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A SURVEY ON CONGESTION AVOIDANCE IN DISTRIBUTED VEHICULAR RE-ROUTING SYSTEM WITH SHORTEST PATH

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Abstract: Centralized solutions for vehicular traffic re-routing to alleviate congestion suffer from two intrinsic problems: scalability, as the central server has to perform intensive computation and communication with the vehicles in real-time; and privacy, as the drivers have to share their location as well as the origins and destinations of their trips with the server. This article proposes DIVERT, a distributed vehicular re-routing system for congestion avoidance. DIVERT offloads a large part of the rerouting computation at the vehicles, and thus, the re-routing process becomes practical in real-time. To take collaborative rerouting decisions, the vehicles exchange messages over vehicular ad hoc networks. DIVERT is a hybrid system because it still uses a server and Internet communication to determine an accurate global view of the traffic. In addition, DIVERT balances the user privacy with the re-routing effectiveness. The simulation results demonstrate that, compared with a centralized system, the proposed hybrid system increases the user privacy by 92% on average. In terms of average travel time, DIVERT's performance is slightly less than that of the centralized system, but it still achieves substantial gains compared to the no re-routing case. In addition, DIVERT reduces the CPU and network load on the server by 99.99% and 95%, respectively.

Index Terms: *Proactive driver guidance, vehicular congestion avoidance, distributed traffic re-routing, VANET.*

I.INTRODUCTION:

The problem addressed in this article is how to perform vehicular traffic re-routing for congestion avoidance in a scalable and privacy-preserving way. Previously, we proposed in centralized vehicular traffic re-routing system for congestion avoidance. The centralized system collects real-time traffic data from vehicles and potentially road-side sensors, and it implements several re-routing strategies to assign a new route to each re-routed vehicle based on actual travel time in the road network. Rather than using simple shortest path algorithms (e.g , Dijkstra), the re-routing strategies use load balancing heuristics to compute the new path for a given vehicle to mitigate the potential congestion and to lower the average travel time for all vehicles. This individualized path is pushed to a driver when signs of congestion are observed on his current path.

II.LITERATURE REVIEW

This section gives a detailed review about various re-routing schemes. Here we reviewed how the congestion problem is determined in each scheme. While reviewing a scheme we scheduled the algorithms and techniques used in that scheme and the merit and demerit of that scheme are also specified. The following papers are survived in this section.

In[1] authors Bjorn Wiedersheim, Zhendong Ma, Frank Kargl and Panos Papadimitratos **"privacy in Inter-Vehicular Networks: Why simple pseudonym change is not enough"** has proposes the Inter-vehicle communication (IVC) systems reveal rich location information about vehicles. High-tech sanctuary architectures are aware of the problem and provide privacy ornamental mechanisms, conspicuously pseudonymous authentication. Vehicles that can communicate with each other and road-side units (RSUs) enable a range of applications. For example, applications that provide warnings on road dangers and traffic jams, or those that offers
Comfort enhancements (e.g., automated update of point-of interest information to car direction-finding systems). Utilizing one approach relating to the problem of multi-target tracking, in particular Multi-Hypothesis-Tracking (MHT) [20], we find that linking between samples under different pseudonyms for the same vehicle can be unpredictably successful under various system setups. To address this problem, solutions in the journalism propose that each vehicle use multiple pseudonyms, changing recurrently from one pseudonym to another [16]. The attacker could then only record location profiles, also denoted in the rest of the paper as tracks, each of them consisting of tuples of the form (PSNYMx, ti, li) with each PSNYMx representing one of the pseudonyms used by a node. The merits are Lower beacon rates and spatial noise of a certain level prevent a tracker from connecting anonymous position samples to a continuous path. The demerits is would provide the majority of transportation safety applications – based on vehicular communication – useless, because they require accurate situation information.

In[2] authors Juan (Susan) Pan, Mohammad A. Khan, Iulian Sandu Popay, Karine Zeitouniy and Cristian BorceaS **"Proactive vehicle re-routing strategies for congestion avoidance"** is to establish three traffic re-routing strategies designed to be incorporated in a cost-effective and easily deployable vehicular traffic regulation coordination that reduces the effect of traffic congestions. In this system, vehicles can be viewed as both mobile sensors (i.e., collect real-time traffic data) and actuators (i.e., change their path in response to newly conventional guidance). Traffic congestion causes driver aggravation and expenditure billions of dollars per annum in lost time and fuel spending. This system collects real-time traffic data from vehicles and road-side sensors and computes proactive, individually-tailored re-routing guidance which is pushed to vehicles when signs of clogging are observed on their route. While congestion is largely thought of as a big city problem, delays are becoming gradually more common in small cities and some rural areas as well. Hence, finding effective solutions for congestion alleviation at practical costs is becoming a inflexible problem. stationary distributed road-side sensors (e.g., induction loops, video cameras) and vehicles acting as mobile sensors (i.e., using implanted vehicular systems or smart phones) can collect real-time data to monitor the traffic at fine granularity. The merits is The EBkSP approach balances best the trade-offs between low average travel time and low down overhead along numerous parameters. The demerits is V2V communication to better balance the need for isolation, scalability, and low overhead with the main goal of low average travel time.

In[3] authors Giovanni Nardini, Antonio Virdis, and Giovanni Stea **"Simulating cellular communications in vehicular networks: making SimuLTE interoperable with Veins"** In this paper, we describe the process of making SimuLTE and Veins interoperable, i.e. using both in the similar simulation scenarios with the specific aim of keeping them divide and independent. We underline the necessities coming from Veins and we list the main modifications toward SimuLTE required to satisfy these requirements, in particular detailing how we manage dynamic creation and obliteration of LTE-capable nodes. The development of cellular technologies toward 5G progressively enables efficient and ever-present communications in an increasing number of fields. Among these, vehicular networks are being considered as one of the most hopeful and challenging applications, requiring support for communications in high-speed mobility and delay-constrained information exchange in proximity. We discuss the limitations of the previous solution, namely VeinsLTE, which integrates all three in a single framework, thus preventing independent evolution and upgrades of each building block. On one hand, cellular communications allow existing vehicular network services to be enhanced and new ones to be enabled. On the other hand, recent research projects imagine vehicular communications as a capable use case for cellular systems, under the name of "connected cars". The merits is the integration of SimuLTE and Veins, with the specific goal of preserving them as independent frameworks. The Demerits is the requirements coming from Veins to allow convention nodes to be managed according to its mobility model.

In[4] authors Rahul N. Vaza, Amit B.Parmar, and Trupti M. Kodinariya **"Implementing Current Traffic Signal Control Scenario in VANET Using Sumo"** is proposing One of the most interesting features is the opportunity to use a spontaneous and reasonably priced wireless ad hoc network between vehicles to exchange helpful information such as caution the drivers of an accident or a danger. VANET are self organizing network. It does not rely on any fixed network infrastructure. Even though some fixed nodes act as the roadside units to make easy the vehicular networks for allocation geographical data or a gateway to internet etc. Higher node mobility, speed and rapid pattern movement are the main characteristics of VANET. A Vehicular Ad-Hoc network (VANET) is a type of Mobile Ad-Hoc (MANET) network in which the nodes are guarded to move along the street. Vehicles in VANET are furnished with a radio device to communicate with each other and also with the road side units i.e.in VANET, Infrastructure to Vehicle as well as Vehicle to Vehicle communication is done. SUMO is an open source traffic simulation package including net bring in and demand modeling components. In this paper we are representing features of SUMO and algorithm to produce current traffic signal control scenario in VANET using SUMO. The development of "**S**imulation of **U**rban **MO**bility", or "SUMO". The merits is the increasing approval and politeness in VANETs has impelled canvassers to develop precise and realistic simulation tools. The Demerits is extended to the green signal pre-emption or adaptive traffic control system or any other exclusive application by modifying necessary steps in the given algorithm.

In[5] authors S. Jeevitha and S.Sampath **" Hybrid Data Transmission Framework with Prediction based Channel Assignment under Cognitive Radio based Vehicular Ad-Hoc Network"** it has to determine the hybrid data communication framework is build to execute the multicast and broadcast data transmission tasks. The Secure Hybrid Routing Protocol (SHRP) integrates the ROFF and TMC protocol features with security solutions. The Dirichlet Process (DP) and Hidden Markov Model (HMM) methods are engaged for the spatio temporal correlation based channel allocation process. Service channels are assigned with unlicensed frequencies and licensed frequencies are allocated for the emergency conditions. The transmission delay is controlled with high throughput and detection probability rate levels. Many works focus on spatial cloaking [6] to provide k-anonymity. The work argues that both spatial and temporal dimensions should be considered in the algorithm to achieve better k-anonymity. DIVERT has a different goal from all these works: it focuses on protecting the driver's location privacy from the central server, not from the other drivers in VANET. For driver-to-driver privacy, DIVERT can leverage the solutions. The Cognitive Radio based Vehicular Ad-Hoc Network (CR-VANET) is constructed to support the data communication over the vehicles. The data transmission and receive operations are managed with cognitive radio devices. The Road Side Infrastructure (RSI) or Access Points (AP) is deployed to transmit the data values. Data provider manages the shred data values. Unicast, multicast and broadcast data communication operations are supported by the CR-VANET environment. The merits is Robust and Fast Forwarding (ROFF) protocol is used to handle data dissemination process. The demerits is the system can be improved to handle anonymous and malicious attacks. Clustering techniques can be integrated to develop the bandwidth arrangement process.

In[6] authors Divya.R, Suganthi.V, and Jayachitra.J **" Modified Congestion Re-routing scheme using centralized Road side Unit"** this is proposed to Congestion is a serious problem with high populations for big cities. Google maps traffic of internet based solutions are not satisfactory for instant response to fine grained traffic, highly dynamic and congestion control. Vehicles that are already in packed areas are direct against the use of assured roads, and the VANET-assisted communication helps nearby vehicles to re-route themselves around unexpected traffic jams. In order to face traffic congestion, there is need to eliminate traffic in an automated process. Centralized solutions to improve congestion, suffer from scalability and privacy problems such as the central server has to perform intensive computation with the vehicles in real-time and the drivers have to share their location of both origins and destinations of their trips with the server. Ns2 simulation is used to evaluate the performance of RSU backbone routing. Thus Simulation results that the proposed RSU technique provides detailed information for each vehicle with an individual information range of more than 50km from the current position with low delay and high accuracy. The merits is complete appraisal, Increasing the throughput ,Reduce the delay.They are effective in avoiding accidents and traffic congestion. The demerits is resulting closed-form expressions for average packet loss probability and throughput of a VANET cluster.

In[7] authors Shen Wang Soufiene Djahel and Jennifer Mcmanis **"A Hybrid Vehicular Re-routing Strategy with Dynamic Time Constraints for Road Traffic Congestion Avoidance"** this is determined to Smart routing of vehicles is one of the key services presented by ITS for achieving best possible load balance of the traffic on the roads. Some of the existing commercial routing products, such as Google Maps and Nokia Ovi, can either only plan the route before the drivers start their journey or cannot rapidly provide an alternate route in case of incidents. Thus they cannot respond to rapid changes in route conditions during the journey. the immediate rise of the number of vehicles on the roads has led to several demanding problems for road authorities, such as traffic congestion, increasing number of accidents and air pollution. According to current statistics, road traffic jam leads to a huge economic loss due to the increasing delay on the roads and the extra fuel consumption. Intelligent Transportation System (ITS) provides a capable framework to alleviate the congestion on the roads. The main focus of this paper is on designing novel vehicles re-routing strategy to reduce the traffic congestion in urban areas. The proposed strategy is a hybrid approach which takes full advantage of both exact and heuristic algorithms and meets the requirements of dynamic time constraints of real road traffic scenarios. The next step of our work is to estimate the performance of our approach and compare it with the existing algorithms. The merits is Lower fuel consumption reduces the economy cost for a driver as well as the air pollution. The demerits is it should be measured as the average litres of the consumed fuel per kilometre. It based on several metrics and under a benchmark of road topologies and traffic scenarios.

In[8] authors John B. Kenney **" Dedicated Short-Range Communications (DSRC) Standards in the United States"** is determined to The primary inspiration for deploying DSRC is to enable collision prevention applications. These applications depend on frequent data exchanges between vehicles, and between vehicles and roadside infrastructure. The U.S. Department of Transportation (DOT) has estimated that vehicle-to-vehicle (V2V) communication based on DSRC can address up to 82% of all crashes in the United States. This paper provides a description of the core DSRC standards under development for use in the United States. Most of these standards are either recently published or in the final stages of specification. If a vehicle determines that a prospective collision or other hazard (e.g., violating a red light) exists, the onboard system can take action to caution the driver, or even to assist in controlling the vehicle. Wireless vehicular communication has the potential to enable a host of new applications, the most important of which are a class of safety applications that can prevent collisions and save thousands of lives. The automotive industry is working to develop the dedicated short-range communication (DSRC) technology, for use in vehicle-to-vehicle and vehicle-to-roadside communication. The merits is effectiveness of this technology is highly dependent on cooperative standards for interoperability. The demerits is Policy and Business issues, many of which will not require technical standardization but which nevertheless are important for deployment.

In[9] authors Rick Zhang,,Federico Rossi and Marco Pavone in the paper **"Routing Autonomous Vehicles in Congested Transportation Networks: Structural Properties and Coordination Algorithms"** describes about the a attractive operational model involves coordinating a fleet of autonomous vehicles to provide on-demand service to customers, also called autonomous mobility-on demand (AMoD). An AMoD system may decrease the cost of travel as well as give additional sustainability profit such as increased overall vehicle consumption, reduced demand for urban parking infrastructure, and reduced pollution (with electric vehicles). The key benefits of AMoD are realized through vehicle allocation, where each vehicle, after servicing a customer, drives itself to the place of the next customer or rebalances itself throughout the city in anticipation of outlook customer demand. This paper considers the trouble of routing and rebalancing a shared fleet of autonomous (i.e., self-driving) vehicles providing on-demand mobility within a capacitated transportation network, where congestion might interrupt throughput. We model the difficulty within a network flow structure and show that under relatively mild assumptions the rebalancing vehicles, if properly coordinated, do not lead to an increase in congestion (in stark contrast to common belief). From an algorithmic standpoint, such theoretical imminent suggests that the trouble of routing customers and rebalancing vehicles can be decoupled, which leads to a computationally-efficient routing and rebalancing algorithm for the autonomous vehicles.The merit is formulateing the routing and rebalancing problem and showed that on symmetric road networks, it is always possible to route rebalancing vehicles in a coordinated way that does not increase traffic congestion. The demerit is that rebalancing did not increase congestion even for reasonable degrees of network asymmetry.

In[10] authors Toby Xu and Ying Cai in the paper **"Feeling-based Location Privacy Protection for Location-based Services"** proposes the scheme of location-based services (LBSs) offer important opportunities for a wide range of markets, they present users significant privacy threats. An evident one is service anonymity threat, i.e., the potential contact of service uses. Just like normal Internet access, a user may not want to be identified as the subscriber of some LBS, especially when the service is sensitive. An additional threat, which is more grave, is location privacy. A user's location disclosed in her service demand may reveal sensitive private information such as health conditions, lifestyles, and so on. In particular, it has the potential to allow an opponent to locate the subject and effect in physical harm. This is due to the fact that a user's location itself may be associated with controlled spaces such as house and office to reveal her real-world uniqueness. For example, if a location belongs to a private property, then the opponent can derive that the user is most likely the owner of the property. Anonymous location information may be correlated with restricted spaces such as home and office for subject re-identification. This makes it a great challenge to provide location privacy protection for users of location-based services. Existing work adopts traditional *K*-anonymity model and ensures that each place disclosed in service requests is a spatial region that has been visited by at least *K* users. This strategy requires a user to specify an appropriate value of *K* in order to accomplish a desired level of privacy protection.The merit is that model allows a service user to express her privacy requirement by requesting that the location disclosed on her behalf must be at least as popular as some spatial region such as a shopping mall.The demerit is to measure the popularity of a spatial region, we borrow the concept of entropy from information theory to take into account not only the number of its visitors.

III.ANALYSIS

This section presents the study on re-routing schemes which we reviewed in previous section. Based on this study results we can find the finest scheme used for congestion avoidance.

Table 1: COMPARITIVE STUDY ON RE-ROUTING SCHEMES

S.No	**TITLE**	**Type of Re-routing system**	**Algorithms Used**	**Merits**	**Demerits**
1.	Privacy in Inter-Vehicular Networks: Why simple pseudonym change is not enough	Pseudonymous authentication.	To improve pseudonym: potential tracking algorithm. Multiple Hypothesis Tracking: Reid's algorithm. Anonymous location: multi target tracking algorithm.	Lower beacon rates and spatial noise.	It have to provide the majority of transportation safety applications.
2.	Proactive vehicle re-routing strategies for congestion avoidance	Traffic re-routing system.	Shortest path to destination: dynamic shortest path (DSP). K shortest paths: random multipath load balancing (RkSP). Vehicle positions: Multipath load balancing (EBkSP).	Best the trade-offs between low average travel time and low down overhead.	V2Vcommunication to better balance the need for isolation, scalability, and low overhead with the low average travel time.
3.	Simulating cellular communications in vehicular networks: making SimuLTE interoperable with Veins	SimuLTE and Veins interoperable.	Multiple eNBs connection: enabling coordination algorithm CoMP vehicular mobility: SUMO.	Independent Framework.	Requirementcoming from Veins to allow convention nodes to be managed.
4.	Implementing Current Traffic	Traffic Signal Control	The taxonomy: VANET simu-lation	Increasing approval and	Extended to the green

	Signal Control Scenario in VANET Using Sumo.	positioning scheme.	Software road networks and traffic demand: simulation SUMO.	politeness in VANETs.	signal pre-emption or adaptive traffic control system.
5.	Hybrid Data Transmission Framework with Prediction based Channel Assignment under Cognitive Radio based Vehicular Ad-Hoc Network	Cognitive Radio based Vehicular Ad-Hoc Network (CR-VANET). Data Dissemination under VANET.	To better k-anonymity: spatial and temporal dimensions algorithm. Channel assignment operations: Dirichlet Process and Hidden Markov Model techniques.	Robust and Fast Forwarding (ROFF) protocol is used to handle data dissemination process.	The system can be improved to handle anonymous and malicious attacks.
6.	Modified Congestion Re-routing scheme using centralized Road side Unit	A centralized RSU (Road side unit). Adaptive path re-routing schemes.	Basic Safety Messages: message types and information exchange. Creating and Storing Congestion Information: congestion information database. Avoid congestion: dynamic route planning technique.	Complete appraisal, Increasing the throughput, Reduce the delay,effective in avoiding accidents and traffic congestion.	Average packet loss probability and throughput of a VANET cluster.
7.	A Hybrid Vehicular Re-routing Strategy with Dynamic Time Constraints for Road Traffic Congestion Avoidance	Intelligent Transportation System (ITS).	To avoid the congestion: Re-routing algorithm. Dynamic time: Particle Swarm Optimisation (PSO), Simulated Annealing (SA) or Tabu Search (TS).	Lower fuel consumption reduces the economy cost for a driver as well as the air pollution.	It should be measured as the average litres of the consumed fuel per kilometre.
8.	Dedicated Short-Range Communications (DSRC) Standards in the United States	Dedicated Short-Range Communication (DSRC) Technology.	Improves the probability of successful decoding: Forward error correction (FEC). To transmit a frame: PMD Transmitter.	Effectiveness of this technology is highly dependent on cooperative standards.	Policy and Business issues, many of which will not require technical standardization but which

			The demodulation: PMD Receiver. Allocated the spectrum: DSRC Spectrum.		important for deployment.
9.	Routing Autonomous Vehicles in Congested Transportation Networks: Structural Properties and Coordination Algorithms	Rebalancing a shared fleet of autonomous Vehicles.	The autonomous vehicles: rebalancing algorithm. Congestion-free Routing and Rebalancing Problem (CRRP).	Does not increase traffic congestion.	Rebalancing did not increase congestion even for reasonable degrees.
10.	Feeling-based Location Privacy Protection for Location-based Services	Feeling-Based Privacy Model.	Minimizes the size of the cloaking box: Selecting cloaking set. Footprints of users in the cloaking set:	Prevent an adversary with restricted spaces such as home and office.	The user does not have location privacy at that time point.

IV.POSSIBLE SOLUTION:

DIVERT offloads the path computation to the vehicles and the server is only responsible for the graph weight updating, these results demonstrate a substantial CPU load reduction at the server.

DIVERT also reduces the network load on the server, which could become a major bottleneck as the number of vehicles increases. Since the privacy enhancement protocol only allows vehicles to send traffic reports when the privacy metric meets the probabilistic criterion, the number of messages is decreased by 95%.

V.CONCLUSION:

This system, DIVERT, offload a large part of the re-routing computation at the vehicles, and thus, the re-routing process becomes scalable in real-time. To make collaborative re-routing decisions, the vehicles exchange messages over VANETs. We have optimized VANET data dissemination to allow for efficient distributed re-routing computation. In addition, the system balances user privacy with the re-routing effectiveness. The simulation results demonstrate that, compared with a centralized system, DIVERT increases the user privacy substantially, while the re-routing effectiveness is minimally impacted.

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