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A Review of Minimizing Movement for Target Coverage and Network Connectivity in Mobile Ad Hoc Networks

Amanpreet Kaur[1], Rajnish Kansal[2]

M.Tech Student, Department of CSE, Asra Institute of Engineering and Technology, Bhawanigarh, Punjab, India[1]

HOD (M.Tech), Department of CSE, Asra Institute of Engineering and Technology, Bhawanigarh, Punjab, India[2]

ABSTRACT: The salient features of a wireless sensor network is an arrangement of autonomous and well distributed nodes which may or may not have an additional facility of mobility. Due to the mobility of sensors, the nodes are deployed and relocated on their own. Similarly, sensors also get their own location and get placed at the target area deployment of mobile sensors. The main issue of redeployment is coverage and connectivity. There are also some additional factors we need to take care about. They are: sensor relocation, energy efficient movements of sensors, obstacle adaptability, lifetime of network, fault tolerance, etc. This project basically works to get best network coverage and connectivity by having minimum or zero movement of the sensors.

KEYWORDS: Zone routing protocol, Mobile ad hoc networks(MANETs), Network connectivity, IERP, IARP.

I. INTRODUCTION

The application domain of Mobile Ad Hoc Networks (MANETs) is growing. All nodes in MANET are mobile in nature, so a MANET has dynamic topology structure. Moreover, without prior notice each node is free to join or leave a MANET whenever it wants. MANET is also self-organizing and self-configuring since it does not rely on fixed infrastructure and works in shared wireless media. Lastly, each node in MANET is equipped with limited resources. With these characteristics of MANET, performing routing in MANET is a challenging task. There are many routing protocols available in literature. Excellent survey of these can be found in [8]. They are mainly classified in two categories:

A. Proactive routing

In proactive routing, the routes to all destinations are determined at the start-up and maintained by using a periodic route update process. So, these schemes cannot scale well as the network size increases. It is also called Intra zone routing protocol(IARP).

B. Reactive routing

In reactive routing, each node tries to reduce routing overhead by only sending routing packets when it needs to communicate with other nodes. So, these schemes cannot scale well as number of traffic sessions increase. It is also called Inter zone routing protocol(IERP).

Zone Routing Protocol (ZRP[2]) combines both proactive and reactive routing strategies to get the advantages of both. Zone Routing Protocol has the network topology.It is overlapping zones centered at each node. Within a zone, proactive IntrAzone RoutingProtocol (IARP) is used to maintain local zone topology information. For nodes outside the zone, reactive IntErzone Routing Protocol (IERP) is used for sending data. Like the traditional reactive routing protocols, IERP also performs route discovery and route maintainance activities. To reduce the routing overhead while performing reactive route requests, Boardercast Resolution Protocol (BRP) is used which broadcasts the route queries through the boarders of the zones [9].

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Ad-hoc networks are mobile wireless networks that have no fixed infrastructure. There are no fixed router instead each node acts as a router and forwards traffic from other nodes. Ad-hoc networks were first mainly used for military applications. They have become increasingly more popular within the computing industry. Applications include emergency search-and rescue operations, deployment of sensors, conferences, exhibitions, virtual classrooms and operations in environments where construction of infrastructure is difficult or expensive. Ad-hoc networks can be rapidly deployed since lack of infrastructure. [10] [11].

A MANET (Mobile Ad-hoc Network) is a type of ad hoc network with rapidly changing topology. These networks typically have a large span and connect hundreds to thousands of nodes[11]. Correspondingly, the term Reconfigurable Wireless Networks (RWN) refers to large ad-hoc networks that can be rapidly deployed without infrastructure and where the nodes are highly mobile [12]. The widespread rapid development of computers and the wireless communication, the mobile computing has already become the area of computer communications in high-profile link. Mobile Ad Hoc Network (MANET) is a completely wireless connectivity through the nodes constructed by the actions of the network, which usually has a dynamic shape and a limited bandwidth and other features, network members may be inside the laptop, Personal Digital Assistant (PDA), mobile phones, MP3 players, and digital cameras and so on. On the Internet, the original Mobility (mobility) is the term used to denote actions hosts roaming in a different domain; they can retain their own fixed IP address, without the need to constantly changing, which is Mobile IP technology. Mobile IP nodes in the main action is to deal with IP address management, by Home Agent and Foreign Agent to the Mobile Node to packet Tunnelling, the Routing and fixed networks are no different from the original; however, Ad Hoc Network to be provided by Mobility is a fully wireless, can be any mobile network infrastructure, without a base station, all the nodes can be any link, each node at the same time take Router work with the Mobile IP completely different levels of Mobility. Early use of the military on the Mobile Packet Radio Networked in fact can be considered the predecessor of MANET, with the IC technology advances, when the high-tech communication equipment, the size, weight continuously decreases, power consumption is getting low, Personal Communication System (Personal Communication System, PCS) concept evolved, from the past few years the rapid popularization of mobile phones can be seen to communicate with others anytime, anywhere, get the latest information, or exchange the required information is no longer a dream, And we have gradually become an integral part of life. The current wireless LAN technology, Bluetooth is has attracted considerable attention as a development plan. Bluetooth's goal is to enable wireless devices to contact with each other, if the adding the design of Ad Hoc Network (MANET)[13].

II LITERATURE REVIEW

Shamshad Begum, B. Bala Chandrudu, [2015], this describes that the Mobile Sensor Deployment(MSD) find the problems and investigates how to deploy mobile sensors with minimum movement to form a WSN that provides both target coverage and network connectivity. For the MSD problem is decomposed into two sub-problems: the Target coverage (TCOV)problem and the Network connectivity (NCON)problem. We then solve TCOV and NCON one by one and combine their solutions to address the MSD problem. The NP-hardness of TCOV is proved. For a special case of TCOV where target disperse from each other farther than double of the coverage radius, an exact algorithm based on the Hungarian method is proposed to find the optimal solution.[1]

Navjot singh, Amandeep singh, [2015], In this research Network connectivity, throughput, load balancing and energy conservation are the primary requirements in a Wireless Sensor Networks (WSN's) whenever sensors are deployed in a dense and harsh environment. As these sensors are battery- operated, so it is very crucial to use this limited energy in an efficient way for data sensing, processing and communication across the network. Some mobile nodes having higher energy must be placed & relocated in a suitable way to prolong the network lifetime and connectivity. In the same sense, sink or base stations can also act as mobile nodes. Several mobility & communication algorithms and network architectures are developed so far. This paper points out some researches made in the field of WSN's, which had contributed in prolonging overall network lifetime and effective energy utilization.[2]

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Sonali Karegaonkar, Archana Raut,[2015], Acc. to this research Target Coverage and Network Connectivity may also affect the quality of network. The target coverage is based on two algorithms i.e. Basic algorithm based on clique partitions and TV Greedy algorithm based on voronoi diagrams of target are proposed. For network Connectivity, an optimal solution based on Steiner tree concept is proposed. In addition, LZW compression algorithm is used to compress data, due to which energy consumption is minimized.[3]

H. Mahboubi, K. Moezzi, A. G. Aghdam, and K. S. Pour, [2014], This research describes that Voronoi diagrams are used to detect coverage holes. After that, sensors are dispatched to cover these holes. As a result, the area coverage ratio is improved. Further, a multiplicatives weighted Voronoi diagram is used to discover the coverage holes corresponding to different sensors with different sensing ranges.[4]

Enrico natalizio and Valeria Loscr, [2011], Acc. to this author wireless self-organizing networks are attracting a lot of interest in the research community. Moreover, in the last decade many mobile devices have appeared in the market. Exploiting mobility in a wireless environment, instead of considering it as a kind of disturbance, is a fundamental concept that the research community is beginning to appreciate now. Of course, the advantages obtainable through the use of the mobility imply the knowledge of the different types of mobility and the way to include it in the management architecture of the wireless networks. In this work we claim that mobility and wireless sensor networks can be considered as two synergetic elements of the same reality. For this purpose, we sketch a macro-classification of the different objectives which can be pursued by controlled mobility. Moreover, we identify and highlight the interactions between this specific type of mobility and the layers of the control stack. Lastly, this paper reports a case study in which we show how controlled mobility can be exploited practically.[5]

Raymond Mulligan, Habib M. Ammari, [2010], In this research Wireless sensor networks are used to monitor a given field of interest for changes in the environment. They are very useful for military, environmental, and scientific applications to name a few. One of the most active areas of research in wireless sensor networks is that of coverage. Coverage in wireless sensor networks is usually defined as a measure of how well and for how long the sensors are able to observe the physical space.[6]

Brijesh Patel and Sanjay Srivastava, [2010], Acc. to this author In Mobile Ad Hoc Networks (MANETs), routing is a challenging task due to node mobility, traffic and network size. It is very important to analyze the scalability characteristics of the routing protocols with respect to these parameters. Zone Routing Protocol (ZRP) is considered to be one of the most scalable routing protocols due to its multi-scoping and hybridization features. We propose a general, parameterized model for analyzing control overhead of ZRP. A generic probabilistic model for data traffic is also proposed which can be replaced by different traffic models. Our analytical model is validated by comparisons with simulations performed under different network scenarios. In our simulation results, we have observed that the optimal zone radius lies at a point where proactive and reactive overhead components of ZRP are approximately equal as observed in[1]. Further, as the mobility increases the optimal zone radius value decreases, and as the traffic increases the value of optimal zone radius increases. If a node operates away from the optimal zone radius setting then it has to bear additional routing overhead. We show that the additional overhead is around 35% higher under a wide range of mobility scenarios.[7]

III PROPOSED WORK

1. We will start by deploying sensor nodes randomly in a described area.
2. Now, since our aim is to provide a better information transfer between source and destination with less usage of energy, we prefer to have static nodes.
3. We will divide the complete area in zones.
4. Each zone will have a zone header.
5. Now, we will select a source and a destination.
6. Information will transfer from sub-nodes to headers and then from headers to headers, finally to the destination.

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7. In this process, a lot of energy will be saved, thus increasing network lifetime of our network.

IV. FUTURE SCOPE

In this study, fundamental problem of deployment in mobile sensor network is discussed. Following deployment problem has considered: Given a target area and number of sensor node, how the given approach should self-deploy the sensor into a connected network that has the maximum coverage. The issues of mobile sensor network deployment are investigated in detail. For future study, more real world problem formulation for deployment could be addressed. Again the soft computing approaches and bio inspired algorithm could be studied in future work.

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