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Impact of Two-Level Fuzzy Cluster Head Selection Protocol for Earthquake Wireless Sensor Network: An Energy Efficient Approach

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The robust application of Wireless Sensor Networks has increased during the past decade due to the potential use of wireless nodes in transmission of information related to efficient earthquake early warning scenarios for surveillance and monitoring. The study proposes an Energy Efficient Dynamic Scenario (EEDS) for cluster head allocation for optimum balance in the energy consumption of the whole network that will prolong the lifetime of the network in an efficient manner to finding precursory changes occurring in different rock types that have different thresholds for stress values. We develop an algorithm to calculate energy across the network if the source and destination is known. We calculate the residual energy across nodes with 0.01 J given out per packet. We evaluate the cost and benefit of the data fusion, in order to adaptively adjust whether fusion shall be performed for minimizing the total energy consumption when MA migrates to a particular node. In this paper, a two-level fuzzy logic is proposed in choosing cluster head based on node localization and network traffic. In the upper decision making level called global level of qualification leads to better performance of the inference system. Simulation results show that EEDS gives the best performance with respect to network life time density and residual energy of the node.

Keywords : Clusterhead, Energy Awareness Design, Fuzzy Logic, Life Time, Matlab, Wireless Sensor Network.

1. INTRODUCTION

Environmental research involving the study of earthquakes and other catastrophes require primary sensing and alarming using wireless networks can give significantly good results with the ease of access to data and control to environmental hazards spread over a large geographical region. Numerous civil and disaster information gathering scenarios applications can be leveraged by networked sensors. In disaster management situations such as earthquakes, sensor networks can be used selectively map the affected regions directing emergency response units to take a quick action. The use of wireless sensor in hierarchial clustering algorithms in varied environment usage leads to many complications related to network lifetime. Due to resource constraints in Wireless Sensor Networks placed in remote locations, message passing among clustering wireless nodes by cluster head allocation can be done to prolong the network lifetime.

Wireless Sensor Network consists of low cost nodes with limited power applications for information gathering in harsh terrains for weather and climate monitoring. An important characteristic of these nodes is that the nodes remain unattended and are resource constrained due to their deployment to some remote location. Due to such limitations of unpredictable behavior of nodes [1] it is necessary to implement optimum procedures that make the sensor nodes conserve energy to increase the lifetime of the network [2-4] for information pro-

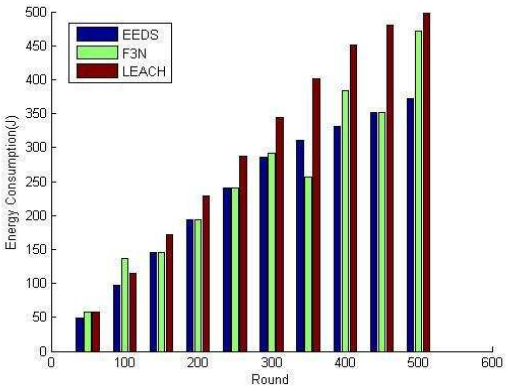

Figure 9. Comparative Analysis of Energy Consumption with Various Rounds for EEDS, F3N and LEACH

number of neighbor nodes and remained battery power and is decreased with the increase of distance from the cluster centroid.

With the introduction of the forced cluster head based on fuzzy inference rules for finding data relativity of the monitoring stations and measuring variation for the unit pitch points within the continued time, the redundant data latency can be brought down. A comparison simulation on the network for existing time of the improved algorithm for the LEACH and fuzzy rule base protocols was conduced comparing EEDS with F3N and power constrained LEACH. We found that EEDS performs better than all other protocols. Moreover, a robust load distribution and a variance in energy consumption process for the two step fuzzy approach shows that it can be easily tuned for different network and node conditions simply by changing shapes of the fuzzy sets that will increase the efficiency of the proposed algorithm. A topic for future research is the analytical study of implementing fuzzy logic implementation for variables that allow the cluster heads to be more sparsely distributed [33,34,35].

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