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BMRRP- Block Mesh Reliable Routing Protocol for Vehicular Ad hoc Networks

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Abstract: Vehicular Ad hoc networks (VANETs) are special kind of wireless adhoc networks that aim to establish communication between vehiclesand road side units. In order establish path between source and destination the intermediate nodes are used that carry data packets .However existing approaches choose nodes based on velocity, position and direction of vehicles, Due to the dynamic nature of the vanets, thenode links will not remain constant which affects reliability of network .Our proposed Block Mesh Look-up approach focuses on finding nodes with maximum stability which in turn used as co-operative nodes to improve transmission reliability, packet delivery ratioand to reduce end to end delay. Simulation and experimental results shows that block lookup approach improves the performance in terms of end-to-end delay and throughput.

***Keywords*:** VANETs, link stability,meshtopology, lookup, reliable routing

1. INTRODUCTION

VANET is an on-demand and a self-organizing wireless network. Vanets grew lot of significance in the field of intelligent transport system (ITS).In order to improve roadsafety, efficient traffic control and entertainment applications in depth research are going in the field of vehicular networks. Designing a reliable routing is a challenging issue in co-operative communication, choosing end-to-end path is crucial ,network performance degrades if path not consistent .Most existing protocols [1], [2], [3] focus on vehicle mobility, end-to-end delay and speed. Another solution [5] greedy forwarding strategy, here link state is calculated to evaluate the quality of a certain link using expected transmission count (ETX) as a metric along with vehicle mobility. It improves network throughput and avoids transmission delay. But only ETX calculation is unable to improve the network throughput because link status at any point may change. So in this paper we proposed a routing algorithm for improving network throughput and also toreduce end-to-enddelay.Finally, the BMRRP algorithm chooses best end-to-end path by selecting nodes with good link quality.

2. RELATED WORK

There have been a lot of works addressing the reliable routing issues in the VANET. In Vanets research [6],they developed a routing mechanism which takes many metrics specifically data transmission rate, vehicle mobility and end-to-end distance to improve throughput of the network. In research [7], they addresses link stability to avoid route breaks, here link stability is based on packet delivery ratios. However, link quality between source and destination is not sufficiently considered. They choose end-to-end path at the beginning of data transmission, frequent topology changes may cause link breaks between vehicles which affects throughput. Scalable hybrid routing protocol [4] have been proposed to address link failures to increase network scalability, it uses position information. It exchanges data locally when link is broken where as if neighbour vehicle not available again flooding is needed for route discovery.

However there is no proper mechanism for estimating link quality proactively. As a result, delay may occur that affects throughput. In the similar study [8] probability model based routing link exists between two nodes stay connected after a certain time intervals. It fits to certain conditioned traffic pattern. But it is not suitable for dynamic traffic environment. In this method [9], VANET is divided into small clusters with long head duration when there is a failure in an actively link, then cluster head chooses next node from the cluster table to transfer data to the destination. But here, cluster head maintains members but not member's quality i.e. it maintains list of members.

3. PROPOSED WORK

Vehicles do not move randomly they use only predefined roads possibly in two directions, normally diversions takes place at junctions of the road. Highways usually form a multilane road with large divisions and well defined in and out paths.

The vehicles are inbuilt with on-board units (OBU) which consists of communication sensors to support multihop data communication and also equipped with a GPS system that provides vehicle position to all neighbours and digital road maps which gives exact position of roads.

In this paper, we focus on selecting relay nodes with good link stability for establishing path between source and destination to avoid packet drops and reduce end-to-end delay. We assume that each node knows its position and capable of communicating with neighbour nodes by using geographic routing algorithm.

The Framework contains the following modules:

1. Block Mesh Formation.
2. Block Head selection.
3. Lookup table maintains nodes link quality.
4. Reliable routing.

4. METHODOLOGY

1) Block Mesh Formation :
Our Proposed work dynamically divides nodes into blocks and selects Block Head (BH) for each block, which has the long duration in the block. All the nodes In block communicates with each other forms mesh network topology.

2) The Block Head (BH) continuously sends hello messages to the Block Nodes (BN) which are members in the particular block. However vehicles may join or leave the block. BH maintains LOOKUP table which contains vehicle-id, velocity, direction and link status and sorts table with link status. .

3) In general whenever source wants to send data to destination, initially BH identifies nodes to forward packets based on look up table entries.

4) In our proposed work if linkfailure occurs, in short span new node is identified to takeoff, because in block all the nodes updatetheirstatus(Ready-to-Help, Failure status),to remaining nodes so that it makes easy to find alternate node without delay.

5) If problem is not resolved in between nodes, then BH tries to find out solution.soour proposed approach efficiently handles route breaks issues by adjusting routes with readily available neighbors.

External Phase:
BlockHead Look –up procedure:

```
Start:
1: Lookup procedure for the intermediate
   Nodes (IN) in the block
2: For all the neighbors NN (Max=10)
        Send Hello Packets.
3: while (1)
   {
    BH receives replies form
     Nodes
     If (Ack-time< ET)
        {
       Info is update in
"STATUS (N.id)"
        Table w.r.t to Node.
         }
Else
          {
             Drops Ack.
          }
}
End:
```

// process repeats for all the nodes in the Block until duration of node expires.

Internal Phase:
Mesh Node Look- up procedure.

Start:

1. *Initially all nodes in block acts as cooperative nodes as selected by BH.*
2. *Every node maintains list of neighbor's status information using control packet (ReadyToHelp).*
3. *If (Link breaks occurs at any node)*
   {
   Immediately data packets send to another node readily available.
   }

```
Else
  {
    BH Checks its Look Up table
to find alternate solution.
  }
End.
```

5. SIMULATION ENVIRONMENT

Table 1. Simulation parameters and range of values.

Factor	Range of Values
Simulation Area	**1.2 * 1.2 km²**
Inter vehicle distance	**20m**
No. of Vehicles	**300**
Communication range	**100-300m**

No. of vehicles in one block	**Max 8**
Vehicle speed	**10-60 mph**
Maximum hop count from BH	**4**

6. RESULTS

Simulationresults shows that our proposed approach performance enhanced when compared with existing traditional routing protocols. The chosen parameters should resemble that of heavily dense areas. In this simulation environment to support dynamic route construction based upon selecting nodes with high link stability. Graph 1 and Graph2 shows that the average route reliability between source and destination is high, less overhead, increased stability of the paths (lower rate of path breakages)and improved packet delivery ratio.

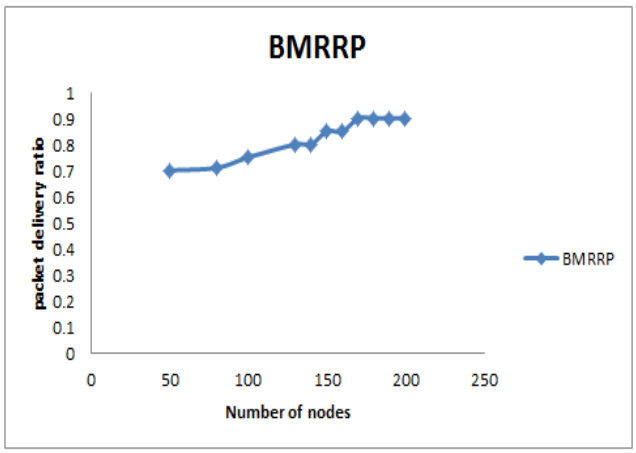

Fig 1. Packet delivery ratio

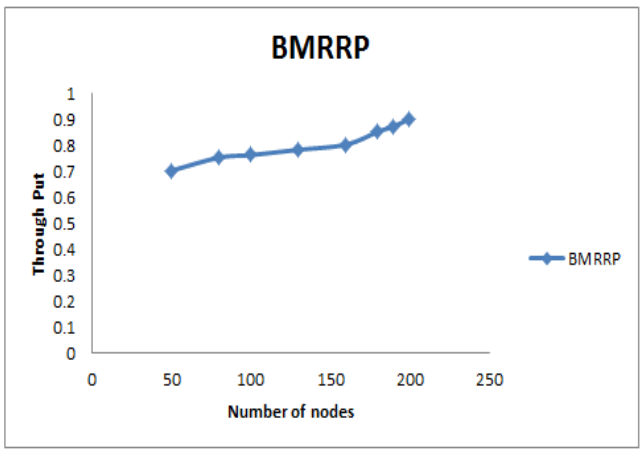

Fig 2. Throughput

7. CONCLUSION

In this paper we proposed reliable routing protocol which improves performance of IVC and RVC communication. The key idea behind proposed scheme is to group vehicles as blocks. Link stability is ensured by BH by providing nodes with high stability and also reduces end to end delay due toblockmesh configuration of nodes. Finally, simulation results shows the benefits in terms of parameters such as high throughput, link stability and less control overheadwhile route reconstruction.

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