International Journal of Future Generation Communication and Networking
Vol. 13, No. 3, (2020), pp. 2307–2315

An Analysis of Efficient Model for Geographic Routing in Mobile Adhoc Networks

Dr.V.Sangeetha[#1] M.Praneesh[#2] M.Karpagam[#3], Karunya Rathan[#4]

[#1]*Associate Professor, Department of Computer Science, Karpagam Academy of Higher Education*
[#2]*Assistant Professor, PG & Research Department of Computer Science, Sri Ramakrishna College of Arts and Science*
[#3]*Assistant Professor (SG), Department of Computer Science, Saveetha School of Engineering*
[#4]*Operations Manager, Petras*
sangeetha.swetha2003@gmail.com

raja.praneesh@gmail.com

Abstract

In recent trends of MANET geographic routing has grow to be one of the best routing strategies mainly because of its scalability. It does not need to maintain routes explicitly. Greedy forwarding is the principal approach of geographic routing. This could be solved by any coordinate based routing algorithm or protocol. In recent years the emerging strategy namely game theory is to be impulse to solve the issue of finding the best adaptive strategy via geographic routing and fixing the optimal neighbor which includes the concept of periodic beaconing and has a outline of promising network metrics like packet delivery ratio, eliminating error rates, progressive throughput and reducing routing overhead. In this paper discusses the overview of Geographic Routings in MANET.

Keywords: *We would like to encourage you to list your keywords in this section*

1. Introduction

A mobile ad hoc network is a transitory self organizing network of wireless mobile nodes. It does not rely on any physical infrastructure; it can incorporate various devices to communicate without any existing structure like conventional networks. But there are many issues and challenges to be solved for deploying the systems in a large scale environment. So it is useful when infrastructure is not available and said to be impractical and expensive. It is highly useful for military applications, rescue and home networking. Parenthetically routing is a major issue that is to be subjected for betterment in order to attain an optimal networking performance.

The goal of routing is to locate and uphold routes amid nodes in a dynamic topology with possible links and minimal resources. Most ad hoc routing protocols are combination of DSR/DSDV. Mobility in DSR causes short lived routes whereas DSDV is not that scalable. This paper propose a MANET routing by means of AODV protocol which is said to be a reactive protocol considered for the On-Demand Learning concept which encompassed in the work. The packet size in AODV is uniform and is table-driven. It supports both the unicasting and multicasting within a uniform framework. In recent trends of MANET geographic routing has become one of the best suiting routing strategies mainly because of its scalability. It does not need to maintain routes explicitly. Greedy forwarding is the primary loom of geographic routing. It is a suggestion that AODV protocol is the best joining hand for geographic routing since it provides highly adorable efficiency and scalability.

ISSN: 2233-7857 IJFGCN

We explore an issue of discovering a proper neighbor for information sharing during routing in MANET since it's a stateless network, but position plays a vital role in geographic routing. This could be solved by any coordinate based routing algorithm or protocol. In recent the emerging strategy namely game theory is to be impulse to solve the issue of finding the best adaptive strategy via geographic routing and fixing the optimal neighbor which includes the concept of periodic beaconing and has a outline of promising network metrics like packet delivery ratio, eliminating error rates.

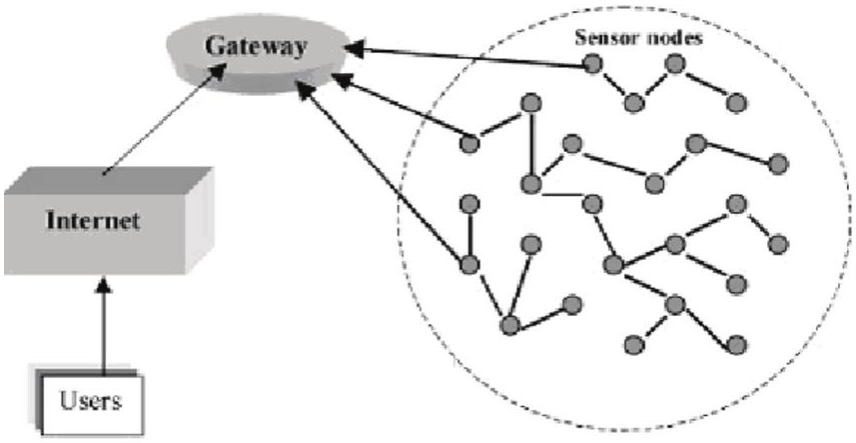

Figure 1 Basic Routes of Geographic Routing

2. **Resilient Features of Geographic Routing**

The objective of routing should be to minimize the intrinsic positioning errors on the throughput of the set of connections [1]. So the expectation should be to select the best forwarding algorithm. Because inaccurate location may cause packet delivery failure, wrong routing decision and complete collapse of the communication. So it is significant to emphasize the priority of defecting location errors in geographic routing.

Due to the principle of greedy forwarding approach [19] [1] i.e. the packet encounter a failure when it finds a void node. This routing definitely needs some topology based or position based routing protocols. In order to offer a anonymity protection for the primary components source, route and destination with low cost is the ultimate ambition of the development of this protocol [16]. The name itself carries a word stateless which clearly defines it is meant for MANET. It joins hands with ALERT Protocol to give the compatible anonymity. It can also avoid timing attacks which assures a excellence networking.

In stateless multicast notion beneficiary based cross layer rules and regulations that performs which performs multicast routing based on unicast geographic protocol which only needs the sender location and the destination node's location which are provide in the MAC packet to decide the next hop along the route [3]. Geographic Routing for Large Scale networks significantly reduces the communication, routing and storage overhead. In order to prove the working mechanism they have used a distributed convex hull algorithm which updates the intermediate destinations iteratively and formally improves the routing.

2.1 Greedy Perimeter Stateless Routing Protocol

ISSN: 2233-7857 IJFGCN

Routing has become one of the challenging things among wireless networks. The major issue is we could not build the addressing scheme globally for the node deployment and therefore the traditional IP based protocols are not suitable. Moreover in wireless ad hoc networks particularly the flow of the networks is to be monitored and traffic is also to be maintained. Considering all this process energy becomes a concerned fact, so location based routing protocols can solve those issues and significantly reduces the drawbacks. The GPSR is a location based protocol meant for MANET which represents the geographic location of nodes eliminating the address of the node. It follows the greedy forwarding approach to transmit the data whereas each transmitted data packet that contains identification of destination node and its geographic location and periodically sends beacon and finally synchronizes the communication.

There are various approaches in geographic routing for flooding data packets, such as single path, multi path. In that mostly the single path data transmission relies on two techniques such as Greedy forwarding and Face Routing.

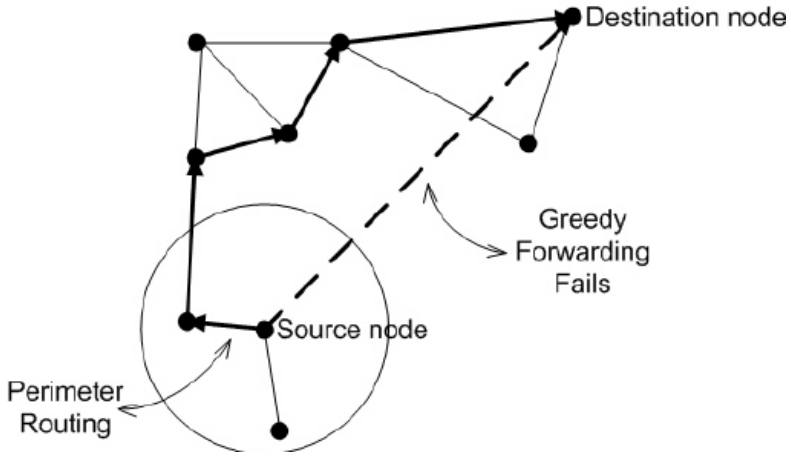

Figure 2 Architecture of Greedy Perimeters Stateless Routing Protocol

3. Discovery of Nearest Neighbour Nodes

Finding the nearest neighbor is a proximity search. It is considered to be finding the optimized solution. If the nearest neighbor is found based on the optimization criteria (distance), the routing overhead can be significantly reduced since the distance between the source and destination is reduced. The discovery of nearest neighbor nodes via an efficient method significantly increases the performance of the network and a reliable communication [9]. To improve the search time, some of the optimal traversal tree mechanisms, spatial and temporal imputations, correlations, binary search tree are used widely. In order to avoid the synchronization problems, packet collisions it is important to choose the best mechanism that suits the research.

Considering the significant concept of finding the best neighbor strategy is the stable mechanism for the invasion of selfish strategy in different proportions [9]. So in order to simulate and enforce cooperation among the selfish nodes, considering the game theory each player plays a packet forwarding game with its neighbor and records the possible outcome. Basic model is analyzed with two players using markov process and tit-for-tat. Nearest neighbor can also be found through some imputation algorithms included the concept of substitution of missing values is called as imputation, those algorithms are traditionally compared on the basis of imputation and original values [7] [5]. The

ISSN: 2233-7857 IJFGCN

quality of imputation is measure by two metrics; one is prediction ability and classification bias. Kim Nearest Instance Impute (KNII), Sequential Kim nearest Neighbor (SKNN) is some of the suitable neighbor predicting algorithms.

3.1 Position Based Routing for MANET

It is put forward that the main characteristic of position based protocols is to grasp the location information of the distributed nodes to carry out the routing decisions. The work almost covered 50 protocols and their comprehensive view on efficient routing. They have also suggested certain design parameters for measuring routing performance, wherein the algorithm depends upon the process considering distributed operation, selecting path strategy, packet forwarding, message delivery, path selection metric and overheads.

Metric	Type	Rob-ustness	Scalabi-lity	Packet Overhead
MFR	Greedy (Prog-ress)	Medi-um	High	Low
LAR	Restricted Directional Flooding	Low	Mediu-m	Medium
DREAM	Restricted Directional Flooding	High	Mediu-m	Medium
AODPR	Restricted Directional Flooding	Low	Medium	Medium
LABAR	Hierarchical	High	High	Low
SPAAR	Restricted Directional Flooding	Low	Medium	High

Figure 3 Comparisons of Different Routing Protocols

3.2 Anonymity Protection

High anonymity protection routing protocol using neighbor coverage based probabilistic rebroadcast in MANET. They calculate the delay of rebroadcasting on the basis of ALERT and AODV node identification method. Also dealt with extracting probability by means of the additional coverage ratio and connectivity factor. To improve the routing performance they have implied the metrics like end-to-end delay, packet delivery ratio, compromised vs attacked node and location verification vs security. Finally a more accurate coverage ratio has been derived.

3.3 Minimal Location Update

An idea on dynamic position update in mobility environment. When each node receives the beacon it updates its neighbours position and velocity in its neighbor list. Whenever a new node overhears transmission it checks its neighbor list. If it is a new neighbor it broadcasts its location to its neighbours and they update their neighbor list. Overhearing helps to maintain an accurate local topology. Hence they have completely analyzed the need for dynamic location update in geographic routing.

3.4 Selfish Nodes

ISSN: 2233-7857 IJFGCN

Modelling the selfish behavior of nodes in MAC layer using certain game theory can reduce the negative effect of selfish nodes on networking [11] [6]. An adapted markov chain model on a single hop saturated MANET is dealt with repeated multi stage game formulation, it also solves the nash equilibrium by maximizing the pay off. Nowadays content based publish/subscribe services has become a trend in the research field of mobile networks. Since behavior of nodes become selfish sometimes [5], it is now a common problem in reality. Nodes behave selfishly in order to incorporate their own utilities and performance without considering other nodes on connection. To deal with the selfish behavior of nodes they have used tit-for-tat strategy. Content based publish/subscribe with opportunistic networks consist of diversity of portable devices with the capacity of ad hoc wireless communication.

4. Node Selection and Packet Forwarding

Efficient node selection and packet forwarding are definitely not a new concept to the area of telecommunications [14]. It has been purposely modeled to eliminate the selfish nodes and establish coordination between nodes. The topology problems in the network are normally categorized under non cooperative games. The model is divided into two types namely connectivity and reach ability. For the purpose of packet forwarding cooperative games can be indulged [10]. Basically the process of analyzing the node to find its neighbor's past behavior tit-for-tat strategy is used with cooperative enforcement. By the way AODV protocol is said to be the best in synchronization protocol type for dealing with the game theoretic approaches over ad hoc networks.

4.1 Network Selection

The user always faces a problem of selecting the network that differs in technology, bandwidth and latency. So in set up the network decisions can be made by indulging decision theory with game theory by monitoring and triggering the proper decision an optimal communication can be carried out [17].

4.2 Mobility Routing

Divulged the concept of cooperation of nodes is extremely important for routing protocol to render their optimal work. So considerably it shows that elimination of selfish nodes is significant in routing [13]. Their ultimate objective is to maximize the profit and being harmless to the neighbor nodes, this is possible only when mobility predictions are incorporated. Mobility predictions is completely based on decisions, to substantiate the best decision, there is an unavoidable need of game theory. So a multi-dimensional optimal auction game is proposed to determine the winner route between the source and the destination.

4.3 Path Discovery

Since cooperation and completion exists in the wireless networks, it is good for a node to solve the completion with other nodes and help other nodes in forwarding the packet [4]. By the use of the game theory it is must to eliminate the selfish nodes which work only for maximizing their own payoff. Considering the concept of tit-for-tat of prisoner's dilemma, it will durably reduce the selfish behavior of nodes. The classic AODV protocol goes in hand with the theory to support the execution of play. The number of defects and cooperation is considered mathematically by formulated payoffs. Here goes the layman explanation of the theory, Prisoner's dilemma models a situation in which there is two suspects in a major crime, if both cooperate each other they will be sentenced jail for 1 year. If both defect each other then they will be jailed for 3 years. In case one of them cooperate and the other one defect, the cooperated will be freed and the defected will be jailed for 4 years.

ISSN: 2233-7857 IJFGCN

4.4 On Demand Learning

The On Demand Learning rule is mobile communication that means mobile to mobile communication which is meant for long internet access. Greedy Perimeter Stateless Routing (GPSR), a geographic routing protocol in wireless datagram networks that used the routers position and a data packet's destination to make packet forwarding decisions making.

5. Conclusion

Various trends in Mobile Ad hoc Networks, and its significant view was to explicate the challenges, issues and vulnerabilities that is faced by the MANET in the modern era and to relay an idea on how to handle and solve those for achieving a better networking performance. Since MANET is subjected to numerous routing issues, it is important to grip it with a prominent solution, that's why implementation of game theory has been illustrated. So that it is attested that the proposed idea would definitely improve the network performance.

References

[1] He tao, Wang Souping, "A Novel Path Discovery Process Based on Iterated Prisoner's Dilemma in Wireless Mesh Network", Nanjing University of China, 2012.

[2] Huan Zhou, Jiming Chen, Jialu Fan, Yuan Du, Sajal.K.Das, " ConSub:Incentive-Based Content Subscribing in Selfish Opportunistic Mobile Networks", IEEE Communications Vol.31, September 2013.
d
[3] Huan Zhou, Jie Wu, Hongyang Zhao, Shaojie Tang, Canfeng Chen, Jiming Chen, "Incentive Driven and Freshness Aware Content Dissemination in Selfish Opportunistic Mobile Networks", Journal of Nokia Research, 2014.

[4] Kamiya Shrivastava, Satendra.K.Jain, "Enhanced Greedy Perimeter Stateless Routing Protcol (E-GPSR)", The International journal of Engineering and Science", December 2012.

[5] K.Komathy, P.Narayanaswamy, "Best Neighbor Strategy to Enforce Cooperation Among Selfish nodes in Wireless Ad hoc Networks", Elsevier Journal of computer Communications, August 2007.

[6] K.Komathy, P.Narayansamy, "Trust Based Evolutionary Game Model Asisting AODV Routing against Selfishness", Elsevier Journal of Network and Computer Applications, February 2008.

[7] Lin Chen, Jean Leneutre, "Selfishness Not Always a Nightmare: Modeling Selfish MAC Behaviours in Wireless Mobile Ad hoc Networks", ICDCS of Canada, 2007.

[8] Luc Hogie, Pascal Bouvry, Frederic Guinand, "An Overview of MANET's Simulation", Elsevier Journal of Electronic Notes in Theoretical Computer Science", December 2007.

[9] Mehrdad Khaledi, Mojgan Khaledi, Hamid.R.Rabiee, " An Optimal Game Theoretical Framework for Mobility Aware Routing in Mobile Ad hoc Networks", IEEE Communications, July 2014.

ISSN: 2233-7857 IJFGCN

[10] Mohammed Nasarian, Kemel Tepe, "Game Theoretic Approach in Routing Protocol for Wireless Ad hoc Networks", Elsevier Journal of Ad hoc Networks, July 2008.

[11] Priyanka Goyal, Vinti Parmar, Rahul Rishi, "MANET:Vulnerabilities, Challenges, Attacks, Applications", international Journal of Computer Science, Engineering and Management, Vol.11, January 2011.

[12] P.Samundiswary, P.Sathian, P.Dananjayan, "Secured Greedy Perimeter Stateless Routing for Wireless Sensor networks" International Journal of Ad hoc Sensor and Ubiquitous Computing, Vol.1, June 2010.

[13] Ramona Trestian, Olga Ormond, Gabriel Miro Munten, "Game Theory Based Network Selection: Solution and Challenges", IEEE Communications, 2012.

[14] Shengbo Yang, Chao Kiat Yeo, Bu Sung Lee, "Toward Reliable Data Delivery for Highly Dynamic Mobile Ad hoc Networks", IEEE Transactions on Mobile Computing, Vol.11, January 2012.

[15] T.Hari Shankar, S.Dilip Kumar, " GPSR Geographical Routing Protocol Using MANET", International Journal of Computer Science and Mobile Applications, Vol.2, January 2014.

[16] Vinod Kumar Verma, Surinder singh, Nagendra.P.Pathak, "Analysis of Scalability for AODV Routing Protocol in Wireless Sensor Networks", Elsevier Journal of Optics, July 2013.

[17] Xinyu Zhang, Kang.G.Shin, " Delay – Optimal Broadcast for Multihop Wireless Networks Using Self Interference Cancellation", IEEE Transactions on Mobile Computing, Vol.12, January 2013.

[18] Yuan Yuan Li, Lynne.E.Parker, " Nearest Neighbor Imputation Using Spatial Temporal Correlations in Wireless Sensor Networks", Elsevier Journal of Information Fusion, August 2012.

[19] Y. Kim, J. Lee, and A. Helmy, "Impact of location inconsistencies on geographic routing in wireless networks," in Proc. ACM MSWIM'03, pp. 124–127, 2003.
Hjkg,ugyurjgg
[20] Zhixiao Wang; Deyun Zhang; Alfandi, O.; Hogrefe, D.; , "Efficient geographical 3D routing for Wireless Sensor Networks in smart spaces," Internet Communications (BCFIC Riga), 2011 Baltic Congress on Future , vol., no., pp.168-172, 16-18 Feb. 2011.

[21] Jonathan De Andrade Silva, Eduardo Raul Hruschka, " An Experimental Study on the Nearest Neighbor-based Imputation Algorithms for Classification Tasks", Elsevier Journal of Data and Knowledge Engineering, January 2013.

Authors

Dr.Sangeetha V received MCA Degree from Avinashilingam College for women in 2002, Doctor of Philosophy in Computer Science in 2017 from Anna University, Chennai, India.. At present she is working as an Associate Professor, Department of Computer Science from Karpagam Academy of Higher Education. Her research interests are Grid Computing, web Mining

and Networking. She has 12 years of Teaching and Research experience. She has published 7 International Journals and presented More than 10 research articles in National and International Conference. In addition to that she has applied ICSSR Project entitled with Impact of Digitalization in Rural Economy. She is a Life member of IAENG, SDIWC. She has guiding Research scholar various universities in M.Phil and PhD.

Mr. Praneesh.M received M.Sc Degree in Computer Science in 2010, Master of Philosophy in Computer Science in 2011 from Bharathiar University, Coimbatore, India. Pursuing PhD Computer Science from Bharathiar University (University Department) in the area of remote sensing based Image Classification. At present he is working as an Assistant Professor, PG & Research Department of Computer Science, Sri Ramakrishna College of Arts and Science (formerly SNR Sons College). His research interests are Medical Image Processing, Remote Sensing, Machine Learning, Natural Language Processing, Software Metrics/Reliability and Theory of Computation. He has Published 40 Journals (UGC Approved, Scopus, SCIE, UGC Care List), also he presented and published more than 100 research articles in National and International Conferences. He has published two books namely Research Ethics in Computer Science and Discrete Mathematics and also published 16 Book chapters in Leading publications like Springer, IEEE and Excel Publishers. He has completed 65 online courses conducted by NPTEL, Swayam, Open to Study, Cognitive class IBM, Test dome, Udemy, Coursera and Saylor Academy. He has attended 75 conferences, workshop and Seminar (National/International). He has also organized several conferences and seminars. He has produced 3 M.Phil Scholars under his guidance. In addition to this, he is a life Member of ACM, IAENG, SDIWC, SCIEI, IACSIT and ASR. He is a Reviewer and Programme Committee member of various International conferences in countries such as Australia, Poland, Switzerland, Indonesia, and Dubai. For his credit, he received "Best Young Teacher Award" at Grabs Educational Trust, Chennai for the contribution of Teaching and Research in the year 2017, “Best Paper Award” at Bapurao Deshmukh College of Engineering, West Bengal in the year 2011, “Emerging Researcher Award” at International Institute of Organized Research in the year 2018, “Best Teacher Award” at Sri Ramakrishna College of Arts and Science in the year 2018. “Best Young Scientist Award” at GRABS Educational Trust in the year 2019, “Elite Academician Award” from Texas instruments, DST,AICTE and IIT-Bombay in the year 2019, “PK Das National Best Young Faculty Award” in the Computer Science Junior Category at Nehru Group of Educations in the year 2019. He also filed a Patent on Artificial Intelligence System for Pest Control in Agricultural Field in 2020.

Ms. M.Karpagam received M.Tech Degree in Information Technology in 2014, from Anna University, Chennai. Pursuing Doctor of Philosophy in Computer Science from Anna University in the area of scheduling workflow of task in Cloud Computing. She has passed UGC NET Exam (Assistant Professor) with 97 Percentile score, Dec.2019. At Present she is working as an Assistant Professor, Department of Computer Science, SAVEETHA School of Engineering, and Chennai. She has 8 years of Teaching Experience. Her Research Interest is Machine Learning, Deep Learning and Artificial Intelligence.

ISSN: 2233-7857 IJFGCN

Ms. Karunya Rathan has received her B.Tech degree in Information Technology from AMS Engineering College, Namakkal, affiliated to Anna University, Chennai, TamilNadu in 2006. She has received her M.Tech Degree in Information Technology from Sathyabama University, Chennai, TamilNadu in 2007. She has worked as an Assistant Professor for Sathyabama Institute of Science and Technology (Deemed to be Univerisity) for over a decade and has published around 18 papers in National and International Journals and conferences. She is currently working as Operations Manager in Petras, Chennai and pursuing her Ph.D. in Wireless Mesh Networks from Sathyabama Institute of Science and Technology (Deemed to be Univerisity). Her research interests include Wireless Sensor Network, Internet of Things, Data Sciences.

ISSN: 2233-7857 IJFGCN