

# A New Routing Protocol for MANET

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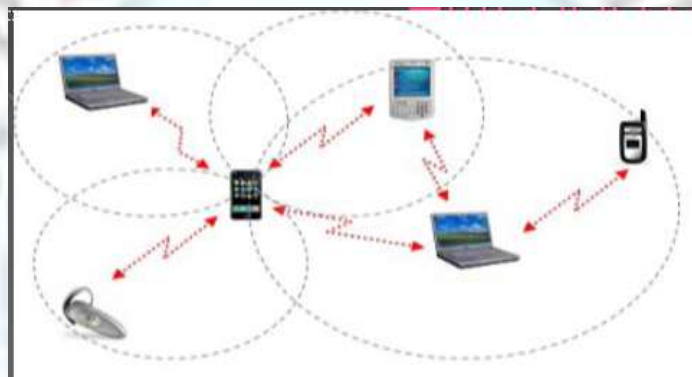
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**Abstract:** A Mobile Ad hoc Network (MANET) is a collection of mobile hosts that move in different directions and speeds without the need to maintain connectivity with existing network infrastructure. Different routing protocols have been designed since the existence of ad hoc networks. This work presented below proposes a new routing protocol for ad hoc networks which aims to reduce network overhead, power consumption, Multi-user Interference (MUI), and provide link reliability.

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## I. INTRODUCTION

An ad-hoc Wireless Local Area Network (WLAN) is a network without infrastructure connectivity where different types of hosts (nodes) exist; such as PDAs (personal digital assistants), laptops and cellular phones. These nodes are equipped with short range transmitters and receivers, and antennas which may be omnidirectional (broadcast), highly-directional (point-to-point), or a combination of the two.



As shown in this Figure an ad hoc network might consist of several home-computing devices, including laptops, cellular phones, and so on. Each node will be able to communicate directly with any other node that resides within its transmission range. For communicating with nodes that reside beyond this range, the node needs to use intermediate nodes to relay the messages hop by hop . Wireless networking protocols enable nodes to relay data packets between nodes that are distributed geographically. If the nodes are within transmission range, they can communicate directly, but if they are away from each other, intermediate nodes are required to establish a multi-hop route between source and destination. Wireless routing protocols in MANET are classified into two distinct categories, topological based, and position based.

Topological based routing protocols use the existing information about links in the network to flood (forward) packets. There are two main routing strategies classified as topological based; proactive protocols [2] that maintain routing information for each node in the network and stores this information in routing tables, such as Destination-Sequenced Distance Vector (DSDV) [3], Cluster-head Gateway Switch Routing (CGSR) [3], Wireless Routing Protocol (WRP) [4], and Optimized Link State Routing Protocol (OLSR).

The second type is reactive routing protocols which maintain route on demand, such as Ad hoc On-Demand Distance Vector (AODV) [6], Dynamic Source Routing (DSR) [7].

Position based routing protocols exploit positional information to direct flooding towards the destination in order to reduce network overhead and power consumption, Location Aided Routing Protocol (LAR) [8], GRID [9], Compass [10], and Greedy Perimeter Stateless Routing (GPSR) [11] are all examples of position based routing protocols.

This paper proposes a new routing protocol that exploits position, velocity and direction of nodes. Here, a source node initiates an imaginary line perpendicular to the line connecting the source and destination. Only nodes within the imaginary line and destination respond to route requests (RREQ) whilst nodes outside this line do not respond in order to reduce network overhead.

When node forwards RREQ, it adds to RREQ header all neighbour nodes that are covered by its transmission range, while receiving node checks the covered nodes in the received RREQ header, if some of them received RREQ, it ignores them and adjust its transmission range to cover the furthest uncovered neighbour node in order to reduce power. When two nodes move in the same direction, they can forward RREQ in order to achieve link reliability.

### **Ad hoc On-Demand Distance Vector (AODV)**

AODV [6] belongs to the class of Distance Vector routing protocols (DV). In a DV, every node knows about its neighbours and the costs incurred in order to reach them using the Bellman-Ford algorithm [12].

AODV is a reactive shortest single path wireless routing protocol based on the DSDV protocol. When a source wants to send a message to a destination address, it checks its routing table, if there is a valid route to destination, it starts sending packets immediately. If not, it broadcasts a RREQ to all neighbouring nodes (intermediate nodes). It should be noted that the RREQ contains the fields: hop count, source and destination sequence numbers, destination and source addresses, RREQ ID, and other pre-determined fields. When an intermediate node receives a RREQ, it checks its routing table for a path to the destination, if it exists, it unicasts a route reply (RREP) to the source, otherwise, it increases hop count by one, and adds its ID to the RREQ and then re-broadcasts it to its neighbours. It continues to do so until the RREQ reaches its destination. Then, the destination selects the first coming RREQ, and unicasts the RREP using the reverse path to the source node. When the source receives several RREPs, it selects the route of highest sequence number and minimum hop count, and then establishes the route and starts sending packets.

Source node uses sequence number and includes it in RREQ to guarantee loop freedom. When a node receives a control message (RREQ, RREP, or RRER), it checks its routing table for an entry to the specified destination, if there is no entry in the routing table about the destination, it creates a new one.

If there is an entry in the routing table, the route is only updated if the new sequence number is either higher than the destination the sequence numbers are equal, but the hop count plus one is smaller than the existing hop count in the routing table, or the sequence number are equal, but the hop count plus one is smaller than the existing hop count in the routing table, or the sequence number is unknown. Also the source uses a time to live (TTL) count to limit the flooding of RREQ packets and controls the overhead associated with the network

Finally, a HELLO message is broadcasted periodically to inform neighbor nodes about node existence. When an active node (a node on the active route) detects a route failure (the neighbour node is unreachable; i.e. the HELLO is not being received), it sends a route error (RERR) packet to the source address, which in turn, initiates a new RREQ.

### **ROUTING STRATEGY**

1. When a source node wants to send packet to a destination it establishes an imaginary line perpendicular to the line connecting the source and destination.
2. All nodes located within the area that is confined by the line and destination node respond to RREQ. Other nodes outside the area do not respond to RREQ.

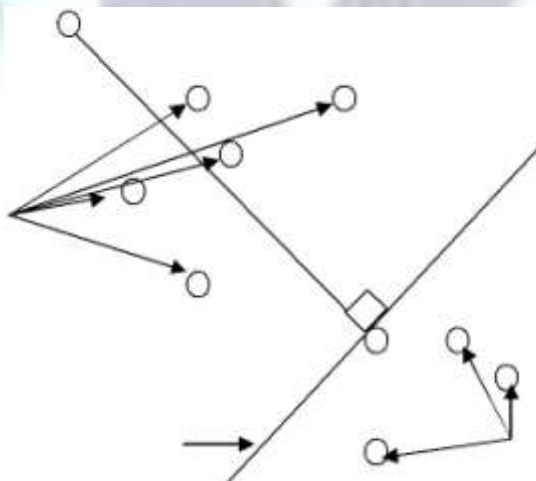


Fig. 2. Imaginary line

Source node sends RREQ including all neighbor nodes that are covered by transmission range in the RREQ header, every receiving neighbouring node checks the RREQ header to distinguish the covered nodes, if all its neighbours are included in the RREQ header, it discards the message, if some of them are not included, it measures the current

distance to sending node, velocity and direction of the previous sending node, and if both nodes (sender and receiver) move in opposite directions, the receiving node discards the message as shown in fig. 3a. If they move in the same direction, the node forwards the RREQ, as shown in fig. 3b, including all its covered neighbor nodes with maximum transmission range equal to the furthest uncovered neighbor node as shown in fig. 4. It continues to do this until RREQ reaches the destination, which replies to the first RREQ.

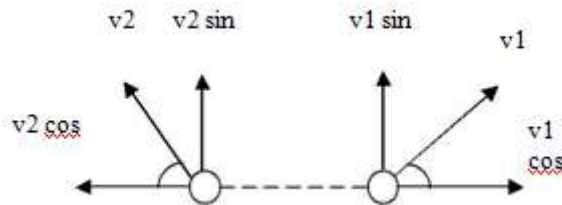


Fig. 3a: Nodes move in opposite directions

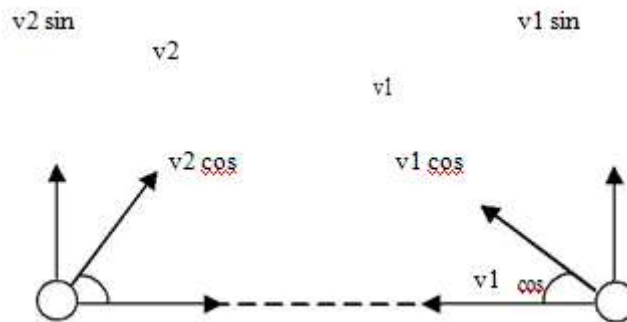


Fig. 3b: Nodes move in the same direction

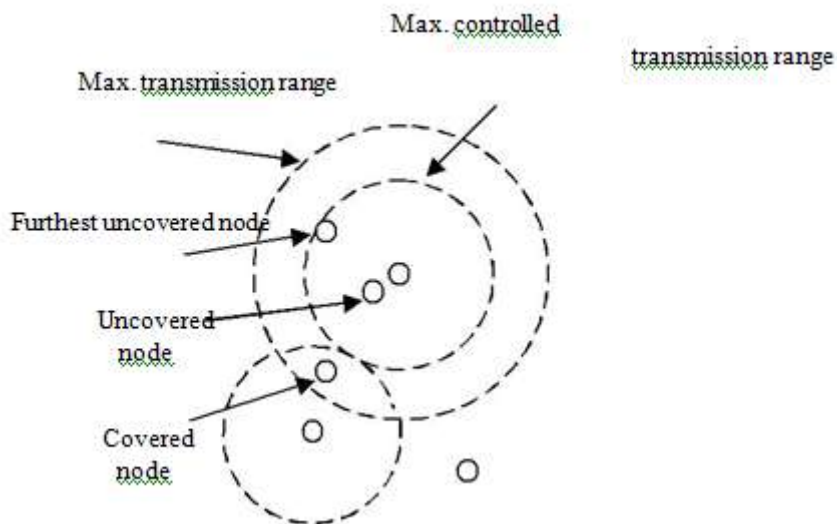


Fig. 4: Maximum transmission range

### Route Maintenance

After setting up the connection in the proposed routing protocol, the connection can be aborted by MUI noise or the movement of nodes. Here an intermediate node that detects a link failure sends a RERR to the source, and then the source node will initiate another RREQ.

## CONCLUSION

In this paper, a new routing protocol for MANET is proposed, which exploits position, velocity and directional information in order to reduce overhead, power consumption and MUI and thus increase the reliability of the route.

In the proposed protocol, only nodes located in the area between the source and the destination respond to a RREQ packet in order to limit flooding of RREQ packets, and therefore reduce the overhead and also packet interfering.

In order to decrease the number of transmitted packets and packet interference, intermediate node adjusts its transmission range to cover the furthest neighbour node which is not included in the received RREQ header.

To achieve link reliability, intermediate node forwards RREQ to its neighbour node that moves towards it as shown in fig. 2b, which means that both nodes are in their each transmission range and the link between them is maintained.

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