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Convolutinal Encoding Integrated Load Balanced Clustering Model to Optimize WSN

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Abstract: A sensor network is restricted resource network with limited energy and sensing range. To obtain the maximum resource utilization clustered communication architecture is applied. In this work, a load sensitive and encoded communication architecture is presented. The presented work is about to provide the communication reliability and effectiveness in terms of communication. To achieve the reliability convolution encoding is integrated while forming the packet formation. While setting the clustered architecture, node density and cluster load are analyzed to provide load robust communication. The result shows that the work has improved the communication and network life.

Keywords: WSN, Encoding, Clustered, Convolutional Coding.

INTRODUCTION

Wireless networks give the concept of distributed architecture so that the sharing of information as well as resources can be done effectively. In last few years, different kind of ad-hoc networks come into the existence. With the advancement of internet and the growth of personal computers, the use of sensor computers is been increased very fast. There are different mediums of performing the communication over the network. This all results an effective sharing of information and resources. While performing the communication in such network there is the requirement of more effective information sharing techniques.

Wireless sensor networks have broadly utilized in a variety of industrial, medical, consumer and military applications. Such applications are classified them based on their modes of acquiring and propagating sensor data. We use WSNs in various fields but mainly under tracking and monitoring of things depends on various needs. Some of the applications of WSN in different fields are given below:

- Enemy tracking: Enemy tracking is very important and smart application of WSN. We can track our enemy by the minor wireless sensor nodes. It can be very useful in war situations; we can track our enemy and attack them.
- Animal tracking: Animal tracking is another very common application of wireless sensor networks, for example in a big graze land we can place the wireless sensor at some fixed boundary, so that we can identify our animals if they go to which direction and on what distance.
- Traffic tracking: Traffic tracking is also very smart and important application of WSNs, because due WSN police can track traffic jams in city and can take necessary steps to avoid the critical situation.

A) Different Encoding techniques

a) Convolution Code

The convolutional codes are defined as the length code with specification of relative n bits so that the output driven codeword bits are formed. The output size is here defined under specification of k bits. The input level dependency is performed under the output specification with constraint length ordering which is denoted by vector K and identified by relative memory allocation.

b) Hamming codes

This coding method is also block adaptive and provides the code specification with n bits so that the data sequence formation for k information bits is done. The work also includes the generator matrix specification with different relative bits and the group formed

c) Convolution Code

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B) Clustering

It is a process in which the network is divided in to clusters and deploying in each cluster, a cluster-heads to perform data aggregation. The job of these cluster-heads is aggregating the data received from the sensors, removing redundancy, if any, and transmitting it to the BS. In most scenarios, they do not perform any sensing. A number of routing protocols have been proposed for WSN. However, few of them are cluster based.

Clustered Network Architecture

The basic objective on any routing protocol is to make the network useful and efficient. In a cluster based routing protocol group's sensor nodes, each group of nodes has a CH or a gateway. Sensed data is sent to the CH rather than send it to the BS; CH performs some aggregation function on data it receives then sends it to the BS where these data is needed.

I. RELATED WORK

Yean-Fu Wen (2007) has presented a work to optimize the aggregative routing approach in communication network. Author defined a scheduling mechanism to optimize the routing in clustered network. The analytical decision is here taken under multiple vectors such as capacity analysis, energy analysis and communication. The effective communication is here been achieved by optimizing the clustered routing along with aggregative approach [5].Yu GU (2007) has presented an improved scheduling approach to optimize the routing in communication network. Author has improved the coverage range and life time effective routing to optimize the network throughput and effectiveness. Yavuz Bogaç Turkogullari (2008) presented a work on improvement to the routing and scheduling mechanism in sensor network by estimating the localization of nodes. The main work is based on the coverage problem analysis for heterogeneous sensor network. Author has analyzed the network under activity scheduling and node deployment so that the effective path will be generated over the network.

The improvement is here defined using linear programming approach so that the effective route over the network will be generated. Author has defined a computational experiment based approach for improving the network constraints for specific instance. Author analyzed the communication under energy effectiveness and obtains the accurate hop detection. This effective hop selection has generated the optimized route over the network [8].Yawen Dai (2009) has presented an improvement to the effective scheduling for sensor network. Author has defined an energy effective approach under multiple constraints to generate the optimize route. The communication analysis is here been performed under topological specification for route generation. At the earlier stage of work, the traffic monitoring is performed under reliability and efficiency vectors. This analysis is performed under city scenario and the constraints are defined to optimize the route in restricted constraints.

Author defined the improvement to the energy vector so that the reliable communication will be performed over the network. Author defined an adaptive shortest path routing approach under computational analysis to optimize the communicating route [9].Jiann-Liang Chen (2010) has presented a work to generate the adaptive route over the network. Author has defined an improvement to the proactive routing over the network. According to this approach the route redundancy is reduced the effective route generation is performed. The implementation results show the work has improved the existing proactive protocol [12].Amulya Ratna Swain (2010) has defined an energy effective route generation in sensor network. Author has defined the battery effective communication in sensor network. Author defined the node localization in simulation environment with constraint specification in terms of energy.

The scheduling algorithm is defined to optimize and synchronize the communication over the network. Author has defined an improved scheduling scheme to optimize the route between two ends. A tree specification based route is generated under scheduling mechanism to provide the balanced communication over the network. The defined approach adaptive to the scenario so that the more dynamic constraints are identified [13]. Qian Ye (2010) have defined an effective multipath routing in multimedia sensor network. Author defined a disjoint path communication routing. Author defined the work to deliver the multimedia traffic in communication. Author defined the disjoint multipath routing in sensor network. Author defined the packet communication and its classification. Author improved the real time communication and reliable communication under priority specific scheduling model. Author defined the traffic aware routing and scheduling so that the simulation results will be effective[16].

II. WORK MODEL

The presented work is defined to optimize the sensor network communication by improving the architectural representation as well as data encoding. To form the network and the communication over the network, the network is designed with following parameters.

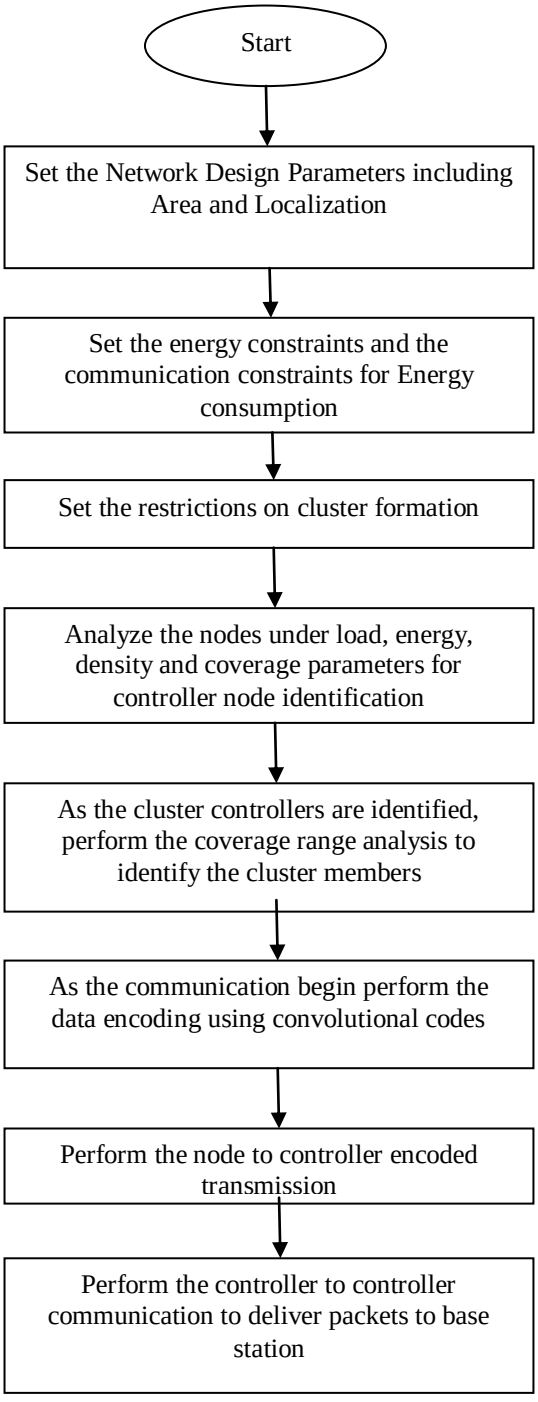

Figure 1 : Proposed Model

These parameters are collected from the work defined by earlier researchers. Some of the common parameters defined for this work are includes:

- Energy Parameters (Initial Energy, Transmission energy, Receive Energy, Forwarding Energy)
- Design Parameters (Network Area, Node Position, BS Localization)
- Convolutional Encoding Parameters

The communication architecture adopted by this work is clustered network. According to this architecture, the complete network is divided in smaller sub networks. Each of the sub network is controlled by the controller node. The presented work model is shown in figure 1. The work is here defined to perform the effective controller seletion. As the controller is identified the next stage associated with this work is to identify the cluster members. The range based analysis is defined to decide the controlled sensor nodes. In the final stage, instead of performing the raw data communication, the encoded communication is performed in this work. This data encoding is done here using convolutional encoder. The work is here defined to at the early stage to encode the data elements so that the data size will be reduced. This encoding mechanism has improved the communication reliabillty as the size of the dataset is reduced as well as secure data form has improved the communication strength

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III. RESULTS

The presented work in simulated in MATLAB environment. Here figure 2 is showing the analysis on the existing and proposed approach absed on the dead nodes. The green line here shows the proposed approach and red line is showing the existing approach. The figure shows that the number of dead nodes after 1000 rounds is high in case of existing approach. The frequency of dead node conversion throughout the communication is high in existing approach, which shows that the presented work has improved the communication.

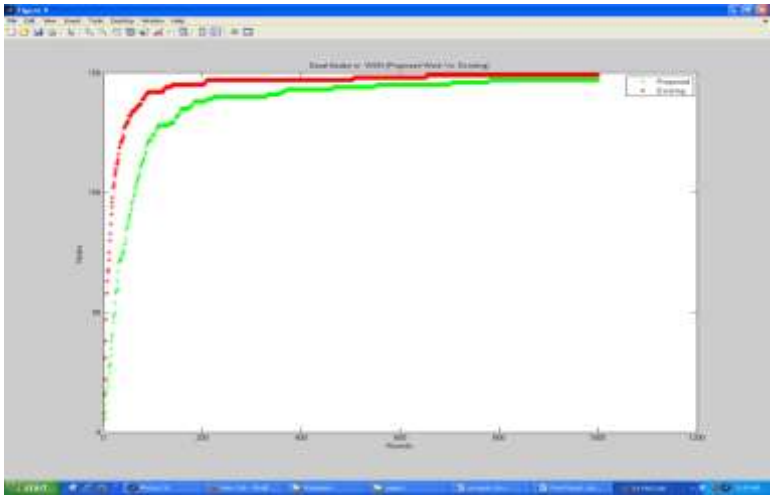

Figure 2: Dead Node Analysis (Existing Vs. Proposed)

Here figure 3 is showing the analysis on the existing and proposed approach based on the alive nodes. The green here shows the proposed approach and red line is showing the existing approach. The figure shows that the number of alive nodes after 1000 rounds is less in case of existing approach. The frequency of dead node conversion throughout the communication is high in existing approach, which shows that the presented work has improved the communication. The figure shows that in case of proposed approach after 1000 rounds there are some alive nodes left.

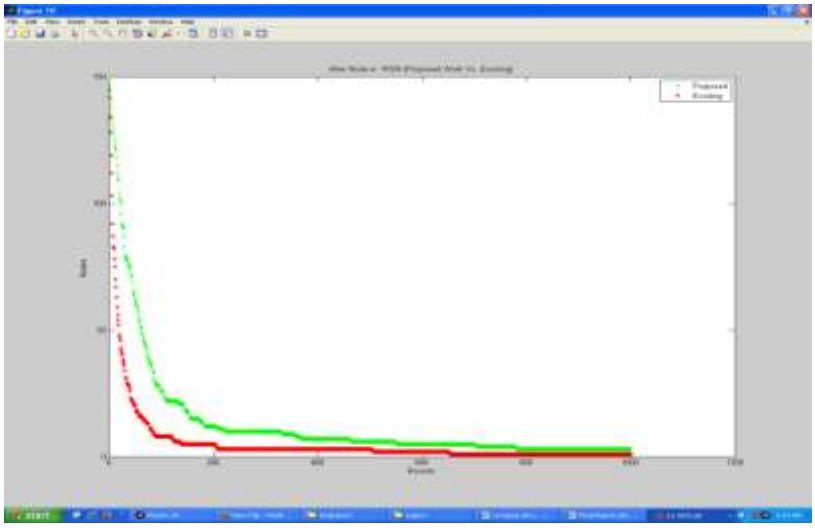

Figure 3: Alive Node Analysis (Existing Vs. Proposed Approach)

Here figure 4 is showing the analysis on the existing and proposed approach based on network communication. The green here shows the proposed approach and red line is showing the existing approach. The figure shows that the communication in case of proposed approach is much higher than existing.

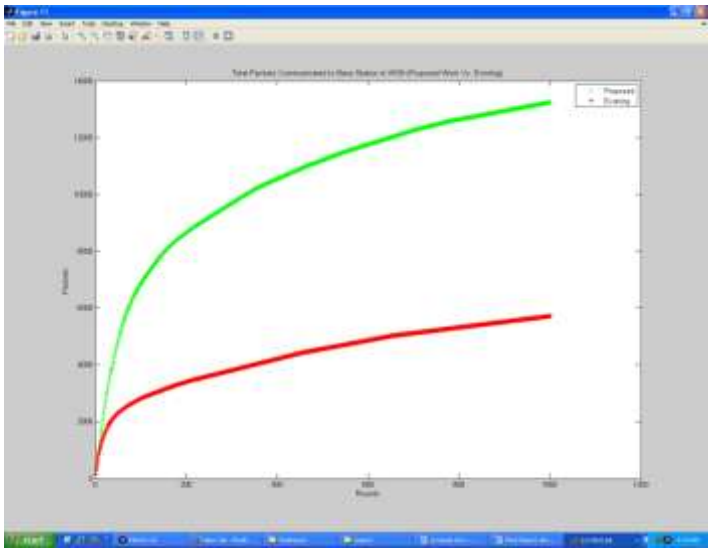

Figure 4: Network Communication Analysis (Existing Vs. Proposed Approach)

CONCLUSION

In this paper, a convolution code based clustered network model is provided. The clustering is here optimized under the load vector. To achieve the reliability and data integrity the convolution encoding model is applied during the packet formation. This model provides the safe and the reduced data transmission so that the overall optimization to the network life is achieved. The comparative results show that the work has improved the network communication and network life. In future same kind of work can be applied on more challenging networks such as opportunistic network etc. The constraint based improvement can also done in future.

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