A Modified Approach for Data fusion technique for Routing and Performance Enhancement in WSN

Er. Aarju, Er. Samath Kapoor
Student (M.Tech), Dept. of C.S.E, SDDIT, Kurukshetra University, Haryana, India
Astt. Professor, Dept. of C.S.E, SDDIT, Kurukshetra University, Haryana, India

ABSTRACT

The design of a protocol for data fusion (in data processing), energy-aware, energy-efficient wireless sensor network protocol is challenging task to handle in WSN along with the constraint resources. The data fusion task separates the unrelivant data from being on the base station. Sensing data so collected, processed, filtered and forwarded to the base station contains the supported values refined from the data received and pre-processed with data fusion.In this paper, the approach for the data pre-processing is modified to involvement of data fusion along with the routing modified to makes the better utilization of the computing environment using data fusion and provide network a better life time and better energy efficiency. As a result the simulation results come in favour of what it is designed for to increase in network's life time and data efficiency and reliability of the network data increases.

Keyword: *energy efficient; WSN; Minimization transmission energy; optimal number of cluster heads; network lifetime*

1. INTRODUCTION

The widely used sensor network used in monitoring systems and various environment and movement monitoring applications are the Wireless sensor networks (WSNs). These network which are collaboratively built by the sensor nodes of very small size(of the size of the coin) using their separate protocols for the communication and transmission of data contains few hundreds of sensors to thousands of sensors.Patient monitoring, animal monitoring , environment monitoring, movement monitoring are few of the applications of these networks. Along with the applicability, flexibility ease of collecting data they also comes up with some of challenges and constraints. Various research and intensive study is being carried out to overcome the shortcoming which may be in form of the constraints or performance degradation. These networks primitively designed to submit the collected data to the base station. Data communication becomes the main focus carried around the field of WSN. Reduction in energy involved in transmission of information is focus area of various researchers, reduction in energy while maintaining the effective of the sensor node is a big step forward for the network efficiency.

Life time measured in terms of the number of rounds treated as life time, maximization of life time (main purpose) directly related to efficiency can be achieved by the routing schedules to reduce the network overhead from the duplicated data arising from different nodes , in addition it can be done by reduction in data by data aggregation. Different approaches are utilized to work on different requirements. Two matrices remain at the central point of the network design and the efficiency i.e. reduction in transmission energy need and increase in network lifetime. Although appear similar these term are having different meaning and are attained by different approaches. E.g. maximizing network lifetime doesn't guarantee in efficient utilization of energy in transmitting data, this may come in compromising with the coverage of the network. Number of nodes actively participating in communication process describes the first metrics while second is based on the residual energy present in network nodes participating in communication process.

2. RELATED WORK

In [1], a scheme is evolved named as ReDAST, for reliability of data. The data so received go through the process of data acquisition and the simulation is presented in the presence of transfaulty nodes whose behaviour is unpredictable, sometimes when the nature of the network and conditions around these nodes is favourable they

behave normally but in case some of the circumstances or the situation of the network is against the favouring nature these nodes stop responding, the respond of these nodes effect the size of the network and so the routing in the network. The size decreases with unavailability of these nodes and then this reduced size increases with the respond of these nodes. The behaviour and the area coverage at a time is totally dependent on the nodes present in the network so the big difference arises in the routing requirements and the coverage with the increase and decrease in number of nodes in the network. To prevent the loss arising due to transfaulty nature of the nodes the dual mode of the nodes is used in the network. Data fusion technique is used to process the data to get the information from the redundant information.

In [2], concern is shown towards the data fusion base attack which comes in the form of Denial – of – Service (DoS). Resilient Control System popularly known as RCS is defined in terms of Joint Directors of Laboratories framework for data fusion. A decision hierarchy is built at different levels. To drive the derivation condition along with the existence, interdependency consideration due to observance between different levels of JDL is done. The model so built is finding its application in Load Frequency Control (LFC) for the power system, which work as a measure to verify effectiveness.

In [3], the review of the various data fusion methods adopted along with the various other techniques and schemes is presented. The data aggregation is explored to much higher level as compared to the data fusion, data fusion as a result is not able to get its share of attention of the research according to its importance in the field of data pre-processing by removing the duplicate values while preserving the data effectiveness for the data interpolation. The outcomes arising due to extensive exploration of each and every technique studied is represented as the comparison for these techniques.

In [15], model presented as a result of extensive research provides the correct sequence for the performing different activities. Popularly known as OODA, the first comes Observe, then the second which provides the execution of Orientation task(orient in short), then comes the Decide (decision making about the supported and unsupported values – the value generated from the actual collection of data and generated by error) , at last comes the act – the information gathering from the nodes , this step is performed in case of sensor nodes by the base station which may be situated in the middle spot or any other spot randomly - in accordance with the application.

Fig 1:OODA model

3. PROPOSED ALGORITHM

3.a Problem Description

The problem addressed is related to the data generated by sensor nodes along with the noise and error produced in the reception or communication of data. The data so generated if reaches to the final destination or the base station – can alter the results and the interpretation of the data changes and change is the objective set for the data in some cases due to this change is observed. The observance directly depend on the number of sensor nodes present in the sensing field in active state who are responsible for the generation of data for the base station. The error value thus received if differ slightly from other values can be ignored because the deviation generated by these error values are not so high but if the difference is larger it can deviate to a large extent. For this along with the efficient scheme for the network communication the data fusion scheme is also used in the network for this it combines the two goals of coverage and efficiency as such.

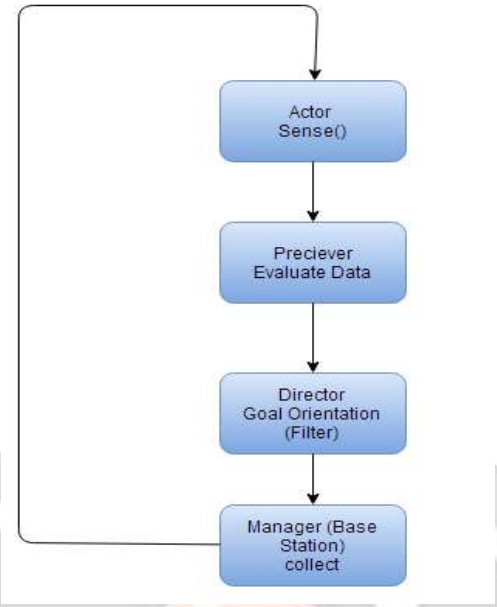

Fig2: Work Flow basic model used

Work flow figure guides through the various stages of the data that are during sending of data through data fusion processes toward base station along with representations, Actor- the sensor node- main activity sensing, Preciever- Evaluate data- cluster head, Director- the intermediate node and Manager- Base Station- execution and the utilization of data.

a. Design Considerations:

- Battery energy -in accordance to standards set for sensor network
- Sensor nodes.
- Supported data and removal of unsupported data.
- Gather all data – refining thereafter.
- Cost for each- error, process, communication, filterization.

b. Description of the Work:

- Data Gathering: (Observe) Data collection phase, how the data results collected.
- Signal Processing: (Observe) Preprocessing data – allocation done before the fusion process begins.
- Object Assessment: (Orient) after preprocessing it leads to => patterns and features (mean, median), these data are assigned to objects to generate the supporting values.
- Situation Assessment: (Orient) it involve the situation predictions, the data fusion process and analysis of results.
- Threat Assessment: (Orient) possible threat identification.
- Decision Making: (Decide): by system, separation of supported and deletion or removal of uns upported data.
- Action Implementation: (Act): Threshold application(d) => actual plan extraction

Proposed work description separate out each level from the other which are further constituted, by merger or separator of the steps of the system but it has the upper hand in providing the separate system tasks at each phase of the proposed work.

4. PSEUDO CODE

The basic and the core data fusion strategy lies in between the removal of unsupported data from the collected values. This phase-and error removal for the proposed work can be given as:

The data fusion is done on the basis of similarity between data values. Error makes the sudden change in data or makes unsupported data. By unsupportive, it gives the ability to remove the sudden raises or fall in data. The re is the importance of each value generated from the sensor node while maintaining the support levels. Functions are designed to separate out the supportive data from unsupportive and most generalized can be shown as:

For necessary support criteria:

1. support(a,b) € [0,1]
2. support(a,b) = support(b,a)
3. If |a-b| <|x-y| => support (a, b) > support(x, y) provided that x, y are greater than 0.
4. On the basis of above

$$\text{support}(a,b) = \begin{cases} K & |a-b| <= d, \ (K>0, \ d>0) \\ 0 & |a-b| > d \end{cases}$$

Pseudo code for the data fusion process:-

1. Size of Data - no. of sensing nodes responsible for the generation of sensing values.
2. Threshold – the sensing data get difference above which treated as a unsupportive value.
3. Sorting the (Data generated)
4. Refinement of Data may include deletion from most values.
5. Preprocessing of refined data.
6. Median and mean value for the data is generated.
7. Median value generation results in support value.
8. Mean value generate a separate support value.
9. Support value generated is compared.
10. Result is generated by the weighted result.
11. Step 1 to 10 is repeated in each phase of the data communication so that the data which reach to the base station is completely processed.

5. CONCLUSION

Simulation and the experimentation results are plotted and the summarization of these results ensure to have the greater efficient and reliable network for the data reliability and energy efficiency. The data fusion task separates the unrelivant data from being on the base station. Sensing data so collected, processed, filtered and forwarded to the base station contains the supported values. Supported values can be generated through various support function , for the mean and median method and further the fuzzy mean median method can be utilized along with the method supporting minimum deviation and error in support value generation. The threshold hold a greater degree of control for the inclusion of the values arriving near to unsupportive. The data error so removed , removes the possibility of error or attack in the form of false data packets or modified data packet thus, increasing the reliability of the system. This approach is carried out in the presence of Transfaulty nodes for the complete system implementation.

REFERENCES.

[1] Kar, Pushpendu, and Sudip Misra. "Reliable and Efficient Data Acquisition in Wireless Sensor Networks in the Presence of Transfaulty Nodes." (2016).

[2] Yuan, Yuan, and Fuchun Sun. "Secure the control system against DoS attacks: A JDL data fusion method." *Multisensor Fusion and Information Integration for Intelligent Systems (MFI), 2014 International Conference on*. IEEE, 2014.

[3] Jayashri, B. S., and G. Raghavendra Rao. "Reviewing the research paradigm of techniques used in data fusion in WSN." *Computing and Communications Technologies (ICCCT), 2015 International Conference on*. IEEE, 2015.

[4] Ranjani, S. Siva, S. Radhakrishnan, and C. Thangaraj. "Secure cluster based data aggregation in wireless sensor networks." *Science Engineering and Management Research (ICSEMR), 2014 International Conference on*. IEEE, 2014.

[5] Soltani, Mohammadreza, Michael Hempel, and Hamid Sharif. "Utilization of convex optimization for data fusion-driven sensor management in WSNs." *Wireless Communications and Mobile Computing Conference (IWCMC), 2015 International*. IEEE, 2015.

[6] Yu, Yanan, Xiufang Feng, and Jingxian Hu. "Multi-sensor data fusion algorithm of triangle module operator in WSN." *Mobile Ad-hoc and Sensor Networks (MSN), 2014 10th International Conference on*. IEEE, 2014.

[7] Almasri, Marwah M., and Khaled M. Elleithy. "Data fusion models in WSNs: comparison and analysis." *American Society for Engineering Education (ASEE Zone 1), 2014 Zone 1 Conference of the*. IEEE, 2014.

[8] Sarkar, Anibroto, and Indrajit Banerjee. "A grouping based prioritized sensor data fusion algorithm for deciding the state of a coal mine." *Advances in Computing, Communications and Informatics (ICACCI), 2015 International Conference on*. IEEE, 2015.

[9] Sethi, Preeti, Dimple Juneja, and Naresh Chauhan. "Hybrid data fusion using software agents for an event driven application of wireless sensor networks."*Information Systems and Computer Networks (ISCON), 2014 International Conference on*. IEEE, 2014.

[10] Mirzaei, Golrokh, et al. "Data Fusion of Acoustics, Infrared, and Marine Radar for Avian Study." *Sensors Journal, IEEE* 15.11 (2015): 6625-6632.

[11] Nayaka, Raja Jitendra, and Rajashekhar C. Biradar. "QoS analysis of WSN based cluster tree data fusion for integrated public utility management."*Advance Computing Conference (IACC), 2015 IEEE International*. IEEE, 2015.

[12] Gambhir, Sapna, and Nida Fatima. "Op-LEACH: an optimized LEACH method for busty traffic in WSNs." *Advanced Computing & Communication Technologies (ACCT), 2014 Fourth International Conference on*. IEEE, 2014.

[13] Simon, Carsten, Daniel Clarke, and Aaron Knoll. "Modular multi sensor data fusion architecture for autonomous vehicles: Using the RACE system on a segway RMP 440." *Multisensor Fusion and Information Integration for Intelligent Systems (MFI), 2014 International Conference on*. IEEE, 2014.

[14] Gherbi, Chirihane, Zibouda Aliouat, and Mohammed Benmohammed. "Distributed energy efficient adaptive clustering protocol with data gathering for large scale wireless sensor networks." *Programming and Systems (ISPS), 2015 12th International Symposium on*. IEEE, 2015.

[15] *J.R. Boyd , "The essence of winning and losing" Unpublished lecture notes, 1996.*