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A WSN-based maritime border alert system to protect fishermen

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Abstract:

The safety of fisherman has become a big issue in Tamil Nādu because of fishermen invading the Sri Lankan border. This initiative primarily seeks to save fishermen's lives by tracking the location of their boats and alerting them to the boundary limit, which is then sent to the control centre. A pulse detector is also included, which aids in the monitoring of the fishermen's health. The concept is built around an embedded system that protects fisherman by alerting them to the country's border via a wireless sensor network (WSN) and a global mobile communication system (GSM). Each zone in the region has a different function, but they all have four things in common: they're all in the same general area. While fishing, if the fisherman ignores or fails to see the display, the alarm will go off, alerting him and slowing down the boat as it gets close to the forbidden zone. It includes a pulse oximeter as well; in case the user has any health issues. This information is sent to the command centre.
Keywords — WSN, GSM

1. INTRODUCTION

The primary objective of this research is to create a low-power wireless sensor network communication system. Sensing networks have a lifespan based on how long they remain operational once they have been installed. Using clustering to prolong the life of a sensor network saves energy. With data aggregation, it may extend the life of a sensor. Each cluster has a cluster head, which is selected at random from the other cluster nodes. First, the sensors provide data to the cluster head, which then sends it to the sink. They can aggregate sensor data so that it doesn't have to be sent as much.

Our task is to provide a method for conducting WSN on the surface sea and informing fishermen of the boundary limit. Sensor nodes detect information from a boat nearing the boundary and transmit it to the base station through Tran receiver. Information may be transmitted to satellite from BS. Because of this design, many BSs may be linked over the internet. The Fisherman's boat may be used to mount ZigBee transceivers. In a cluster, the nodes that serve as cluster heads (CHs) periodically gather data from their CMs (Cluster Members), aggregate it, and send it to the BS. Contact between fisherman and the sea is made easier as a result of this.

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2. RELATED WORK

While Wendi Rabiner Heinzelman et alEnergy .'s Adaptive Clustering Hierarchy (LEACH)[4] uses direct communication nodes to communicate with the Base Station, direct communication nodes may link directly with the Base Station (BS). Distance from the node when communicating directly reduces the battery life of the BS. The MTE technique utilises a technology known as minimal transmission energy to receive data from the other nodes and send it to the BS (MTE). The nearest node to BS is the one that suffers the most. With Wireless Sensor Networks (WSNs), nodes are often grouped into clusters and connected through a Cluster Head (CH) (BS).

Using the L-DCHS (LEACH with Deterministic CH selection), M. J. Handy and colleagues were able to prolong the life of a network. As the remaining energy in each node is taken into consideration, the threshold value is adjusted accordingly. Improved Energy-efficiency Algorithm Based on L-DCHS was developed by Linping Wang et al. to make L-DCHS more efficient. The MCH is chosen once a threshold value has been calculated. All nodes in a cluster send the node factor to MCH as a single packet to be processed by MCH. The Vice CH (Vice CH) with the greatest node factor is selected by the MCH. Monitoring the present condition helps keep the cluster up to date. The lifelong improvement in IEAL has been seen. For HND (Half Node Dies), the lifetime increase in WSN is 19.8%, and for LND (Long Node

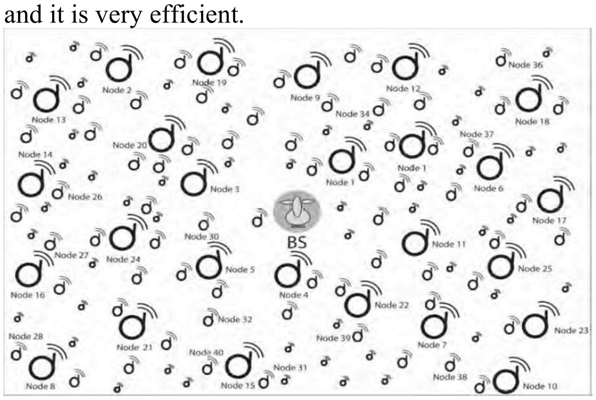
Dies), it is 6.7% (Last Node Dies). To further enhance energy efficiency, NEAW (Novel Energy-efficient Algorithm for WSN) [7] divides overall energy consumption into smaller units of energy. For HND (Half Node Dies), the WSN is 19.8%; for LND, it is 6.7%. (Last Node Dies). It also increases energy efficiency by splitting the whole area into three zones the NEAW (Novel Energy-efficient Algorithm for WSN) [7]. MCH and VCH are found in all three locations, although their responsibilities are very different in each one. Multiple hops from the VCH nodes are used to send the data to BS. Using MCH, data is gathered from all nodes and sent to VCH. Prior to being sent to BS, the data is compressed by VCH. While the first node dies, the NEAW is 8.6% slower than L-DCHS, but it improves by 24.2% when half the nodes are still alive. Additionally, NEAW can improve LND by 14.3 percent.

2. PROPOSED ALGORITHM

- Deployment of Nodes
- Formation of Groups
- Choosing CH for Energy Routing and Upkeep

A. Nodes Deployment

The wireless sensor nodes are placed on the ocean's surface. The sensor nodes are deployed on the sea's surface by attaching a weight to the sensor using a rope that is somewhat longer than the depth of the water [14]. The sensors are also connected to the surface with foam balls so that they can float [15]. Every node acts as a transceiver. The information is sensed by the node and sent to BS. The NES-WSN Algorithm is used to communicate between the node and the BS, and it is very efficient.



B. Cluster Formation and CH selection

BS sends a message to all nodes asking for their host id and remaining energy. All nodes respond with the information requested. The nodes that receive messages from BS send the Acknowledgement, host id, and remaining energy. Columns in the table produced by the BS include host id, TF (Time Factor), remaining energy, and region. To find out how big something is, use the TF function. This information is kept by the Mac's Energy Maintaining Module (EMM). It's explained how clusters develop and how CHs are selected.

In the BS process paradigm, there are three different FSMs to choose from (Finite State Machines). The init state is the only one of these three that must be entered (green in colour). The last two conditions are optional (red in colour). After the entrance and exit executives have been compelled to commit suicide, the process will go on to the next phase. Exit executives are executed after waiting for interruptions in an unforced state; entrance executives run first. BS is responsible for the following four tasks:
Updates to the table () Region split () PMN selection () SMN selection is broadcast ().

C. Routing-LEACH Protocol

An energy-efficient microsensor network architecture known as the Low Energy Adaptive Clustering Hierarchy (LEACH) protocol combines the idea of aggregating application-specific data while maintaining excellent system lifespan and latency with energy-efficient cluster-based media access. To reduce the amount of data transmitted from the cluster to the base station, data aggregation is used

The network's nodes group together to form clusters, with one node serving as the cluster's master controller. Rather than the cluster head node sending data, other nodes send it. The cluster head node receives data from all members.

D. Energy Maintenance

Whenever the energy level of the cluster head node falls below a particular threshold, the cluster head node ceases to function as the cluster's head and the cluster's nodes cease to communicate with the base station. LEACH resolves this problem by shifting the cluster head to the most energy-efficient node to avoid the wireless sensor nodes in the network from running out of battery life. Thus, the WSN cluster chooses an energetic cluster head node as its cluster head.
Setup and steady state are the two stages of the LEACH protocol's operation. Each wireless sensor node in the network picks a random number between 0 and 1 during the setup process. As a starting point,

each wireless sensor node decides whether or not it will be the cluster head by setting the threshold value for node 'n' as T. (n). There are enough cluster head nodes anticipated in this round so the threshold value is chosen to ensure that. When there are N wireless sensor nodes in a network, how many cluster heads are expected?

$$E(\#CH) = \sum_{n=1}^{N} \mathrm{T(n)} = \mathrm{K}$$

Each cluster is replaced with its mean value to get the average image M. The average image is shown in Figure 8. The texture has been removed from the final picture to make it seem cleaner.

3. **FUTURE IMPROVEMENT**

Additionally, it's possible to include apps for oceanographic data gathering and pollution monitoring in addition to off-the-shelf exploring.

4. CONCLUSION

The suggested system can prevent inadvertent entry of fishermen into another country's border, as well as monitoring the fisherman's health concerns and informing the control station of his status in the event of an emergency.

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