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RESEARCH ARTICLE

A Fault Tolerant Target Coverage Model under Location Deficiencies

Yashika Dahiya
Student, M.Tech, CSE, Amity University, Haryana
yashikadahiya91@gmail.com

Mr. Krishan Kumar
Assistant Professor, Dept.of Computer Science, Amity University, Haryana
kkumar@ggn.amity.edu

Mrs. Geet Sandhu
Assistant Professor, Dept.of Computer Science, Amity University, Haryana
geetsandhu13@gmail.com

ABSTRACT: A sensor network applied in real time scenario is described under some specialized nodes. These specialized nodes are directly connected to the real environment. To keep the network tracking, it is required to provide regular backup to these critical nodes. A set of one or more sensor nodes form the coverset and provide the continuous tracking to these nodes. In this work, a fault driven analysis model is presented for critical node tracking. The work also includes to provide the solution to location switch problem in dynamic sensor network. The results show that the work has reduced the failure probability and improved the network life.
Keywords – Target, Coverset, Critical, WSN, Optimization

1. INTRODUCTION

Target Coverage problem is the specialized activity of sensor network defined to cover the associated network phenomenon. This network form is able to provide the network monitoring under the sensor node tracking. The target coverage problem is required to optimize the network QoS under sensing function and to improve the system performance under quality vectors. The work also requires number of interpretations so that the node tracking and reliable communication will be performed. Coverage aspects are also defined under different aspects so that the effective network deployment and network reconfiguration will be done. This kind of coverage performance analysis is also required to provide the solution under two main criteria

- The coverage performance can be improved if the network deployment is known. The region adaptive coverage is required to optimize the restriction of limited sensing range. If the location is not exactly known, some predictive approach is required optimize the network communication and target optimization.
- Different performance constraints are required to analyze so that the reliability and performance of network under activity specification will be improved.

a) Coverage Problems

Coverage problems include the design time network problems defined under area specification so that the system performance under activity monitoring and failure node tracking will be improved. This model is having the significance to provide the dependent solution for target coverage and barrier coverage. The target coverage is considered as the sensing area monitoring under fixed deployment. For dynamic network, it is also required to process the associated activity and scheduling mechanism. This system requires defining the sequence for coverset activation so that the performance of system will be improved. Area coverage also the significant processing mechanism defined to cover the network area and reduce the chances of node placement in non-cover position. The complete area utilization is defined by area coverage. The barrier coverage is defined respective to some obstacle so that the node level tracking under barrier situations will be obtained.

b) Target Coverage

Target coverage is the critical problem domain considered in this work to provide the solution over random deployment of nodes with network restrictions. The problem also covers the constraints level limitations including the energy, computational speed, bandwidth and the memory. The energy adaptive analysis is performed to provide the confirming coverage tasks so that the effective network deployment under certain criteria will be done. The basic process of target coverage is shown in figure 1.

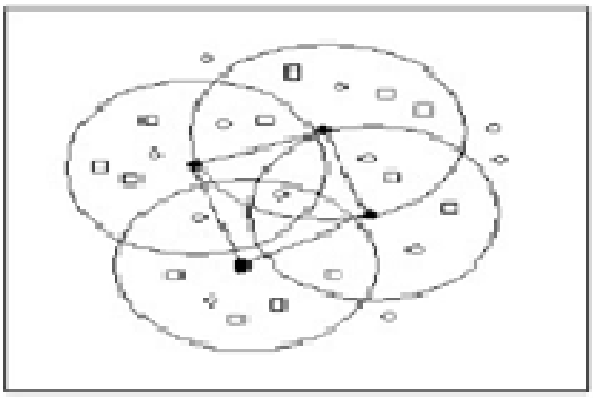

Figure 1 : Target Coverage

The target coverage is the application specific phenomenon applied in many surveillance systems or the critical area monitoring. The process model is having the significance to provide the tracking on geographically separated areas or locations under network limits. The cluster specific analysis along with radio range specification is applied to provide the continuous monitoring of nodes under radio range specification. The cluster adaptive range specification is done to provide the safe communication in the network. This network model is defined under various targets so that the geographically separate nodes will be tracked and deployed in random network. The sink adaptive communication is provided by the network.

c) Issues with Target Coverage

As the sensor network itself is specialized real time network with restricted constraints and capabilities. The target coverage issues also include this phenomenon so that the active network issues relative to target coverage are experimented. The node level observation is provided under path generation so that the effective node tracking will be done. Along with node monitoring, it has to provide the solution in terms of

- Network Life Improvement
- Minimum Participation Analysis
- Reducing the Failure Rate
- Scheduling the coverset
- Reducing the Energy consumption of network.

In this paper, an adaptive fault tolerant model is presented to provide target coverage under certain restrictions. The work has provided the solution to handle the location deficiencies associated to the target coverage. In this section, an exploration to the different aspects of network coverage are presented including target coverage, barrier coverage and area coverage. The section also identify the problems and issues associated with target coverage. In section II, the work defined by earlier researchers is explained. In section III, the proposed work model is presented. In section IV, the results obtained from the work are shown. In section V, the conclusions of this work are presented.

2. RELATED WORK

In this section some of the work relative to target coverage is presented and discussed. GholamAli Yaghoubi[1] has defined the work to provide the target coverage solution using genetic based adaptive approach. Author defined the DFS based model for tracking the target nodes while analyzing the node connectivity. This network model is defined to reduce the network energy consumption and improve network life. Nauman Aslam[2] has presented the work on sensor network optimization under connectivity aspect so that the node

deployment will be improved and overall network performance is improved under distributed coverage algorithm. Yinian Mao[3] has provided the secure communication solution under sensing coverage and optimization under area limits and deployment. This model also includes the haxogan based coverage under location upation analysis so that the centroid adaptive coverage will be provided. Author defined the secure connectivity so that the node tracking and coverage will be optimized. Author defined the solution under area coverage and target coverage. Chi-Fu Huang[4] has provided the solution to target coverage problem under decision problem. Author provided the tracking of service area with specification of k sensor nodes with pre-defined range validation. Ashwinkumar Badanidiyuru[5] has defined the dimensional reduction approach to optimize the coverage problem under various complexities. Author defined the approximation ratio based greedy algorithm to provide the solution to target coverage. Author provided the half space analysis in four dimension to provide the local search so that the maximized target coverage will be achieved. Vikram P. Munishwar[6] has provided the solution against mobile targets in visual sensor networks. Author provided the mobile target based model to provide the solution under scalability vector. Author provided the node level tracking so that the global utilization under multiple vectors will be done.

Vijay Chandrasekhar[7] provided the solution for node localization in underwater sensor network. Author provided the requirement analysis in emerging sensor application so that the distributed communication environment will be provided. Author provided the solution to provide multi hop localization environment under positional node tracking and node estimation under region adaptive node tracking. Muzammil Hussain[8] has provided the clustered mechanism for effective target node monitoring in distributed environment. Melike Erol[9] has provided the solution under acostic sensor network. Author provided the beacon handling in localization method to improve the success rate of node tracking and reducing the error rate while working with static and mobile networks. M Bala Krishna[10] has provided the localization solution for positional analysis under different associated vectors with generic and soft computing approach so that the node tracking will be optimized. Author provided the performance solution under critical network vectors with positional aspect estimation. Diba Mirza[11] has provided the collaborative node tracking in real time environment under vehicle formation. Author defined energy effective model to reduce the localization tradeoff. Sangbo Seo[12] has provided the solution for data transmission in critical sensor network under cell based analysis. Author defined the hybrid transmission mechanism under load balancing behavior. Author provided the node tracking to improve the system performance under energy vectors.

3. RESEARCH METHODOLOGY

In this present work, a fault tolerant model is presented to provide the optimize solution against target coverage. This proposed model includes the handling of uncertain localization situation so that the node tacking will be optimized under positional vector. The work model is here divided in three main phases shown in figure 2. The work is based on the parametric specification for node tracking and then formation of coverset based on the tracked nodes. Once the nodes are tracked, the next work is to perform the parameter based evaluation on nodes so that the formation of coversets will be done. The coverset formation is here based on the main vectors called energy, distance and fault adaptive analysis. In the final stage of this model, the node sequence processing is done.

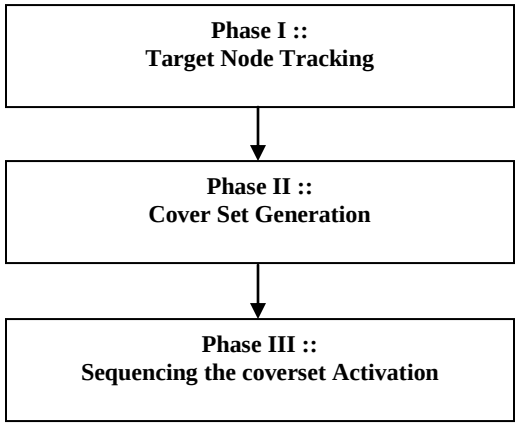

Figure 2 : Proposed Model

a) Phase I

The foremost problem covered in this work is the location deficiency. The first level analysis is here done to define the process to divide the network in smaller segments so that the location tracking will be done. The peak point analysis in each segment is done to identify the estimated node position. This positional estimation is done for both the target node and the sensor nodes. Once the node tracking is done, the sensing range estimation is done to form the coverset. The location predictive estimation is the foremost method for node tracking adapted in this work. The tacking adaptive method applied in this work is shown in figure 3.

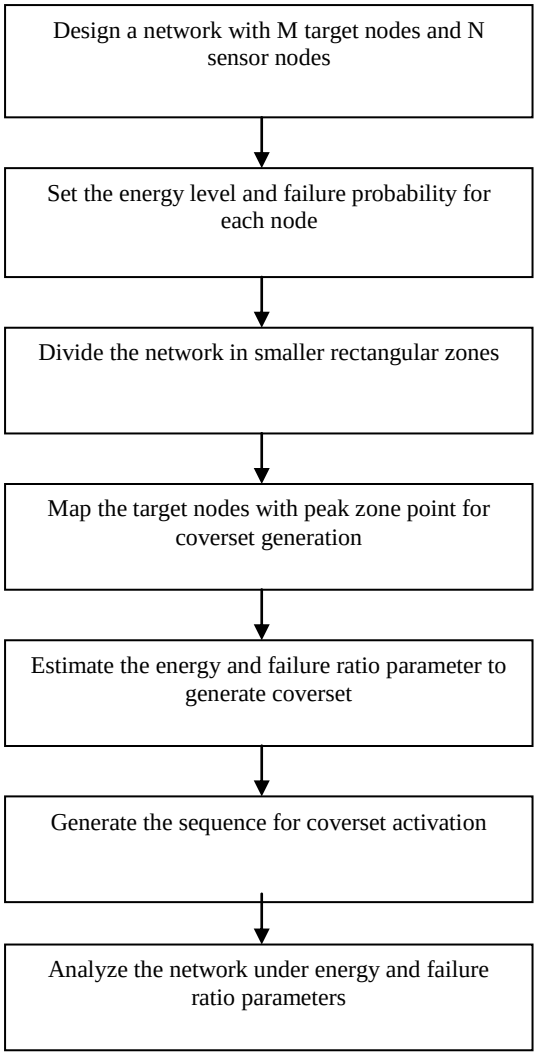

Figure 3 : Algorithmic Procedure

b) Phase II

After resolving the location deficiency problem, the next work is to provide the node tracking using under multiple vectors. The vectors considered in this work are energy, distance and failure probability. The coversets are formed under these parameters.

c) Phase III

In final stage of this model, the generated coversets are activated so that the continuous target tracking will be done. As a coverset is activated, the failure probability estimation is done.

The proposed model has provided the effective solution for coverset activation so that the network life will be improved and the failure ratio will be decreased.

4. RESULTS

In this paper, a fault tolerant adaptive model is defined to provide target monitoring. The presented model is simulated in matlab environment with random network. The dynamic network is considered in this work in which the nodes movement is done randomly. The nodes are defined under sensing restriction, energy vector specification and failure rate specification. The network is having M number of target nodes and N number of sensor nodes. The analysis of work is here done under network life and failure probability parameters. The results obtained from work are described in this section.

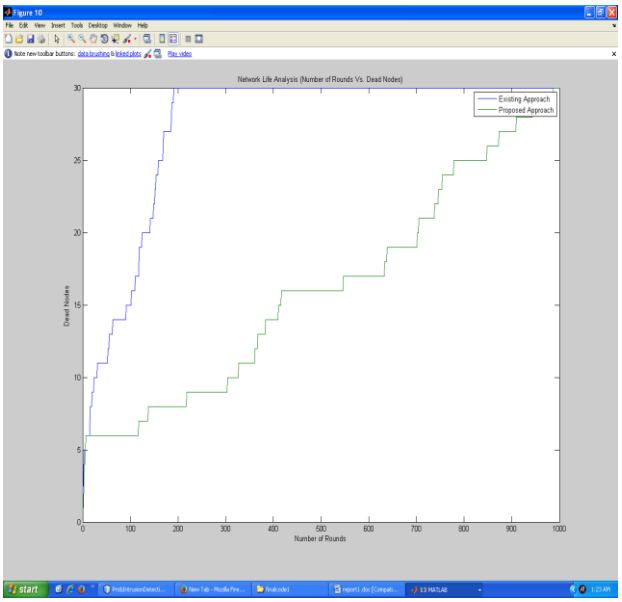

Figure 4 : Dead Node Analysis

Here figure 4 is showing the estimation of network life under dead node analysis. The figure shows that the network in this proposed work is improved. Here x axis showing the rounds and y axis is showing the dead nodes. The figure shows that the network has reside for maximum time in this proposed work.

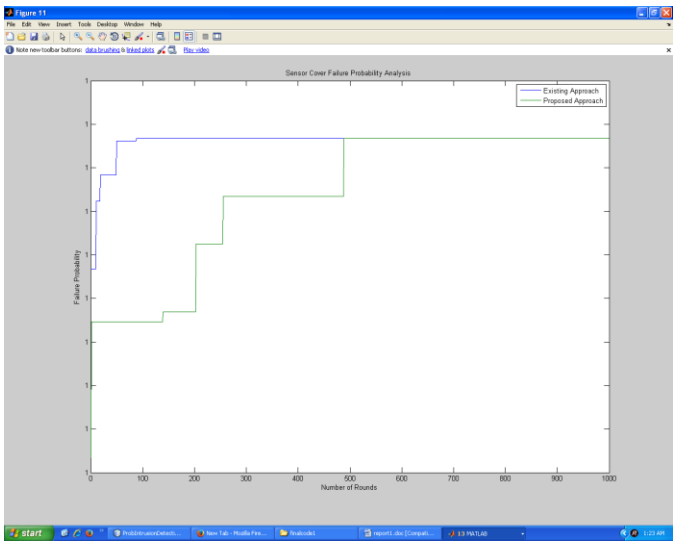

Figure 5 : Failure Rate Estimation

Here figure 5 is showing the comparative analysis of existing and proposed work under failure rate. The figure shows that the failure rate in case of proposed work is decreased. The figure shows that the work has improved the reliability of target coverage.

5. CONCLUSION

In this paper, a fault tolerant model is presented under location deficiencies. The proposed model is here defined under three phase model. In this model, the location tracking, fault based coverset formation and coverset activation mechanism is defined. The simulation results show that the work has improved the network life and network reliability.

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