu, Han Zhao, Xin Yang, and Xiaolin Li. Sinktrail: A proactive data reporting protocol for wireless sensor networks. IEEE Transactions on computers, 62(1):151–162, 2011.
[30]Xun-Xin Yuan and Rui-Hua Zhang. An energy-efficient mobile sink routing algorithm for wireless sensor networks. In IEEE,2011 7th International Conference on Wireless Communications, Networking and Mobile Computing, pages 1–4. IEEE, 2011.
[31]Ays¸egu¨l Tu¨ysu¨z Erman, Arta Dilo, and Paul Havinga. A virtual infrastructure based on honeycomb tessellation for data dissemination in multi-sink mobile wireless sensor networks. Springer,EURASIP Journal on Wireless Communications

IJARSCT
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International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 7, May 2022
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and Networking, 2012(1):17, 2012.
[32]Mohammadreza Eslaminejad, Shukor Abd Razak, and Abdul Samad Haji Ismail. Eedars: An energy-efficient dual-sink algorithm with role switching mechanism for event-driven wireless sensor networks. KSII Transactions on Internet & Information Systems, 6(10), 2012.
[33]Mohd Fauzi Othman and Khairunnisa Shazali. Wireless sensor network applications: A study in environment monitoring system. Elsevier,Procedia Engineering, 41:1204–1210, 2012.
[34]Mohsin Raza Jafri, Nadeem Javaid, Akmal Javaid, and Zahoor Ali Khan. Maximizing the lifetime of multi-chain pegasis using sink mobility. arXiv preprint arXiv:1303.4347, 2013.
[35]Babar Nazir and Halabi Hasbullah. Energy efficient and qos aware routing protocol for clustered wireless sensor network. Springer,Computers & Electrical Engineering, 39(8):2425– 2441, 2013.
[36]Cedrick S Nomatungulula, Kabeya Gilbert Ngandu, Suvendi Rimer, Babu Sean Paul, Omowunmi M Longe, and Khmaies Ouahada. Mobile sink wireless underground sensor communication monitor. In Springer,International Conference on eInfrastructure and e-Services for Developing Countries, pages 172–177. Springer, 2013.
[37]Lei Shi, Baoxian Zhang, Hussein T Mouftah, and Jian Ma. Ddrp: an efficient data-driven routing protocol for wireless sensor networks with mobile sinks. Wiley Online Library,International Journal of Communication Systems, 26(10):1341–1355, 2013.
[38]Can Tunca, Sinan Isik, M Yunus Donmez, and Cem Ersoy. Distributed mobile sink routing for wireless sensor networks: A survey. IEEE communications surveys & tutorials, 16(2):877–897, 2013.
[39]Bruno S Faic¸al, Fausto G Costa, Gustavo Pessin, Jo´ Ueyama, Heitor Freitas, Alexandre Colombo, Pedro H Fini, Leandro Villas, Fernando S Oso´rio, Patr´ıcia A Vargas, et al. The use of unmanned aerial vehicles and wireless sensor networks for spraying pesticides. Elsevier,Journal of Systems Architecture, 60(4):393–404, 2014.
[40]Yifan Hu, Yongsheng Ding, Kuangrong Hao, Lihong Ren, and Hua Han. An immune orthogonal learning particle swarm optimisation algorithm for routing recovery of wireless sensor networks with mobile sink. International Journal of Systems Science, 45(3):337–350, 2014.
[41]Abdul Waheed Khan, Abdul Hanan Abdullah, Mohammad Abdur Razzaque, and Javed Iqbal Bangash. Vgdra: a virtual grid-based dynamic routes adjustment scheme for mobile sink-based wireless sensor networks. IEEE sensors journal, 15(1):526–534, 2014.
[42]Basanta K Nayak, Monalisa Mishra, Satyananda Champati Rai, and Sateesh K Pradhan. A novel cluster head selection method for energy efficient wireless sensor network. In 2014 International Conference on Information Technology, pages 53–57. IEEE, 2014.
[43]Ashok V Sutagundar and Sunilkumar S Manvi. Fish bone structure based data aggregation and routing in wireless sensor network: multi-agent based approach. Springer,Telecommunication Systems, 56(4):493–508, 2014.
[44]Kartik Trivedi and Ashish Kumar Srivastava. An energy efficient framework for detection and monitoring of forest fire using mobile agent in wireless sensor networks. In 2014 IEEE International Conference on Computational Intelligence and Computing Research, pages 1–4. IEEE, 2014.
[45]Gurkan Tuna, V Cagri Gungor, and Kayhan Gulez. An autonomous wireless sensor network deployment system using mobile robots for human existence detection in case of disasters. Elsevier,Ad Hoc Networks, 13:54–68, 2014.
[46]Can Tunca, Sinan Isik, Mehmet Yunus Donmez, and Cem Ersoy. Ring routing: An energy-efficient routing protocol for wireless sensor networks with a mobile sink. IEEE Transactions on Mobile Computing, 14(9):1947–1960, 2014.
[47]Chuan Zhu, Yao Wang, Guangjie Han, Joel JPC Rodrigues, and Jaime Lloret. Lpta: Location predictive and time adaptive data gathering scheme with mobile sink for wireless sensor networks. Hindawi,The Scientific World Journal, 2014, 2014.
[48]Dalei Wu, Dimitris Chatzigeorgiou, Kamal Youcef-Toumi, and Rached Ben-Mansour. Node localization in robotic sensor networks for pipeline inspection. IEEE Transactions on Industrial Informatics, 12(2):809–819, 2015.
[49]Chuan Zhu, Shuai Wu, Guangjie Han, Lei Shu, and Hongyi Wu. A tree-cluster-based data-gathering algorithm for industrial wsns with a mobile sink. IEEE Access, 3:381–396, 2015.
[50]Omar Aldabbas, Abdelrahman Abuarqoub, Mohammad Hammoudeh, Umar Raza, and Ahce`ne Bounceur. Unmanned ground vehicle for data collection in wireless sensor networks: mobility-aware sink selection. The Open Automation and Control Systems Journal, 8(1), 2016.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
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Impact Factor: 6.252

[51]Bhaskar Bhuyan and Nityananda Sarma. A qos aware routing protocol in wireless sensor networks with mobile base stations. In Proceedings of the International Conference on Internet of things and Cloud Computing, pages 1–6, 2016.
[52]Jau-Yang Chang and Ting-Huan Shen. An efficient treebased power saving scheme for wireless sensor networks with mobile sink. IEEE Sensors Journal, 16(20):7545–7557, 2016.
[53]T Hayes and Falah H Ali. Robust ad-hoc sensor routing (raser) protocol for mobile wireless sensor networks. Elsevier,Ad Hoc Networks, 50:128–144, 2016.
[54]S Jegadeesan and GKD Prasanna Venkatesan. Smart cow health monitoring, farm environmental monitoring and control system using wireless sensor networks. Int J Adv Engg Tech/Vol. VII/Issue I/Jan.-March, 334:339, 2016.
[55]Farhoud Jafari Kaleibar, Maghsoud Abbaspour, and Hadi S Aghdasi. An energy-efficient hybrid routing method for wireless sensor networks with mobile sink. Springer,Wireless Personal Communications, 90(4):2001–2015, 2016.
[56]Alexander E Kostin, Yasemin Fanaeian, and Hayder AlWattar. Anycast tree-based routing in mobile wireless sensor networks with multiple sinks. Springer,Wireless Networks, 22(2):579–598, 2016.
[57]Guangqian Xie and Feng Pan. Cluster-based routing for the mobile sink in wireless sensor networks with obstacles. IEEE Access, 4:2019–2028, 2016.
[58]Guisong Yang, Huifen Xu, Xingyu He, Liping Gao, Yishuang Geng, and Chunxue Wu. A clue based data collection routing protocol for mobile sensor networks. IEEE Access, 4:8476– 8486, 2016.
[59]Catalina Aranzazu-Suescun and Mihaela Cardei. Distributed algorithms for event reporting in mobile-sink wsns for internet of things. TUP,Tsinghua Science and Technology, 22(4):413– 426, 2017.
[60]Catalina Aranzazu-Suescun and Mihaela Cardei. Reactive routing protocol for event reporting in mobile-sink wireless sensor networks. In Proceedings of the 13th ACM Symposium on QoS and Security for Wireless and Mobile Networks, pages 43–50, 2017.
[61]Rajanpreet Bhatti and Gurinderjeet Kaur. Virtual grid based energy efficient mobile sink routing algorithm for wsn. In IEEE,2017 11th International Conference on Intelligent Systems and Control (ISCO), pages 30–33. IEEE, 2017.
[62]Hailong Huang, Andrey V Savkin, and Chao Huang. I-umdpc: The improved-unusual message delivery path construction for wireless sensor networks with mobile sinks. IEEE Internet of Things Journal, 4(5):1528–1536, 2017.
[63]Selvakumar Sasirekha and Sankaranarayanan Swamynathan. Cluster-chain mobile agent routing algorithm for efficient data aggregation in wireless sensor network. IEEE,Journal of Communications and Networks, 19(4):392–401, 2017.
[64]Suraj Sharma, Deepak Puthal, Sanjay Kumar Jena, Albert Y Zomaya, and Rajiv Ranjan. Rendezvous based routing protocol for wireless sensor networks with mobile sink. Springer,The journal of Supercomputing, 73(3):1168–1188, 2017.
[65]Carlos A Trasvin˜a-Moreno, Rube´n Blasco, A´ lvaro Marco, Roberto Casas, and Armando Trasvin˜a-Castro. Unmanned aerial vehicle based wireless sensor network for marinecoastal environment monitoring. Multidisciplinary Digital Publishing Institute,Sensors, 17(3):460, 2017.
[66]Jin Wang, Jiayi Cao, Sai Ji, and Jong Hyuk Park. Energyefficient cluster-based dynamic routes adjustment approach for wireless sensor networks with mobile sinks. Springer,The Journal of Supercomputing, 73(7):3277–3290, 2017.
[67]Ayush Agrawal, Vinay Singh, Shubhra Jain, and Rajeev Kumar Gupta. Gcrp: Grid-cycle routing protocol for wireless sensor network with mobile sink. Elsevier,AEU-International Journal of Electronics and Communications, 94:1–11, 2018.
[68]Thair A Al-Janabi and Hamed S Al-Raweshidy. A centralized routing protocol with a scheduled mobile sink-based ai for large scale i-iot. IEEE Sensors Journal, 18(24):10248–10261, 2018.
[69]Mukil Alagirisamy and Chee-Onn Chow. An energy based cluster head selection unequal clustering algorithm with dual sink (ech-dual) for continuous monitoring applications in wireless sensor networks. Springer,Cluster Computing, 21(1):91–103, 2018.
[70]Muhammad Faheem and Vehbi Cagri Gungor. Mqrp: Mobile sinks-based qos-aware data gathering protocol for wireless sensor networks-based smart grid applications in the context of industry 4.0-based on internet of things. Elsevier,Future Generation Computer Systems, 82:358–374, 2018.
[71]Ashish Gupta, Hari Prabhat Gupta, Preti Kumari, Rahul Mishra, Surbhi Saraswat, and Tanima Dutta. A real-time precision agriculture monitoring system using mobile sink in wsns. In 2018 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), pages 1– 5. IEEE, 2018.
[72]Md Ahsan Habib, Sajeeb Saha, Md Abdur Razzaque, Md Mamun-or Rashid, Giancarlo Fortino, and Mohammad Mehedi Hassan. Starfish routing for sensor networks with mobile sink. Elsevier,Journal of Network and Computer

Applications, 123:11–22, 2018.
[73]Bilal Muhammad Khan, Rabia Bilal, and Rupert Young. Fuzzy-topsis based cluster head selection in mobile wireless sensor networks. Elsevier,Journal of Electrical Systems and Information Technology, 5(3):928–943, 2018.
[74]Xiaodong Liu and Qi Liu. A virtual uneven grid-based routing protocol for mobile sink-based wsns in a smart home system. Springer,Personal and Ubiquitous Computing, 22(1):111–120, 2018.
[75]Ratijit Mitra and Suraj Sharma. Proactive data routing using controlled mobility of a mobile sink in wireless sensor networks. Elsevier,Computers & Electrical Engineering, 70:21– 36, 2018.
[76]Madhuri Rao, Narendra Kumar Kamila, and Kulamala Vinod Kumar. A hierarchical underwater wireless sensor network design for tracking ships approaching harbors using an aerial mobile sink (ams) node. In Springer,International Conference on Intelligent Computing and Applications, pages 299–307. Springer, 2018.
[77]Jin Wang, Yu Gao, Xiang Yin, Feng Li, and Hye-Jin Kim. An enhanced pegasis algorithm with mobile sink support for wireless sensor networks. Hindawi,Wireless Communications and Mobile Computing, 2018, 2018.
[78]Jun Xu, Gurkan Solmaz, Rouhollah Rahmatizadeh, Ladislau Boloni, and Damla Turgut. Providing distribution estimation for animal tracking with unmanned aerial vehicles. In 2018 IEEE Global Communications Conference (GLOBECOM), pages 1–6. IEEE, 2018.
[79]Yinggao Yue, Li Cao, Bo Hang, and Zhongqiang Luo. A swarm intelligence algorithm for routing recovery strategy in wireless sensor networks with mobile sink. IEEE Access, 6:67434–67445, 2018.
[80]Vinith Chauhan and Surender Soni. Mobile sink-based energy efficient cluster head selection strategy for wireless sensor networks. Springer,Journal of Ambient Intelligence and Humanized Computing, pages 1–14, 2019.
[81]Sajjad Hussain Chauhdary, Ali Hassan, Mohammed A Alqarni, Abdullah Alamri, and Ali Kashif Bashir. A twofold sink-based data collection in wireless sensor network for sustainable cities. Elsevier,Sustainable cities and society, 45:1–7, 2019.
[82]Hui Cheng, Lei Tao, and Xinming Zhang. A fast and efficient broadcast protocol with a mobile sink node in asynchronous wireless sensor networks. IEEE Access, 7:92813–92824, 2019.
[83]Rabiaa Elkamel, Asma Messouadi, and Adnane Cherif. Extending the lifetime of wireless sensor networks through mitigating the hot spot problem. Elsevier,Journal of Parallel and Distributed Computing, 133:159–169, 2019.
[84]Shubhra Jain, KK Pattanaik, and Anupam Shukla. Qwrp: query-driven virtual wheel based routing protocol for wireless sensor networks with mobile sink. Elsevier,Journal of Network and Computer Applications, 147:102430, 2019.
[85]Minjae Kang, Ikjune Yoon, and Dong Kun Noh. Efficient location service for a mobile sink in solar-powered wireless sensor networks. Multidisciplinary Digital Publishing Institute,Sensors, 19(2):272, 2019.
[86]A Karimi and S Moloud Amini. Reduction of energy consumption in wireless sensor networks based on predictable routes for multi-mobile sink. Springer,The Journal of Supercomputing, 75(11):7290–7313, 2019.
[87]Abdul Waheed Khan, Javed Iqbal Bangash, Adnan Ahmed, and Abdul Hanan Abdullah. Qdvgdd: Query-driven virtual grid based data dissemination for wireless sensor networks using single mobile sink. Springer,Wireless Networks, 25(1):241–253, 2019.
[88]Kumar Nitesh, Amar Kaswan, and Prasanta K Jana. Energy density based mobile sink trajectory in wireless sensor networks. Springer,Microsystem Technologies, 25(5):1771–1781, 2019.
[89]Ling Zhang and Cheng Wan. Dynamic path planning design for mobile sink with burst traffic in a region of wsn. Hindawi,Wireless Communications and Mobile Computing, 2019, 2019.
[90]H Al-Behadili, S AlWane, Yasir Al-Yasir, Naser Ojaroudi Parchin, Peter Olley, and Raed A Abd-Alhameed. The use of multiple mobile sinks in wireless sensor networks for large scale areas. 2020.
[91]Fatemeh Banaeizadeh and Abolfazl Toroghi Haghighat. An energy-efficient data gathering scheme in underwater wireless sensor networks using a mobile sink. Springer,International Journal of Information Technology, pages 1–10, 2020.
[92]V Bibin Christopher and J Jasper. Dhgrp: Dynamic hexagonal grid routing protocol with mobile sink for congestion control in wireless sensor networks. Springer,Wireless Personal Communications, pages 1–20, 2020.
[93]Dionisis Kandris, Christos Nakas, Dimitrios Vomvas, and Grigorios Koulouras. Applications of wireless sensor networks: an up-to-date survey. Multidisciplinary Digital Publishing Institute,Applied System Innovation, 3(1):14, 2020.
[94]TH Feiroz Khan and D Siva Kumar. Ambient crop field monitoring for improving context based agricultural by mobile sink in wsn. Springer,Journal of Ambient Intelligence and Humanized Computing, 11(4):1431–1439, 2020.

IJARSCT
ISSN (Online) 2581-9429
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