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Fault Reduction Algorithm for under Water Acoustic Networks using Neural Networks

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Abstract

The Wireless Sensor Networks is the type of network in which sensor nodes sense environmental conditions and pass sensed information of the base station. The underwater acoustic networks are the type of sensor network which is deployed under the oceans. Based on the comparison study, one can select carriers for underwater sensor networks that enhance the communication efficiency in specified underwater environment. The UNA takes into account the underwater networking needs and is specific enough to allow easy integration between employments of different layers by different research teams. At the same time, the architecture is flexible enough to adjust in itself different application requirements and new ideas. In addition to defining a layered architecture, the architecture definition specifies the primitives that define communication between layers. The whole network is divided into fixed size clusters and in each cluster, cluster heads are selected on the basis of energy, distance which reduces energy consumption in the network. To reduce chances of faults in the network, the neural network approach is implemented in this work which increase network lifetime.

INTRODUCTION

The industrial, micro-habitat and structural monitoring applications are new opportunities that comes in existence due to ability of small devices to be distributed physically. As compared to ground applications of sensor net systems, underwater operations are new in this field. In ocean applications, wireless underwater networking comes as a new enabling technology. Over a particular given area a collaborative monitoring tasks has been performed by deploying variable number of sensors and vehicles in under water sensor network. To adapt different characteristics and existing situations of ocean environment, sensors or self organize vehicles has been used in autonomous networks that helps in achieving afore mentioned objective. The nodes density and spatial coverage has been used to characterize an underwater network. In pollution monitoring, collection of data, offshore exploration, disasters prevention and tactical surveillance applications an ocean bottom sensor nodes has been deployed in a network. In missions of collective monitoring, a scientific data collection and natural undersea resources exploration are applications comes by Autonomous or multiple man less underwater applications with underwater sensors. There are different underwater devices and it is required that it should be capable to use in different underwater communications that makes these applications more feasible. There is need of self configurable capabilities in sensors and vehicles of underwater that means their operation must coordinates with themselves. In order to active coordination they should have to exchanges their configurations, movement information and location information that is transmits to onshore station. All these existing applications perform using one of enabling technology, wireless underwater acoustic networking. In one given region a task of collective monitoring has been perform by deploying large number of sensor nodes and vehicles that comes under Underwater Acoustic Sensor Networks (UW-ASN)[13]. The ocean environment sensor nodes and vehicles characteristics and situations need to be self adapted to achieve a main objective. Some peculiar characteristics of underwater acoustic networks:

a. Communication media: The acoustic waves, electromagnetic waves or optical waves like medium can be used for transmission of information in underwater communication systems.
b. Transmission loss: There can be large number of losses in case of UANs network two of them has been considered name as attenuation and geometric signal spreading losses. Due to conversion of acoustic energy into heat absorption of signal takes place that result in attenuation of signal that increase by increase in used frequency and distance.

c. Noise: The noises are mainly classified into manmade or ambient noise and manmade occur due to noise of machinery pumps, power plants, shipping activity and reduction gears.
d. Multipath: A Inter Symbol Interference (ISI) will take place due to multipath propagation that causes a degradation in acoustic communication signal. The link configuration is also get affected by geometry of multipath in this a little time dispersion are used to characterized vertical channels.
e. Doppler spread: The digital communication performance get degraded by Doppler spread that results in frequency spread. The simple and continuous frequencies spreading caused simple translation of frequency are two effect of Doppler spreading that constitutes a non-shifted signal.

LITERATURE REVIEW

Sharma, Gaffar.H, et.al, 2012 presented in this paper [7], an overview of the underwater wireless sensor network different protocol that proves to be helpful for different researchers. The underwater sensor network major routing protocol is considered as a main research issue that's why different operation has been performed to test it. The specific purpose routing protocol can be find out through the platform provided by it and in underwater sensor network are mostly suffer from network interrupts that also can be solved by their research. Some of the challenging research and underwater sensor network projects correct routing protocol has been found that prove to be useful in this kind of network system. In the comparison study for different protocols they have given also given their limitation and advantages.

G. Divya, Prakash, et.al, July 2011 presented in this paper [8], that the Underwater Acoustic Networks routing challenge has been meet by vector-based forwarding (VBF) proposed protocol by authors in this paper. The scalability, robustness and energy efficient are properties that have been achieved through proposed protocol and this paper presents about VBF that at nodes there is no need of state information and routing information is present in a packet that makes it scalable in terms of size of a network. In the process of data forwarding only those nodes will be involved that are close to routing vector that makes it more efficient protocol in terms of energy. The more energy can be saved by adjusting forwarding policy using self adaption algorithm that helps in estimating its neighborhood importance. The propose protocol has been tested by performing different experiments on it that show its promising performance.

K. Ramesh et.al, November 2011 presented in this paper [9], a special emphasis on selection strategies of cluster head techniques that have been proposed in various researches. A comparative analysis is provided on these techniques in order to provide a clear difference amongst various methods in terms of various aspects. In order to select the cluster heads amongst each cluster, the clustering technique is to be used which needs to be studied here. There is also further the need required to generate balanced clusters within the network. The parameters that have been utilized within the network are also studied in this paper. While emphasizing on the effects that are caused when the cluster head selection mechanism is applied on the network there are various measures provided which are studied here. Even though there are various enhancements proposed by numerous researchers, it is seen that there is still the need of providing more scalable, energy efficient as well as stable clustering method in order gather the data across the whole network.

Manjula. R. B, et.al, 2011 presented in this paper [10], that there is very less study done on the various applications of oceans and the Earth related studies which include the various communication applications within them. In terms of costs of energy and the channel propagation mechanism, the underwater environment is completely different from the terrestrial radio environment. The limited bandwidth, battery power and various other failures occurring within the sensors are amongst the many issues that arise in USWSNs. In this paper, the various manners in which UWSNs are designed and the various issues arising within them are studied. Further, there are also many communication devices utilized in these networks due to which many problems may arise. These problems are to be discussed in this paper along in order to provide an enhanced environment which can help in monitoring the surroundings in better and effective way.

Wahid, Dongkyun, et.al, December 2010 presented in this paper [11], that there are many similarities amongst the underwater sensor networks (UWSN) and terrestrial sensor networks. A review of various routing protocols that can be used of UWSNs is presented in this paper. The protocols that are of great use are studied here and their detailed description is presented in this paper. The state-of-art routing protocols to be used within the UWSNs are analyzed and presented in this paper. On the basis of various methods and approaches used for routing such as the flooding based approach, multipath approach and cluster based approach, the various protocols are categorized. The various routing protocols proposed are described in this paper. The direction of current research related to routing layer of UWSNs is understood through the study presented here related to the selected protocols. Within the future studies, the implementation of major protocols involved within various categories is presented. Further, the performance of various mechanisms involved within these UWSN networks are measured and compared.

Zheng, Hou, Li, et.al, 2010 presented in this paper [12], the study related to the energy consumed by wireless networks and devices. The method through which the radio electronic can be turned off and the wireless device can be placed into low-power states is known as power management. However, the method in which various coding methods are used and the RF output power is adjusted accordingly for minimizing the overall power being consumed during the transmission process is known as power control method. Important performance objectives for each of these techniques are presented in this paper. On the basis of environmental properties and constraints, the performance needs of applications and the presence of costs of hardware devices, the various power management and control techniques are chosen. The various advantages, and disadvantages of the techniques, the performances of each of the proposed methods is compared in order to provide a clear

view of which technique can be used as per the generated scenario within a specific application.

PROPOSED WORK

Reclustering the grids with the help of neural networks is the main concern of our proposed work. In the existing technique the clustering of grids is static but in our proposed work, the clustering of grids is dynamic. The situations arising can change and adjust them accordingly. According to the situation and the calculations made on the basis of battery consumption the node data sent is easily adjustable. The major concern here is to avoid the battery wastage. The cluster head selection is also done on the basis of minimum battery consumption through election algorithm.

START ( )

1. A fixed number of sensor nodes are used to deploy a sensor network.
2. In cluster sensor nodes a location base clustering is applied.
3. The LEACH protocol is used to select cluster head in each cluster.
4. If (link failure occurred in the network)

{

1. Weight=0,bais=0, input=0
2. R=max(x)
3. While the whole data get classified into two classes in the for loop do
4. For i=1 to CS(n) do
5. If $Y_i(<W_{i,}X_i > +bias)< 0$ then
6. $W_{k+1}=W_k+Y_iX_i$
7. K=k+1;
8. End if
9. End while
10. Return Classified data K, The k is the number of classes and x is the data in the classes
11. Recover path through sensor nodes which has higher rating

}

Else

{

Start communication from source to destination

}

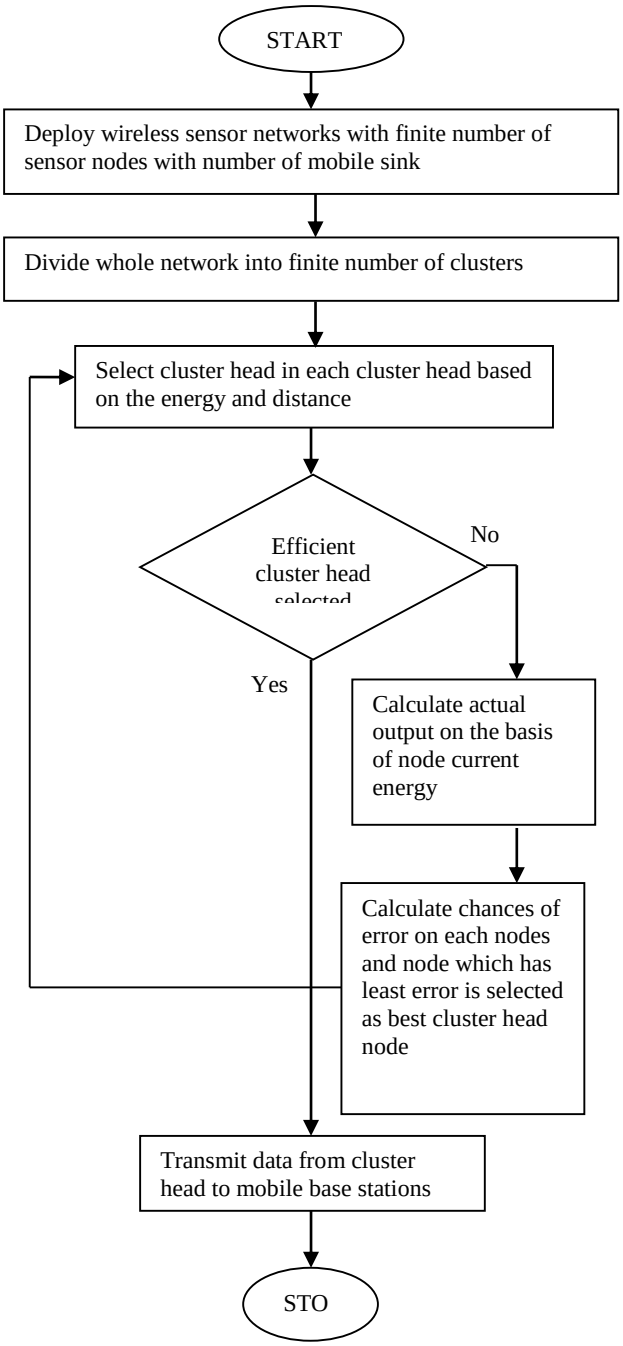

Figure 1: Proposed Flowchart

EXPERIMENTAL RESULTS

The proposed work is implemented in NS2 and the results are analyzed in terms of various parameters such as throughput, energy consumption and packet loss.

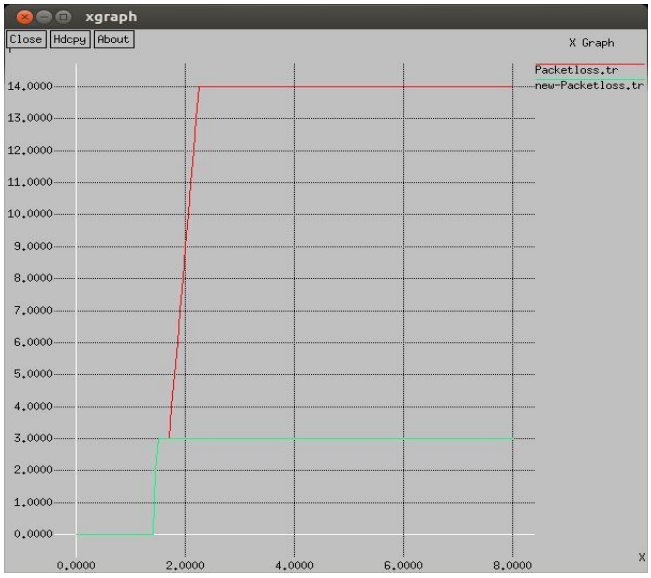

Figure 2: Packet loss comparison

As shown in the figure 2, the packet loss in the proposed and existing algorithm has been compared and it is been analyzed that packet loss in the proposed technique is reduced due to correct selection of cluster head.

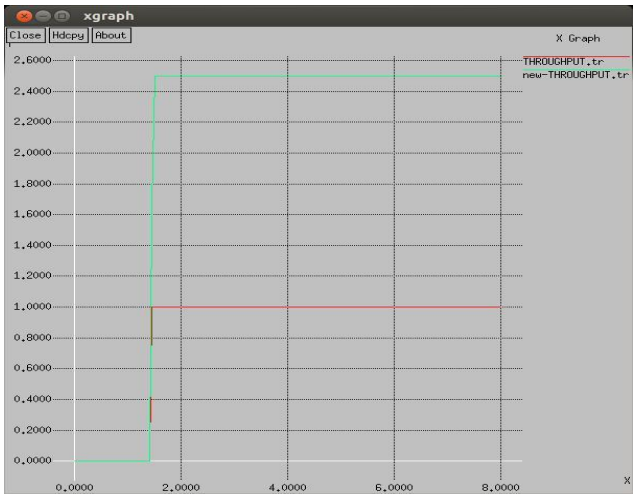

Figure 3: Throughput Comparison

As shown in the figure 3, the throughput of the proposed and existing algorithm are compared and it is been analyzed that network throughput is increased due to reduction of chances of fault in the network.

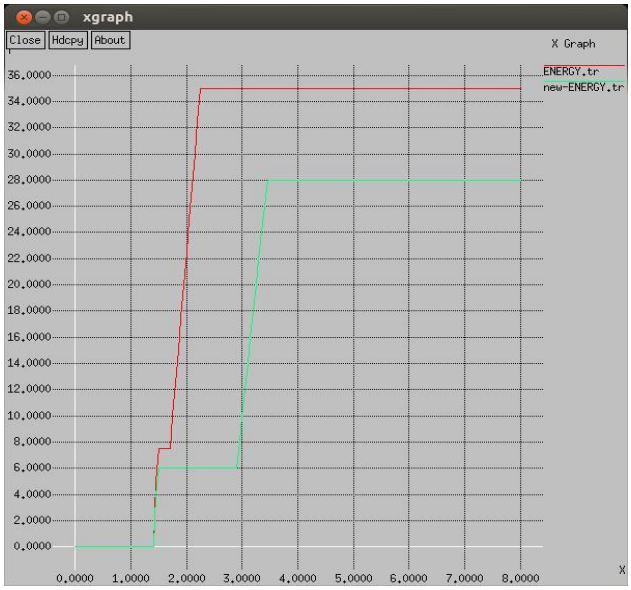

Figure 4: Energy Comparison

A proposed algorithm is compared with existing one in terms of energy consumption as shown in figure 4. It has been concluded that as compared to existing algorithm a proposed one have less energy consumption.

CONCLUSION

Underwater Sensor Networks are employed for information transmission which is different from the communication media. To enhance the communication efficiency one can select the carrier's in particular underwater environment. For the employment of different layers with the help of research team to allow simple integration can be taken into account using underwater networking. To implement new ideas and different applications is flexible using architecture. The layered architecture provides the communication between the layers. This architecture also provide flexibility and additional framework to expand the architecture and cross-layer optimization can be taken for the consideration. Therefore, it is found that underwater acoustic network is one of the types of sensor network which sense all the underwater conditions under oceans. Every network is alienated to different size of clusters and these clusters are used to select cluster head on the basis of its energy and distance. Existing scenario can be changed or improved by applying cluster head using neural networks which leads to increase in network lifetime and reduction in energy consumption. In conclusion, this proposed technique will be used in future to increase network security.

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