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TRANSMISSION OF DATA AND ERROR RECOVERY ON WIRELESS SENSOR NETWORK

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***Abstract*—Wireless sensor networks have the major role in monitoring our environment. Major issue in deployment of wireless sensor network is transmission of data without any error or loss of data. During the bulk data transmission in wireless sensor network, there should not be any noise or error. Efficient approach for detection and correction of error make the receiver to get noise free data. When there is transmission of bulk sensor data in star or mesh network, the data cannot be send accurate error free data. So, this survey is based on error detection and correction in sensor networks.**

Key words: Wireless sensor networks, Error detection and correction, Forward Error Correction, Data Fault

I. INTRODUCTION

Wireless Sensor Networks consist of a large numbers of wireless sensor nodes dispersed in an area of interest with one or more base stations, where data is collected. It is a small device which enables the measurements of physical and also environmental conditions. While transforming the information in sensor network, there may loss of data or error may occur in receiving data. The integrity of data has the effect in performance of data. To improve the accuracy of sensor data, the error are detected based on the classification of errors. Noise removal in sensor data also improves the reliability. Allow the sensor networks to be easily implemented in all types of environments. We expect such networks to become ubiquitous in future.

Key words: Wireless Sensor networks, Error detection, Error correction

II. SENSOR NETWORKS

Sensor networks has large number of small sensor devices. They are capable of measuring their environmental changes. Some devices contain with a processor with some functions and antenna for wireless communication networks. It is powered by a battery which makes it resource constrained. Taking the application for sensors, it is used in a battlefield for the purpose of gathering data about the enemy, detect the explosions in the army and also localize the events. Each person in the army can communicate with each other using ADHOC networks and they communicate with centers to gather the information. Sensed data from the network is processed and send to the data processing centers. They have capability to act as node in the wireless networks.

If sensors are mobile more options arise. A sensor node can move to a new location in order to fill a coverage hole. The mobility makes it easier, the frequent changes of location makes the coverage incomplete, it act as a node so it relocate itself to complete the coverage. If any of the nodes failed to locate, then the sensor network can be reconfigured to change its location. There are the challenges faced by movement for selection schemes because the decision of node to move has additional energy cost due to mobility of objects or sensors.

A. ERRORNEOUS PACKET RECOVERY

There are two methods to recover erroneous packets. First method is to use automatic repeat request (ARQ).ARQ is a receiver to acknowledge the message from the sender. Then the sender may resend the message if it is not acknowledged within the time limit. The second method is the forward error correction (FEC). The forward error corrections where a sender sent the information append with the data bits. Then the receiver receives the data bits and also it may correct errors possibly occurring in the transmission using the redundant information. In wireless sensor networks, data packets may broadcast over shared channel. But they forward the data over multiple hops, using Forward error correction. Because it can reduce the need to resend data packets, so it can reduce the power consumption.

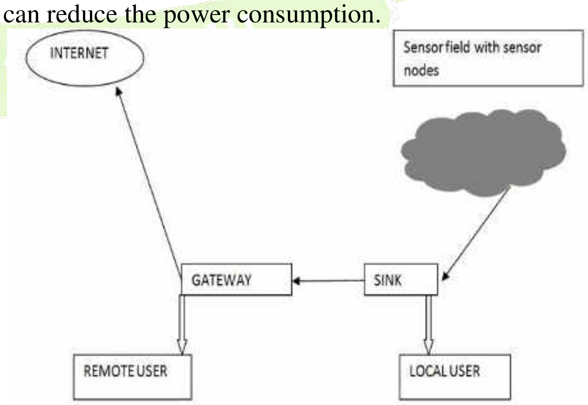

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Fig 1 Sensor networks

B. Error Control Techniques

End-to-End Error Control: It can be implemented at transport layer. In this method, the encoding for ARQ and FEC is done in the initial node and the decoding is done in the BS(base station).Some nodes act as intermediate node to pass the packets from source to destination. The applications in some networks are delay sensitive where they used the End to End error control. Some researchers are having this strategy in wireless sensor networks. They found that the decoding consumes more energy and power. So, the decoding should be performed at base station where the energy is consumed less at node level. There may be accumulated error also occurred due to the decoding scheme. So, the received packets cannot be decoded at the base station in some of the decoding scheme.

Node-to-Node Error Control: Node to node error control can be performed in data link layer. In this method, both encoding and decoding are performed at the level of intermediate nodes. The routing nodes in the sensor networks acts as error checker for the data packets. If there is any error in the data packet, the routing node checks and correct the error and then transmit the node to next position. The error is corrected using ARQ and FEC methods. But in ARQ method, the receiver can resend the data packet.

C. Related Works

[1]For some wireless sensor nodes, the data compression algorithm is used. The algorithm has Huffman variable length code for dictionary .To encode the data, it consider the difference data between new and the previous data for source node. The compressed data is a result of concatenation between Huffman code and a difference data. The difference data is a part of low-order bits from a 2's complement representation. The compressed data have variable length size or variable block size. There might be error occur in the data communication because of error in data dictionary or in the difference data. Because the data packets are depend on each other. These types of error occur in the radio channel in wireless sensor network. The error in one data may affect the succeeding of the sequence. The Problem may be corrected by using retransmission of data packets in the sensor networks. So to protect the data compression they have to use efficient approach of error correction.

III. ERROR AND ATTTACK MODEL

[2]Sensor node may corrupt because of error in sensor hardware or software or due to some disasters, by reprogram the more number of nodes. Malicious tempering and random errors are identified to recover the proper errors. Error is different from attacks that the adversary attacks display as an error for the data packets.

A. RELATED WORKS

Accidental Error:

- Stuck-at-Value Error is the error occurring in the sensors which reports fixed readings constantly.
- Multiplicative error affect the readings of calibration error
- Sensor readings of additive error can be affected by the additive error
- Zero mean noise which have high variance can have the faulty readings in sensors.

Table I. Parity generation

SCHEME	CHARACTER BIT	PARITY BIT
PARITY ODD	1101101 1000100 1111111	0 1 0
PARITY EVEN	1101101 1000100 1111111	0 1 0
SIMPLE PARITY GENERATION		

IV. JAMMING ATTACKS

Jamming attacks are disquiet in wireless sensor networks. To provide the security actions against the jammers, it provide the position of jamming device. So, it can restore the network communication. It is not only have the power of sensing the device but also have the process board, memory device components. The sensor node is not only a device for collection of data, but it is also used for network analysis. It has the property of getting data from other sensor nodes. Wireless sensor networks are formed for monitoring large physical environmental conditions.

A. RELATED WORKS

[4] Using multi hop routing in wireless sensor network, longer distances between a sensor node and the receiving node which is the central processing node are identified. The transmission energy for the distance between sensor and receiver node d scales as ds, where s is the so-called path loss exponent. Short hops are preferable in the sensor network by

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measuring the distance which divides the number of hops n as d/n. The distance will increase the rate of transmission between sender and receiver.

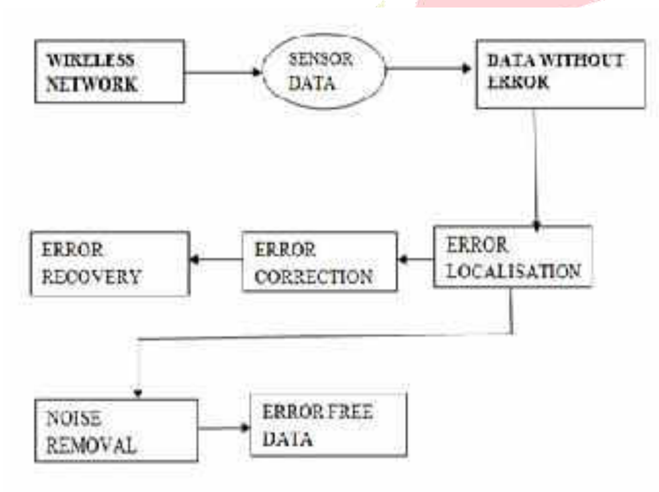

Fig 2 Process to be carried out to receive error free data

Error Detection: There are two phases in the computation required for the error in the whole process. At the error detection phase, there are 3 inputs for error detection algorithm. The first input is the G graph of network. The second input is the total collected data set D. The third input is the defined error patterns p.

Error Localization: In the wireless sensor network, it is important to locate the position of error in the collected data. The input of the algorithm for localization is the original graph of a scale-free network and an error data D from Algorithm for detection. The output of the algorithm is G'(V', which is the subset of the G to indicate the error location and source.

V. DATA ERRORS

For unaccepted long time duration time series will be unchanged in the node of network system. In some real applications, the transmitted data and sampled data always have changes with time flow only. Out of data bound fault can be identified with some domain knowledge. For example, if a temperature value of water is reported as 200 C, it is the data fault. During the data communication if there is missing of any data, it is called as data lost fault. It needs Data cleaning also in the networks. The spike fault indicates in out of the prediction time series data and they may change as normal.

A. RELATED WORKS

A comparative experiment in scale free error detection of big data in sensor networks and non scale-free error detection algorithms is conducted.

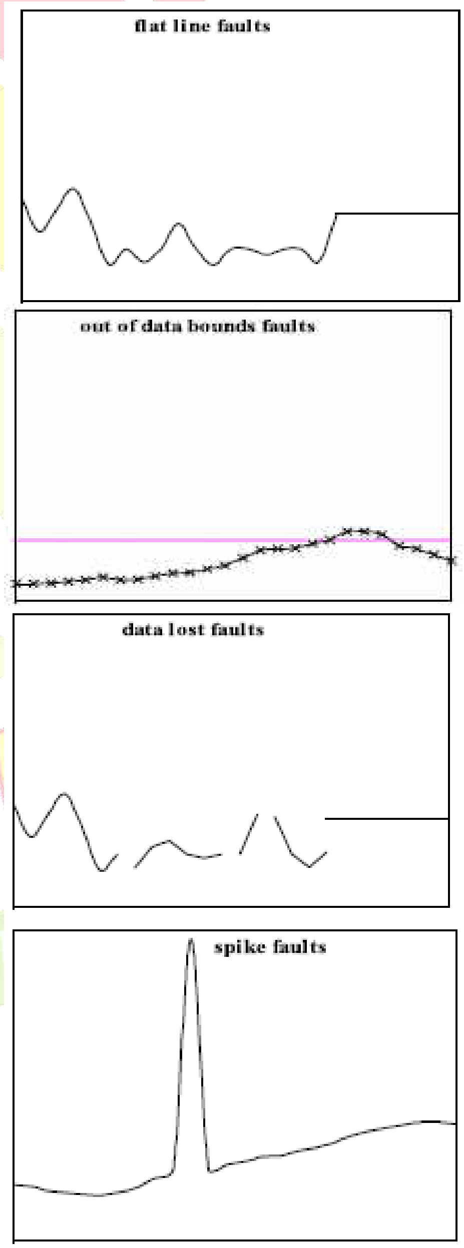

Fig 3 Types of faults

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When the experiments are performed data error rate slightly changes from 1 to 10 percent but the scale-free error detection algorithm performs error detection performance gains compared to algorithm for non scale-free error detection.

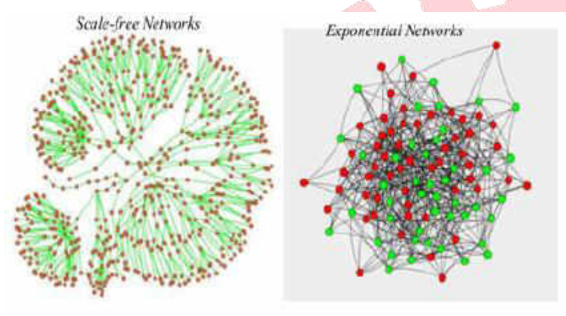

Fig 4 Scale free and non scale free topology

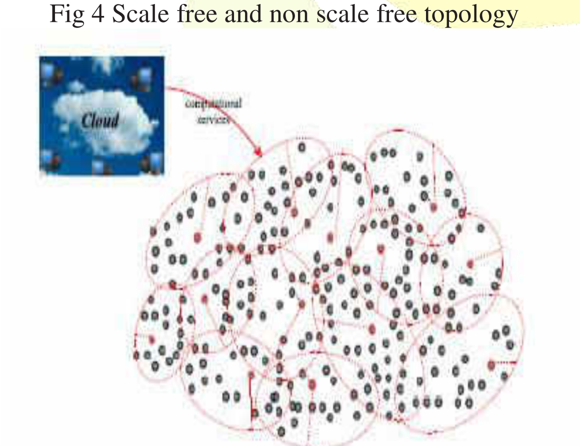

Fig 5 Error detection strategy on cloud

The energy efficiency for optimal data packet size is in the wireless communication channel. The energy throughput and reliability are combined to form the energy efficiency. Fixed size is determined by increase data packet size due to increase in energy efficiency. Reliability is increased by energy efficiency. Every coding technique such as ARQ and FEC are able to improve the efficiency. It gives the energy efficiency of the code for convolution codes and also the binary BCH, they have efficient algorithm.BCH code have the high energy efficiency. Medium rate method have high performance when compared with Low and high methods.

Some measurements are taken from the test performed by sending the same encoded packet 5,000 times in two different test beds . That errors may be occured during the transmission of data packets are mostly single bit errors or double bit errors . Burst errors are very common. Outdoor – Single bit error and for indoor there may be double bit error.

It is widely accepted that in current wireless sensor networks forward error correction is not applicable as they require high computational power and cause a high energy overhead. Some forward error correction techniques are a star shaped single hop networks with one base station. Based on soft channel information system, it is recommended to deploy high decoding scheme. By using low complexity receiver, the soft channel was not directly accessible. It has to be emulated by the scheme, the energy consumption which is measured of this code is the upper bound while comparing to the hardware based solution. While the error of frame error occurs, the retransmission of data takes more energy consumption .So, a simple repetition coding is enough for multi hop structures in the wireless sensor networks. There is an optimal tradeoff between the coding overhead and the coding strength will vary strongly . This difference is based on the channel quality and distance from the node to base station . They can adapt themselves based on the network.

VI. IMPLEMENTATION AND TESTING

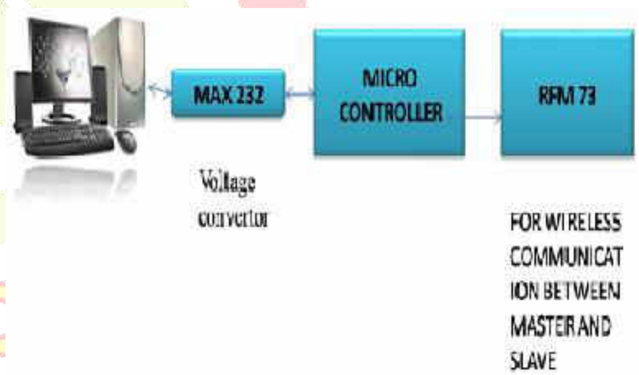

Fig 6 Master communication

The master and slave nodes are connected through wireless network communication. For wireless communication with low cost, it uses ZIGBEE protocol. The normal data is sent simultaneously from sensors to the master PC in star or mesh network. We are using three way pipeline in this network. Bulk data from sensor nodes are sent through the wireless communication to the master PC. The error is detected using localization and detection algorithm for further process for recovery.

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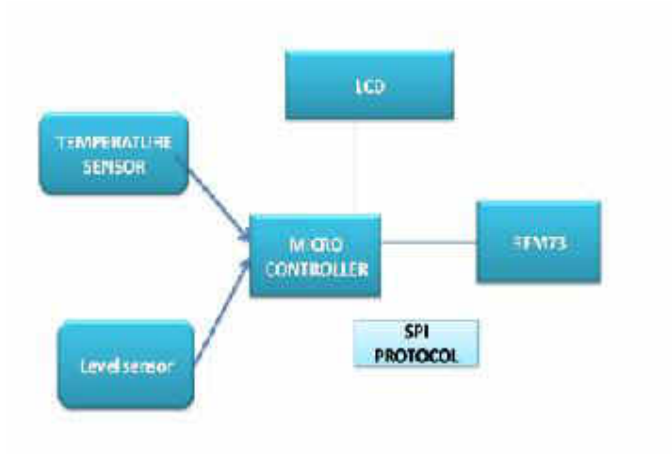

Figure 7: Slave Communication

The data from the sensors are collected and the process for data cleaning is carried out. From the above experiment, it is clear that using some of the encoding scheme the error is detected and cleaned .

VII. CONCLUSION AND FUTURE WORK

For fast data error detection in big sensor data sets, some researchers develop a novel data error detection approach. Some proposed scale-free error detecting approach can significantly reduce the time for fast error detection in numeric data sets, and the proposed approach achieves similar error selection ratio to non-scale-free error detection approaches. In future, in accordance with error detection for data sets from sensor network systems , the issues such as error correction, big data cleaning and recovery will be further explored. This survey is based on error correction techniques in sensor network.

REFERENCES

[1] "A Time efficient approach for detecting errors in big sensor data on cloud "Chi yang, Chang liu, Xuyun zhang, Surya nepal, and Jinjun chen on IEEE transactions on parallel and distributed systems, vol. 26, no. 2, February 2015.
[3] S. Mukhopadhyay, D. Panigrahi, and S. Dey, "Data Aware, Low Cost Error Correction for Wireless Sensor Networks," Proc. IEEE Wireless Comm. and Networking Conf. (WCNC '04), pp. 2494-2497, 2004.
[4] M.H. Lee and Y.H. Choi, "Fault Detection of Wireless Sensor Networks," Computer Comm., vol. 31, no. 14, pp. 3469-3475, 2008.
[5] M.C. Vuranand and I.F. Akyildiz, "Error Control in Wireless Sensor Networks: A Cross Layer Analysis," IEEE Trans. Networking, vol. 17, no. 4, pp. 1186-1199, Aug. 2009.
[6] E. Elnahrawy and B. Nath, "Online Data Cleaning in Wireless Sensor Networks," Proc. First Int'l Conf. Embedded Networked Sensor Systems (ACM Sensys '03), pp. 294-295, 2003.
[7] M. Roshanzadeh, S. Saqaeeyan," Error Detection & Correction in Wireless Sensor Networks By Using Residue Number Systems", I. J. Computer Network and Information Security, 2012, 2, 29-35 Published Online March 2012 in MECS (http://www.mecs-press.org/).
[8] Claudio Basile, Meeta Gupta†, Zbigniew Kalbarczyk, Ravi K. Iyer," An Approach for Detecting and Distinguishing Errors versus Attacks in Sensor Networks",on International Conference on Dependable Systems and Networks (DSN'06),2006
[9] E. T. S. Institute, "Universal mobile telecommunications system (UMTS): Multiplexing and channel coding (FDD), 3GPP TS 125.212 version 3.4.0," Proceedings of the 1993 IEEE International Conference on Communications, pp. 14–20, September 2000.
[10] Sneha V.Tiwari , Trupti Dange," A Survey in Wireless Networks to Enhance An Error Minimization Framework For Localizing Jammers", International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Impact Factor (2012): 3.358, Volume 3 Issue 11, November 2014.
[8] R. Kienzler, R. Bruggmann, A. Ranganathan, and N. Tatbul, "Stream As You Go: The Case for Incremental Data Access and Processing in the Cloud," Proc. IEEE ICDE Int'l Workshop Data Management in the Cloud (DMC'12), 2012.
[9] C. Olston, G. Chiou, L. Chitnis, F. Liu, Y. Han, M. Larsson, A.Neumann, V.B.N. Rao, V. Sankarasubramanian, S. Seth, C. Tian,T. ZiCornell, and X. Wang, "Nova: Continuous Pig/Hadoop Workflows," Proc. the ACM SIGMOD Int'l Conf. Management of Data (SIGMOD'11), pp. 1081-1090, 2011.
[11] "Hadoop," http://hadoop.apache.org, accessed on March 01,2013.
[12] X. Zhang, C. Liu, S. Nepal, and J. Chen, "An Efficient Quasi-Identifier Index Based Approach for Privacy Preservation over Incremental Data Sets on Cloud," J. Computer and System Sciences, vol. 79, pp. 542-555, 2013.
[13] X. Zhang, C. Liu, S. Nepal, S. Pandey, and J. Chen, "A Privacy Leakage Upper-Bound Constraint Based Approach for Cost-effective Privacy Preserving of Intermediate Datasets in Cloud," IEEE Trans. Parallel and Distributed Systems, vol. 24, no. 6, pp. 1192-1202, June 2013.
[14] X. Zhang, T. Yang, C. Liu, and J. Chen, "A Scalable Two-Phase Top-Down Specialization Approach for Data Anonymization Using Systems, in MapReduce on Cloud," IEEE Trans. Parallel and Distributed, vol. 25, no. 2, pp. 363-373, Feb. 2014.
[15] C. Liu, J. Chen, T. Yang, X. Zhang, C. Yang, R. Ranjan, and K. Kotagiri, "Authorized public auditing of dynamic big data storage on cloud with efficient verifiable fine-grained updates," IEEE Trans. Parallel and Distributed Systems, vol. 25, no. 9, pp. 2234–2244,Sept. 2014.
[16] W. Dou, X. Zhang, J. Liu, and J. Chen, "HireSome-II: Towards Privacy-Aware Cross-Cloud Service Composition for Big Data Applications," IEEE Trans. Parallel and Distributed Systems, 2013.