IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Critical Reviews On Systems Using Wsns' For Big Data.

Author: V Suryanarayana Kumar.

Profile: Lecturer in department of Computer Science at Aditya Degree College, Lakshmi Narayana nagar, Kakinanda.AP-India

Abstract

Wireless sensor networks (WSNs) are rapidly developing in the big data world and are being used widespread in many aspects of life. Recently, WSN has also made very significant entry in the management of critical data safety, traffic monitoring, and climate change detection. wireless sensor networks provide a significant amount of data from several sensor-nodes in large-scale networks (WSNs), which are amongst the many potential datasets. This present paper portrays a detailed assessment of recent research on using WSN into large data systems Potential network and effective deployment. This paper contains the cutting-edge research reviews that will be helpful for future work in this area.

Keywords: Wireless sensor networks WSN Big data Sensor network

INTRODUCTION

Sensor-driven networks are aimed to discover and record events, aggregate and report the acquired data, and oversee tasks. WSN has mainly wireless sensor nodes. The sensor detects some event or physical phenomenon and informs the mote about it. The below given components make up Mote:

a wireless communication interface, a digitizer, a CPU, some sort of storage device, and a power supply.

Power storage and power harvesting are two feasible categories into which the nodes' power supply might be segmented [S. Sharma, & V. K. Verma, (2022)]. The installation of WSN are generally done in isolated locations where post-installation maintenance by humans is not feasible. The out-turn efforts are being assumed to increase their effectiveness and robustness. Deployment of WSN is hampered by a number of factors, including power consumption and vast deployment distances. These complications no longer circumventing widespread remote deployment due to automation trends and newly emerging applications. Big data systems benefit from efficient data aggregation and in-network processing. For enhancing the system performance and address WSN's limitations, it is crucial to analyse research articles that merge WSN with big data systems. To exemplify a basic system design, consider about a massive data system that is WSN-based. The data is sent to a temporary store by the sink node once it has been collected from the sensor nodes for subsequent data aggregation. Subsequently, a big data framework employing the primary store may operate with the combined data. Applications and big data platforms manage the converted data [B.S. Kim et. al. (2019].

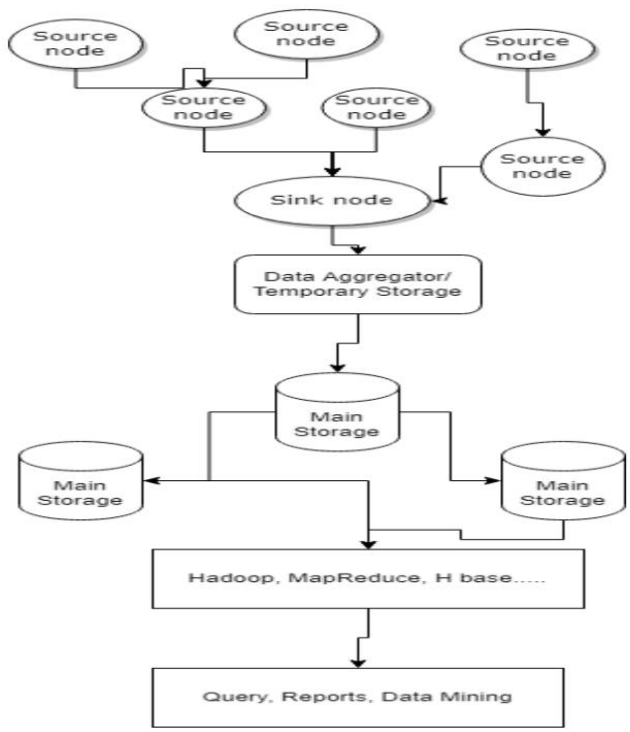

Fig. 1 Large-Scale Network System [B.S. Kim et. al. (2019].

Comparatively, the WSN routing is many times complex than in typical ad hoc networks due to its unique qualities. For WSN, a variety of routing methods that differ from the standard TCP/IP addressing scheme have been proposed. These strategies concentrated on network features as well as structural and functional requirements. Being aware of the factors that are crucial to the sensor applications is necessary for developing a better WSN strategy. It is possible to put sensor nodes in remote or dangerous areas. This demands that nodes be able to communicate with one another even in the absence of a base station or predetermined cluster of motes. Additionally, it might not be able to replenish the sensor nodes' batteries [S. Sharma, & V. K. Verma, (2022)].

Big Data in WSN

Big data term is getting more familiar and popular term in field of Information and Communication technology. As the applications of WSN are increasing enormously, WSN is well-thought-out as key contributor of Big-data. As shown in figure no.2 of sensors deployed are responsible for producing the big data in large volume. According to the literature survey it is observed that amount of user data in the network is getting doubled in two years. Big data can be characterized with 3V's [R. Bergelt et. al.(2014)], which are as below:

Volume = The amount of data

Velocity = Speed of data comes at sensor node

Variety = Array of data

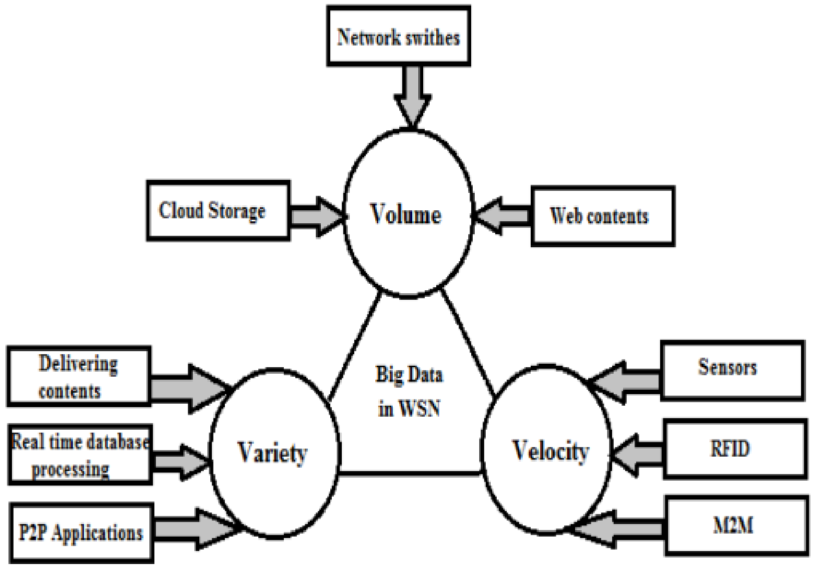

Figure 2: Big data in WSN

Related Reviews of Literature

WSN based Big-data work

Shatat et al. (2022) have used two models for flood disaster detection. The big data was acquired and processed for flood detection. Further, the Adaptive Billiards-Inspired Optimization (A-BIO) in union with Optimized Ensemble-learning-based detection (OED) was used for optimizing and reducing the complexity of the proposed model. The performance of the detection model was analysed and it was claimed that the model has high accuracy in detecting the flood and hence avoided the huge impacts of flood disasters.

[Jeyalaksshmi et. al.(2022)] presented the utilisation of 'Bidirectional long short-term memory' (BiLSTM) techniques to offer adaptive duty-cycle scheduling for WSNs. The 'BiLSTM' captures both past and future steps to fine-tune the sleep schedules of sensor nodes. This algorithm incorporates an eligibility check based on the Jaccard similarity index (JSI) value among the sensor nodes, electing those with higher values to enter sleep mode. The sleep schedule extension is based on data patterns, such as traffic load and energy levels, obtained through BiLSTM analysis. It is important to note that this work assumes that sensor nodes are already in a sleep mode, with intervention limited to their sleep duty cycles. However, the BiLSTM algorithm does not explicitly consider network coverage and connectivity, as it assumes a random duty cycle for all nodes. Moreover, over time, the eligibility rules impact the residual energy, thereby affecting network performance.

A novel energy-efficient clustering routing protocol based on the Yellow Saddle Goatfish Algorithm (YSGA) was introduced by Rodríguez et al. (2020). The protocol is intentional to intensify the network lifetime by reducing energy usage. In his cluster structure, a base station and a set of clusters are collected. The YSGA algorithm determines the number of cluster-heads and the selection of optimal heads of the cluster when the sensor nodes are assigned to the nearest head of the cluster. YSGA reconfigures the cluster configuration of the network to ensure optimum distribution of the cluster heads and to decrease the propagation gap.

Farrah *et al.* [Farrah et,al(2015)] aim to analyze tool for data collected in wireless sensor networks. For this, they proposed a data warehouse protocol based on Hadoop virtual cluster and a Hadoop data warehousing framework, namely Hive [E. Capriolo, et. al(2012)] based on queries written on a SQL-like language called Hive Query Language (HiveQL), and converted to MapReduce jobs.

Zhang et al. (2014) suggested a WSN clustering routing protocol based on form 2 fuzzy logic and ant colony optimization (CRT2FLACO). In particular, in the cluster configuration process, a Type 2 Mamdnai Fuzzy Logic Scheme (T2MFLS) is built to help monitor the volatility of the law and balance the network load, in which three significant variables are treated as inputs: residual power, the number of neighboring nodes and the distance from a node's base station (BS), and the probability of the node being the candidate cluster head (CH).

Li et al. (2013) due to the issue of insignificant imbalance in the energy of the cluster heads, the researchers have combined the improved algorithm for Particle Swarm Optimisation (PSO) clustering with the algorithm for inter-cluster routing to construct an energy-efficient adaptive algorithm.

Issues in Big Data in WSN

[Al-Nader et. al.(2023)] The multiple objective optimization (MOO) problem has consistently been a central research focus, particularly in the realm of safety-critical WSN systems. Safety-critical systems, such as fire detection, military surveillance, and nuclear plant monitoring systems, are instrumental in ensuring human safety, safeguarding assets, and averting fatalities.

[Mohanty et. al. (2020)] The design of WSN includes several constraints. The most essential constraint is because of the fact that sensor nodes are placed in an adverse region and it should be often recharged with batteries. Hence, the sensor lifetime is dramatically reduced compared with quantity of power induced in battery and the way of conserving power.

In WSN each individual node is surrounded with huge amount of data. The main factor regarding a node in network is its coverage area or the area of interest. Since for a particular sensor node, variation in data values in its coverage area is probably less [Y. Demchenko et. al(2012)]. Hence in that area the redundancy is also less.

Vermesan et. al.(2010)]The IoT is a huge network with an enormous number of objects connected to a global information infrastructure. The number of connected devices has increased many folds, giving rise to the scalability issue in the IoT. For proper communication to take place, a unique sender and receiver must be recognized, along with the identification of an appropriate path or channel.

Conclusion

This article provides a thorough analysis of recent research on integrating WSN into large-scale data systems. In order to explore exciting future research opportunities, outstanding topics are then discussed. It is observed that Wireless sensor network is the key contributor for generation of Big data. The volume of data in wireless sensor network is increasing exponentially. Big data in WSN, the issues and challenges occurred during data collection in sensor network are included in brief in this paper which shall be used for further research work.

References:

Abdallah Saleh Ali Shatat, Md. Mobin Akhtar, Abu Sarwar Zamani, Sara Dilshad & Faizan Samdani, Big Data Driven Map Reduce Framework for Automated Flood Disaster Detection Based on Heuristic-Based Ensemble Learning, Cybernetics and Systems, DOI: 10.1080/01969722.2022.2145664. (2022)

Al-Nader I, Lasebae A, Raheem R, Khoshkholghi A. A Novel Scheduling Algorithm for Improved Performance of Multi-Objective Safety-Critical Wireless Sensor Networks Using Long Short-Term Memory. *Electronics*. 2023; 12(23):4766. https://doi.org/10.3390/electronics12234766

B.S. Kim, K. I. Kim, B Shah, F. Chow, and K. H. Kim, (2019) “Wireless sensor networks for big data systems,” Sensors, 19(7), 1565.].

E. Capriolo, D. Wampler and J. Rutherglen, Programming Hive, Sebastopol, CA, USA:O’Reilly Media, 2012.]

Jeyalaksshmi, S.; Ganesh, R.M. Adaptive Duty-Cycle Scheduling using Bi-Directional Long Short-Term Memory (BiLSTM) for Next Generation IoT Applications. In Proceedings of the 2022 International Conference on Computing, Communication and Power Technology (IC3P), Visakhapatnam, India, 7–8 January 2022; pp. 75–80.

Li, Y. L., Shao, W., You, L., & Wang, B. Z. (2013). An improved PSO algorithm and its application to UWB antenna design. *IEEE Antennas and wireless propagation letters*, *12*, 1236-1239.

R. Bergelt, M. Vodel and W. Hardt, “Energy efficient handling of big data in embedded, wireless sensor networks” IEEE Conference, Sept. 2014.

Rodríguez, A., Del-Valle-Soto, C., & Velázquez, R. (2020). Energy-efficient clustering routing protocol for wireless sensor networks based on yellow saddle goatfish algorithm. *Mathematics*, *8*(9), 1515.

S. Farrah, H. El Manssouri, E. Ziyati and M. Ouzzif, "An approach to analyze large scale wireless sensors network data", *Int. Res. J. Comput. Sci.*, vol. 2, no. 5, pp. 1-6, May 2015.

S. Sharma, & V. K. Verma, (2022) “An integrated exploration on internet of things and wireless sensor networks,” Wireless Personal Communications, 124(3), 2735-2770.

Vermesan, O.; Harrison, M.; Vogt, H.; Kalaboukas, K.; Tomasella, M.; Wouters, K. *Cluster of European Research Projects on the Internet of Things: Vision and Challenges for Realising the Internet of Things*; European Commission: Luxembourg, 2010.

Y. Demchenko, Z. Zhiming, P. Grosso, A. Wibisono, and C. de Laat, " Addressing big data challenges for scientific data infrastructure", in Proceedings of the IEEE 4th International Conference on Cloud Computing Technology and Science, IEEE Computer Society, pp.614-617, 2012

Zhang, Q. Y., Sun, Z. M., & Zhang, F. (2014, July). A clustering routing protocol for wireless sensor networks based on type-2 fuzzy logic and ACO. In *2014 IEEE international conference on fuzzy systems (FUZZ-IEEE)* (pp. 1060-1067). IEEE.