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REVIEW ARTICLE

Optimum Path Connectivity and Coverage in WSN: A Review

Navdeep Kaur[1], Vishal Arora[2]

(1) Research Scholar, Department of Computer Science Engineering, SBSSTC, Ferozepur

nkwfeb@gmail.com

(2) Assistant Professor, Department of Computer Science Engineering, SBSSTC, Ferozepur

vishal.fzr@gmail.com

ABSTRACT: Wireless sensor network extremely popular for monitoring the secluded or unfriendly environments. The duration of the network is the major problem in wireless sensor network .The duration of the wireless sensor is the time in which it covers all the targets. This problem can be solved by observing the less number of the nodule lively at the particular time. The sensors from the active sets are monitoring all targets and liable to transmit the data to the base station and remaining nodes are in sleep mode. In this paper we discussed about two algorithm one is svm and another is genetic algorithm used in wireless sensor network. The svm is used to detect the fault tolerance and genetic algorithm is used to find the optimal path.

Keywords: WSN, Optimum path, GA, SVM (Support Vector Machine).

1. INTRODUCTION

Recent years have seen huge advancement in wireless sensor networks due to reduction in development costs and spontaneity in hardware manufacturing. Past two to three decades have been marked with quick use of wireless sensor networks in an assortment of fields. Now wireless sensor networks are used in military shadowing, habitat monitoring, seismic activity survillience and in indoor applications. These wireless sensors have provided us tool to monitor an area of interest remotely. All one is supposed to do deploy these sensors, aerially or manually, and then these sensors which form the junctions of the network gather information from the area under investigation.

The information thus obtained is transfer back to the “main server” or “base station” where the information is processed. The base server is sometimes connected to Internet which then relays the organized information via satellite to the main station or control center for further processing and analysis. Very little or no processing is done while data is transferred from junctions.

Sensor junctions which compose the wireless network are autonomous junctions with a microcontroller, one or more sensors, a transceiver, actuators and a battery for power supply. These junctions, sometimes also referred motes. These sensors have very little memory and perform little amount of processing with the data obtained. Now apart from monitoring, collecting and transmitting data from one junction to another and to the base station moreover the processing unit regulates and controls functionality of other components of the sensor junction. Nevertheless the memory operation is an overhead too. This is because the sensors are provided

with a battery which often is non-replaceable. Thus increase in processing would implicit more energy is being consumed and hence sensor lifetime would decrease thereby affecting the lifetime of the network. As mentioned earlier the relaying of data is done by following a certain transmission protocol. However this facility is achieved by the transmission unit of the sensor. Usually the sensor has a transceiver that can act as both transmitter and a receiver. The transmitter and the receiver hardware both are not kept separate in order to save space and energy. These days, sensors can communicate through transmission media ranging from huge electromagnetic spectrum.

A wireless sensor network is to be found in one of the two ways: intended and unintended. In the planned method of deployment a specific number of sensors are placed in strategic points in predetermined manner.

Here it should be noted that the area to be monitored can be accessed physically, thus the cost is not a factor under such conditions. These junctions are placed using a predetermined algorithm such that the area to be covered is maximized placing less overhead on transmission and battery thereby increasing the network lifetime.

The wireless sensor network countenance various issues one of which includes coverage of the given area under limited energy. This problem of maximizing the network lifetime while following the coverage and energy parameters or limitation is known as the Target Coverage Problem in Wireless Sensor Networks [1].

As the sensor junctions are battery driven so they have limited energy too and hence the main challenge becomes maximizing the coverage area and also protecting a prolonged network lifetime. The work has been done to address this problem but mainly as the challenge by default contain time constraint; hence the problem becomes time dependent [1], which in turn is non-polynomial in nature [1]. Now even non-linear problems belong to the NP-Hard class [1] thus only a few heuristics have been suggested to address the Target Coverage Problem if not in optimal, then near optimal or suboptimal time. One of such algorithm is discusses in further section which is used as a baseline against our proposed algorithm.

In this work one of the proposed algorithm is analyzed which divides the sensors into various covers. These covers are then scheduled for activation one after another a specific, fixed, time quantum. A new algorithm is further suggested which outperforms the existing algorithm in finding the number of covers. Since the number of covers of sensors in a particular wireless sensor network is maximized, the lifetime of network is also maximized

2. RELATED WORK

We proposed the new technique which solved the issues in wireless sensor network. Main objectives of our proposed system are optimum path increase the life time of the network and failure identify ion. We introduce the novel approach in which we merge the two techniques called GA (Genetic Algorithm) and SVM (Support Vector Machine) Optimum path, target coverage and failure identification in wireless sensor Network.

Firstly we initialize network by N number of sensors node and M number of destination and. trained all junctions with the help of support vector machine Support vector machine trained all junctions and use for further testing process and identify failure of any junction by this testing process. Genetic algorithm find optimum path between selected source and destination. If SVM identify any failure junction in wireless sensor network, it informs to network and GA again find another optimum path between source and destination. Thus with this proposed system we can reduce energy expenditure and increase network life time with failure identification

3. IMPORTANT ALGORITHMS

Genetic Algorithm (GA): The genetic algorithm is the searching strategy [9][10].to find optimal solution of a given problem and it also provides an approach to find out the solution of the constrained and unconstrained type of optimization problems which are mainly based on the node selection. All genetic algorithms applies some modifications on a predefined population value of individual problem solutions. The GA randomly selects different individuals from the currently defined population to be parents and applies these credentials to generate the children for the next population sets. After the successful generation of children, the population "evolves" towards an optimum solution. The genetic algorithm has the capability to

provide the solution for different types of optimization problems which are suitable for standard optimization algorithms. Mainly three basic types of rules are defined in the genetic algorithm for generating the next population set by using the current initial population. The very first rule is the selection rule which selects the parents and it help to generate afterwards population set. Second is crossover rules which form children for next population set by combining two parents .Third rule is mutation rule those are applied for unsystematic changes to individual parents to form children.

Terminologies of GA

Fitness Function: The fitness function is the function need to be optimized. The objective function is standard optimization algorithm. The toolbox tries to find the smallest of the fitness function.

Individuals*:* An individual is any point to which you can apply the fitness function. The value generated by the fitness function is its score. An individual is sometimes referred to as a genome and the vector entries of an individual referred as genes. It is also defined as representation. Chromosome can be bit string, real numbers, lists of rules etc. Here the chromosomes are represent in the bit string either 0 or 1, if chromosome is 1 it means the sensor node is present in wake up state and if chromosome value is 0 it means the sensor node is in sleep state.

0	1	0	1	0	1	1	0	0	1	1	0	1	1	1	0

Fig1.1: Chromosome Representation

Populations and Generations: We can say population is an array of individuals. For example, suppose the population size is 1000 and 4 variables are there in the fitness function and represent the population by a 1000 by 4 matrixes. The similar individual can appear more than one time in the population.

Fitness Values: The fitness value of an individual is the value of the fitness function for that individual. The best fitness value for a population is the least fitness value for any individual in the population because the toolbox finds the minimum of the fitness function.

***Crossover*:-**Crossover operate on two parents to producing new child or offspring. After the selection process, new population is created.

(1) Single Point Crossover

Fig.1.1 shows single point crossover procedure and it can be noticed that the bits next to the crossover point are exchanged to reproduce new children. The crossover point can be selected arbitrarily.

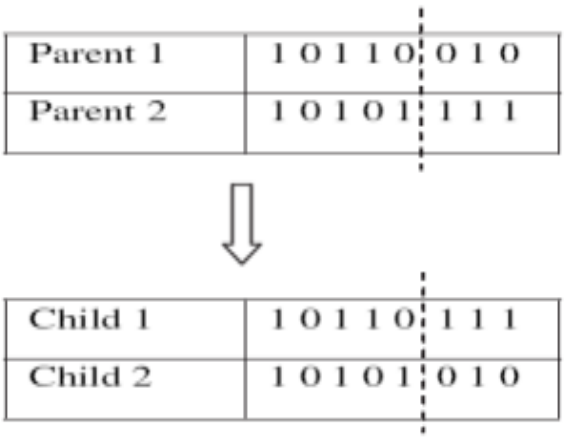

Fig 1.2. *Single Point Crossover*

(2)Two Point Crossover

Adding further crossover points decrease the performance of the Genetic algorithm. In two-point crossover, two crossover points are chosen randomly. Fig 1.2. The dotted lines specify the crossover points. Contents between these points are exchanged between the parents to create new offspring.

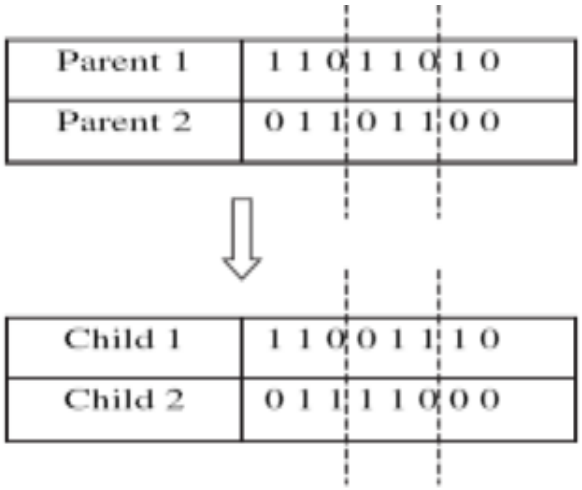

Fig 1.3. two *Point Crossover*

Support Vector Machine: SVMs (Support Vector Machine) are mainly known as the class of machine learning algorithms [13]. These machines are mainly the learning models which are used for analyzing and recognizing the patterns and these SVMs are mainly designed for the purpose of binary linear classification and regression analysis. Now a days the SVMs has expanded their use in many areas in the form of regression analysis, density estimation, one-class and multi-class. In most previous years after the origination of SVMs these has been used for different tasks like handwritten isolated digit recognition, different object recognition, particular face detection from an image and many more. Thus SVMs becomes most familiar tools to be used for dealing with most complex type and non-linear form of problems in a very well formed and structured way.

This research mainly focuses only on the one-class type of support vector machines which are used for analyzing and detecting the selective forwarding type of intrusions performed over a wireless sensor network. The selection of this type of support vector machine has been done because the form of any type of intrusion is not pre-known to us, so it is easy to construct any type of intrusion and it becomes easy to get the accurate and effective representation of the intrusion performed over the sensing network.

The SVM can be described in the following manner: In the priory step the SVM builds up the hyper plane or a bunch of many hyper planes in a very high infinite dimensional space and these hyper planes are further used for different tasks like regression, pattern recognition, classification and many more. After the hyper plane generation the separation is performed and an effective separation can be achieved when the chosen hyper plane has the longest distance to their nearest training data set point of any type of class and this is known as the functional margin of classification. But in most general terms it is said that when there is lower margin rate then the generalization error of classification also becomes lower.

After all this it is stated that the main authentic classification problem might be designed in a finite dimensional space and primarily it occurs that the discriminating sets are not linearly separable in the finite dimensional space. Because of this type of problem, a solution was proposed which dictates to map the initial finite dimensional space into a much higher infinite dimensional space assuming that it can make the separation easy in the final achieved space. For minimizing the load of the calculation and computation to a reasonable point, the mapping schemes used by the support vector machine's algorithms, are structured to make sure that the dot products can be simply calculated in the terms of the variables in that initial space, and it can be done by initializing these dot products in the form of a kernel function K (x, y) to match the problem statement. After that the hyper planes designed in the higher dimensional space are initialized in the form of the set of points which returns a constant value after the

inner product of that with any vector value that space. The vectors describing the hyper planes can be selected to be linear combinations with parameters α_i of images of feature vectors that arise in the data base. With this choice of a hyper plane, the points x in the feature space that are mapped into the hyper planes are defined by the given relation:

$\sum_i \alpha_i K(x_i,x)$=constants.

It is also to be notified that when the value of variable y increases from point x_i, the values of kernel function K(x, y) decreases and every variable used in the computation of the vector sum determines the level of nearness of the test point x to the corresponding data base point x_i.

- Apply fitness function to perform cost analysis.
- Implement crossover function K.
- Apply K=Mutation (K).
- If GA receives warning from SVM in second phase for any node in the current path which may lead in failure then GA leaves that node and randomly selects any other node for generating complete optimum path.
- Go to phase two

4. CONCLUSION

After reviewing some previously done important researches we have proposed a theoretical working system which is based on hybrid approach of using DFS based routing schemes with genetic algorithms for shortest connectivity path along with to find optimal result and then apply kernel function of support vector machine for detecting selective forwarding attack. Thus the paper concludes a system that can solve the issues of WSN which are coverage problem, optimum path, failure detection and energy efficient network.

REFERENCES

[1] "A Wireless Sensor Network- A Theoretical Review", Manoj Ahlawat, International Journal of Wired and Wireless Communications Vol.1, Issue 2, April, 2013.

[2] "Energy Efficient Wireless Sensor Network", Mrs. Rakhi Khedikar, Dr. Avichal Kapur, Dr. M.D. Chawhan, 2014 International Conference on Electronic Systems, Signal Processing and Computing Technologies,978-1-4799-2102-7/14 © 2014 IEEE, DOI 10.1109/ICESC.2014.14.

[3] "Coverage in Wireless Sensor Networks: A Survey", Raymond Mulligan, Habib M. Ammari, Network Protocols and Algorithms, 2010, Vol. 2, No. 2.

[4] "N-target Coverage in Wireless Sensor Network using DFS and Genetic Algorithms", Anudeep, Subhash Chander, International Journal of Scientific Engineering and Research (IJSER), Volume 1 Issue 2, October 2013.

[5] "Energy-Efficient Target Coverage in Wireless Sensor Networks Based on Modified Ant Colony Algorithm",Salma Begum, Nazma Tara, Sharmin Sultana, International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC) Vol.1, No.4, December 2010.

[6] "Maximizing Coverage in a Connected and K-Covered Wireless Sensor Network Using Genetic Algorithms", Tahir Emre Kalaycı, Kasım Sinan Yıldırım, Aybars Ugur,International Journal Of Applied Mathematics And Informatics, Issue 3, Volume 1, 2007.

[7] "Review on Coverage and Connectivity in Underwater Wireless Sensor Networks", Manisha Yadav, Dr.(Prof.) Yusuf Mulge, International Journal of Computer Science & Engineering Technology (IJCSET), Vol. 4 No. 05 May 2013.

[8] "Connectivity Issue in Wireless Sensor Networks by Using Depth-First Search and Genetic Algorithm",GholamAli Yaghoubi, 2010 International Conference on Computational Intelligence and Communication Systems 978-0-7695-4254-6/10 © 2010 IEEE (pp 377- 381).

[9] "Malicious AODV: Implemen- tation and Analysis of Routing Attacks in MANETs", H. Ehsan and F. A. Khan, IEEE Trust, Security and Privacy in Computing and Communications Conference TRUSTCOM, Liverpool, 25-27 June 2012, pp. 1181-1187.

[10] "Research on Intrusion Detection Algorithm Based on Multi-Class SVM in Wireless Sensor Networks", Hangxia Zhou, Qian Liu, Chen Cui, Communications and Network, 2013, 5, 524-528.

[11] "Support Vector Machines Based on K Nearest Neighbor Algorithm for Outlier Detection in WSNs", S. Xu, C. Hu, L. Wang and G. Zhang, Proceedings of the 8th Wireless Communications, Networking and Mobile Com- puting International Conference WICOM, Shanghai, 21-23 September 2012, pp. 1-4.

[12] "Quarter-Sphere SVM: Attribute and Spatio-Temporal Correlations Based Outlier & Event Detection in Wireless Sensor Networks", N. Shahid, I. H. Naqvi and S. B. Qaisar, IEEE Wireless Communications and Networking Conference WCNC, Shanghai, 1-4 April 2012, pp. 2048-2053.

[13] "Security Enhancement in Wireless Sensor Networks Using Machine Learning," A. B. Raj, M. V. Ramesh, R. V. Kulkarni and T. Hema- latha, High Performance Computing and Communication & 2012 IEEE 9th International Conference on Embedded Software and Systems HPCC-ICESS, Liverpool, 25-27 June 2012, pp. 1264- 1269.

