Analytical Study of Traffic Congection Detection and -Avoidance in VANET

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***Abstract*—the advances in wireless technology, mobile vehicular network are likely to become the most relevant form of MANET. Vehicular ad-hoc Networks (VANET) are wireless networks which facilitate information exchange between mobile vehicles with no permanent network infrastructure required. Each vehicle captures and disseminates information such a location, speed and process the information received from other vehicles in the network. The event driven safety messages have stringent requirement on delay and reliability. In dense network large number of vehicle broadcast a beacon messages at a high number of frequencies, the control channel (CCH) will easily congested. It is a very important to keep the CCH channel free from congestion. With the number of vehicle increases rapidly, especially in city whose economy is booming, these situation getting even worse. In this paper we are presenting detection of traffic congestion using proposed approach and analysis of results.**

***Key words*—VANET, Car agent, Signal agent, intelligent transport system, Beacon messages, CCH channel**

I. INTRODUCTION

Vehicular Ad-hoc Networks (VANET)[1] are wireless networks which facilitate information exchange between mobile vehicles with no permanent network infrastructure required. VANETs become a cornerstone of the envisioned Intelligent Transportation Systems (ITS) [2]. There is an increasing interest in developing efficient vehicular ad hoc routing protocols to expand Internet to vehicles on the road, thereby allowing point-to-point Communication between vehicles as well as access to services available on the Internet In this paper we propose a novel vehicular communication system for detecting traffic jam through information gathered using inter-vehicles communication. This information is processed by the vehicles on-the-fly, allowing them to determine the congestion spots in urban areas, and thereby computing alternative and less congested itineraries. In our approach, vehicles play the role of mobile censors which continuously record road congestion information by monitoring their own speed and travel time. This information is processed by the vehicles on-the-fly, allowing them to determine the congestion spots in urban areas, and thereby computing alternative and less congested itineraries. Applying vehicles with communication devices turns them into efficient data collectors. Distributed applications can be implemented over this infrastructure to detect congestion and propagate congestion information to future vehicles to the congestion area making it possible for the driver to know other routes to avoid the congestion. Congestion detection algorithms are designed to detect areas of high traffic density and low speeds. Each node captures and disseminates information such as location and speed and processes the information received from other nodes in the network.

II. NEED TO AVOID ROAD TRAFFIC CONGESTION

Foreseen cooperative systems for intelligent transportation systems (ITS) address the current and future needs of increasing traffic safety, efficiency and comfort. Despite the predicted growth rates in the Number of motorized vehicles and the volume of transported goods, transportation should become safer, cleaner, more efficient and more comfortable. Variable Network density: The network's density depends on vehicular density which is highly variable. In traffic jam situations the network can be categorized in very dense networks which in suburban traffics it could be a sparse network. The topology of the network could be affected by driver's behavior due to his/her reaction to the messages.

Fig. 1 Highway Scenario with a traffic jam in one direction of driving and free flow conditions in the other direction. Eg. West Side Highway Road Rage Attack. Wednesday, October 09, 2013

Real Time Transport System

Interest in RTTS comes from the problems caused by traffic congestion and a synergy of new information technology for simulation, real-time control and communications networks. Due to Congestion which reduce efficiency of transportation and increases travel time, air pollution, and fuel consumption. VANETs are a meaningful component of ITS system, which provides an infrastructure based frame work and all related applications taking full advantage of the Vehicle- 2-Vehicle (V2V) communications. Development of VANETS can further enhance driving safety and support the traditional traffic management concerned with activity on the road ahead and not behind. Besides the analysis of traffic congestion and mobility, data could help develop optimum traffic signal system for efficient traffic flow while comfort.

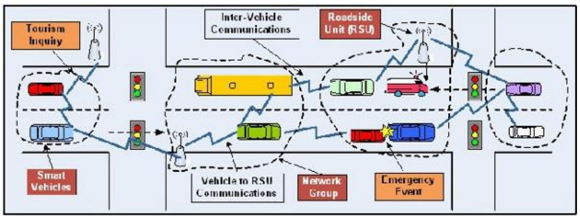

Fig 2. Real Time Transport System Examples.

III. WIRELESS ACCESS IN VEHICULAR ENVIRONMENT (WAVE)

There are greater challenges in wireless traffic patterns .To know the challenges of IEEE MAC layer operations for vehicular communication scenario, IEEE802.11p Wireless Access in Vehicular Environments (WAVE) was introduced. 802.11p is an IEEE standard that supports Real Time Traffic Transportation Systems (RTTS) At present DSRC based on the Wi-Fi standard is widely used in VANETs as it connects infrastructure to vehicles and also vehicles to-vehicles using two way short range radio which is of lower costs compared to other wireless standards available. DSRC/WAVE systems fill a niche in the wireless infrastructure by facilitating low latency, geographically local, high data rate, and high mobility communications.

Less Congested itinerary algorithm

The proposed congestion avoidance algorithm aims at finding the least congested route to a given destination. In this work we considered using a dynamic variant of the classical Dijkstra algorithm [for finding the shortest path between a departure point to a given destination. In general one could have used simply classic Dijkstra by replacing the distance matrix with a congestion index matrix and the algorithm still works since the objective is to find a path with the least distance. First, unlike distances which are static parameters for Dijkstra algorithm, congestion indexes are dynamic. Indeed, traffic congestion condition changes continuously. Therefore while, a vehicle is driving towards its destination, the least congested itinerary may change dynamically, which requires vehicles to regularly recalculate

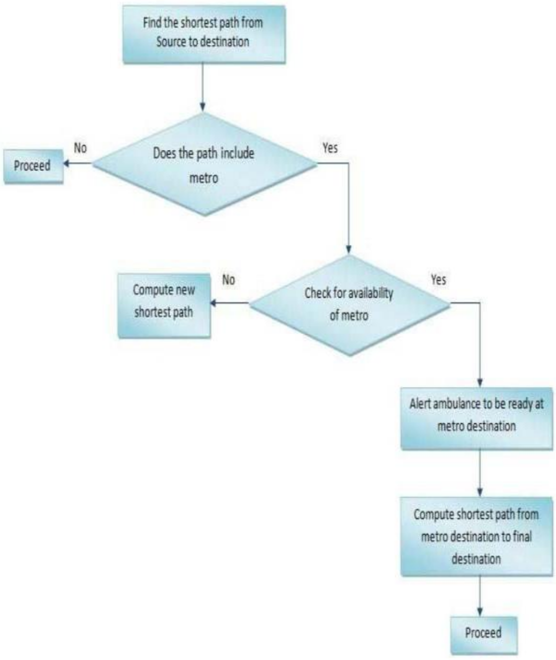

Fig 3 Congestion information flow charts.

their itinerary. Second, a least congested itinerary may not be necessary the best one in terms of traveled distance and cost. This universal center maintains all the information of all the zone of the relevance. If at any point any congestion is occurring which further alert the vehicle coming from behind .Which by using the algorithm finds the less congested path depends on the value of Congestion information (CI).

Hybrid Approach Congested Approach

The relationship of congestion and awareness control to traditional control theory, this paper discusses existing proposals for congestion and awareness control with respect to the concepts and notions typically used in control theory. For this purpose, both methods are analyzed and compared according to the general framework sketched in Fig. 4: an algorithm might use some sort of detection to classify the traffic situation or scenario

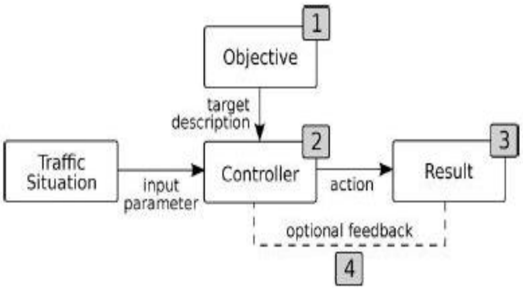

Fig 4 Analysis of congestion and awareness control algorithms

Which the node is currently in, and which might be used proactively by the controller as feed forward input. The controller itself decides how the transmission will be adjusted, of course depending on the situation and the corresponding target description, i.e. the current objective. The selected action then leads to an observable result, which can be fed back to the controller in order to improve its accuracy.

1. *Congestion control*. Limit the load on the medium produced by periodic beacon exchange possible.
2. Fairness. Maximize the minimum transmit power value over all transmission power levels assigned to nodes that form the vehicular network under Constraint.\

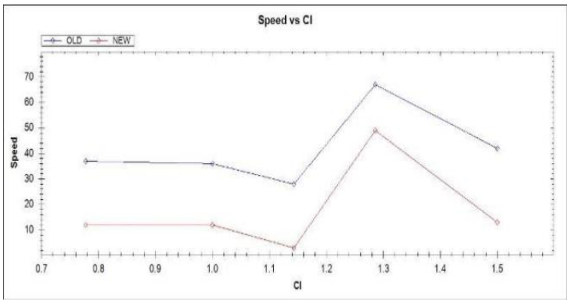

Fig 5 graph

3. *Prioritization*. Give event-driven emergency messages higher priority compared to the priority of periodic beacons.

The congestion control requirement Constraint is applied only to beacon messages, which is coherent with our design goal of controlling the channel bandwidth assigned to safety-related messages.

ALGORITHM	DESCRIPTION	ADVANTAGE	DISADVANTAGE
Least Congestion itinery algorithm	The proposed congestion algorithm to find the least congested path	Fast in operation find out least congested path	Depend on ZOR in rectangle shape
Hybrid approach	Communication between vtov desition to adust the transmission paramaters	Give ability to prevent congestion in proactive environment.	1Load generated by the neighbor vehicles such approach require communication nmodel that's maps
O-PRAM	Based on max-min principle of transmission power	Accurately estimate the node density	Become slow when power on the node increases
Fair Congestion control	Congestion control requirement is applied to beacon messages	Works at the larger width of communication range	Performance decereaces when node density increases.

Traffic Routing Algorithm Design

Traffic advisory or vehicular navigation systems, an increasingly standard feature of most vehicles, rely on positioning information and map databases to provide step-by-step navigation information to the driver. Search algorithm for finding the lowest cost path to a destination given the available segment cost data.

IV. PROPOSED WORK

We describe the approach we took for the detection and the avoidance of road traffic jam. The method consists of integrating both the least-congested it in y algorithm and the SOP in the solution illustrated fig 3. When a vehicle approaches a given junction, it uses the geocast protocol to broadcast a request for traffic. Congestion within a given area indicated by a ZOR. All the vehicles in that ZOR respond indicating the traffic congestion level each in its corresponding location. The vehicle receives from these vehicles the congestion index within the ZOR. The vehicle updates its internal matrix with the congestion indexes it received and preserves the congestion index of the road section that it has not received any update for. Furthermore, since more than one vehicle may send its own congestion index for the same road section, the vehicle aggregates this information by using any variant of averaging techniques. For our work, we have used simple average of all the congestion indexes received for the same road section, since the obtained results did not show noticeable differences. After the matrix has been updated, it is fed as input to the least-congested itinerary algorithm which is executed and may result in a newer itinerary which is the least congested based on the pre-configured D and D factors.

CONCLUSION

In this paper we have presented a novel and integrated solution for detecting and avoiding road traffic congestion using solely the information gathered and exchanged between vehicles on the road. The objective of this paper is to show that ad hoc vehicular communication can be of great use in developing useful applications such as those for road traffic and travel management. Developing useful applications such as those for road traffic and travel management.

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