ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

SELF-DEPLYMENT IN WIRELESS SENSOR NWTWORKS

Lokanath
M.Tech, Dept. of ISE
BMS COLLEGE OF ENG,
BASAVANGUDI, BANGALORE, INDIA

ABSTRACT

Advancement in wireless technology has led to dramatic changes in sensor technology. There are mainly three major problems which are to be tackled “Coverage, Connectivity and Data Transmission”. Researchers have proposed many routing algorithms for data transmission but still sensor technology is facing deployment problem and is a very tedious task which consumes a lot of energy, all sensor devices are powered by batteries and also replacement of dead battery is not a best idea. In this paper we are going to deal with self-deployment. The deployment is automated and it eliminates the human intervention in target region by using an intelligent program. We are using two types of nodes “Core nodes” and “Outlier nodes”. The core nodes have that intelligent program for self-deployment and also it also does sensing, the outlier nodes have only sensing and some routing capability to make sensor network more fault tolerant. The core nodes will have some additional facilities like more battery lifetime and additional processing capability. This is a theoretical proposed model with practical sense.

KEYWORDS: **Core nodes, Outlier nodes, Coverage, Connectivity, Self-deployment.**

INTRODUCTION

In this modern era the availability of computing resources has made a lot of changes in sensor technology. [1] A sensor device is a tiny electronic computing device with limited resources. The modern day’s sensors have a memory, a tiny processor, a transmitter-receiver and mobility in them. Today’s sensors scale from military applications to home appliances. All above mentioned will run only on a single powered battery. These batteries have limited power and replacing a dead battery is a tedious task and generally not preferred. The deployment of sensor nodes consumes a lot of power and a time consuming task. Many researchers have proposed several algorithms for static deployment and this method requires pre-placing of devices in determined field but it requires human intervention, to avoid this problem researchers are concentrating on auto-deployment and this is an upcoming research topic in sensor technology. The major back bone of sensor network is ad hoc network. There are a lot of research people who are trying to improve the ad hoc network performance and security. These methods are also suffering of holes and are formed due to the lack of coverage [7].

Todays all sensors have an embedded microcontroller in them. These microcontroller have very much flexibility, all these support at least one programming language. Most of them will be released as general purpose microcontrollers and these run on single battery. There are a lot of algorithms for full coverage and full connectivity. All algorithms assume that deployment is static and purely done manually. The sensors which are using have very small “Random Access Memory” and very low internal storage, because of this it is very hard to do all computations in a sensor node. The computations itself consumes a lot of energy.

Voronoi diagram is famous but still it does not satisfy the requirements of self-deployment, is a polygon based method which does not guarantee the full coverage. For automating the deployment we need to consider a lot of parameters and situations for example when we deploy some sensor nodes to track the enemies in military, soldiers cannot go to the field and spread them. The tracking is dynamic, so each time it requires the relocation of sensor nodes [2]. It will notbe a feasible. In our papers we are trying propose a model for self- deployment and it is purely a theoretical model.

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

In our papers we use two types of nodes "Core nodes and Outlier nodes". These two have their own responsibility in deployment. Core nodes initialize the actual spreading and Outlier nodes continues to carry on the same procedure. We consider coordinates system for our proposed model. This will address the self-deployment problem.

In our paper we are detailing about solution to the deployment problem using geometrical method. The rest of the paper talks about deployment mechanism. The section 1 gives the introduction, section 2 gives the related work section 3 shows simulation and its results and section 4 concludes the algorithm and section 5 covers references.

REVIEW AND RELATED WORK

We have reviewed many algorithms of deployment for example Voronoi diagrams, Delaunay triangulation, Square grid, Hexagonal method and Triangular lattice methods. According to the many research papers and its simulation results, we can easily conclude that triangular lattice method gives the better coverage and performance but formation of triangle itself is a difficult task. [6] To meet the requirements of 2-coverage and 3-connectivity in our deployment mechanism, we are proposing geometrical algorithm. The ground will have many obstacles present in their path. They have to overcome these obstacles. Many obstacles may be of varying size and structure. The following parameters are very important to be accounted.

Auto-Configuration

The best part of deployment is self-configuring the entire network. Network must be high resilient to the frequent changes in the network and also must handle frequent break downs occur in networks.

Full Coverage and Full Connectivity

The network should achieve full coverage i.e. any point in target field should be covered at least by one sensor node. Maximum connectivity should be achieved i.e. any sensor node in the field.

Efficient and Power Aware Deployment

The deployment should be energy aware and must utilize the minimum resources. It must also consider the battery life for achieving good power utilization.

Isolated Errors and Auto Recovery

The self-deployment will have many errors for example link break downs, connectivity and mobility problems. The network must be able to isolate the error and also must be able to recover itself.

Fault Tolerant, Reliable and Secured

The network must be fault tolerant and reliable, so we can rely on its data. To overcome faults the network must have its own back up plans.

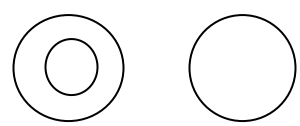
In our algorithm we use two types of nodes. They are as follows,

1. Core nodes.

2. Outlier node.

The core nodes are intelligent sensor nodes and these will have an intelligent program running in them. These will have some additional processing capabilities to command outlier nodes and also they take deployment initialization responsibility. The outlier nodes are like soldier who follows the commander orders they will have limited resources and limited routing capabilities. We have explained formation of crew using propagation algorithm. The alignment of sensor nodes using core nodes and outlier nodes has been depicted in below figure.

Figure:



Core Node Outlier Node

Core nodes are very powerful nodes they will have a program that make its own decisions, calculate the [X, Y] coordinates for relocating entire network. This node has the capability to replace itself with a new healthy node and also faulty Outlier nodes.

INITIALIZATION METHOD

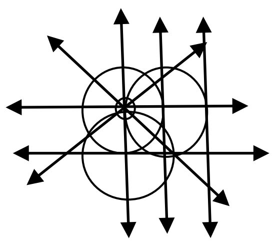
The entire method uses the [X, Y] coordinates system. Initially we assume that we have a flat ground with some obstacles and our sensor device has locomotive parts for mobility. Let us start throwing sensors randomly in to the field. Initially all are disorganized and spread out across the field, we give our control to one of our core node by giving its [X, Y] points. This core node starts drawing a map of co-ordinate system and moves to the given points [X1, Y1]. After occupying its place it starts

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

commanding the nodes which is neighbored to it and places at points[X2, Y2] at angle of 45 degrees.

In initialization many aspects to be covered for example what happens when core node itself has got stuck due to inline obstacle or failure of locomotive parts or it may be the connectivityproblem. If Corenode itself is lost while spreading out, then what has to be done?

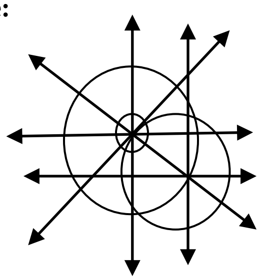
Figure:



AUTO PROPOGATION METHOD

In this auto propagation method when the core nodes take off from initiation the outlier nodes starts taking responsibility for further propagation and the core nodes becomes data collector. If core node goes down, then it will hand over its responsibility to neighbored core node. While auto propagation we have to cover many situations for example while propagating if it finds any obstacles in its path, then what response it should pass back to the Core node? If all nodes exhausted it has to send that information back to the Core node.

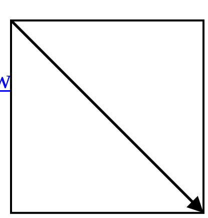
Figure:



The calculation of next points is done as follows, which uses very simple methods to calculate the (X2, Y2) points in the coordinates system. The d is the distance between any two sensor nodes.

Figure:

(X1, Y1)



d

d (X2=X1+d, Y2=Y+d)

CONCLUSION

The wireless sensor networks are battery powered so our major intention should be to minimize power consumption meanwhile giving high reliable deployment that is very fault tolerant and efficient adaptability. Recently many researchers have proposed many algorithms but all have some drawbacks. Our algorithm works parallel so every node in our algorithm simultaneously takes its own deployment decisions independently and this consumes very small amount of time for propagation into the field and becomes oriented in one direction to send data to core nodes. Our algorithms needs redundant core nodes and outlier nodes for backing up the network and deployment decisions are always taken by core nodes and all core nodes send data to the base station. QoS parameters are very important to achieve good performance.

ACKNOWLEDGEMENTS

Thanks to our professors for guiding through our research work and also thanks to our college for providing resources.

REFERENCES

[1] Xue Li, , Vasu D. Chakravarthy, , Bin Wang, and Zhiqiang Wu, "Spreading Code Design of Adaptive Non-Contiguous SOFDM for Dynamic Spectrum Access" in IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING, VOL. 5, NO. 1, FEBRUARY 2011

[2] J. D. Poston and W. D. Horne, "Discontiguous OFDM considerations for dynamic spectrum access in idel TV channels," in Proc. IEEE DySPAN, 2005.

[3] R. Rajbanshi, Q. Chen, A.Wyglinski, G. Minden, and J. Evans, "Quantitative comparison of agile modulation technique for cognitive radio tranceivers," in Proc. IEEE CCNC, Jan. 2007, pp. 1144–1148.

[4] V. Chakravarthy, X. Li, Z. Wu, M. Temple, and F. Garber, "Novel overlay/underlay cognitive radio waveforms using SD-SMSE

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

framework to enhance spectrum efficiency—Part I," IEEE Trans. Commun., vol. 57, no. 12, pp. 3794–3804, Dec. 2009.

[5] V. Chakravarthy, Z. Wu, A. Shaw, M. Temple, R. Kannan, and F. Garber, "A general overlay/underlay analytic expression for cognitive radio waveforms," in Proc. Int. Waveform Diversity Design Conf., 2007.

[6] V. Chakravarthy, Z. Wu, M. Temple, F. Garber, and X. Li, "Cognitive radio centric overlay-underlay waveform," in Proc. 3rd IEEE Symp. New Frontiers Dynamic Spectrum Access Netw., 2008, pp. 1–10.

[7] X. Li, R. Zhou, V. Chakravarthy, and Z. Wu, "Intercarrier interference immune single carrier OFDM via magnitude shift keying modulation," in Proc. IEEE Global Telecomm. Conf. GLOBECOM , Dec. 2009, pp. 1–6.

[8] Parsaee, G.; Yarali, A., "OFDMA for the 4th generation cellular networks" in Proc. IEEE Electrical and Computer Engineering, Vol.4, pp. 2325 - 2330, May 2004.

[9] 3GPP R1-050971,"R1-050971 Single Carrier Uplink Options for EUTRA: IFDMA/DFT-SOFDM Discussion and Initial Performance Results ",http://www.3GPP.org,Aug 2005

[10] IEEE P802.16e/D12,'Draft IEEE Standard for Local and metropolitan area networks--Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems', October 2005

[11] 3GPP RP-040461, Study Item: Evolved UTRA and UTRAN, December 200

[12] R. Mirghani, and M. Ghavami, "Comparison between Wavelet-based and Fourier-based Multicarrier UWB Systems", IET Communications, Vol. 2, Issue 2, pp. 353-358, 2008.

[13] R. Dilmirghani, M. Ghavami, "Wavelet Vs Fourier Based UWB Systems", 18th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, pp.1-5, Sep. 2007.

[14] M. Weeks, Digital Signal Processing Using Matlab and Wavelets, Infinity Science Press LLC, 2007.

[15] S. R. Baig, F. U. Rehman, and M. J. Mughal, "Performance Comparison of DFT, Discrete Wavelet Packet and Wavelet Transforms in an OFDM Transceiver for Multipath Fading Channel,",9th IEEE International Multitopic Conference, pp. 1-6, Dec. 2005.

[16] N. Ahmed, Joint Detection Strategies for Orthogonal Frequency Division Multiplexing, Dissertation for Master of Science, Rice University, Houston, Texas. pp. 1-51, Apr. 2000.