

# Collision Avoidance Techniques in VANET: A Review

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## ABSTRACT

A vehicular adhoc arrange (VANET) is a versatile adhoc organize in which moving street vehicles are arrange hubs. Crash evasion framework is one of the extremely famous frameworks in VANET that dodges from chain crashes. Point - This paper investigates the different crash evasion strategies focused at VANETs. Strategy - The crash evasion (CA) framework recovers the vehicle data and activity information amid any crisis situation and communicate the alarm messages to the vehicles for throttle control to maintain a strategic distance from backside impacts. Results - This review shows the scientific categorization of the different procedures connected to understand the issues of impacts and distinguishes new headings and ongoing patterns in the structure of the methodologies. The CA framework is equipped for scattering the most recent street data all the more regularly to the drivers when the VANET application is in the basic range. In view of the sort of the vehicle, driver's response and nation district, the speed of the vehicle and the rate of deceleration fluctuate. End - This examination is more extensive and sensible in this way concentrating on various methods of impact evasion in Vehicular adhoc arrange.

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## 1. Introduction

Vehicular adhoc network is one of the interesting areas which use moving cars as nodes to create a mobile network. It turns each and every participating vehicle into a wireless router that is 100-300 meters around approximately. If any vehicle drop out of the network or fall out of the range of the signal, other vehicle can join in to create a network by connecting vehicles to one another (Wikipedia 2012). One of the important applications of VANET is Emergency messaging. Through direction transmission, emergency messages can be received by the drivers immediately to take appropriate actions to unsafe situations.

For instance, the vehicles can decelerate near the collision zone or cease before getting collided with the antecedent vehicle or taking a diversion, lanes can be changed. VANET provides traffic safety and supports intelligent inter vehicle communication and it is emerged as a platform to enhance the performance. To achieve the ease of travel and safety, VANET is one of the most promising aspects. For effective remote monitoring and control, a comprehensive and composite system is needed. (J.K.R Sastry et.al 2016)

The Vanet architecture consists of Application protocol layer, External information and management, data, multi-hop and single-hop message dissemination and information connector.

The VANET network comprises Road Side Units (RSUs) which are fixed over the network, On Board Units (OBUs) embedded in vehicles that communicate either with other and Trusted Authority (TA) that provides certificates and distributing secret keys to all OBUs in the network.

The characteristics of Vanet includes high dynamic topology, frequent disconnected network, mobility modeling and

prediction, communication environment, unlimited transmission power, Hard delay constraints, Interaction with onboard sensors, higher computational capability, rapidly changing network topology, potentially unbounded network size, anonymous addressee, Time-sensitive data exchange, potential support from Infrastructure, Abundant resources, better physical protection, partitioned network.

## 2. Literature Review

In VANET research, there has been prominent increase in interests over the last two years. In that collision avoidance is one of unique emerging technology. One of the well-known applications is intelligent transportation system which helps to observe the traffic signals and improves the efficiency of driving by avoiding collisions. In this section, different approaches for inter-vehicle collision avoidance have been presented.

Sok-Ian Sou (2013) utilized the braking model, the dichotomized headway model and Greenberg's logarithmic model to generate vehicular mobility traces for analysis. When a sudden event occurs, the author obtained the probability of rear-end collision between the vehicles which moves in the same road. Using this approach a vehicle collision can be avoided by minimizing the reaction time of drivers. A driver gets more time to respond to hazards when he/she gets early warning message. Lung-Chih Tung, Jorge Mena Mario Gerla (2013) emphasized a cluster based architecture which uses Wi-Fi and LTE channels to transmit Cooperative Awareness Messages (CAMs). For cluster formation, Wi-Fi peer to peer channels are used and for transmitting CAMs, LTE channels are used. The authors have proposed clustering algorithm for intersection collision avoidance and channel allocation algorithm to reduce interference between various clusters in Wi-Fi Channels.

The work by Michael R. Hafner et al. (2013) implements decentralized algorithms for inter-vehicle collision avoidance at intersections. For a collision free system, they applied formal control theoretic methods. A capture set is determined to identify a brake control map for the vehicles. When the system configuration attains the boundary conditions of the capture set, the brake inputs are applied by the control map. The proposed approach guarantees that the system remains collision free and unless or until necessary the automatic control will not be applied. Tarik Taleb, Abderrahim Benslimane and Khaled Ben Letaief, (2010) introduced co-operative collision avoidance (CCA) scheme for intelligent transportation systems. This scheme avoids flooding by organizing the target vehicles as clusters. Also a risk aware medium access control (MAC) protocol is designed to increase the efficiency of the CCA scheme. For clustering, vehicles move in the same road in the same direction is considered. Clusters have been categorized as multiple clusters, independent cluster heads and different sub cluster heads. In this scheme, emergency level is defined for each vehicle and warning message latency is calculated which is inversely proportional to emergency level. Once an

emergency situation is detected, warning messages are disseminated in relatively short latencies.

### 3. Conclusion

The communication of emergency messaging system deals with cluster based organization of vehicles, trajectory planes predictions, warning messages, collision probability estimation, capture set and vehicle information. The Dichotomized headway model gives better results in smaller regions. But for larger areas it gives low end-to-end delay. So cluster based architecture provides solution for this end to end delay but there is a chance of accident within a cluster if the driver does not react quickly. So it can be combined with MarkovHistory based model for better result but again no action is taken to maintain the Quality of service of the warning messages. The joint adaptation of transmission power and contention window (CW) size avoids the adverse effects of high transmission power and also it increases the duration of the communication link in case of low traffic density for inter-vehicle communication. QOS is also maintained and hence the messages are forwarded without fail and the vehicles will not get the same messages repeatedly.

### References

1. A. Bharath and P.T. Sivagurunathan, "Collision Avoidance System in Vehicular Adhoc Network Utilizing Dichotomized Headway Model", International Conference on Circuit, Power and Computing Technologies [ICCPCT], 2014
2. Carolina Garcia-Costa, Esteban Egea-Lopez, and Joan Garcia-Haro, "A Stochastic Approach for Vehicle Safety Modeling in a Platoon of Vehicles Equipped with Vehicular Communications", 15th International Conference on Transparent Optical Networks [ICTON], 2013.
3. Danda B. Rawat, Dimitrie C. Popescu, Gongjun Yan, Stephan Olariu, "Enhancing VANET Performance by Joint Adaptation of Transmission Power and Contention Window Size", IEEE Transactions on Parallel and Distributed Systems, 2011.
4. Garcia-Costa, C., Egea-Lopez, E., Garcia-Haro, J., "A Stochastic Model for Design and Evaluation of Chain Collision Avoidance applications", Transportation Research Part C: Emerging Technologies, vol. 30, pp. 126-142, May 2013..
5. Garcia-Costa, C., Egea-Lopez, E., Tomas-Gabarron, J.B., Garcia-Haro, J., Haas, Z.J., "A stochastic model for chain collisions of vehicles equipped with vehicular communications", IEEE Transactions on Intelligent Transportation Systems, vol. 13, no. 2, pp. 503-518, June 2012.
6. Lung-Chih Tung, Jorge Mena Mario Gerla and Christoph Sommer, "A Cluster based Architecture for Intersection Collision Avoidance Using Heterogenous Networks", 12th Annual Mediterranean Ad Hoc Networking Workshop (MED-HOC-NET), 2013.
7. Michael R. Hafner, Drew Cunningham, Lorenzo Caminiti, and Domitilla Del Vecchio, "Cooperative Collision Avoidance at Intersections: Algorithms and Experiments", IEEE Transactions on Intelligent Transportation Systems, Volume 14, Issue: 3, pp 1162 – 1175, April 2013.
8. Neha S. Patel and Shweta Singh, "A Survey on Techniques for Collision Prevention in VANET", IEEE WiSPNET, 2016.
9. Sok-Ian Sou, "Modeling Emergency Messaging for Car Accident over Dichotomized Headway Model in Vehicular Ad-hoc Networks", IEEE Transactions On Intelligent Transportation Systems, Vol. 14, No. 3, September 2013
10. Stefan Joerer, Bastian Bloessl, Renato Lo Cigno, Christoph Sommer, "A Vehicular Networking Perspective on Estimating Vehicle Collision Probability at Intersections", IEEE Transactions on Vehicular Technology, Vol. 63, No. 4, May 2014