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A Vague Integrated Parameter Analysis for Cooperative Node Selection to Optimize WSN Routing

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Abstract

A sensor network is adhoc network in which communication route is build based on effective neighbor selection. As of restricted resources and limited parametric specifications the neighbor node selection is somewhat critical. In this work, vague rule based node association analysis is provided for cooperative node selection. The parameters here included are link quality estimation, distance coverage and fault criticality observations. The analysis is applied on node pair so that more reliable route formation is done. The simulation is applied in matlab environment. The results shows that work has improved the network life and reduce the communication error.

Keywords : MSE, Cooperative Node, Vague Route Optimization

I. INTRODUCTION

A restricted resource network always requires the optimization to save the resource consumption and to provide the communication optimization. This kind of optimization can be achieved either by improving the network architecture or by applying the communication optimization. The communication optimization is more dynamic, operation specific method. In case of multi-hop communication model, the optimization can be achieved by effective selection of next hop. This kind of analysis depends on the physical parameters of nodes as well as the communication driven parameters. The physical parameters are generally static and can be observed at any instanced of time without performing the network communication. The communication parameters require to observe the network by passing the dummy packets so that the communication delivery analysis can be obtained. These two types of analysis actually identified as the link quality estimation [1].

To generate the optimized communication route, it is required to observe the link quality between the nodes under different integrated parameters. These parameters includes signal attenuation, interference etc. These kind of link reliability estimation not only ensures the packet delivery but also reduces the resource consumption during the communication. As all the neighbors to the current node are estimated, the critical route metric can be generated for confirming the route formation so that the reliable packet delivery will be obtained. The link quality itself is a wider term which actually depends on multiple parameters and used effectively for stable route formulation. This kind of route formulation parameters includes communication throughput, energy estimation, topological reliability and the packet delivery ratio. In sensor network where the energy specific nodes are defined, the link reliability can be computed under energy and failure probability criteria [2]. In mobile adaptive networks, the mobility is another key factor used for the estimation of effective next neighbor. In such case, the session adaptive node stability, positional variation analysis, variation frequency analysis and the direction of the mobility are also considered.

The type of communication or the architecture specification also play an important role in sensor network. These architectures includes the clustering architecture or the aggregative communication phenomenon. In clustered network, the multiple communications are formed simultaneously in different sub networks. In this architecture, the inter cluster and intra cluster communication can be formed based on link quality estimation. The cluster switching and the cluster election can also be done based on the same parameters described for link quality estimation. A high quality node can be elected as the cluster head to provide the communication control in sub network. The aggregative communication is completely to combine the multi path communication in single communication path. The cooperative node analysis is here required to generate the optimized path and to improve the network performance.

In this paper, a vague rule specification based cooperative node analysis model is provided for effective route formulation for sensor network. The node pair association analysis is provided in this work for route optimization. In section I, the criticality of the sensor network is defined along with the method considered for network optimization. The main stress is given to provide the study on different parameters to identify the reliable cooperative node. In section II, the work defined by the earlier researchers is presented in same direction. In section III, the proposed work model is presented and discussed. In section IV, the results obtained from the work are presented. In section V, the conclusion obtained from work is presented.

II. EXISTING WORK

The link quality estimation and the communication level optimization is already provided by different researchers using different routing algorithms. Some of the contributions of earlier researchers is presented in this section. Author[1] has provided a work on route formulation under the network model analysis. Author observed the network architecture at the earlier stage so that the route redundancy will be reduced and communication route will be formed. Author[2] has provided a work on energy adaptive route formulation to optimize the sensor network communication. Author provided the analysis on the localization algorithm integrated with scheduling method to provide the synchronized and optimized route formulation. The improved tree specific method is applied for generating the optimized route and to improve the communication. The dynamic constraint analysis is provided by the author for communication level optimization. Author[3] has provided a work on disjoint path formulation to optimize the network routing and to provide the node level classification. As the quality nodes are identified, the multipath route is formed for reliable communication delivery.The scheduling model for traffic adaptive route formulation and priority specific communication model is descried here. Here traffic driven method for route formulation is also described so that the improved communication path will be obtained. The real time communication analysis is provided for effective route formulation.

Author[4] has provided a delay driven analysis on sensor network for improving the effectiveness of the communication. The topological specifications are utilized under scheduling algorithm to reduce the communication delay and to improve the link reliability. The performance parameters are observed for route formulation in network. Author[5]

provided a work on effective route formulation under cost and reliability vectors. Author provided the hop selection and route selection model for link quality estimation and the communication reliability estimation and route policy driven communication under cost vector improving the decision strength and communication effectiveness. The load constraint analysis under multiple situations is observed for route formulation in the network[7]. Author[8] provided a work on the architectural improvement to optimize the network communication and analyzed under location sensitive deployment method for route formulation with range analysis and provided the optimized path identification for effective communication generation. Author [9] has defined a quality driven routing approach for WSN so that the multipath formulation is done. Author applied the work under fading method and achieved energy effective communication.

Author[10] has provided a work on scheduling method applied under geographical constraints for route scalability analysis for communication optimization under route formulation and the analysis on forwarding method for two phase routing. Here the communication criteria under multiple constraints is improved. Author[11] has presented an opportunistic routing model for routing framework. Author applied the constraint level analysis on network nodes for generating the neighbor list and provides the energy effective route formulation. Author[12] has generated the energy specific route under the quantization parameters. The route optimization is here provided under node level estimation and provides the reliable route generation. Author[13] has provided a work on reducing the energy consumption and failure rate during the route formulation. The delay analysis is provided to provide the effective communication in network. Author[14] has provided a work on location driven routing model in security inclusive sensor network. Author provided the security in terms of link capability analysis along with privacy characteristic observation for link quality assessment. Author provided the flooding model for path formulation under energy constraints. Author[15] provided the improved communication formulation so that the complexity driven communication is formed. The physical characteristics analysis is provided for improving the network communication so that the reliable route formulation will be done. In this section various method provided by different researchers on link quality observation and route formulation are presented. The proposed work model under vague rule for oink quality estimation is described in next section.

III. VAGUE BASED ROUTING METHOD

To optimize the communication in sensor network, one of the most effective and reliable way is to provide the communication on effective neighbor nodes. These neighbor nodes can observed under different parameters of link quality aspects. These aspects can be driven under topological constraints as well as communication level constraints. The dynamic and static observations can be applied for effective link estimation. In this work, a vague rule based model is presented for effective link selection and to provide the optimized route over the network. The parameters considered here are based on the communication computation and the link quality vector. At the earlier stage of this work model, the estimation is provided on the fix parameters such as coverage analysis, energy analysis etc. Later on the dynamic

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parameters are observed based on the failure rate estimation. The presented work model is shown in figure 1.

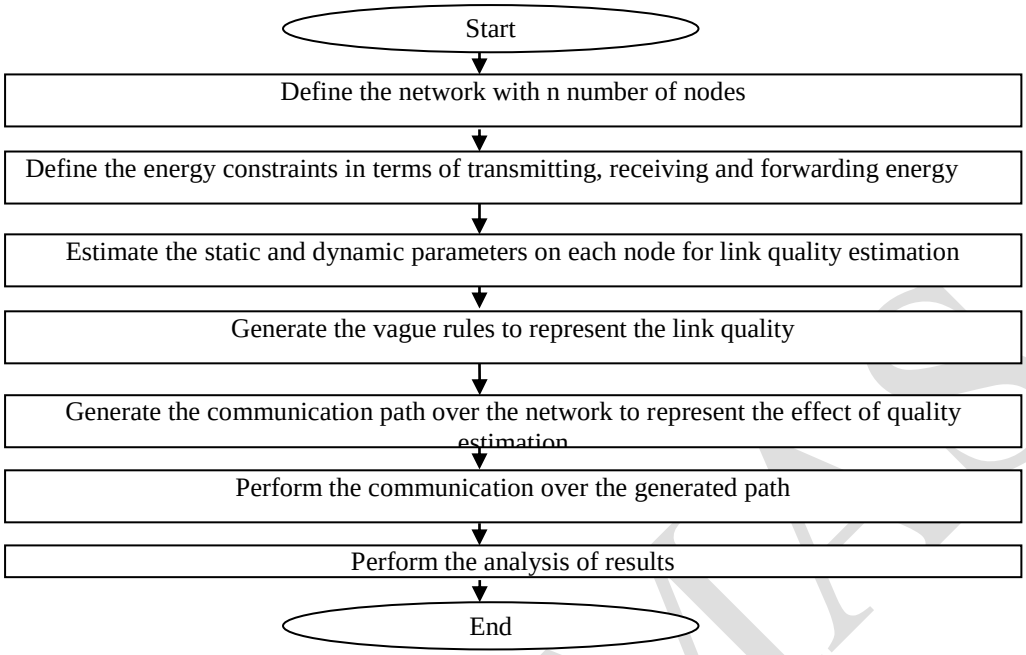

Figure 1 : Proposed Work Model

The figure 1 is showing all aspects of this work algorithm. The work begins with the formulation of network under parametric estimation at energy level. The vague rule is here applied for associated neighbor analysis with quality aspect estimation. The process is repeated till the complete path is not formulated. The route formulation is applied on the static sensor network and the results are observed under multiple network parameters.

A) VAGUE RULE FORMATION

Vague rule is rule formulation method applied on the node and network parameters based on the evidence observation. The operators are based on the associated connectivity analysis for link level observation. The individual and the collective rules are here applied for link estimation and the structural aspect derivation is applied. This conditional observation is here applied for effective node selection and route formulation.

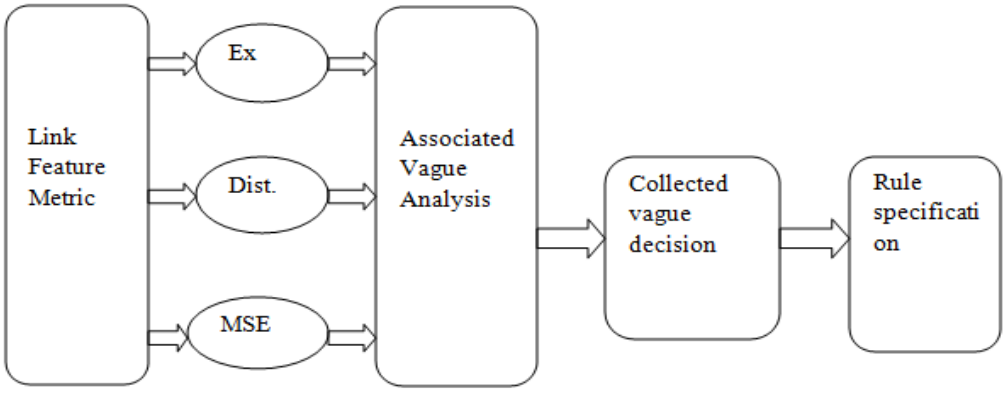

Figure 2: Vague Based Rule Generation

According to this rule model, the link feature analysis is applied under the likelihood and the association node analysis applied on the sender and receiver pair observation. The delivery rate and the coverage associated analysis is provided for link formulation and to provide the route generation over the network.

IV. RESULTS

In this work, a vague integrated rule model is provided to observe the network nodes under static and dynamic parameters. The work is simulated in random network scenario applied in MATLAB environment. The simulation parameters relative to the work are shown in table 1. The work observations are here taken in terms of network life and the error rate in the communication. These results are presented and discussed in this section.

Table 1 : Network Scenario

Parameter	Value
Area	100x100
Number of Nodes	100
Number of Rounds	100
Initial Energy	Random
Transmission Loss	5 mJ
Receiving Loss	5 mJ
Forwarding Loss	1 mJ
Topology	Random
Sensing Range	30

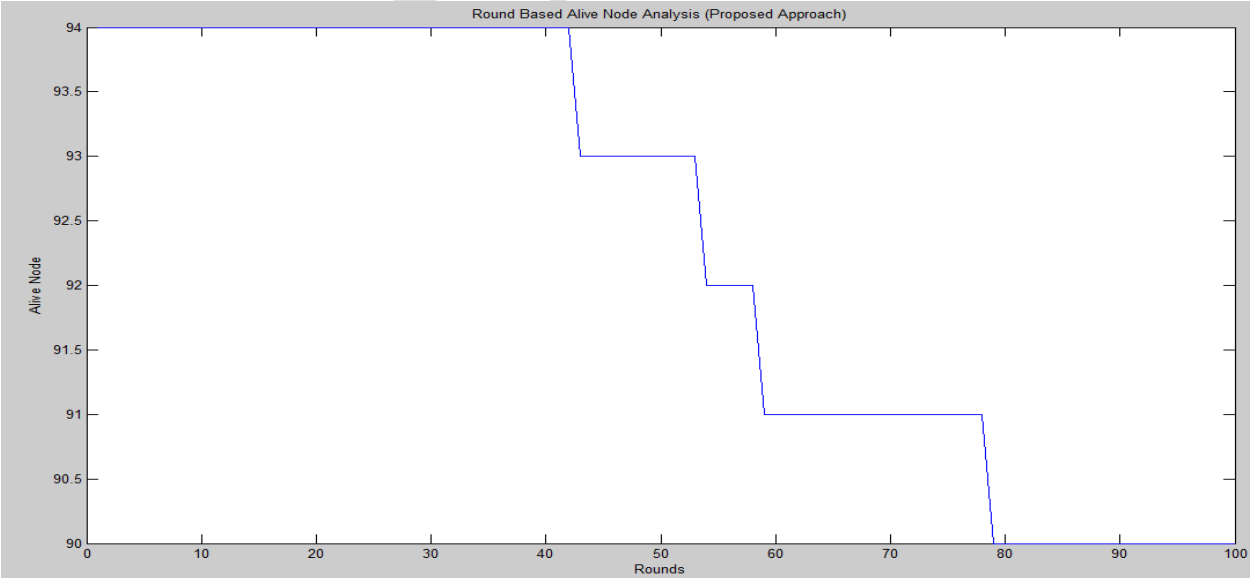

Figure 3: Alive node analysis

Here figure 3 is showing the network life analysis in terms of alive node. The figure shows that the initially 94 nodes are alive in the network but as the communication performed, the

node start losing its life and the node energy is lost. After 100 rounds of communication about 90 nodes are alive in the network.

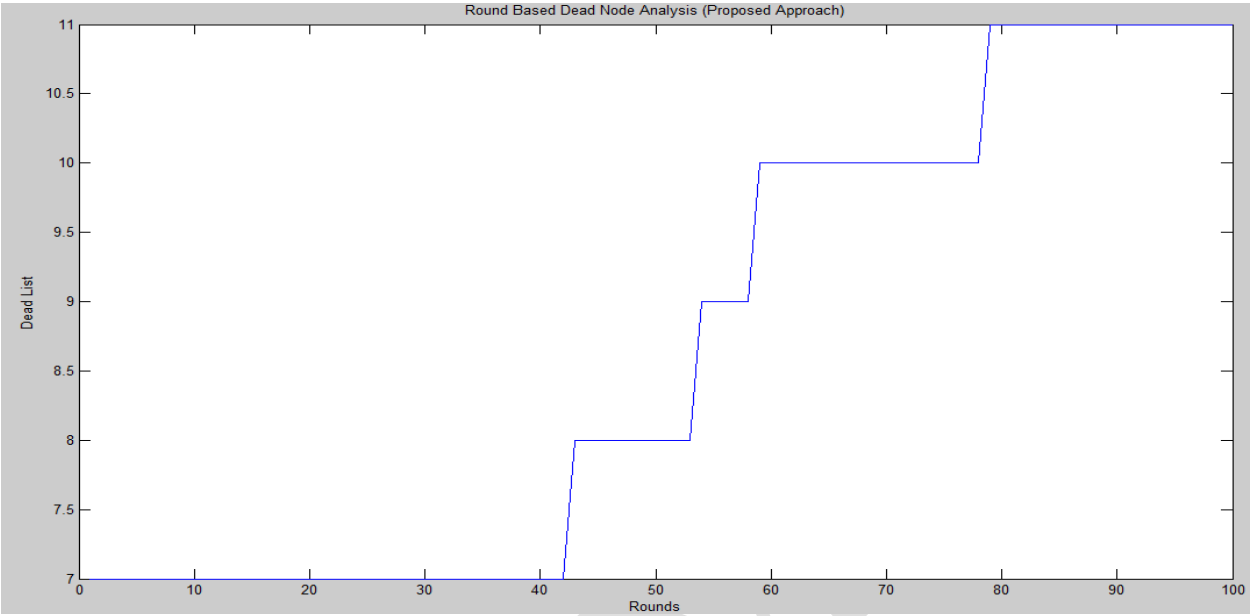

Figure 4 : Dead Node Analysis

Here figure 4 is showing the network life analysis in terms of dead node. The figure shows that the initially no node is dead in the network but as the communication performed, the node start losing its life and the node energy is lost. After 100 rounds of communication about 14 nodes are dead in the network.

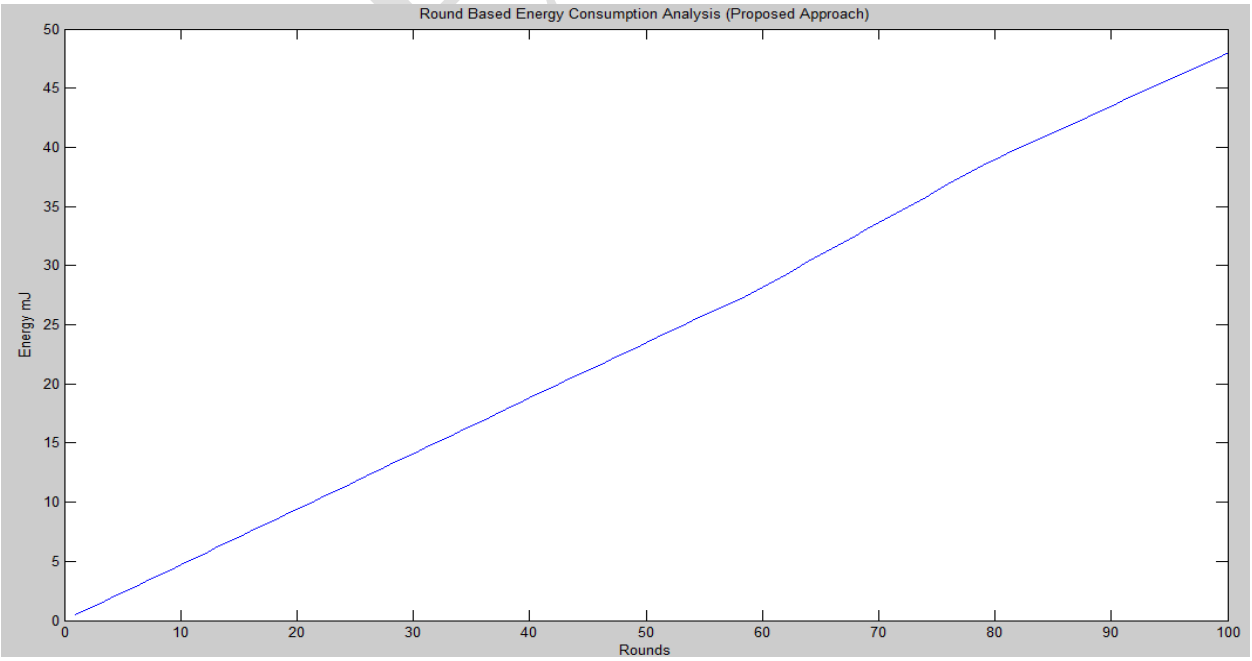

Figure 5 : Energy Consumption Analysis

Here figure 5 is showing the network life observation in terms of energy consumpiton. The aggregative energy consumption for whole network is defined in the figure. As the communication goes on, the energy consumption is increased**.**

V. CONCLUSION

In this paper, A vague integrated model is presented for route formulation in sensor network. The work is applied under the static and dynamic parametric observation for effective route formulation. The communication results shows that the work has reduced the energy consumption and improved the network life.

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