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Research Paper on Wireless Sensor Network for Long Life of Network

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ABSTRACT

Wireless networks give the concept of distributed architecture so that the sharing of information as well as resources can be done effectively. 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. The research paper is about to perform the analysis of sensor network under different real time scenarios so that the work includes the discussion on sensor network, its architecture and define a virtual coordinator based routing for sensor network in details. For this, we will use area localization approach to divide the network in smaller zones with specification of coordinator node. Further, work is to maintain the zone nodes statistics on coordinator node to identify the effective next hop. Final objective of the work is to minimize the energy consumption and improve the network life. All these results are simulated with help of Matlab 2013a tool in a comparison with existing and purposed technique. Parameters taken in consideration are alive & dead nodes analysis, Round Based Communication Analysis.

Keywords: MANET, Sensor Networks, Wireless Network, Zone Selection Techniques, Network Life, MATLAB.

I. INTRODUCTION

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 networks are been increased very fast. These kinds of information transmission include the static and dynamic network types and to define the bidirectional links between the system without defining any wired connection as well as without setting up a static infrastructure. These kinds of network do not require any administrative intervention. These networks are called ad-hoc network. A sensor network [1] is defined as a wide public area network in which number of sensor node are connected. Mobility is the key property of such kind of network.

Here figure 1.1 is showing the example of a standard sensor network [2]. The network is equipped with different kind of communicating devices. There are different definitions of an ad-hoc network respective to the type of devices as well as the communication devices involved in the system itself. These networks are defined as follows: -

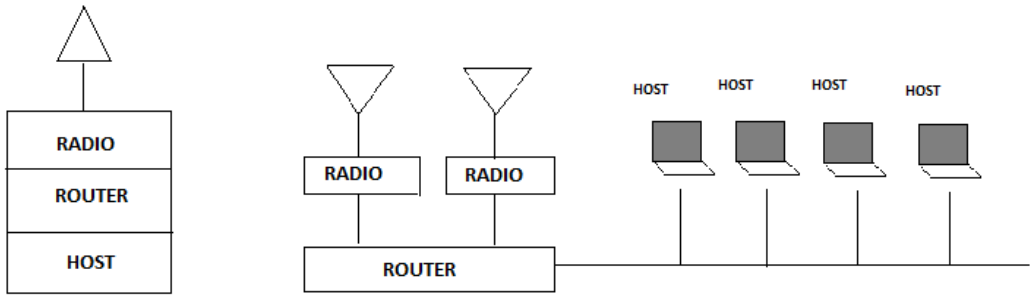

Figure 1.1: An Example of Sensor Network

A sensor network performs the multi-hop cellular network model that requires the base stations as the main controller points. This network architecture is defined in a P2P network [3]. The decision of next node selection depends on different vectors such as number of packets transmitted in store and forward approach. In such network, a source and destination nodes are specified and the intermediate communicating nodes are selected by the network itself dynamically according to the routing information over the network [4].

The main communicating criteria of WSN are the selection of next node. This can be done in static or dynamic way.

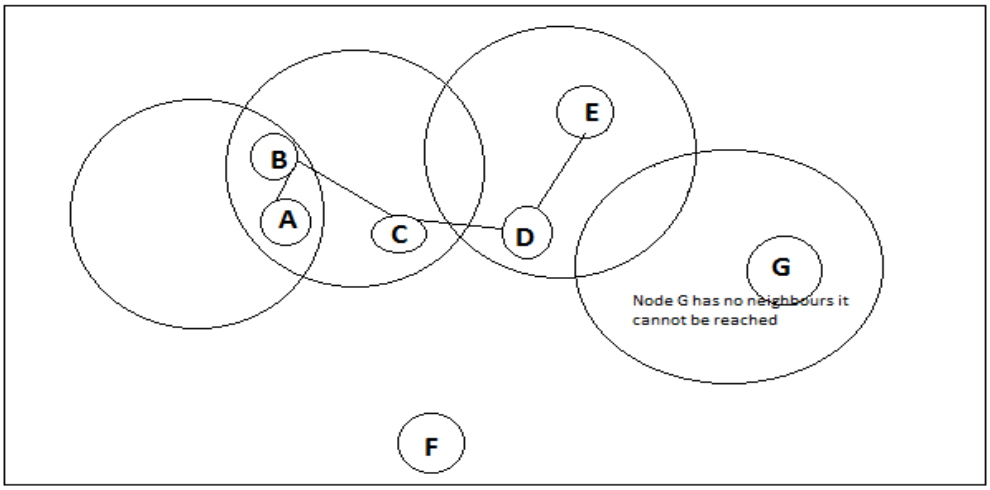

Figure 1.2: An example of Ad-Hoc Networks

Here in figure 1.2, the route construction in a sensor network is shown. In this network, the circles are showing the coverage of the nodes. Here A is the start node, and it will identify the neighbor nodes in the sequence such as B is selected as the next communicating neighbor node for A, C is selected for Node B. In same way the multi-hop path will be constructed between A and E. Communication cannot be performed to node G, as the node is not in the range of the node.

II. PROBLEM DEFINITION

The main application area for sensor network [5] is in the military field or the battle field to provide the survivability. To survive in such critical conditions with war fighters, there is the requirement of some communication medium that is not fixed and does not required any extra infrastructure. This kind of conditions also needs to transmit different kind of data such as text, images, videos etc. A sensor network provides all these facilities and allows to perform the voice communication as well as to communicate effectively under such complicated situations. The sensor network is also defined under the physics of electromagnetic propagation [4]. It defines the frequency analysis so that the data can be transmitted at different frequencies. The frequency range of this network is from 100 MHz to LOS. The transmission in such network can be performed beyond the Terrain, foliage and manmade obstacles. The research paper is about to perform the analysis of sensor network under different real time scenarios. For this, we will use area localization approach to divide the network in smaller zones with specification of coordinator node. Further, work is to maintain the zone nodes statistics on coordinator node to identify the effective next hop. Final objective of the work is to minimize the energy consumption and improve the network life.

III. ZONE ADAPTIVE VIRTUAL COORDINATE SELECTION APPROACH

This is about to improve the routing in sensor network by using the concept of virtual coordinator approach [5]. According to this approach, the node localization will be optimized. The work is here defined to divide the network in smaller zones and identify the virtual coordinator over the zone. This coordinator will contain the communication statistics of zone nodes. As the routing will be performed, the effective hop selection will be done by the virtual coordinator. The algorithm of work is given here. The work is here divided in two main phases. In first phase, the zone generation based on the virtual coordinator is done. The coordinator is here identified based on the network strength analysis. This analysis is based on the node energy, communication strength and the node connectivity parameters. Once the network is formed, the next work is defined to provide the effective communication over the

network. The strong nodes are able to provide the direct communication whereas the weaker nodes can use the virtual coordinator to perform the communication.

The coordinator node election is here done based on

- Node Energy
- Load
- Association Analysis

Algorithm (Sensor Nodes)

/* Sensor Nodes is the list of sensor nodes defined to provide the effective communication over the network using virtual coordinator concept*/

{

1. Define the strength limits to identify the reliable coordinator node to optimize the network communication
2. For r=1 to RMax
   [Perform the communication for Fix Number of Communication Rounds]
   {
3. For i=1 to Sensor Nodes. length
   [Process all network nodes]
   {
4. If(Sensor Node(i).Energy=Adaptive)
   [Check for Energy Level validity on node]
   {
5. If (Sensor Node(i).Load<Lower Threshold And Sensor Node(i).Load<Upper Threshold)
   [Check for the virtual coordinator acceptability respective to the area level load over the zone]
   {
6. If(Count(Critical)<Threshold)
   [Identify the critical nodes in the area]
   {
7. Set Sensor Node(i).Type=”VC”
   [Set the node as virtual coordinator node]
8. Generate Zone (Sensor Node(i),Sensing Range)
   [Define the zone to provide the adaptive communication in range]
   }
   }
9. For i=1 to Sensor Nodes. length
   [Perform communication over the network]
   {
10. If(Sensor Node(i).Type=”Node” And Sensor Node(i).Critical=True)
    [Check for the critical node]
    {
11. Coor=Locate Coordinator (Sensor Node(i))
    [Perform the communication via coordinator node]
12. Perform Commnicaiton (Sensor Node(i),Coor, Base Station)
    [Perform Communication via coordinator node]
    }
13. Else
    {
14. If(Sensor Node(i).Type=”Node” And Sensor Node(i).Critical=No)
    [Check for the critical node]
    {
15. Perform Commnicaiton (Sensor Node(i),,Base Station)
    [Perform Communication without coordinator node]
    }
16. Analyze Communicaiton (SensorNode(i))
    }
    }

IV. RESULTS & SIMULATION

The simulation scenario parameters of presented work using MATLAB 2013a are listed here under in Table 1.1.

Table 1.1 Simulation parameters

Parameter	Value
Area	300x300
Number of Nodes	150
Number of Rounds	1000
Initial Energy	Random
Transmission Loss	50 nJ
Receiving Loss	50 nJ
Forwarding Loss	10 nJ
Topology	Random
Packet Drop Ratio	Random

Analysis Results:

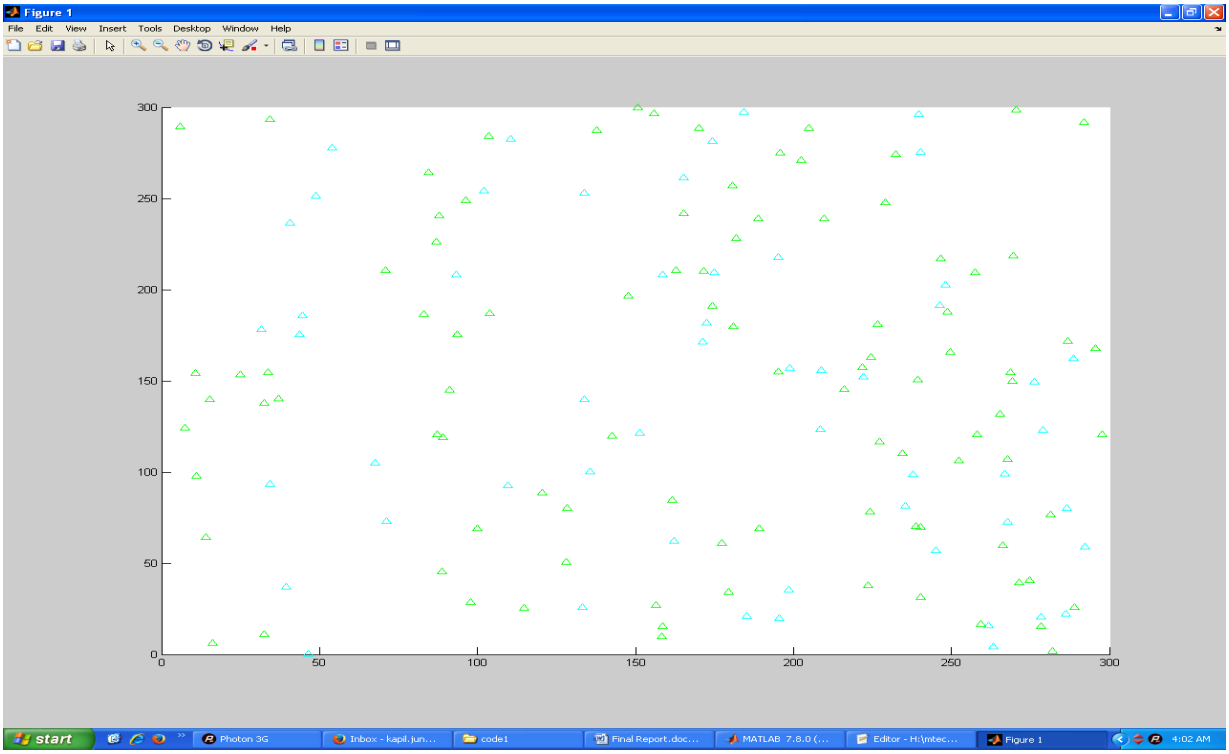

Figure 1.4: Network Architecture

Here figure 1.4 is showing the network structure defined in this work. The network is here defined in restricted area of 300x300. The network is having 150 nodes with random energy specification. The green nodes here presents the normal nodes and the cyan color nodes are the critical nodes of network. The work has defined a zone adaptive model to provide the communication in effective way.

Comparative Analysis:

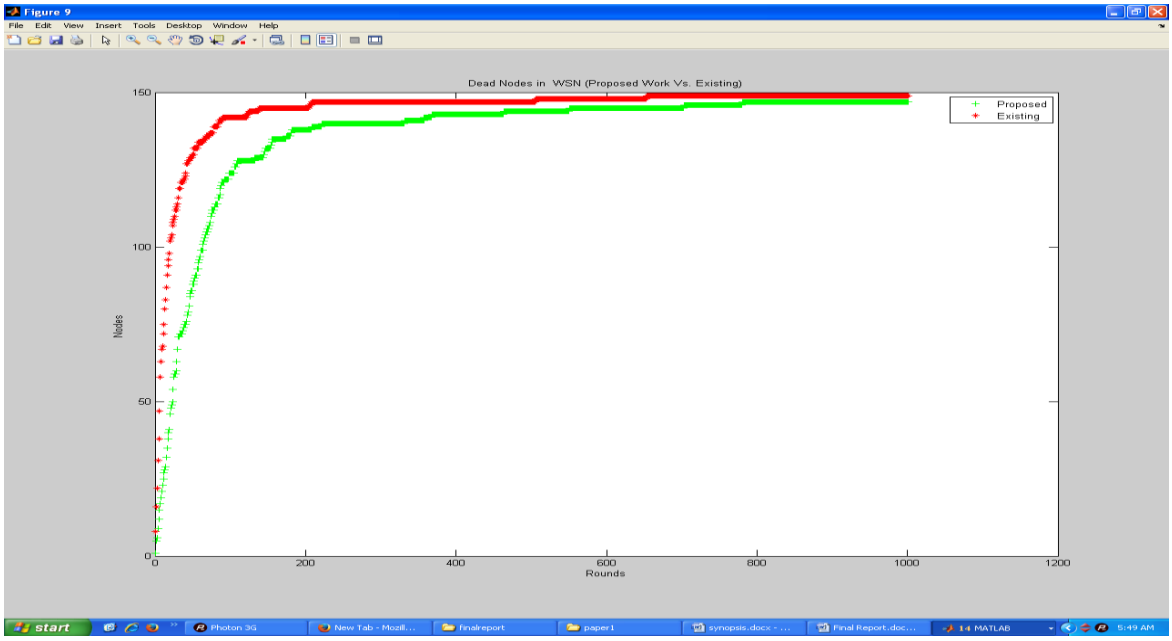

Figure 1.5: Dead Node Analysis (Existing Vs. Proposed Approach)

Here figure 1.5 is showing the analysis on the existing and proposed approach absed on the dead nodes. The green li 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.

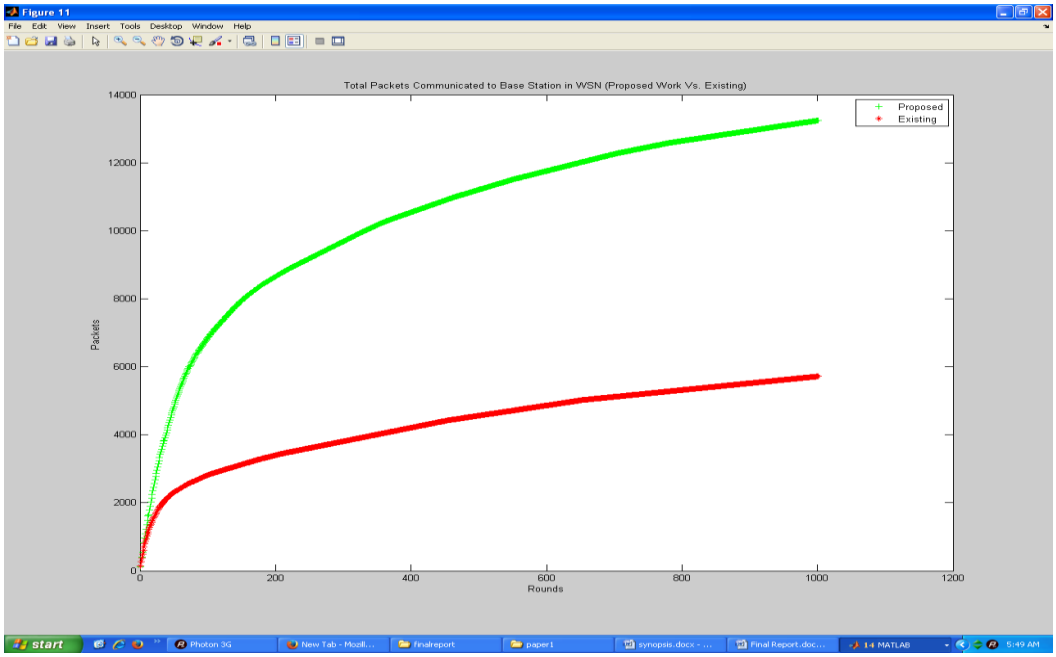

Figure 1.6: Network Communication Analysis (Existing Vs. Proposed Approach)

Here figure 1.6is showing the analysis on the existing and proposed approach based on the 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 approach.

Figure 1.7: Round Based Communication Analysis (Existing Vs. Proposed Approach)

Here figure 1.7 is showing the analysis on the existing and proposed approach based on the network communication in each round. 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 approach. The round based communication is improved in proposed approach so that the overall communication is improved.

CONCLUSION AND FUTURE SCOPE

In this paper, a virtual coordinator based model is defined to provide the optimize network communication in integrated communication. The virtual coordinator has been selected here based on the node level analysis. This coordinator selection will be done under density and the parameter selection.

The work can be improved in future under following aspects: a virtual coordinator based zone adaptive model is defined for improving the communication in sensor network. The node criticality and load parameters are here considered as criticality vector. In future some other parameters can be considered. In this present work, no optimization algorithm is applied to improve the communication but in future some such optimization algorithm can be applied to improve the communication.

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