The Research Monograph Series in Computing, Electrical & Communication Networks
Vol. 1 (01), May 2023, pp. 76–81

CHAPTER 6

CBR-CONTOUR BASED ROUTING IN MULTI HOP WIRELESS SENSOR NETWORK

6.1 INTRODUCTION

Wireless sensor networks is advanced cutting edge which was booming day by day. In recent years various researchers and research forums have gone a wide range of research in these areas. Basically sensors are light weight hardware devices used for various application such as military, medical, biological, GIS etc. Recent research which attracts future scope on wireless sensor networks is termed as MEMS combined with computational intelligence called SWARM. The sensor device generally has three main systems namely 1) an advent subsystem which sense the environment 2) Computational logic which converts the sensed raw into computational data and third one is message exchange protocol.

Each sensor has large number of sensing region with high compatibility, average power consumption, resources and high computation. Computational complexity has reached a wide range of resource utilization and high intensity of power consumption this may leads to failure of nodes. Energy utilization without degrading the network performance will increase the robustness of the sensor nodes. here, we proposed a robust methodology to exchange data packets with less energy consumption and with high processing of data exchange.

6.2 PREVIOUS ATTEMPT

WSN routing starts up with genetic approach which was discussed deeply in "Optimizing Localization Route Using Particle Swarm-A Genetic Approach". Several algorithms exists in literature, since some are of in vital role other may not. Since WSN focus on low power consumption during packet transmission and receiving, finally we adopt by merging swarm particle based algorithm with genetic approach. Initially we order the nodes based on their energy criterion, and then focusing towards node path; this can be done using Proactive route algorithm for finding

optimal path between S-D (Source – Destination) nodes. The work comprises with the clustering setup of each node and how reliably routing takes place within the clusters. The main challenge of the proposed model using K-means and PSO is discovering neighbour nodes and during node failure the clustering algorithm fails to predict the neighbour node. Fast processing and pre traversal can be done using selective flooding approach and results are in genetic. We have improved our results with high accuracy and optimality in rendering routes. GSO algorithm consists in a strong cooperation of GA and PSO, since it maintains the integration of the two techniques for the entire run. In each iteration, the population is divided into two parts and they are evolved with the two techniques in that order. Next start up with the hybrid model in combining k-means and PSO.

In multi hop networks, the routing is very critical and node behaviour is not at stable range. Hence we proposed a new routing scheme called straight line routing with ACO (Ant colony optimization algorithm) to find the straight line of the nodes. The main problem defined here was node discovery in which the following scheme is used to utilize it, RTS/CTS are two reliable request response messages broadcasted to find the neighbour nodes. Initially the root node sends the ARP RTS message to all the nodes. Once the node within the range receives the request, then the node replies with the node identity (PMAC address. The node starts to send the ACK reply/response with CTS message. Once the CTS message is received at the root node, based on common evaluation the neighbour nodes are identified.

6.3 PROPOSED METHODOLOGY

In multi hop networks in WSN, the major problem is finding the node adjacency in order to group all the node members, in the previous work finding the node head and discovering the neighbouring nodes in heterogeneous network is also one of the challenging deals. In this proposed routing scheme the routing is fully based on contours of the nodes which are always assisted by the base station. Such the transmission area and sector of transmission range are clearly defined in the Figure 6.2.

The contour range is defined with the radius of the nodes. The radius clearly denotes the node range and its transmission sector. Since the transmission of each sensor can directly receive the response message from the base station. To determine the neighbouring node and availability of the node within the tower range the base station scans the entire frequency based on angle value of sensors. This type of scanning is fully based on various energy levels of the nodes. The nodes location

is found by means of the last RTS transmission message and its positive reply sequence (Sector level – denoted in Figure 6.2b).

6.4 CONTOUR BASED DATA EXCHANGE

In this section the basic protocol scheme for routing and data exchange has been discussed. Whenever the RTS message is broadcasted from the base station, the particular event is recorded and CTS message is acknowledged to send the packets from the sensors to base station. The event detection is fully accomplished by means of setting the timer interval to receive the broadcasting RTS packets. When two or more sensors receive the same broadcasting request, the sensor with highest energy level takes the first bonding request to the base station. The basic sensor identities are:

Sensor ID – defines the sensor identity
SourceID – source station identity
Basestation_addr_id – base station unique identity MAC address
Timer – Timer to monitor the event occurrence
Signature_id – channel identifier (base station)

6.5 MULTIPLE BASE

A senor node which receives two or more RTS message from multiple base stations, the identity of sensors will select the unique identifier of the base station (MAC address). The sensor node's frame header is checked for the base_station_mac to define its legal identity to exchange data between nodes to the base station.

6.6 SIMULATION RESULT AND PERFORMANCE ANALYSIS

The proposed scheme was simulated in the MATLAB environment with 150m nodes and 500 nodes. The performances of the two active networks are compared. The node with higher range performs with the desired output results with less number of deviations in the packet loss. We have tested the previous protocol scheme of with the proposed protocol model, the model have high compatibility. The contour based routing schemes have higher identity for the sensor nodes in terms of power consumption, reliability, robustness etc. the comparison stats of the proposed protocol with the previous protocol is shown in the Figure 6.1.

The experimental results are clearly denoted in the Figure 6.2. The Figure 6.1 defines the clear cut edge level scheme for the proposed model.

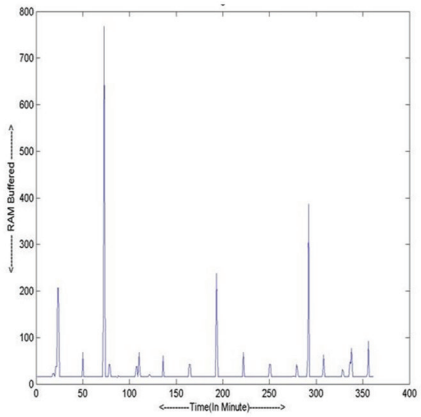

Figure 6.1a. Rate of data transmission.

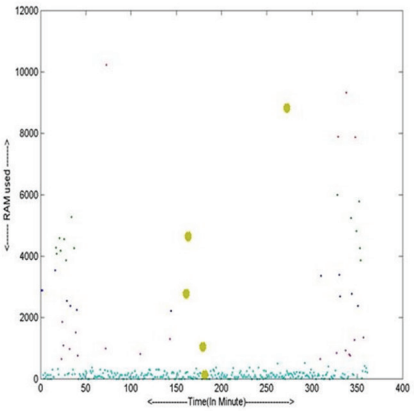

Figure 6.1b. Contour level and node identity.

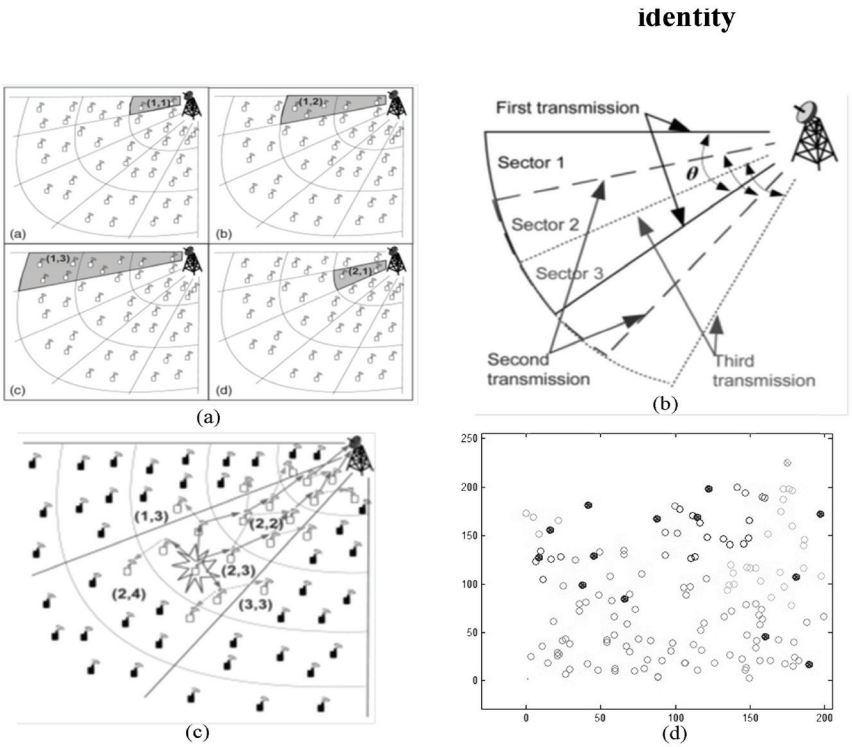

Figure 6.2. Implementation of Contour Routing Scheme (a) Actual nodes connected to base station (b) Value of data transmission with angle (c) Routing scheme (d) Simulation results in MATLAB R2013b.

Hence by the final claim we achieved that the CBR has high compatibility and reliability over data transmission and finding optimal path based on contour.

6.7 A COMPARISON

The routing performance was stated in Figure 6.3, which states the proposed protocol outperforms the existing protocol with better performance and better reliability.

The Figure 6.4 defines the error rate, at which the packet is not stable to reach the destination, i.e., it denotes the non-transmission rate of data packets from source to base station. The X-axis denotes the time interval at gradual of data transmission. Y-axis denotes the route information of the data packets routed from the source to destination. The range of saturation is achieved at the point of 2.4(approximate) for the scale of 10 which denotes the range of non-transmission.

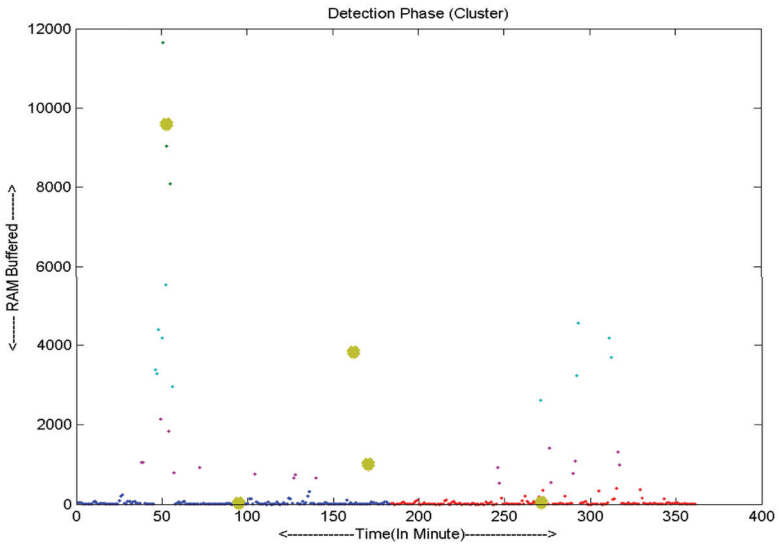

Figure 6.3. Simulation model of the Contour based routing.

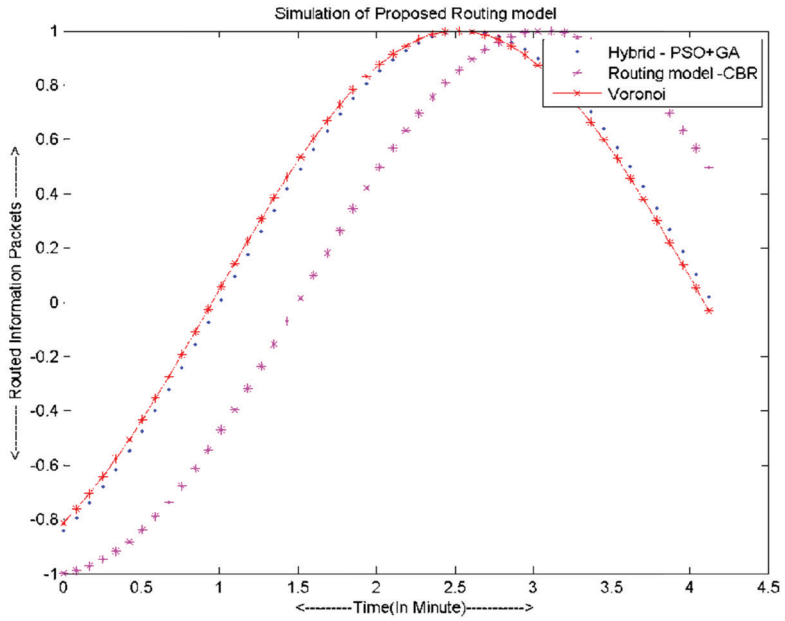

Figure 6.4. Comparisons of the Proposed Routing Schemes.

6.8 CONCLUSION

Hence we conclude with a robust routing protocol for wireless sensor networks. The proposed protocol is robust in nature and highly compatible to adopt the entire existing protocol scheme. The main motto of the work is to transfer the data reliable in context to robust delivery of data transmission without degrading network performance. The experimental results are clearly denoted in the Figure 6.2. The Figure 6.1 defines the clear cut edge level scheme for the proposed model. Hence by the final claim we achieved that the CBR has high compatibility and reliability over data transmission and finding optimal path based on contour. The routing performance was also compared in Figure 6.3 which states the proposed protocol outperforms the existing protocol with better performance and better reliability.