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Study and analysis of recent multi-path routing solutions for mobile Ad Hoc networks

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Abstract
The Mobile Ad Hoc Network (MANET) is common research domain in which number of researchers shows their interest due to increasing demand and use of MANET in day to day applications. The quality of service (QoS) performance is important factor for MANET. There are significant amount of research methods already proposed for QoS improvement in MANET over different issues like routing protocol, MAC protocol, queuing etc. The routing protocol is strong component for QoS improvement in MANET. Routing plays major role in deciding the QoS performance. The single path and multi path routing protocols are two main types of routing schemes. We focused only on multi-path routing in MANET. To study on different methods presented recently on multi-path routing communications is the main goal of this paper. This paper presents comparative study of recently proposed multi-path routing protocols. As we know, MANET is nothing but self organized wireless communication network consisting of mobile nodes without any physical infrastructure. In such networks, all mobile nodes treated as routers as well as communicators. With use of multi-hop routing, MANET can be suffered for different issues like QoS provisioning, security issues etc. To address such issues, different multi path routing schemes recent designed which we discussed in this paper.

Keywords: wireless communications, MANET, QoS, multi-path, routing protocol, AOMDV

1. Introduction
The collection of mobile nodes connected by wireless links are known as Mobile ad hoc networks (MANETs). The ability to deal with the rapid changes in the network should present in Routing algorithms in MANETs. The classification of these algorithms can be done in two classes as: Table-driven or Proactive routing algorithms and On-demand or Reactive routing algorithms. In table-driven routing algorithms [1], the complete routing information of the network is continuously maintained by every node. The route is readily available, when a node needs to forward a packet. On-demand routing algorithms [1] when mobile nodes need to pass on information only look for routes. Hence, routing information cannot be exchanged periodically between these algorithms. Because of the low routing overhead, On-demand routing algorithms have been widely studied. The ad hoc on-demand distance vector (AODV) is a most known routing algorithm that belongs to this category.
MANETs give a developing innovation to regular citizen and military applications. One of the critical research territories in MANET is setting up and keeping up the specially appointed system using directing conventions. Understood source-started on request steering conventions incorporate AODV and DSR [3]. These conventions depend on the procedure of just finding legitimate courses once they are required by the source hub. This method, known as course revelation includes the course ask for stage (RREQ) and the course answer stage (RREP). These conventions develop a solitary way course between a source hub and a goal hub. At whatever point correspondence connect breaks on the dynamic course, every convention needs to conjure a course revelation process. Postponement in course disclosure and regular course revelation process can cause the execution antagonistically. The multipath on request conventions are useful to help the issue by finding numerous [3] ways in a solitary course disclosure process. The new course disclosure is required just when all courses to the goal fall flat or when there just remains a solitary way accessible. The fundamental concentration is not picking multi-way or single way, but rather how to find most extreme conceivable finish hub disjoint ways.
The portable hubs of MANET can join and leave or change their position whenever inside the system. In such sort of circumstance it might be essential for one hub to enlist different has in sending [6] a bundle to its goal because of the restricted transmission scope of remote system interfaces. Each and every hub in the system may not be in coordinate transmission scope of with different hubs and every hub in the system works as a host as well as switch by sending bundles to other portable hubs in the system. Notwithstanding the steering conventions in MANETs need to adapt to issues like the uncovered and concealed terminal issue or the use of a common medium, which can prompt edge crashes. Cases for versatile specially appointed systems are ZigBee and Bluetooth systems. The most primary element of the MANETs is the absence of a settled foundation. None of the system is to help independently or particular system usefulness, with steering topology revelation and information [6] sending being the most conspicuous case. Extra cases of capacities that can't depend on a focal administration, and which are likewise of high importance to this work, are naming administrations, affirmation experts (CA), catalog and other managerial administrations. Planning a directing convention for versatile adhoc systems relies upon different elements like portability, asset requirement, transfer speed, covered up and uncovered terminal issues and so forth.

The Mobile Adhoc Network is an array of self-representing versatile hubs which can relate with each other in remote environment. The portable hubs which are not in a similar range can chat with each other through different middle of the road hubs [12]. These hubs are adaptable, self-designed, vigorous and are a piece of a conveyed arrange. Despite the fact that directing in such a system is skillful yet it is a testing undertaking because of constrained battery based power in the portable hubs and to keep up steering we need to apply effective steering techniques.

2. Multi-Path Methods

In this section study on recent nine methods of Study and Analysis of Recent Multi-Path Routing Solutions for Mobile Ad hoc Networks. The methods studied are from 2013, 2012 and 2016.

Radwa Attial *et al*., (2009): In [1], this paper presents two directing calculations in MANETs motivated by the insect state improvement steering calculations. The rIrst calculation is a Hybrid Multi-Ant (HMAnt) steering calculation. It is a half and half since it joins receptive way foundation with proactive way upkeep. It bolsters multi-way while keeping up an adequate level of directing control overhead. The second calculation is a HMAnt with QoS arrangement (HMAnt-QoS), which fulfills QoS necessities of the approaching activity. Reenactment comes about demonstrate that HMAnt beats AODV, AntNet, and AntHocNet as far as end-to-end defer and parcel conveyance proportion, while having a direct steering control overhead. HMAnt-QoS accomplishes its objective by giving ways that certification the QoS imperatives for constant applications

X. Li *et al*., (2010): In [2], the creators consolidate the idea of trust to MANETs and assemble a basic trust model to assess, neighbor's behavior's-sending bundles. This is stretched out from the specially appointed on request separate vector (AOTDV) steering convention and the impromptu on-request multipath remove vector (AOMDV) directing convention, a trust-based responsive multipath steering convention, specially appointed on-request trusted way remove vector (AOTDV),is proposed for MANETs. This convention can find numerous circle free ways as applicants in one course disclosure. These ways are assessed by two viewpoints: bounce numbers and confide in values. This two-dimensional assessment gives an adaptable and possible way to deal with pick most brief way from the applicants that meet the prerequisites of information bundles for constancy or trust. Besides the creators give a steering case in points of interest to depict the methodology of course disclosure and the distinctions among AOTDV, AOMDV and AOTDV. The different trials have been led to think about these conventions and the outcomes demonstrate that AOTDV enhances parcel conveyance proportion and mitigates the imperative from dark opening dim gap and changes stacks.

Wahabou Abdou *et al*., (2013): In [3], this paper presents NICE-MRP, a novel multi-way steering convention for portable adhoc systems giving efficient arrangements as for physical radio-obstructions between ways. This convention finds and stores a few mixes of non-meddling multi-way courses. The best multi-way course is utilized to transmit information, though elective multi-way courses are kept to powerfully respond to course breakages because of versatility and hub disappointments. Contrasted with other surely understood conventions, NICE-MRP exhibits great qualities as far as dormancy, overhead and parcel misfortunes. Also, these outcomes end to be fairly free from the level of versatility.

Thomas Chowdhury *et al*., (2014): In [4], this paper gives another thought to find numerous hub disjoint directing ways. This broadened AODV adjusts vitality and activity stack on entire system to expand the system lifetime. Recreation comes about demonstrate that the execution of proposed Maximum Multipath AODV (MM-AODV) is vastly improved than that of existing AODV.

Salwa Othmen *et al*., (2014): In [5], in this paper, the creator propose another power and defer mindful directing convention for remote Ad Hoc arranges. The objective of our proposed directing convention is not exclusively to discover more steady ways from a source to a goal hub regarding remaining life time of battery, yet in addition to discover multi-ways that fulfill Quality of Service (QoS) prerequisites, given as far as deferral and transmission capacity.

Pratapa Reddy *et al*., (2016): In [6], this approach is an expansion work to our past work where data transmission and deferral are considered amid the steering. Here in this approach arrange gauges the lingering vitality and soundness of the connections in the system. While assessing the leftover vitality it likewise considers the getting vitality and transmitting vitality of the hub. At that point solidness of the connection LET is assessed, this LET is gotten utilizing movement parameters i.e. speed, bearing of the hubs. In view of these parameters the system chooses the way to transmit the information parcels between the hubs.

Elsa Baby *et al*., (2016): In [7], this paper proposes a crossover multi-rate multipath directing convention in view of AOMDV. The proposed directing plan utilizes SNR of a connection to distinguish its transmission rate and relegates a connection cost in view of the deliberate transmission rate. Course with less way cost (aggregate connection cost) is picked as the best way. Reproductions are completed in Qualnet. The recreation result demonstrates that the proposed directing plan performs superior to anything AOMDV as far as throughput, delay, parcel conveyance and steering overhead.

Ahmed Khalid *et al*., (2016): In [8], they propose Reliable and Efficient Multi-rate Aware Reactive (REMAR) directing convention for MANET. REMAR does not settle on directing choices in light of RSSI esteem henceforth gives more solid ways. REMAR additionally diminishes the overhead caused by intermittent hi messages in different conventions. The proposed convention responds successfully to changes in interface states in this manner making it more efficient than different conventions. Recreation comes about demonstrate that our proposed convention can expand the throughput by 157% and diminish the system delay by 44%.

Versha Matre *et al*., (2016): In [9], MANET the best research range is Quality of Service Routing, since the vast majority of the new found system administrations require Quality of Service (QoS) particular functionalities yet those can't be given by momentum steering conventions which all are QoS uninformed. Right now information steering in light of QoS is the most required space in this period. It is obligatory for higher Quality of administration, the versatile adhoc arrange needs bring down cost estimation or matric method. This strategy can adjust the nature of the most brief way arbitrarily

in light of customers QoS prerequisites and existing movement stack, this all issues can comprehended effortlessly by particularly outlining Multi-Protocol Enabled Network. This work manages execution assessment of Trust based AODV directing convention for MANET.

Dejian Wei *et al*., (2016): In [10], this paper, the creator initially propose a novel trust display, in which hubs ascertain trust an incentive as per different occasions including verifiable communications, collaborations setting elements and proposals from neighbor hubs. At that point the model is brought into AOMDV, shaping a novel trusted multipath directing convention, named as Trust-construct Ad Hoc With respect to request Multipath Distance Vector convention (TAOMDV). The TAOMDV gives an adaptable approach to choose the most limited way or various briefest ways from all confide in fulfilled ways to adjust stack. Tests demonstrate that TAOMDV enhances altogether in organize misfortune proportion and normal end-to-end inactivity.

3. Comparative Study

In this section we are presenting the tabular form analysis of methods studied in above Section of this paper with their advantages and disadvantages. After tabular (table 1) analysis, the graph of accuracy is presented.

Table 1

Paper Title	Methodology	Advantages	Disadvantages
A Hybrid Multi-path Ant QoS Routing Algorithm for MANETs.	Mobile ad hoc networks (MANETs)	Fathoms the all the more overhead and the long union time issues of the ACO calculations.	The NBR contains only the sender address which are short messages.
A Novel Approach to Find the Complete Node Disjoint Multipath in AODV.	AODV, Multipath Routing Protocol.	To lighten the problem by finding multiple paths in a single route discovery process, The multipath on demand protocols are helpful.	When all routes to the destination fail then only The new route discovery is needed.
Power and Delay-aware Multi-path Routing Protocol for Ad Hoc Networks.	SPR; MAODV; AODV	Supports to the energy module.	The disadvantage is a life time of each node in this protocol decreases when it sends or receives a packet.
Reliable and Efficient Multi-rate Aware Reactive (REMAR) Routing for IEEE 802.11 Based MANET	DSDV,AODV	The advantage is multi-rate transmission capability.	When the transmit the data that time required more time this is disadvantage.
Multipath Routing Protocol for Mobile Adhoc Networks.	Secure routing protocol, Ad-hoc networks.	All mobile nodes of the network have equal importance means that any node of the network will be work as a host or router and might communicate by transmission the data on to any node or device on the network.	The management of the network is additionally distributed to each node of the network

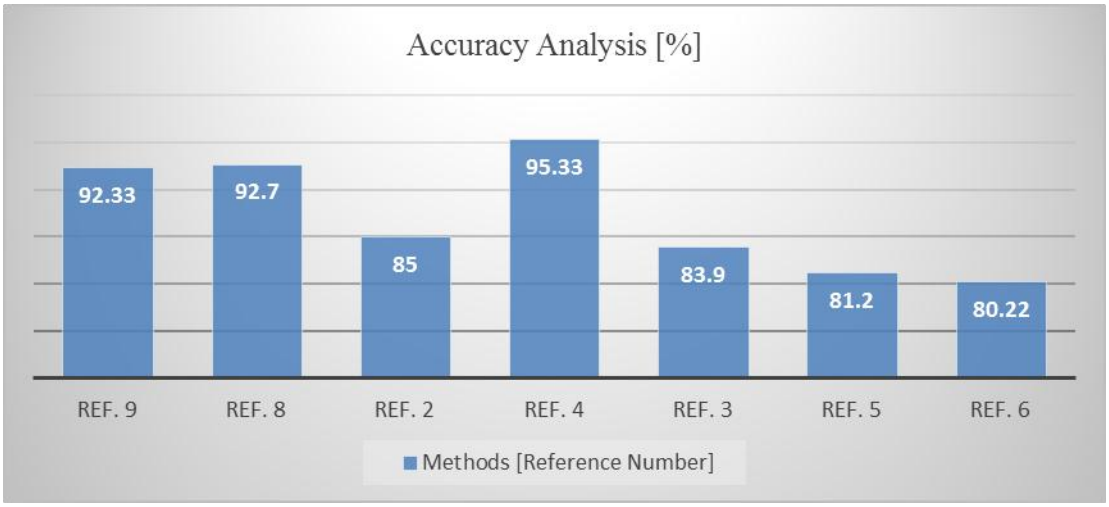

Fig 1

4. Conclusion and Future Works

The multipath steering empowers to diminish the overhead of course revelation procedure of AODV. The new approach in this paper improves the AODV by taking the advantage of exchange ways that can be gotten amid course disclosure. This multipath steering viably lessens the recurrence of course disclosure hence the idleness for finding another course is decreased when presently utilized course is broken. This paper introduces a technique for finding complete hub disjoint ways between a couple of hubs in an on-request way. Without starts another course disclosure process, the new course can be set up and the dynamic transmission can be proceeded. This approach utilizes a similar guideline of AODV convention which is all around acknowledged, yet the memory impression is expanded as the option ways are put away.

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