Abstract: - Distributed heterogeneous networks are given major attention for mobile system nowadays. These systems co-relate all the major applications affecting the daily life. This paper explores the past research effort in the direction of energy efficient schemes for mobile networks. Moreover, we designed and developed a model based on the region based approach for distributed mobile networks. Additionally, we assessed our model on performance based parameters. Next, the results obtained from the investigations can be helpful for the distributed mobile networks designers. Finally, simulation explorations have been carried to validate our proposed scheme.

Key-Words: - Region, energy, mobile, distributed, networks.

1 Introduction
Heterogeneous mobile networks become the major field of research among researchers due to its wider sphere affecting our daily life. The availability of heterogeneity present in the network severely affects the performance of any distributed mobile systems. Energy efficient is the major factor can enhance the lifetime of mobile applications. This depends on the way to handle the data present in the networks. Distributed energy efficient schemes are always preferred in mobile networks. The region over which these schemes are deployed also effect the functioning of mobile systems. In this paper, we focused on the one of the distributed energy efficient scheme namely: Region Based Adaptive Energy Efficient Scheme (RBAEES). We comprehensively evaluated this scheme and present our investigations that surely help the distributed mobile system designer.

The layout of this paper is described in the following sections. Section 2 reported the related work in distributed mobile networks. Section 3 presented our proposed adaptive energy efficient model Section 4 highlights the detailed setup. Section 5 describes the results and discussion of the designated model. Finally, conclusions are made in Section 6.

3. Region Based Adaptive Energy Efficient Scheme (RBAEES) Model RBAEES

We proposed and implemented an adaptive energy efficient transmission scheme using mobile sink for wireless sensor networks. We have taken 100 nodes deployed over 100 m × 100 m area for our proposed scheme. We calculated the aggregate transmission energy (ETA) at the sender and transmitter side. Next, signal to noise ratio (SNR) is calculated for our proposed framework. We have randomly selected the temperature in range from [-10(C)-53(C)]. Then, we estimated RSSI-loss (dBm) for given temperature. To estimate required transmitter power level for given RSSI, we divided the proposed network into three regions on basis of RSSI-loss. We calculated the minimum value, maximum value and average value in array. Then, we computed the number of nodes in A region (RSSIH), the number of nodes in B region (RSSIM) and the number of nodes in C region (RSSIL). We estimated RSSI and power level (Plevel) for each node in region A, power level (Plevel) for each node in region B and power level (Plevel) for each node in region C. The mean value of RSSI (Threshold) for each region is calculated. Next, we estimated corresponding power level and defined the rounds. To estimate required transmitter power for given RSSI, we generated scenario for region A, for region B and for region C. Also, we computed power saving for A region, power saving for B region and power saving for C region.

4 Detailed Setup

We use the MATLAB version 2010a over the WINDOWS platform for the designing and implementation of our proposed model. The simulation scenario of the deployed network is shown in figure 4.1. We used the following parameters in our proposed model. The diameter of sensor network 100 m, distance of base station from the network 100 m, number of nodes 100, probability of a node to become cluster head 10%. The .energy supplied to each node 0.5 J, transmitter energy per node 0.00000005 J, receiver energy per node 0.00000005 J, amplification energy when d is less than d0 0.000000000001 J, amplification energy when d is greater than d0 0.0000000000000013 J, data aggregation energy 0.000000005. Table 1 shows the parameters summarization for our proposed scheme.
Table 1: RBAEES parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes</td>
<td>100</td>
</tr>
<tr>
<td>Area (m x m)</td>
<td>100 m x 100 m</td>
</tr>
<tr>
<td>Aggregate Transmission energy (ETA)</td>
<td>0.003 J</td>
</tr>
<tr>
<td>Signal to noise ratio (SNR)</td>
<td>0.0203</td>
</tr>
<tr>
<td>Temperature</td>
<td>-10(C)~53(C)</td>
</tr>
<tr>
<td>Network Regions</td>
<td>3</td>
</tr>
<tr>
<td>Network Deployment</td>
<td>Random</td>
</tr>
</tbody>
</table>

The simulation scenario is shown in figure 1. In the snapshot, circle shows the number of nodes deployed in the random manner.

![Simulation Snapshot](image)

**5 Results and Discussion**

We design and implemented adaptive energy efficient scheme for wireless sensor networks. We focused on transmission power and time factors for our evaluations under different conditions. the mobile sink is evaluated with respect to different X,Y coordinate values. We set the five coordinate values for the mobile sink namely: (i) (50,50) (ii) (50,50) – (0,0) (iii) (0,0) – (0,100) (iv) (0,100) – (100,100) (v) (100,100) – (100,0). We divided the simulation scenario into three regions A,B and C. In region A, RSSI value is high. In region B, RSSI value is low. In region C, RSSI value is the average of the high and low values. The value of transmitter power shows non linear behaviour on all the X,Y coordinate values as shown in figure 2. The transmission power save value remains maximum at (50,50) coordinate values then rest of the cases. This is due to the fact that under first coordinate values, it has to consider only one coordinate values. Other coordinate system uses two values resulting in higher power consumption.

![Figure 2: Transmitter power level versus time analysis for region A](image)

Next, we observed the power level saving for the region B. Overall, the scenario shows higher power consumption. We noticed that the power saving remains higher on first coordinate value as compared to other coordinate values. It is observed from the figure 3 that the power consumption depicts non linear behaviour in all the cases. As the power saving remains higher in region B at 10 sec for first coordinate values and lowest at the second coordinate positions.

![Figure 3: Transmitter power level versus time analysis for region B](image)

Next, we observed in region C, the behaviour of five coordinate points as shown in figure 4. It is noticed from the figure 4 that the fifth point coordinates shows better behaviour that rest of the coordinate points. We also noticed that non linearity exists more in the region C. Specifically, second point coordinates shows linear behaviour as compared to the other point coordinates. There exist relation between power saving and the time. Power saving
reduces with respect to the time and also depending on the sink position in the proposed model.

Figure 4: Transmitter power level versus time analysis for region C

Further, we observed transmitter power at (50,50) coordinate individually as shown in figure 5. It is observed from the figure 5.15 that the power value remains -84.8 dBm, -83 dBm, -85.1 dBm, -87 dBm, -83.6 dBm, -85.1 dBm, -84.1 dBm, -84 dBm, -85.1 dBm, -85 dBm respectively. These values are corresponding to the time spam from 1 sec to 10 sec. The value of transmitter power remains maximum at 2 sec and minimum at 4 sec in the proposed framework.

Figure 5: Transmitter power versus round analysis first level

Next, we observed transmitter power at (0, 0) coordinate individually as shown in figure 6. It is observed from the figure 5.16 that the power value remains -70.6 dBm, -70.8 dBm, -69.9 dBm, -71.4 dBm, -70.5 dBm, -69 dBm, -70.3 dBm, -70.5 dBm, -69.8 dBm, -69.5 dBm respectively. These values are corresponding to the time spam from 1 sec to 10 sec. The value of transmitter power remains maximum at 8 sec and minimum at 1 sec in the proposed framework.

Figure 6: Transmitter power versus round analysis second level

Next, we observed transmitter power at (0,100) coordinate individually as shown in figure 7. It is observed from the figure 5.17 that the power value remains -73 dBm, -69.9 dBm, -70.5 dBm, -70.4 dBm, -72 dBm, -70.8 dBm, -70 dBm, -69.8 dBm, -69.9 dBm, -70.6 dBm respectively. These values are corresponding to the time spam from 1 sec to 10 sec. The value of transmitter power remains maximum at 8 sec and minimum at 1 sec in the proposed framework.

Figure 7: Transmitter power versus round analysis third level

Next, we observed transmitter power at (100,100) coordinate individually as shown in figure 8. It is observed from the figure 5.18 that the power value remains -70.4 dBm, -69.6 dBm, -72.1 dBm, -70.6 dBm, -71.3 dBm, -71.5 dBm, -71 dBm, -71.3 dBm,
-72.5 dBm, -70.7 dBm respectively. These values are corresponding to the time spam from 1 sec to 10 sec. The value of transmitter power remains maximum at 2 sec and minimum at 9 sec in the proposed framework.

6. Conclusions

This paper made inclusive explorations of round based adaptive energy efficient scheme for distributed heterogeneous mobile networks. We design and implemented adaptive energy efficient scheme for wireless sensor networks. We focused on transmission power and time factors for our evaluations under different conditions. The mobile sink is evaluated with respect to different X, Y coordinate values. We focused on region fragmentation aspect our investigations. We observed that the transmitter power and its level severely affected by the time and round factors. In the future, we will work for the enhancement of our proposed scheme for mobile networks.

References:


