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CHAPTER 4

ANALYSIS OF SHORTEST ROUTE FOR HETEROGENEOUS NODE IN WIRELESS SENSOR NETWORK

4.1 INTRODUCTION

Wireless sensor networks provide the bridge between the actual physical real time entity virtual worlds. WSN has the vast advantage to observe the observable at a range of fine resolution over large scale spatial and temporal measures. WSN has wide range of application and application career to the industry in the active domains like military, computer science, GIS, security etc. Wireless sensor nodes consists of the components such as memory (RAM, ROM), transceivers, GPS, processor, sensors, power source (battery). The main challenges arise here, due to limited resource (power), the energy consumption should be minimized, transmission rate should be probably robust in nature and the node should be highly reliable during scalability. The previous research was carried in routing scheme which was explained clearly in the section 1.1. The proposed work is to discuss about finding optimal path between source and destination using particle swarm optimization algorithms.

4.2 PROPOSED METHODOLOGY

4.2.1 Node Identity

Node identity is one of the key term for providing the nodes identity as well as integrity. In our methodology we used PMAC (PseudoMAC) address for identifying the nodes. The below example states how the PseudoMAC is defined

48 bit MAC address + random number = hashed (PseudoMAC)

For example F8: F5: BE: 4F: H0:8G + 2523 = GE: 54: LG: H7: 8F: 8G

PMAC for Node 1.

4.2.2 Bounding Region for Traffic Analyzing

Voronoi Cell is used for partitioning the range/area of sensor nodes, here we used optimal K-Means clustering algorithm for clustering the sensor nodes in the corresponding Cell. By using K-means clustering, a partition of sensor node of n observation is made into k-Clusters at which the observation is made by the nearest mean of the node which serves as the actual threshold of the centralized server.

4.3 ALGORITHMS-VORONOI CELL AND K-MEANS CLUSTERING

Split the region
Assign the threshold for each region
    Predict the actual node traffic
Observe interval data
Initialize K # — with one mean per cluster
For each interval data
    Assign the threshold value
Predict the mean of the neighbour nodes
Assign the centroid to the group of neighbour node
Move the centroid to the center based on mean and threshold
Activate the cluster

4.4 ASYMPTOTIC RULE CLASSIFICATION FOR DEFINING SOURCE AND DESTINATION

Asymptotic rule definition is carried to define the destination range in the form of little 'o' notation. The state full rule definition is stated

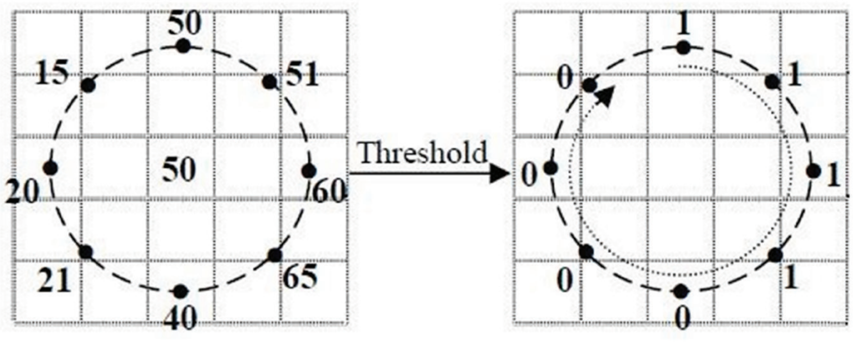

Figure 4.1. Threshold based traffic analyzing.

as Destination should be defined within the cell region; each region should be propagated within the cell range. If the range is beyond the cell range propagates using the inbound function according to the threshold stated in Figure 4.1. Functional threshold ~ V (1)…..V(n) for 1<=n, For the range beyond the cell region-Functional threshold ~ V(1) + V(2) V(n)

4.5 PATCH SERVERS

Point at which the active session of the mobile node is patched or saved to the centralized server is called as Snapshot point. Snapshot is defined here as, point or interval at which the node floods the SYN Req packet (say RTS packets) to know the neighbour nodes in WSN. The node at which the optimized route is evolved and the node activates the intermediary position (by applying PSO) to the velocity and weight inertia is at the level of CPosandBPos at 1. Then the point or interval is said to be the snapshot point. Each active snapshot point is store in the centralized server. The snapshot is taken for the reason of data recovery and data backup.

$$\text{Snapshot (time +Pos)} = \{(\text{Weight} * \text{velocity (time)}) + ((\text{CPos} =1) * \text{random (1)} * (\text{BPos} =1))\}$$

4.6 DATA ROUTING

The actual position of each node is estimated using PSO – ACO algorithm. The region is defined clearly using the Voronoi cell. The cell representation is used to monitor the traffic between the sensor nodes at the particular range. The data routing within the cell is carried out by means of Ant colony optimization algorithm, where the ants are used to find the optimal route within the Voronoi cell. The actual principles of Ants are used in this work to find the optimal route. In ACO – rank based ants are used to discover the shortest path. The algorithm is explained clearly in the Section 4.3 and 4.6.1.

4.6.1 Data routing using ANTS

FunctionBCO_KMeans_Metadata
Initialize(Voronoi)
Split the region
For all the region
Initialize(cluster)

```
While(!grouped)
        Group_meta (nodes)
End while
        Threshold (nodes)
        Centroid ( nodes)
while(!termination)
rank(priority)
createSolutions()
daemonActions()
pheromoneUpdate()
endwhile
end For
end Function
```

4.7 EXPERIMENTAL SETUP

Here the proposed methodology is experimentally setup with the simulation using OMNET++ for 11sensor nodes. Figure 4.2 States the actual routing mechanism within the cell. Initially SYN Req is flooded to discover the neighbour node. Once the neighbour is discovered the CTS message is tracked, iteratively using this principle all the neighbour nodes are discovered. Figure 4.2 defines the routing mechanism beyond the Voronoi cell. Patch servers are defined clearly in the scenario. The snapshot point is also defined clearly in the Figure 4.2.

Initially the test run was carried out for the actual routing model using Voronoi cell. The proposed model is only capable to route using rank based Ants, when it is tested with max – min ant system it yields less accuracy than the rank based. Rank based ant routing algorithm within the Voronoi yields better accuracy in terms data routing. The simulation was carried out using OMNETPP, software IDE for network simulation.

4.8 CONCLUSION

Hence we conclude, with the appropriate result of data routing, Voronoi cell region, node location etc. Figure4.2-c states the node location in Voronoi cell in terms of plotting x, y coordinates. The proposed routing method guarantees that the routing data packets within the Voronoi region are fast and reliable in delivering same number of messages. Snapshot option in centralized server leads to automatically data recovery during node failure. The working environment is clearly tested in multi hop networks with inbound region and outbound regions. Hence by

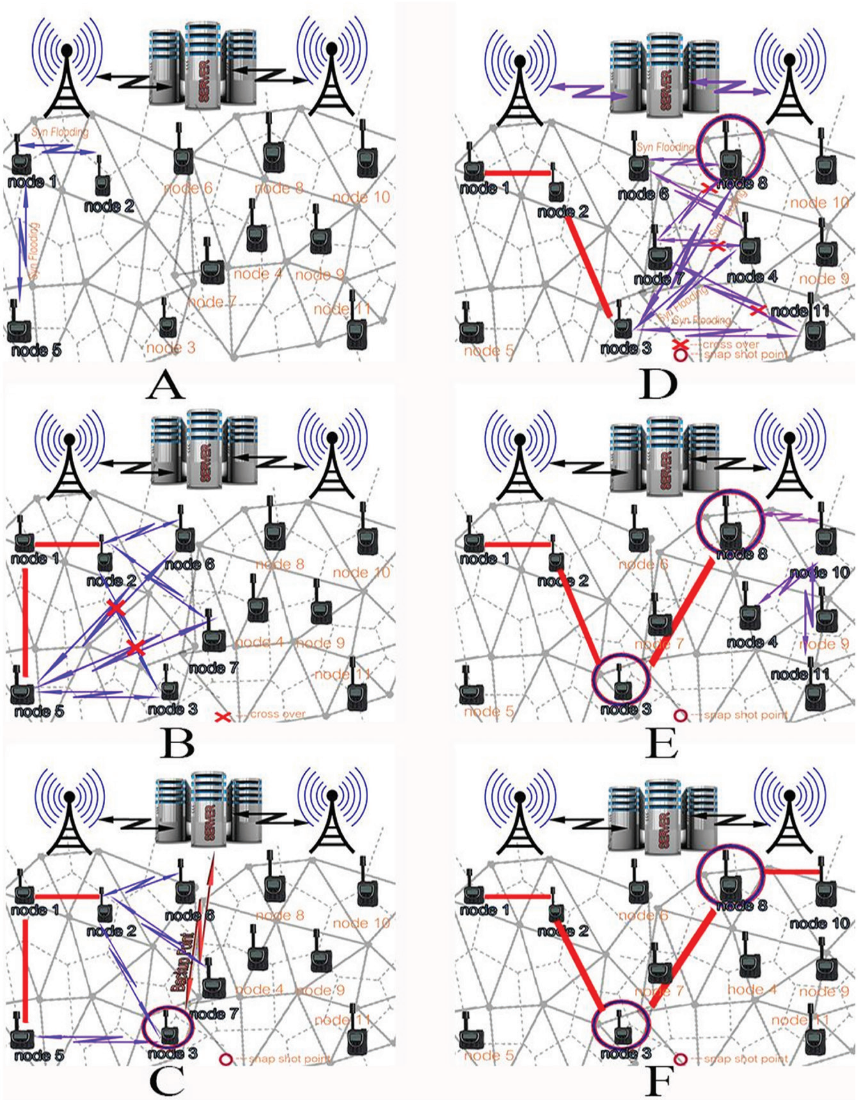

Figure 4.2. Simulation Model of the Proposed Routing protocol.

conclusion, the proposed model yields 78% in terms of data routing. The main challenge in this work is drawing Voronoi region is bit tougher task, when we are switching it to homogeneous nodes in WSN. Hence it is considered as one of the key challenge in this work and in future the addressed problem will be taken care and resolved.