



Delay Optimization in VANET Using ant Colony Optimization and WIMAX

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Abstract: *The mobile ad hoc network is the network in which mobile nodes move freely in the environment and when these nodes are combined together, they form a network. The VANET is the type of MANET. In VANET, the smart cars can move freely in the City area. Vehicular to vehicular and Vehicular to infrastructure communication is possible. The intelligent vehicles are been defined respective to distance, direction and speed analysis. If some accident occurs over the network, the neighbor node sent information to other nodes, so the information sent to the entire infrastructure that is connected to that system. In it, the road side has servers that are attached further to main servers. The entire vehicle communicates with the help of radio waves after the collision neighbor node sent information to servers. All the servers are connected with Wimax that update and replicate the information in few seconds. This information replicate all the servers to all the vehicles, so all the vehicles change their path flow in another direction for going from source to destination. In this paper, a bio inspired V2V communication approach is been suggested to identify the safe path over the network.*

Keywords: - WIMAX, Ant Colony, VANET, MANET, REPLICATION

1. Introduction

Vehicular ad-hoc network are wireless networks where all the vehicles moves from the nodes of the network. It is for the driver comfort and road safety, the inter-vehicle communication provide them. Vehicular ad-hoc network is subclass of mobile ad hoc networks which provides a distinguished approach for intelligent transportation systems. It is very necessary for all the vehicles. Vehicular ad hoc network is special form of MANET which is vehicle to vehicle roadside wireless communication network. It is autonomous and self-organizing wireless communication network, where all the nodes in VANET involve themselves as servers or client for exchanging and sharing information. The today's era used Wi-Fi IEEE 802.11 based technology which is very commonly used for deploying VANETs. All the vehicles are connected with the wireless network interface that can use either 802.11b or 802.11g standards for access media. These standards are general purpose standards and they do not fit properly the requirements of high dynamic network such as VANETs. This scenario currently describes the DSRC (Dedicated short-range communication) has been proposed as the communication standard for VANET and it is used in those platforms where short medium range communication service offered at very low latency and high data rate. IEEE 802.11 standard implies that vehicles communicate with in limited range while moving. These kinds of networks are very optimal configuration protocols in order to increase the effective data packet exchange, and reduce the transmission time and network usage [8].

The Literature Review is written in section 2. ANT COLONY optimization and WIMAX is discussed in section 3. In Section 4 New proposed technique is discussed. In the section 5, experimental results are discussed. In section 6, performance is evaluated and in the last section 7, conclusion and future work is illustrated.

2. Related Work

Cristina Rico Garcia(2006) and et al.[1] A reliable MAC protocol for broadcast VANET is an approach based on efficient design and reliable broadcast MAC layers for wireless mobile ad-hoc networks (MANET) at especially allowed high user speeds is a current challenge. Despite the absence of infrastructure, it would permit channel allocation, awareness techniques by allowing a certain channel assignment. In this paper, the MAC layer protocol is designed for broadcasting MANETs called COMB cell based orientation- aware MANET Broadcast. The technique of COMB allows the realization of collision free transmission supports high speed and requires handshake. COMB is based on the localization aware cross layer dimensioned CDMA cell and it use the SOTDMA protocol as intra cell scheme. Jason J. Haas(2007) and et al.[2] Real-World VANET security Protocol Performance represents security of VANET based on the performance measurements obtained from simulations of the (VANETs) vehicular ad-hoc networks. These simulations use as input traces of vehicle movements that have been generated by traffic simulators which is based on the traffic model theory. This paper mainly works based on the actual large scale recordings of vehicle movements. To our knowledge, no one has published any work on actual large scale recording of vehicle movements. In order to enable analysis on this scale, we have developed a new VANET simulator which handles more vehicle than ns2. Amour med tahar(2007) and et al.[3] AODV Extension using multi point relay for high performance routing in VANETs is an approach on VANET vehicular ad-hoc network where vehicles like car, bus, truck can assume as nodes of the network. Recently for driver comfort and road safety, the inter-vehicle communication became increasing a subject of much

scientific research. VANETs routing protocol have a great consequence where AODV is one of the most popular routing protocol dedicated to ad-hoc network that can use the flooding techniques for locating the destinations and possibly cause an overhead in the network. To overcome this problem, multi point relay algorithm in the AODV protocol is used in order to reduce the number of messages transmitted during the flooding techniques.

M.S.Kakkasageri(2007) and et al.[4] Agent based Multicast routing in MANETs is a type of routing on mobile ad-hoc network that define the several challenges due to integral characteristics of the network for example node mobility, reliability and their rare resources etc. In this paper, the agent based multicast routing scheme in the (MANETs) is defined. It can use the static and mobile agents. Different scheme operates in different sequences like identifying the reliable nodes and made connection between the reliable nodes. Construct a backbone for multicasting using the reliable nodes and intermediate nodes. There are so many cluster members that join to the backbone network. Five types of agents are used in the scheme route manger agent, network initiation agent, network management agent, multicast initiation agent and multicast management agent.

Neeraj Rajgure (2009) and et al. [5] VANET Routing on City Roads using Real-Time Vehicular Traffic Information. The proposed method is based on class of routing protocols called road-based using vehicular traffic routing (RBVT) routing in city based vehicular ad-hoc networks which supplies real time vehicular-traffic information to create road-based paths consisting of road intersections. Geographical forwarding is used to transfer packets between intersections on the path by reducing the sensitivity of paths to movements of individual nodes. So, the forwarding using a distributed receiver-based election of next hops based on multi criterion prioritization function to take non uniform radio propagation is optimized for dense networks with high contention.

Rakesh Kumar (2011) and et al. [6] A Comparative study of various routing protocols in VANET is subclass of mobile ad-hoc network which provide a distinguished approach for intelligent transportation systems (ITS). According to the survey, it is very necessary to use the IT'S with the help of VANET routing protocol. In paper, we will also discuss the advantages, disadvantages and applications of different routing protocols for vehicular ad-hoc networks. This paper also explores the motivation behind the designed and traces the evolution of this routing protocol. At last, this paper also shows the tabular comparison with various routing protocols for VANET.

Rakesh Kumar (2012) and et al. [7] A Review of various data dissemination protocols in VANET. Vehicular ad-hoc networks are upcoming wireless network environment for intelligent transportation system. In the VANET, applications build upon the data push communication model where information is propagated to set of vehicles. There are so many types of VANET applications and their communication protocol needs a systematic literature survey. In this paper, the VANET applications based on the various broadcasting data dissemination protocols are mainly defined, surveyed separately and their fundamental characteristics are revealed and various routing protocols are also compared.

Jamal Toutouh (2012) and et al. [8] Intelligent OLSR Routing Protocol Optimization for VANETs is based on advanced technologies that gave rise to the emergence of vehicular ad hoc networks (VANETs). This type of scenarios has limited coverage of Wi-Fi and high mobility of nodes generated frequent topology with the changes and fragmentations. For this reason, there is no central manager entity, routing packets through the network is challenging task. Therefore, efficient routing strategy is important to deploy VANETs. This work deals with optimal parameter setting the OLSR a well known mobile ad-hoc network routing protocol by defining an optimization problem.

3. ANT COLONY OPTIMIZATION and WIMAX

Ant communication is accomplished primarily through chemical called pheromones. Ants communicate to one another by laying down pheromones along with their tail. Other ants receive the presence of pheromone and tend to follow path where the pheromones concentration is higher. Pheromone trail starts to evaporate, then reducing its attractive strength. The more time the pheromones have to evaporate. Ant follows that path which are shorter and the pheromone density remain high as it lay on the path as fast as it can evaporate [3].

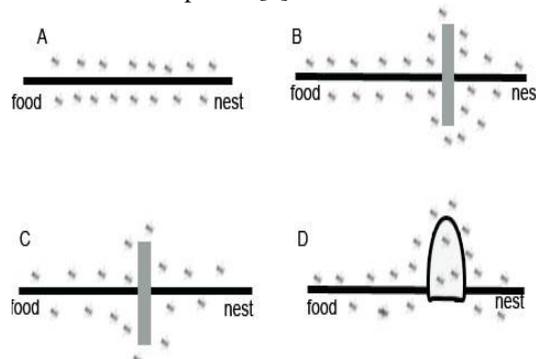


Figure 1: Ant behavior

In the figure a, ants in the pheromone trail between nest and food; on other side in figure B, an obstacle interrupts the trail; as it is same. Side C ants find two paths to go around the obstacle; as compared to other sides. In D figure, new pheromone trail is formed along the shorter path. Pheromone evaporation has also advantage of avoiding the convergence to locally optimal solution. If there was no evaporation at all, the path chosen by the first ants would tend to be excessively attractive to the following ones. Ant find a good path from food to destination and other ants follow that

path and positive feedback eventually leaves all the ants following a single path. ACO is basically the optimization approach that is speed up the algorithmic process. In the wireless network, the ACO is basically used to optimize the communication process. This approach is used in the nodes to find the optimized path over the network. Ant places the pheromones on the located path, so all other nodes can follow these pheromones to communicate on this optimized path. Wi-Max is a wireless system that is designed for metropolitan area. Therefore, the wi-max supports non-LOS channel, pedestrian mobility and high data rate. The core technique of wi-max is based on the IEEE802.16 family standard. Wi-max offered a metropolitan wide coverage. With the help of local hotspot, it receives the Wi-max signal convert into the Wi-Fi protocol because it is compatible with most the existing wireless devices. The institute of electrical and electronics which sets networking standards such as Ethernet 802.3 and wi-fi 802.11 has published standards. Wi-Max is based on RF technology called orthogonal frequency division multiplexing which is very effective means of transferring data when carries width of 5MHz or greater can be used. Below 5MHz carrier width, current CDMA based 3G systems are compatible to OFDM in terms of performance. Wi-Max is standard-based wireless technology that provides high throughput broadband connection over long distance, hotspots and high speed connectivity for business customers [6].

4. The Proposed Technique

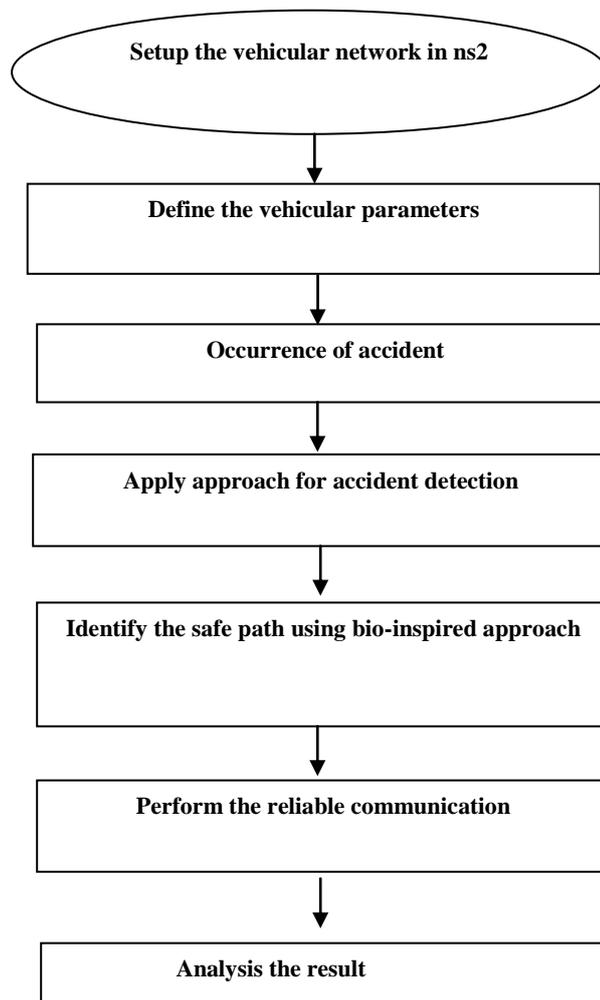


Figure 2: Data flow diagram

In this proposed work we have defined the network with a new intelligent algorithm to perform the vehicle to vehicle communication. Each vehicle can pass the information to other regarding the path, speed etc. This information also includes the accident status also. In this proposed work, as a vehicle get some collisions it will inform to the follower vehicles about its status so that they can perform the decision regarding the route change at earlier stage. The intelligent bio inspired algorithm is suggested in this work to identify the new route.

5. Experimental Results

To evaluate the performance of our approach, a series of experiments were conducted. We carried out these experiments by implementing proposed ant colony optimization and wimax in network simulator 2. It defines the structure & vehicles of the road. Around the road, define the RSU (road side unit) which sent information and between the vehicles on road side, vehicle to vehicle work them.

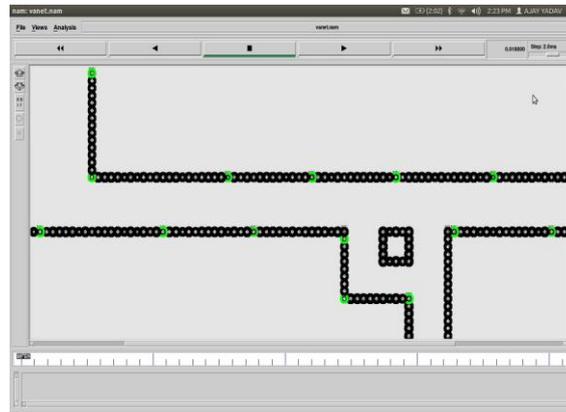


Figure 3: Defines RSU

In this scenario all the vehicles are moving on the road and are shown in the blue color.

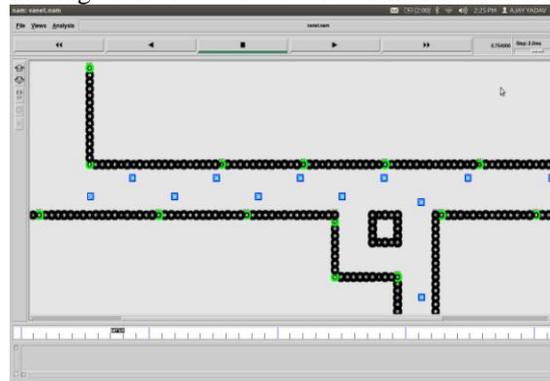


Figure 4: Vehicles moving on road

In the simulation of scenario, when accident happens on the road between two vehicles.

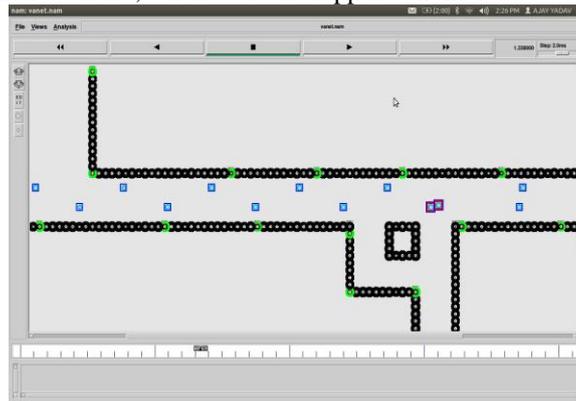


Figure 5: Occurrence of Accident

In this scenario, when accident happens, all the vehicles jam on the road and wait for path.

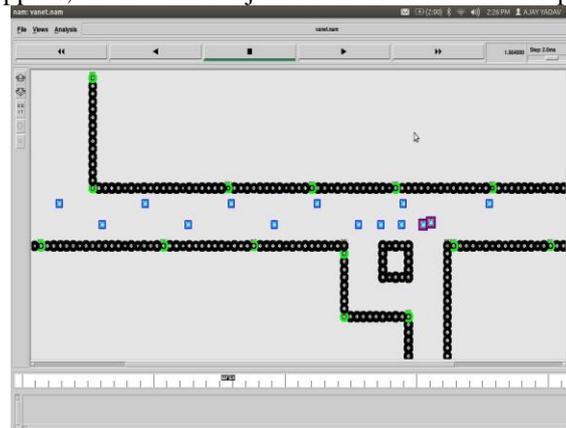


Figure 6: Jamming of vehicles on road

In this scenario, one more vehicle collides between the accidental vehicles.

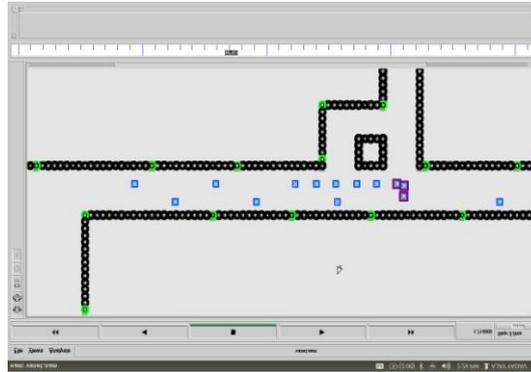


Figure 7: Collision of one more vehicle between accidental vehicles

In this scenario, flooding and time delay occurs between the vehicles and generates the new path using AODV.

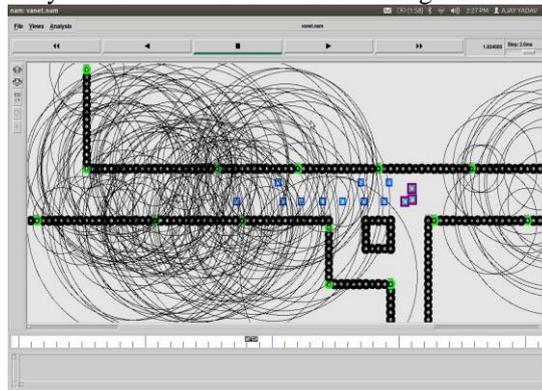


Figure 8: Flooding and time delay between vehicles

6. Performance Evaluation

In this research proposal, the comparison of graph shows that in the 1st scenario, delay in the network is more & congestion in the network also happened. On the other hand, there is no jamming in the network & delay is totally decreased between vehicles in case 2.

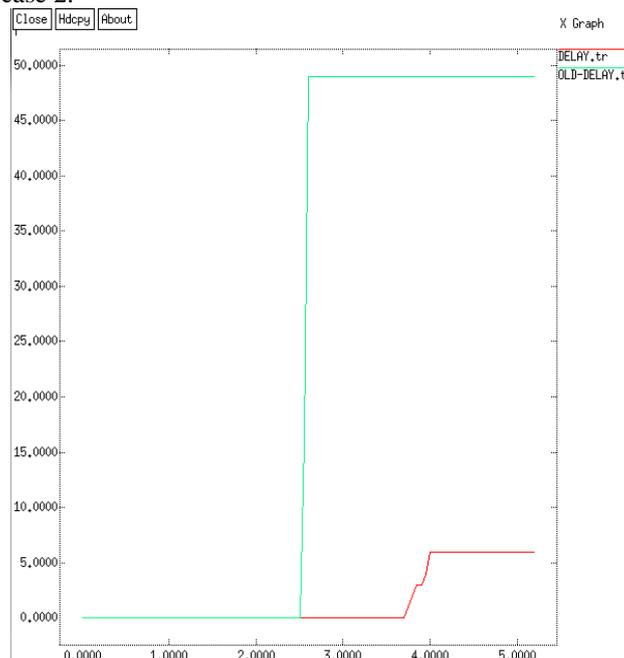


Figure 9: Comparative analysis of delay using ant colony optimization and Wimax

7. Conclusion

In this paper we conclude that the ant colony optimization is efficient approach for VANET. The accident information should be flooded in the city roads as soon as possible. The accident information is exchanged between the road side sensors using WIMAX. The simulation results shows that proposed technique is more efficient than the previous techniques.

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