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Enhancement in Cooperative Positioning Using Ad-Hoc on Demand Vector Protocol in Vehicular Ad-Hoc Network

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***Abstract**: In a city environment, the routing protocol is designed for VANET. Obtaining not only shortest path but the most efficient path for a packet to reach its destination is the main goal in VANET. Packets are routed through the fastest path rather than the shortest path. Fastest path is considered as the shortest time for a packet to reach destination irrespective distance. While shortest path is the path that adopted by routing protocol to a network condition and performs routing accordingly. VANET are transported system which consists real-time vehicle safety estimated traffic condition on real-time dense vehicle network. A number of safety models in vehicle applications such as collision avoidance, lane management, and emergency braking assistance system fully depends on accurate and reliable knowledge of vehicles positioning their one-hop node area. In this paper presents, the performance of evaluation of Ad-Hoc On Demand Vector Routing (AODV) protocol in terms of energy consumption, packet delivery ratio, average end-to-end delay, packet loss. In our approach, we propose the VBFR algorithm to improve the performance of the cooperative positioning. In AODV, the node inside each hop is allowed to communicate themselves and RSU to reach their destination node. This system considers each vehicle get to communicate with nearest node and RSU to transmit or receive a message like an emergency or update their position and send RREQ to them and wait for RREP after selecting a one-hop node in the forward direction.*

Keywords: RSSI(Receiving Signal Strength Indicator), RSU(Road Side Unit), RREQ (Route Request), RREP (Route Reply), VANET, AODV, CP, CAM (Collision Avoidance Messages), ITS (Intelligent Transportation System).

I.INTRODUCTION

Vehicular Ad-Hoc Network (VANET) is one type of Mobile Ad-Hoc Network (MANET). Mobile Ad-Hoc Networks (MANETs) generally do not depend on fixed infrastructure for communication of information. VANETs uses the same principle and apply it to the high mobility environment of surface transportation. VANET are developing new technologies integrating abilities of new generation wireless network of vehicles. VANETs provide global connectivity on the road and traveling users. This technology used for avoiding vehicles accidents, a dangerous alert about any movement in vehicles on road. Intelligent Transportation System (ITS) is main application of VANET. ITS includes applications such as collision avoidance, Road hazard warning, blind crossing. Another important application of VANET is mobile vehicular node can be connected to the outer environment means driver able to download music, send emails. VANET produce two types of communication. First is a vehicle to vehicle communication (V2V), and second is communication between vehicle and roadside infrastructure such as Road Side Unit (RSU).

RELATED WORK

There are many methods in proposed by J. Yao, A. Balaei, M. Hussan, N.Alam[2], for vehicular positioning system which consists range-independent cooperative positioning (CP), examples Real-time kinematic (RTK), a satellite-based augmentation (SBAS), Assisted Global Positioning system (A-GPS), Differential global positioning system (DGPS) and a ground-based augmentation system(GBAS). Above all technique consists communication between fixed or moving reference nodes with non-position of vehicles. Reference nodes provide augmentation information like the one measured common positioning error near the location. A vehicle by augmentation information improves their position estimate with respect to the reference node. Therefore, this range independent CP majorly depends on infrastructure like Road Side Unit (RSU). These techniques commonly required GPS signal quality such as low multipath error, at least 4-5 GPS satellite that is not possible in dense metropolitan areas. In other technique, mitigating GPS errors using Kalman filter which fuses GPS signal and RSSI. However, accuracy provided by this technique is not much higher to control robust crash condition and various vehicular applications.

Drawil and Basir [3] proposed a distributed CP method that reduces the multipath effects to the GPS positioning accuracy. In this method vehicle, send request RREQ to its neighboring node to achieve proper ranging information. Neighboring node acknowledges the message send RREP along with GPS positioning reading to estimate the distance between the neighbours. Thus, distance estimation was done using GPS data. Therefore, there are uncertainties, which cause the error in the view of safety application instantaneous acquisition of position of surrounding vehicles is very important in fast moving VANET environment. A message like cooperation collision warning (CCW) transmitted. If an accident or any serious condition occurred ahead, CCW and RREQ transmitted to alert the neighbouring vehicles to warn the driver to apply brakes or change the lane.

G.M. Hoang, B. Denis, J. H¨arri, D. T.M. Slock [10]proposed the problem of V2V overhead and channel congestion inherent to particle-based CP in GPS-aided VANETs. On the one hand, results show that a significant amount of the CAM payloads could already be saved under standard protocol constraints (i.e., under normal transmission rates and packet sizes) through parametric messages approximation. This comes with almost no accuracy degradation in comparison with impractical solutions that would explicitly send each particles cloud to neighbouring cars. Simulations also show that unimodal Gaussian approximations of the local estimates probability densities are fairly sufficient to achieve the required localization accuracy with much lower computational complexity while being still robust to occasional geometric ambiguities caused by sparse VANET connectivity. On the other hand, on top of message approximation, the jointly adaptive transmission payload, rate, and power control maintain the continuity of high-precision location service in channel congestion while reducing significantly communication traffic as well as computation load in congestion-free conditions without trading much accuracy.

PROBLEM DEFINITION

Geo localization of vehicle is the significant demand of cooperative intelligent transport system (C-ITS). C-ITS includes GPS or GNSS in which vehicular location in the range of 3-10m can be used for suitable applications like Road Hazard Warning(RHW), Vulnerable Road Users(VRU), dangerous driving or rash driving, Lane management. These applications required an accurate position in the range of less than 0.5m. The range of GPS or GNSS is limited. In this project use the AD-HOC On Demand Vector Routing (AODV) system in VANET.

EXISTING SYSTEM

An existing system based on Receiving signal strength indicator (RSSI). Cooperative positioning (CP) may be improved by a cooperative vehicular system that is created using Roadside units (RSUs). RSU are called as static anchors and virtual anchors such as vehicles nearby the reference vehicle. All vehicles transmitted CAMs periodically and receive GNSS data i.e., use to measure range-independent radio metrics parameter such as Received signal strength indicator (RSSI). CP does not require previous condition, the position of anchor nodes, which are required in non-cooperative approaches. In Cooperative positioning, the virtual anchor which are surrounding vehicles provides this data for communication. As CP, significantly increases Geo localized position but still exist errors in GNSS/GPS positions and received power over V2V in terms of severe fading conditions. CP is also prone to transmit consecutive intervals of CAMs, which affected by channel load conditions, dynamic transmission of CAM, asynchronous data received by virtual anchors. Thus, if CP not configured properly can lead to major Geo localized errors. The second challenge in CP is fusion filter i.e., is used consists integrated observation of GPS/RSSI is affected by white noise which is correlated with space and time. Practically saying, the spatial correlation of measurement (vehicle position with respect to time under mobility), GPS condition cannot affect much more on multiple samples of CAMs and between neighbouring vehicles. In addition, channel fading due to obstacles such as mountain, buildings does not affect the successive transmission of CAM, by surrounding vehicles as CAMs are transmitted periodically 100ms. Therefore, the white noise of correlation severely affects the fusion filter, which leads estimated to large fluctuations.

In this approach, CP can be asynchronies and decorrelate GPS/RSSI observation time varying position of the vehicle to mitigate the harmful effects of spatial correlation. The approach consists detail illustrations of the effect of correlated GPS/RSSI value on state of art CP performance in the vehicular ad-hoc network (VANET) under time varying conditions.

I. ALGORITHM OF PROPOSED SYSTEM

Step 1: Select nodes, F= $\{N_i\}$, Where N_i is within the range of source node toward the forward direction of the destination.

Step 2: For every N_i, calculate distance $d_k = \sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2}$, where d_k= distance between two forward nodes. In VBF, each node makes packet-forwarding decisions based on its distance to the vector from the source to the forward node.

Step 3: In this step, Calculate node speed $N_0 = |Ss-S_k|$; Where Ss is speed of Source Node, S_k is speed of Forwarding node

Step 4: Compute Cost C = (d_k-Pi) + No; Where d_k=Distance; Pi=Energy of node; No=Speed of node;

Step 5: Select Min(C) (minimum cost) from every N_i, then forward packets to the forward node.

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II. FLOWCHART OF PROPOSED SYSTEM

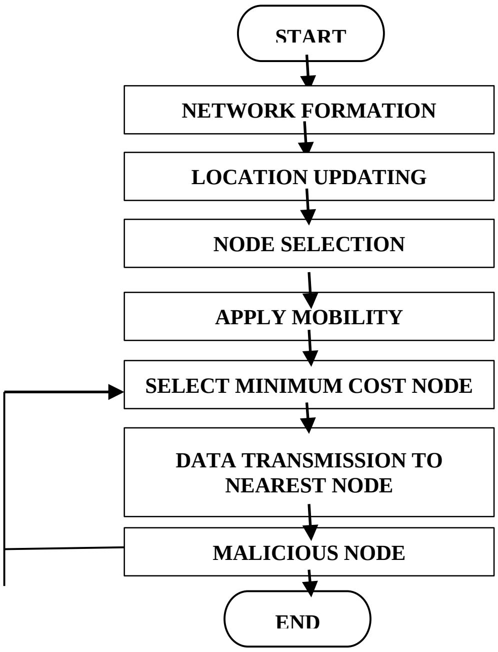

Fig.1. Flowchart of proposed system

III.PROPOSED SYSTEM

In our method, an adapted Route request (RREQ) is transmitted and submit in the forward table consequent to the node that has left of coverage range. We represented four latest parameters to determine the node metrics and cost, thus the extra information is envelope in the new packet format correspondingly. The proposed method based on priority based arrangement of parameters of Energy, speed, and distance in choosing the forward node through which data will be transferred. Protecting the lifespan of the network, we have to increase communication time of each vehicle. Hence, our proposed an efficient Ad-Hoc On Demand Vector routing algorithm (AODV) in VANET which considers the Energy and node speed issues.

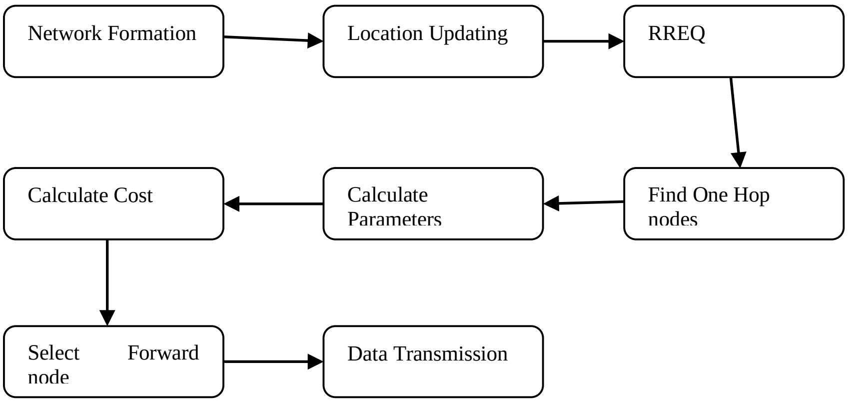

Fig.2.Block diagram of proposed system

The network is formed by reference node with other virtual nodes which are surrounding reference node and auxiliary RSU within the vicinity, which is called one-hop node. One hop node vehicle locations are updated using RSU. Messages like an emergency or normal (position of the vehicle) are transmitted or received by nodes with RSU. Then, RREQ sends to V2V and V2I and waits for an acknowledgment. After acknowledgment information regarding the distance from V2V and V2I are obtained which is used to obtain one-hop node network. According to these parameters such as energy, speed, distance, packet loss is calculated. Inter-vehicle distance is evaluated and shortest path node is selected to transmit or receive the message. If the distance between the reference and virtual node increases, then this node is removed from one hop node and the new node is discovered to select a forward node and finally, data is transmitted to the destination node.

IV.PERFORMANCE EVALUATION

Packet Delivery Ratio

Routing efficiency can be calculated in terms of packet delivery ratio and jitter. Packet Delivery Ratio is a one of the performance indices parameters which shows the performance of Ad-Hoc protocol in the mobile network. The ratio of packet delivery is nothing but a number of packets send by source and the total number of packets received at the destination.

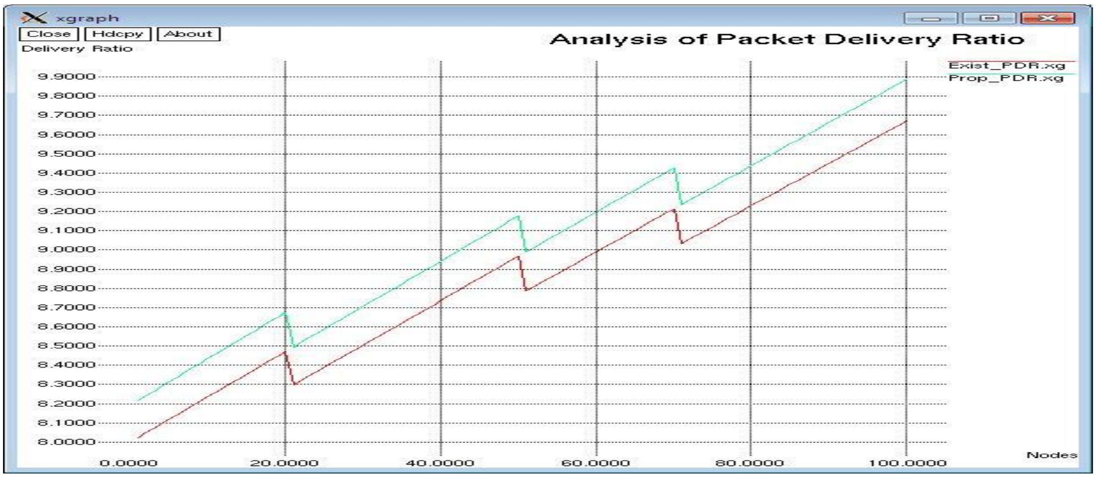

Fig.3. Analysis of Packet Delivery Ratio

Packet Overhead Ratio

The number of bits which required sending the packet from source to destination in the secure tunnel to avoid noise & packet loss, these extra bits is overhead in the network. So, packet overhead ratio is calculated as a total number of bytes sends per important information. In our system, this overhead is less than existing system still network is secure.

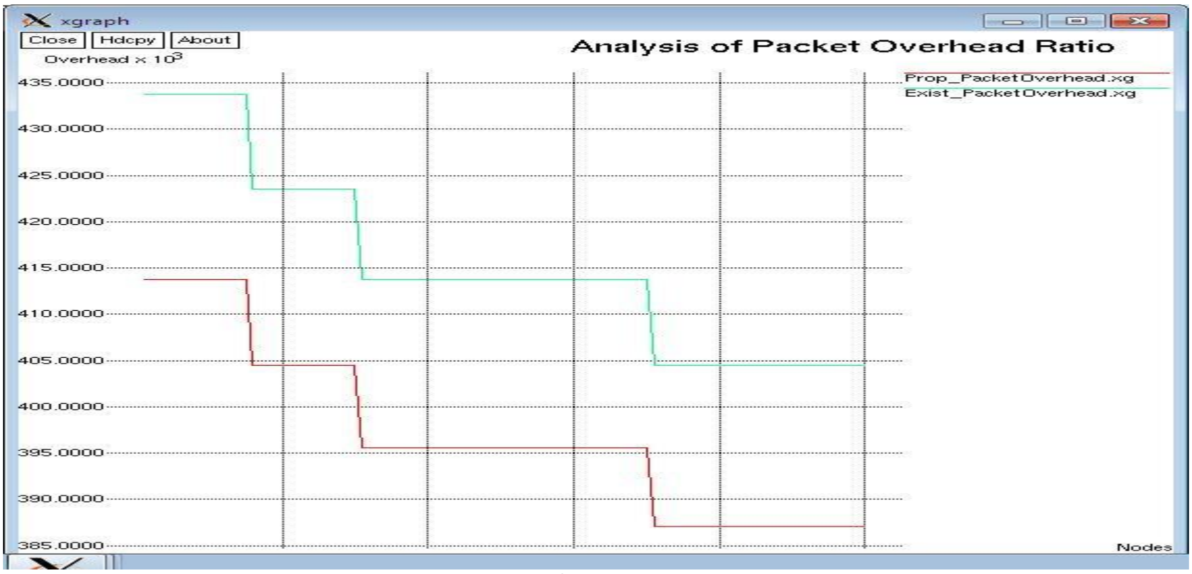

Fig.4. Analysis of Packet Overhead Ratio

End-to-End delay

Average time taken by each packet sent from source to destination is called end-to-end delay. This delay is measured in seconds. In our proposed system, this delay slightly more than existing system due to Ad-Hoc nature of protocol but increases route accuracy.

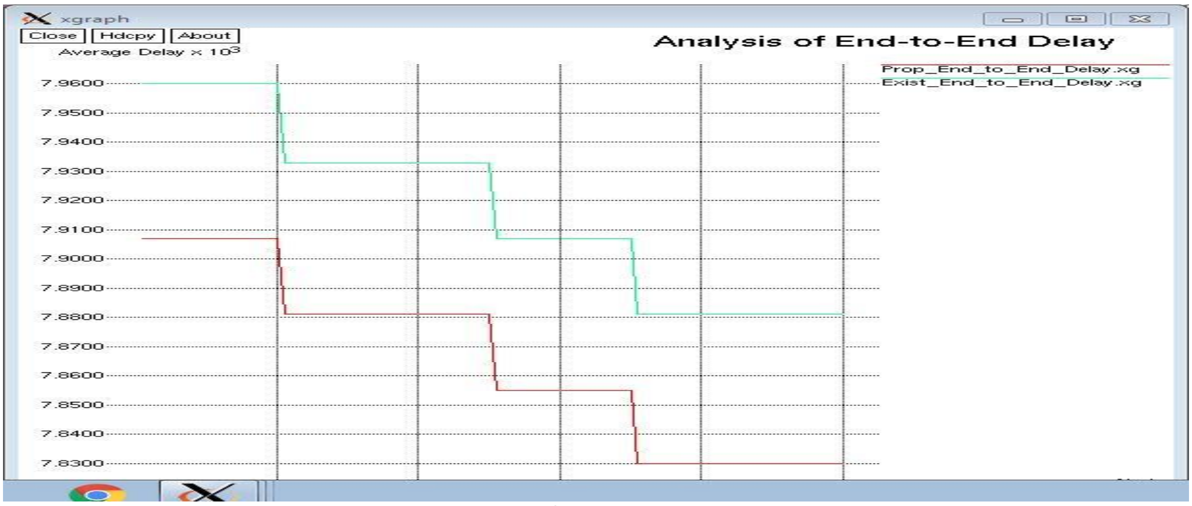

Fig.5. Analysis of End-to-End Delay Ratio.

Throughput

Throughput is expressed as the ratio of total amount of data send by the source to destination. Thus, total time consumers to received last data which is expressed in terms of bytes/sec or bits/sec. In our proposed system, throughput is more than existing system within selected node.

Fig.6. Analysis of Throughput.

Residual Energy based on Mobility

In our proposed system, as a number of nodes increases residual energy increases. Therefore, signal strength also increases.

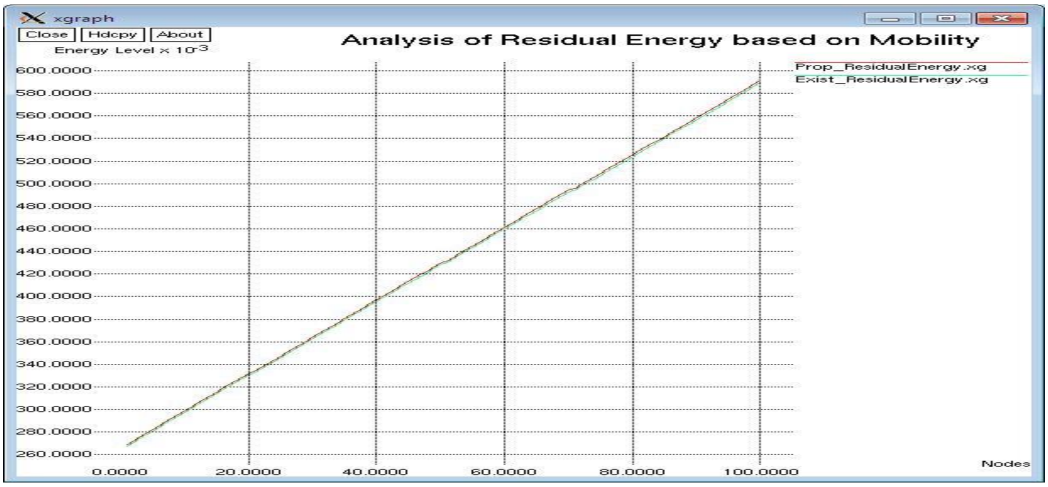

Fig.7.Analysis of Residual Energy based on Mobility.

Mobility Vs Packet Transmutation

As mobility means a number of intermediate nodes increases packet transmutation decreases. When a number of nodes of cooperative positioning increases request packet from source to destination & acknowledge from destination to source require more time due to this transmutation of packets decreases.

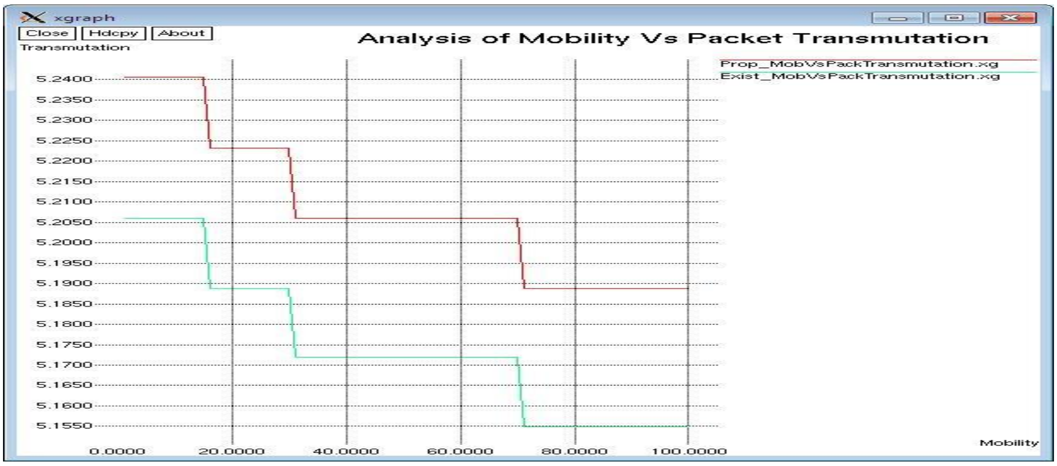

Fig.8. Analysis of Mobility Vs Packet Transmutation.

CONCLUSION

Due to geographical constraints position based and geo-cashing based routing protocols are more promising than other routing protocols. Driving environment is higher mobility, auto vehicle, vehicular density and environmental conditions (obstacles like building, trees), traffic condition such as highway and city degrade the performance of the routing protocol in the VANET. This proposed method represents the improvement of CP in VANET by using AODV protocol. In the previous method, Collision Avoidance Messages (CAMs) periodically broadcasted by vehicles. So, the energy efficiency of the system is decreased. In proposed method, we reduce high amount of time delay and energy loss. If we want to send an emergency message, we have a lot of time. Therefore in our system, we can provide minimum delay processing based AODV protocol. AODV protocol communicates to an only newest node in the network. Thus to obtain less delay, minimum energy consumption, increase transmission speed and less overhead compare to another existing system.

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REFERENCES

[1] G. M. Hoang, B. Denis, J. H¨arri, and D. T. M. Slock, "Breaking the Gridlock of Spatial Correlations in GPS-aided IEEE 802.11p-based Cooperative Positioning," IEEE Trans. on Veh. Technol., 2016

[2] J. Yao, A. Balaei, M. Hassan, N. Alam, and A. Dempster, "Improving cooperative positioning for vehicular networks," IEEE Trans. on Veh. Technol., vol. 60, pp. 2810–2823, Jul. 2011.

[3] N. Drawil and O. Basir, "Intervehicle-communication-assisted localization," IEEE Trans. on Intel. Transp. Syst., vol. 11, pp. 678–691, Sept. 2010.

[4] R. Parker and S. Valaee, "Vehicular node localization using received signal strength indicator," IEEE Trans. on Veh. Technol., vol. 56, pp. 3371–3380, Nov. 2007.

[5] V. Kukshya, H. Krishnan, and C. Kellum, "Design of a system solution for relative positioning of vehicles using vehicle-to-vehicle radio communications during GPS outages," in Proc. IEEE VTC, Sep. 2005, pp. 1313–1317.

[6] R. Iyengar and B. Sikdar, "Scalable and distributed GPS-free positioning for sensor networks," in Proc. IEEE Int. Conf. Commun., May 2003, pp. 338–342.

[7] D. Caveney, "Cooperative vehicular safety applications," IEEE Cont. Syst., vol. 30, pp. 38–53, Aug. 2010.

[8] "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service," ETSI Std. EN 302 637-2 V1.3.2, Oct. 2014.

[9] "Vehicle Safety Communications-Applications (VSC-A), Final Report," Tech. Rep. DOT HS 811 492A, U.S. Dept. Transp., Nat. Highway Traffic Safety Admin., Sept. 2011.

[10] G. M. Hoang, B. Denis, J. H¨arri, and D. T. M. Slock, "Distributed link selection and data fusion for cooperative positioning in GPS-aided IEEE 802.11p VANETs," in Proc. WPNC'15, Mar. 2015.

[11] N. Patwari, A. Hero, M. Perkins, N. Correal, and R. O'Dea, "Relative location estimation in wireless sensor networks," IEEE Trans. on Sig. Proc., vol. 51, pp. 2137–2148, Aug. 2003.

[12] Kevin C. Lee, UCLA, USA, Uichin Lee, UCLA, USA, Mario Gerla, UCLA, USA. March 2011, "Survey of Routing Protocols in Vehicular Ad Hoc Networks."
[13]Perkins, C. E. and Royer, E. M. (2012), "Ad-Hoc On-Demand Distance Vector Routing,"Proc. IEEE WMCSA "12, New Orleans, LA, Feb. 2012."
[14] H. Wymeersch, J. Lien, and M. Win, "Cooperative localization in wireless networks," Proc. of the IEEE, vol. 97, pp. 427–450, Feb. 2009.
[15] H. Lu, S. Zhang, X. Liu, and X. Lin, "Vehicle tracking using particle filter in Wi-Fi network," in Proc. VTC'10-Fall, Sept. 2010.
[16] L. Sun, Y. Wu, J. Xu, and Y. Xu, "An RSU-assisted localization method in non-GPS highway traffic with dead reckoning and V2R communications," in Proc. CECNet'12, pp. 149–152, Apr. 2012.
[17] N. Patwari, J. Ash, S. Kyperountas, A. Hero, R. Moses, and N. Correal, "Locating the Nodes: Cooperative localization in wireless sensor networks," IEEE Sig. Proc. Mag., vol. 22, pp. 54–69, Jul. 2005.

