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EFFICIENT ENERGY CONSUMPTION IN AD HOC NETWORK USING AOMDV-FF

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Abstract:

In the mobile ad hoc network, the nodes are connected without infrastructure. In the manet, while the data transmit or receive between the nodes the energy consumption was main issue because it have a limited battery power. Ad hoc on demand multipath distance vector (AOMDV) routing protocol energy consumption optimisation via fitness function. By the AOMDV protocol, we get the all possible routes from source to destination node. The suggested technique uses the fitness function of AOMDV (FF-AOMDV). The fitness function is primarily used to reduce energy consumption in multipath routing by determining the best route from source node to destination node. The FF-AOMDV protocol's performance has been evaluated using network simulator version 2 and compared to that of the AOMDV protocol with optimised link state routing(OLSR).

Keywords: MANET, AOMDV, QoS Parameters.

Introduction:

Wireless technology is developing quickly. Our future can easily be tracked and improved thanks to wireless computer technologies. This technology is utilised to keep an eye on the weather and physical environment. The goal of mobile ad hoc networks, or MANETs, is to support effective and wireless network operation. The Internet Protocol (IP) family will be used extensively in this upcoming development. Mobile ad hoc networks (MANETs) are designed to support efficient and mobile wireless network operation by integrating routing functions into mobile nodes. The topologies of the networks' transitory, multi-hop topologies are designed in such a way that they can occasionally alter quickly. These topologies are made up of wireless links that have limited bandwidth. Ad hoc networks are crucial. In order to increase the energy efficiency of the MANET, different routing costs and path selection methods have been studied utilising such power aware routing protocols.

Over the past few years, a variety of routing protocols have been created in an effort to prolong the life of a route and, consequently, the network. The creation of multipath routing protocols is one of these. During a single route discovery process, multipath routing protocols allow the source node to select the best route from a variety of routes. Because there are backup routes already in place and in the event that one fails, this multipath routing procedure will reduce the number of route discovery processes, network lifetime, and energy usage. Several paths to the destination are learned by multipath routing protocols in order to forward packets through them. It is not required that the source always takes the best or quickest path possible. The power supply for mobile nodes is limited, so it is important to manage how much power these nodes consume in order to prolong the lifespan of the network. The problems with multipath routing technologies are numerous. Finding the best route between the sources and the destinations is one of them. When there are several mobile nodes connected to each other for data transfer, the problem gets more challenging. In this situation, searching for the shortest routes will use up the majority of the energy. The more energy is lost during data transit.

This study introduces the ad-hoc on-demand multipath distance victor with fitness function, a multipath routing protocol with low energy consumption (FF-AOMDV). The FF-AOMDV uses the fitness function as an optimisation method. In this optimisation, we look for two parameters to select the best route: one is the route's energy level, and the other is its distance. This allows us to transfer data more effectively while using less energy and extending the network lifetime. According to the simulation results, the FFAOMDV routing protocol performed better than both the ad-hoc on demand multipath distance victor (AOMDV) and the ad-hoc on demand multipath routing with life maximisation (AOMRLM) routing protocols in terms of throughput, packet delivery ratio, end-to-end delay, and energy consumption. The two most widely used protocols in this field are multipath routing with life maximizing (AOMR-LM). Using different node speeds, packet sizes, and simulation times, the comparison was assessed using performance indicators for energy consumption, throughput, packet delivery ratio, end-to-end delay, network lifetime, and routing overhead ratio.

Related Work:

A mobile ad hoc network (MANET) is made up of a number of wireless mobile nodes that spontaneously come together to establish a temporary network without the need for any centralised administration or infrastructure. Energy consumption is one of the key limitations of MANET because mobile nodes are dependent on batteries and lack a reliable power supply. Batteries quickly deplete when nodes move and switch locations often throughout a MANET. In order to highlight the energy consumption in MANET, the fitness function technique is employed in this study to lower the energy consumption of the ad hoc on demand multipath distance vector (AOMDV) routing protocol. Aqeel Taha et.,al.,[1] proposed protocol has the fitness function and is known as AOMDV (FF-AOMDV). The fitness function is used to choose the most energy-efficient path from the source node to the destination node in multipath routing. The performance of the proposed FF-AOMDV protocol was evaluated using network simulator version 2, and its results were compared to those of AOMDV and ad hoc on demand.

A mobile ad hoc network (MANET) is made up of a number of wireless nodes and only functions effectively when all of the nodes are trustworthy and work together. The primary problem that results in dishonest and noncooperative nodes is a lack of infrastructure support and resource limitations. As a result, major attacks could be launched against
MANET

A WSN node is made up of a number of components, including the radio, memory, and microcontroller, which use the most energy. Due to uncontrolled node mobility, constrained wireless device battery capacity, and limited and unpredictable shared wireless channel bandwidth, mobile ad hoc networks are characterised by dynamic topologies.Designing efficient dynamic routing techniques that use minimal overhead is one of the main difficulties in these networks. In order to reduce the hazards provided by such nodes and enhance the network's security, Abrar Omar Alkhamisi et. al. [2] proposed an adaptation of the Ad hoc On-Demand Multipath Distance Vector (AOMDV) Routing protocol called Trust-based Secured Ad hoc On-Demand Multipath Distance Vector (TS-AOMDV). The proposed TSAOMDV aims to defend against attacks like floods, black hole, and grey hole attacks in MANET by identifying and isolating these types of attacks. the incursion phase is used. It is simpler with IDS. Deskhmukh Preeti et.,al.,[3] proposed to decrease energy usage and prevent packet loss in wireless sensor networks. Hence, a protocol for communication A highly dynamic wireless network called an AOMDV, where each node can function as a router, can be created without the aid of any pre existing infrastructure. The AOMDV (Ad-hoc 0n-demand Multipath Distance Vector) routing protocol is the main topic of this work. In order to calculate various loop-free and link disjoint pathways, the AODV (Ad-hoc OnDemand Distance Vector) Routing protocol is extended with the AOMDV protocol. AOMDV was primarily created for extremely dynamic ad-hoc networks with frequent link and route failures. Although it has larger packet delays and routing overheads than AODV, it is more effective in terms of packet delivery and packet drop rates. By decreasing the frequency of route discovery operations, AOMDV lowers routing overhead.

We design an on-demand multipath distance vector protocol for mobile ad hoc networks. We explicitly suggest multipath improvements to the well-researched single path routing technique known as the ad hoc on-demand distance vector protocol (AODV). The resulting protocol is called Ad hoc on-demand multipath distance vector (AOMDV). Several loop-free and link-disjoint pathways are computed by the protocol. M.K. Marina et.,al.,[4] proposed the concept of "advertised hopcount" ensures loop independence. It is possible to achieve link-disjointness of numerous pathways by employing a specific flooding feature According to performance comparisons of AOMDV with AODV using ns-2 simulations, AOMDV is able to achieve a significant improvement in the end-to-end delay— often more than a factor of two—and is also able to minimise routing overheads by about 20%. The main idea behind AOMDV is to compute many paths while doing route discovery. It is specifically designed to be used in extremely dynamic ad hoc networks that frequently experience connection and route failures. Every time a route breaks in a network using a single path on-demand routing protocol like AODV, route discovery is necessary. There is a large overhead and latency associated with every route discovery. This inefficiency can be avoided because to the abundance of duplicated paths. Now, only when all routes to the destination become blocked is finding a new route necessary.

A collection of mobile nodes using a single wireless channel allows for the creation of mobile ad hoc networks, which are dynamic multihop wireless networks (MANET). Data is transferred through a network from a source to a destination through the process of routing. Because to the nodes' mobility as well as other factors including time varying QoS requirements, energy consumption, and resource limitations, MANET performance suffers. In wireless ad hoc networks, QoS routing is crucial for creating a path between communication end points that complies with user QoS criteria. In order to enhance QoS in MANET, Bhaskara Murthy et., al.,[5] focus on using Ant Colony Optimization (ACO) with the Optimized Link State Routing Protocol (OLSR). The network's performance is improved by the proposed routing, according to simulation data.

A collection of mobile nodes using a single wireless channel allows for the creation of mobile ad hoc networks, which are dynamic multi hop wireless networks (MANET).There are no routers, and each node acts as a data end point. both as intermediary relay points and/or routers for communication. MANET additionally supports wireless hops between nodes to connect nodes that are indirectly connected to each other. A MANET routing algorithm is required to determine the shortest path between a source and a destination and to be adaptable to node mobility and shifting environmental variables.

Mobile Ad Hoc Networks (MANETs), commonly referred to as Mesh Networks, are made up of a sizable number of mobile nodes that communicate with one another in the absence of any fixed infrastructure or centralised control. The two fundamental characteristics of MANET are its dynamic architecture and the limited battery life of mobile nodes. One of the problems that arises when a battery empties is the loss of packets and the reinitialization of route finding, which results in increased bandwidth consumption, an increase in delay, and a decline in throughput. In this research, we present a brand-new power and delay-aware routing strategy for wireless ad hoc networks. Our proposed routing protocol intends to establish more stable paths from a source to a destination node in terms of battery life remaining in addition to identifying multi-pathways that satisfy Salwa Othmen et.,al.'s[6] proposed Quality of Service (QoS) requirements, expressed in terms of delay and bandwidth.

Reducing the need for packet retransmission after the broken link by using the energy sensing routing protocol. With this project, the network lifetime is where we put the majority of our attention. The simulation findings demonstrate that the network lifetime will be increased and energy consumption will be successfully balanced as a consequence of the assessment in comparison to alternative routing protocols on the NS2 platform.

Due to their dynamic nature and resource limitations, conventional routing techniques are inefficient for MANETs. A MANET routing method must be able to adapt to the changing network by efficiently utilising the limited resources, such as bandwidth and energy. Factors as traffic density, network size, and network segmentation. It thought to function in a distributed manner as well. Three types of MANET routing algorithms are categorised: proactive, reactive, and hybrid . Always, proactive algorithms keep the routes between network node pairs current. Proactive routing methods include Optimal Link State Routing (OLSR) and Destination-Sequence Distance-Vector Routing (DSDV). When a new communication session begins or when a current communication session fails because there is no route, a reactive algorithm preserves the routing information that is strictly necessary. They create routes whenever necessary. Multimedia traffic make up the majority of all types of traffic. Several conditions are placed on MANETs by traffic. The use of multimedia applications has grown in acceptance as a means of communication information. Applications for it in the areas of advertising, product demonstrations, elearning, and tourism information are widely used wireless networks. For multimedia applications, wireless communication needs a lot of bandwidth, which is unpredictable due to network restrictions like bandwidth, delay, jitter, routing, etc. The term "mobile ad hoc network" (MANET) refers to a collection of wireless mobile nodes that voluntarily band together to form a temporary network without the need for any centralised infrastructure or management. One of the key limitations of MANET is energy consumption because mobile nodes are battery-powered and lack a reliable power source. Batteries deplete quickly in a MANET when nodes move and change locations quickly.

The proposed algorithm is known as the fitness function (FF-AOMDV). The fitness function is used to find the optimum path from source node to destination node in multipath routing in order to reduce energy consumption. The suggested FFAOMDV protocol's performance was evaluated and contrasted with that of AOMDV, one of the two most used protocols in this area, using network simulator version 2. The comparison was evaluated based on energy consumption, throughput, packet delivery ratio, average latency, and packet drop performance parameters using various node speeds, packet sizes, and simulation times. The results conclusively demonstrate that the proposed

FFAOMDV outperformed the FF-AOMDV in the majority of network performance measures and indicators. It makes use of a revolutionary intelligence optimisation technique. In essence, this topology represents the optimal network architecture. The RREQs are used to create numerous pathways in the conventional AOMDV. The energy expended on choosing the paths is not considered. In this case, the suggested protocol takes into account both residual energy and node transmission power when choosing paths to extend the network lifetime. Three stages make up the suggested system: Compute leftover energy when designing an effective network. Determine your route discovery's energy consumption. Upon failure of the selected route, the supply node may, during the event on route selection, select a different route from its routing database that reflects the shortest way with a higher energy level and minimal energy consumption.

Methodology:

While using multipath routes to send data from source to destination in the MANET. There are various issues with multipath routing solutions. One of them is determining the optimum path between the sources and the destinations. We are currently determining the optimum path with AOMDV-FF.

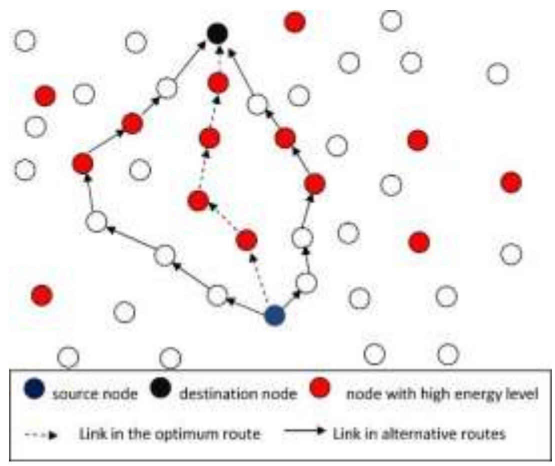

Fig 1: Optimum route in selection in FF-AOMDV

Fig 1: depicts the route from source to destination using the best possible route. The source node is indicated by the colour blue, the destination node by the colour black, and the node with the highest energy by the colour red. Dashed line shows the optimum route and darked line shows the alternative path. Our goal is to transfer the data from source to destination. We must first identify all possible routes by which the AOMDV protocol was successful. The alternative path was identified by AOMDV protocol. Based on the previous energy level, we must choose the nodes that have the highest energy among them while calculating the energy of the nodes in them. We apply the fitness function to use on high-energy nodes and available pathways. Finally, an optimal path is used to transmit the data from source to destination. The optimum path which was show by dashed line.

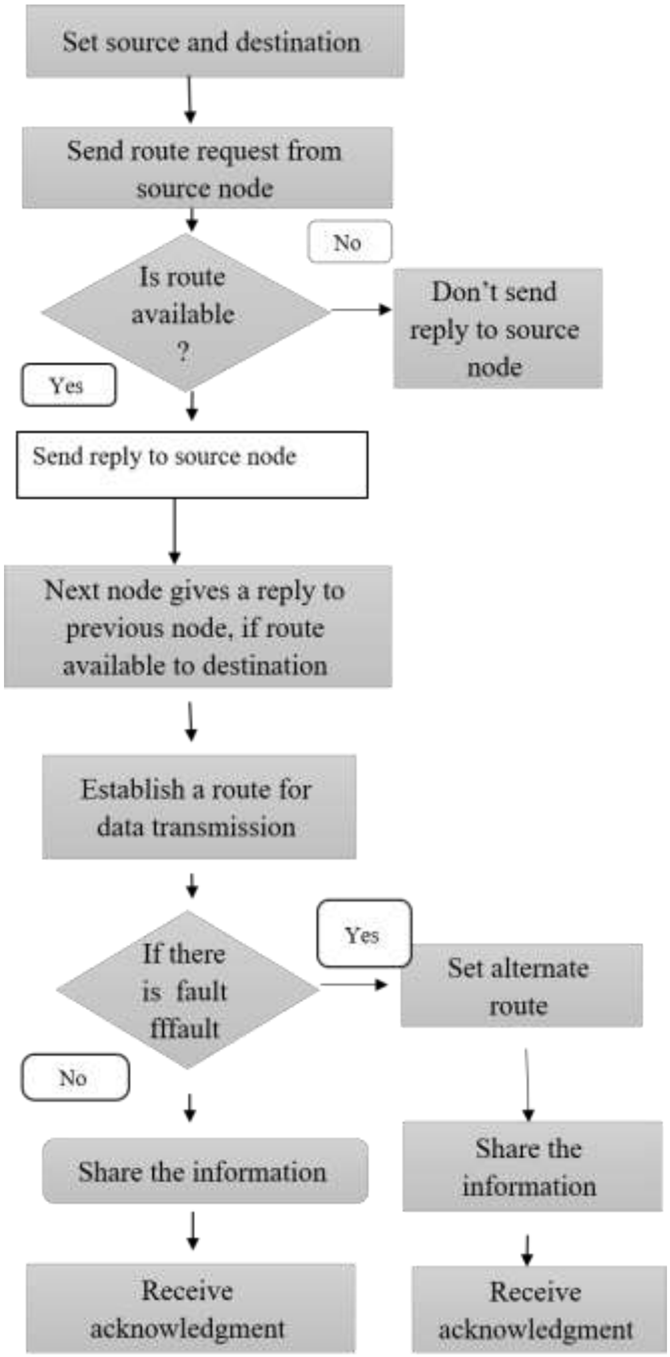

Fig 2: Flow Chart

The fig 2 depicts how the data packets transfer from source to destination node. Initially we have to set the source node and destination node. The source node sends the requests packets to the neighbour nodes. If there exist a route from neighbour node it will give the reply request packets to the source node. Source node get the reply request packets. If route isn't available the neighbour node don't send reply to source node. And now this process will continue until to reach the destination node. It seems like the next node gives a reply to source node, if route available to destination. If there is a fault exist in a path now here to set an alternate route between from source node to destination node. It all was achieved by AOMDV-FF protocol. Finally the data packets transfer from source node to destination node.

Simulation Results:

This section details how well the NS2.35-implemented AOMVD-FF protocol performs. The suggested protocol's performance is contrasted with that of the current approaches. This is a list of the different parameters that were utilised for the suggested simulation. To be able to transmit data wirelessly from source node to destination node in a mobile Ad-hoc network (MANET). Certain characteristics must be regard in order to evaluate the efficiency of MANET.

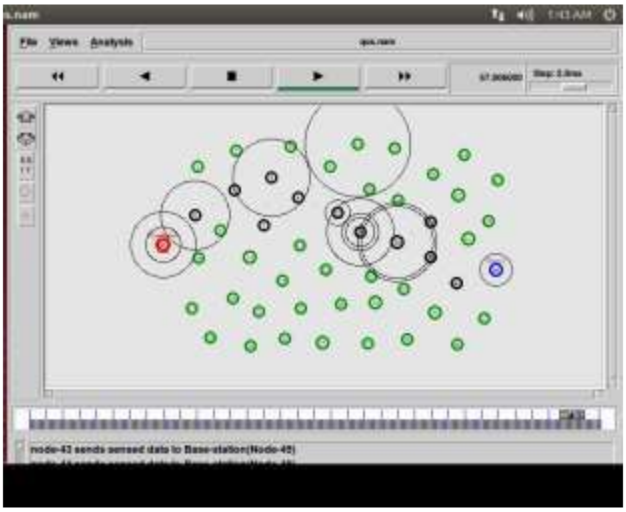

Fig 3: Transfer of Data Packets

Fig 3 shows the packetized transmission of data from source to destination. Several nodes can be seen to be participating in this data transmission process. The research uses a network coding technique that allows us to transport data without suffering any data loss. In order to assess the proposed model in terms of the following evaluation criteria, the simulation and proposed model will be used.

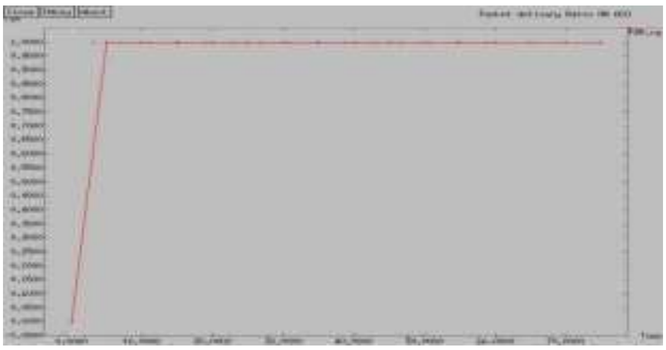

Fig 4. Packet Delivery Ratio on ACD

The packet delivery ratio of the ACD is shown in Fig 4. Time is plotted on the y-axis, and PDR is plotted on the x-axis. The ratio of total packets sent from source nodes to destination nodes that are actually

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delivered is known as the packet delivery ratio (PDR), and it is a network metric. In the ACD, the PDR value is quite close to 1.

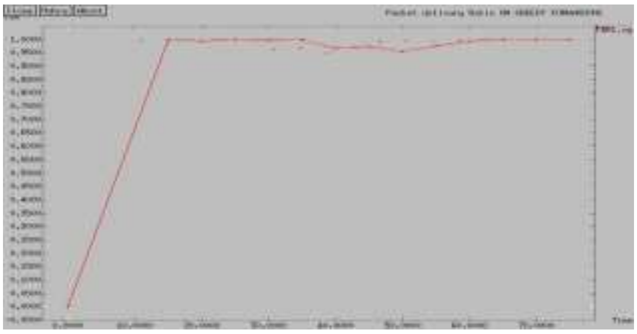

Fig 5. PDR on Greedy Forwarding

Fig 5 shows the greedy forwarding packet delivery ratio. The graph has time on the y-axis and PDR on the x-axis. To provide the shortest routing path in the greedy, routing optimization is used. The PDR value in this technique is around 1 PDR.

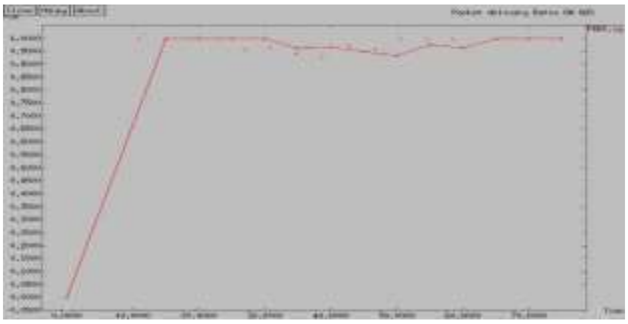

Fig 6. Packet Delivery Ratio on QOS

The QoS packet delivery ratio is shown in Fig 6. Time is on the y-axis of the graph, and PDR is on the x-axis. The packet delivery ratio that the DSR protocol generated is used in this manner. This routing gives the network's dynamic route rather than the quickest path. This approach generates a PDR value of about 1, but it cannot give the shortest path

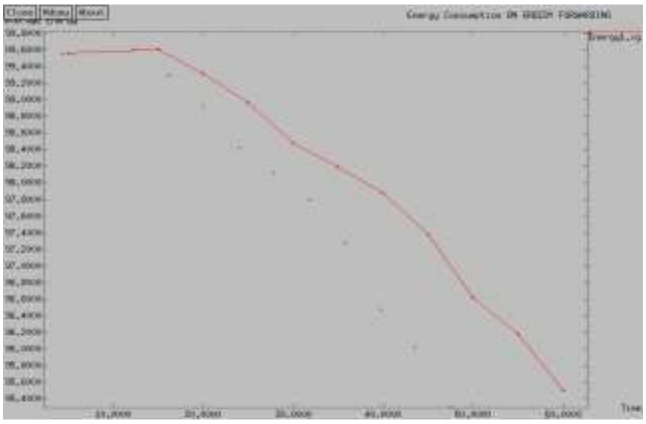

Fig 7. Energy Consumption on Greedy Forwarding

Fig 7 shows the energy usage for Greedy Forwarding. The graph shows time on the x-axis and average energy on the y-axis. One of those tactics will be demonstrated to be the most efficient way to consume energy in MANET with the aid of AOMDV-FF. The energy consumed by this technique should be less than compare to remaining techniques and it also produces the shortest path between source and destination.

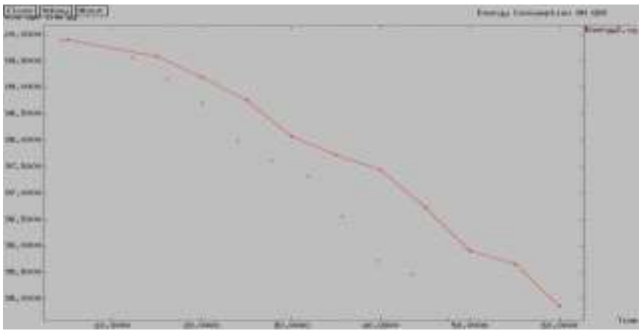

Fig 8. Energy Consumption on QOS

Fig 8 shows the energy usage for QOS. The graph has time on the x-axis and average energy on the y-axis. With the aid of DSR, one of those methods will be the less effective method of energy use in MANET. This procedure should use more energy than the other techniques combined. It generates the dynamic routes rather than the quickest path.

Conclusion:

We therefore proposed a unique energy-efficient multi-path routing method named AOMDV and used NS-2.35 to simulate three different scenarios with varying node speed, packet size, and simulation time. AOMDV performance measures were used to test these scenarios utilising five of them (Packet delivery ratio, Throughput, Average delay, Energy consumption and Packet delivery drop). The suggested AOMDV beat the original AOMDV in terms of throughput, packet delivery ratio, and average delay, according to simulation data. In terms of improved energy efficiency and extended network lifetime, it fared better than AOMDV.

In the future work, One such network resource that might be taken into account as a fitness factor is bandwidth. In this scenario, energy, distance, and bandwidth will be taken into consideration while choosing routes to the target.

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