A Review on Bayesian Filtering Approach for Vehicular Cloud Computing

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Abstract **- Vehicular networking has become a significant research area due to its specific features and applications such as standardization, efficient traffic management, road safety and infotainment. Vehicles are expected to carry relatively more communication systems, on board computing facilities, storage and increased sensing power. Hence, several technologies have been deployed to maintain and promote Intelligent Transportation Systems (ITS). This paper reviews the works done in the field of Vechicular Cloud computing and presents a comparative analysis of the various techniques in terms of their merits and demerits**.

Keywords **- Vehicular Adhoc Network, Mobile Cloud Computing, Vehicular Cloud**

I. INTRODUCTION

Nowadays most of the automobile have intra conveyance network that permits wireless communication between vehicle and electronic gadgets like good phone ,Global Positioning System (GPS) ,Bluetooth media players. however the lay conveyance communication network continues to be not on the market. therefore to produce lay conveyance communication VANET i.e. Vehicular ad-hoc Network technologies ar rising. Vehicular unexpected networks (VANETs) are designed as a set of mobile unexpected networks (MANETs) with the distinctive property that the nodes here are vehicles [1]. So node i.e. vehicle movement is restricted by road course, encompassing crowd and crowd rules. Attributable to these restrictions, VANET is supported by some fixed infrastructure that assists with some services of the VANET and provides access to stationary networks. The fixed infrastructures are deployed at essential locations like road sides, service stations, dangerous intersections or places with unsafe weather conditions.

Vehicular Cloud Computing

Recently, a number of solutions were proposed to address the challenges and issues of vehicular networks. Vehicular Cloud Computing (VCC) is one of the solutions. VCC is a new hybrid technology that has a remarkable impact on traffic management and road safety by instantly using vehicular resources, such as computing, storage and internet for decision making. This paper presents the state-of-the-art survey of vehicular cloud computing.

Various Characteristics of VANET

High Dynamic Topology: VANETs have very high dynamic topology .The communication links between node changes terribly speedily. Communication between two nodes remains for terribly less time [3]. As an example if two vehicles moving off from one another with a speed of 25m/sec and if the transmission range is 250m, then the link can only last solely for less than five seconds (250m/ 50ms-1). Therefore, this however extremely dynamic topology is present in VANET

Frequent disconnected Network: From the above characteristic we have seen that connection between two or additional vehicle remains for five second roughly. To keep up the continuous property vehicles desires another association close straightaway. But if failure happens vehicles will connect with Road facet Unit (RSU). Frequent disconnected network in the main happens wherever vehicle density is incredibly low like country.

Mobility Modelling and Prediction: The above two properties needs the data of positions of vehicles and their movements however this is often terribly dealt to predict since vehicle will move willy-nilly and it doesn't have a pattern. Therefore quality models node prediction that supported the study of predefined road route model and vehicle speeds are use.

Communication Environment: The mobility model highly varies in different environment from rural area to urban area, from highways to that of city environment. So mobility modeling and vehicle movement prediction and routing algorithm should adapt to these changes. For highways mobility models are very simple because vehicle movement is one dimensional. But in case of city environment lots of vehicle present different obstacle like building are present it makes communication application very complex in VANET.

Hard Delay Constraints: Safety aspect like accident, sudden break and emergency call of VANET application depends upon the delivery time of data. It cannot compromise for data delay in this type of application. Therefore hard delay constrain is more important in VANET than high data rate.

Crowd Sensing through Vechicular Cloud Computing

Mobile crowdsensing aims to provide a mechanism to involve participants from the general public to efficiently and effectively contribute and utilize context - related sensing data from their mobile devices in solving specific problems in collaborations. Also, a remarkable trend in mobile computing is the increasing use of mobile devices to access social networking services. The wide availability of sensing modules in mobile devices enables social networking services to be extended to incorporate location based services, media tag services, etc. Therefore, there is growing interest in fusing social networking services with real - world sensing, such as crowdsensing [2]. Mobile social networks (MSNs) [12] not only can provide an ideal and ubiquitous platform to enable mobile users to participate in crowdsensing, but can also help to improve the context - awareness of mobile applications and better assist users in mobile crowd sensing by analyzing and utilizing their social contexts.

II. RELATED WORK

Various literatures regarding the selected topic has been studied and reviewed in this chapter and they are as follows:

S. Kanhere,[1] et al. proposed an algorithm in which the evolution process of the message clustering is taken into account. The fuzzy clustering procedure normally divided into steps. In VANETs, several aspects of the vehicle state information, which are generated by on-board sensors, like as vehicle speed s, brake frequency b, acceleration e, message creation time t, horizontal or vertical geographical coordinate (σ, ρ). This information can be indirectly reflected the road crowd situation, or it can be grouped into a one atomic message as its attributes.

Olariu et al., (2013)has introduced the vehicular cloud concept which is a further step to assemble the computational and situational consciousness of drivers in public and the greater portion of the population. The ultimate focus of the VC is to offer on demand solutions for unpredictable events in a proactive fashion. We must outline the structural, functional and behavioral characteristics of VCs and recognize the independent cooperation of vehicular resources as a unique feature of VCs. VCs are able to offer a unified incorporation and reorganized management of on board facilities. VC can adapt dynamically according to the changing application requirements and system environments.

In [2] Baguenaet. al. present "adaptive Anycasting solution for Vehicular Environments" (AVE), which is a message delivery protocol that combines geographical and topological information to dynamically adapt its behavior to network conditions. We focus on vehicle-to-infrastructure connectivity for cloud services, where the vehicles send the sensed information as individual and independent messages to a cloud service in the Internet. This scenario requires access to any available close-by roadside unit, thus making anycasting the ideal delivery mechanism. Simulations results show that the hybrid and adaptive approach of AVE is able to improve network performance.

In this, Q. Fang [3] et al. proposed With the attained feature information, design the D-SEMA scheme to enhance the accuracy of an event detection by introducing with one message credibility assignment function or an enhanced D–S evidence reasoning theory. The system architecture of D-SEMA, the road congestion event is denoted as ''A''. If a huge number of aggregation messages are used in a D–S evidence combination, and the computational overhead of the event detection will be unacceptable. Therefore, firstly set the two threshold values θa, θs for the message attributes a(ni) r, s(ni) r to reduce an amount of aggregation messages. Only all of the message attributes of an aggregation message has satisfied the following conditions can be used as a congestion feature evidence.

$$\begin{cases} 0 \le s_r^{(n_i)} < \theta_s \\ 0 \le a_r^{(n_i)} < \theta_a. \end{cases}$$

In this method, L. J. Guibas [4] et al. proposed the research of congestion control algorithm which ensures a high reliability or time bases delivery of disseminating the event-driven safety messages. The purpose of congestion control algorithm that can be divided into following two main parts: measurement-based detection and event-driven detection. The flowchart steps for congestion control algorithm are demonstrated.

In this, Darus, MohamadYusof [5] et al. proposed the measurement-based congestion detection that will monitor the CCH channel based on the packets of channel queue. The CCH channel is congestion if the number of messages in queue exceeds a defined threshold. It based on the research which is concluded that a queue with the length of five beacon messages that can be sufficient to used for 802.11p beaconing. In congestion control algorithm, congestion control discarded a packet queue much more than 5 beacon safety messages.

In this method, Darus, MohamadYusof [6] et al. proposed an event driven detection method that monitors an event-driven safety message or decides to intialize the congestion control algorithm. When an event-driven safety message is detected and generated. The congestion control will be launched immediately the queue freezing technique for the all MAC transmission queues that except for an event-driven safety message. Follow the order to send an event-driven safety message with minimum delay, the lower priority messages like as beacon messages emission has breezed. Presently, an event-driven detection method is used in existing of congestion control algorithm.

In [7], PM Dhanya et al. proposed the major goal of CEP system is to track and detect real world situations, known activities such as crowd-sensing along a motorway. The CEP is based on the idea which an activity has been split in simpler ones. In this case, crowd-sensing can be divided in various groups of the slow vehicles. In turn, each of the activities can be divided into sub activities with lower level of abstraction [11]. In the summing up, some are reflected as clouds of the interrelated rough events in lowest layer of an IS. In present scope, the target IS has own VANET. The CEP system gets as input of the rough events and creates a layered hierarchy of the events with individual levels of the abstraction to compose one and more complex of events

which represent an initial real-world activity. These complex events can be sent to back-end system that performs some kind of actions or procedures.
To do the CEP tries to search relationship, detailed as predefined patterns, among the events of IS. The patterns are described in the CEP system as the event-processing rules that comprise both of pattern definition and the action to be changed whenever pattern is met. It based on EPRs, the event processing agents are designed. An EPA is composed of EPRs which generate events of a particular level of abstraction. It contains an event processing engine [8,9]. This engine is charged while running the individual EPRs of EPA and performing their associated actions.
In this, H. Takagi [10] et al. proposed the EDA that acts as a middleware between network level that is in charge of VANET communications at low level, and higher level holds the back-end applications. The general structure of EDA takes beacon messages from a network layer as rough events, or the EPAs perform a CEP processing of afterward; more so, the EDA gets as input events from the data sources that state road environment. These data sources mainly inform the weather conditions on EgoV road. Such these events are merged with events that made up from the beacon messages; conversely, the EPAs works in cooperative way and a hierarchy has composed. In the conclusion, the EDA creates a crowd alarm when a crowd jam is detected or tracked. This event is sent to back-end application and they could be used, either to an alert both driver and passengers of the EgoV and to display a warning message on information panels of motorway depends upon, where the EDA is running.
Alberto Gordillo Muñoz et al. [11] proposed Multicast over vehicle adhoc networks. In this work, several approaches are categorized and compared which provides its merits and demerits to give better result for multicast over vehicle adhoc network. Vehicular networks may improve the safety and efficiency of road travel but there are many challenges that still need to be overcome .There exist many different protocols that try to solve these issues using different approaches.
Marwa Altayeb1 and ImadMahgoub et al. [12]presented A Survey of Vehicular Ad hoc Networks Routing Protocols.The objective is to give a survey of the VANETs routing mechanisms, this paper gives an overview of Vehicular ad hoc networks (VANETs) and the existing VANET routing protocols; mainly it focused on vehicle to vehicle (V2V) communication and protocols. The paper also represents the general outlines and goals of VANETs, investigates different routing schemes that have been developed for VANETs, as well as providing classifications of VANET routing protocols (focusing on two classification forms).
SanjoyDas, and D.K Lobiyal et al. [13] presents a performance Analysis of LAR Protocol for Vehicular Ad Hoc Networks in City Scenarios. In this paper, performance analysis of Location Aided Routing (LAR) protocol in different city scenarios has been done. The mobility model considered is Manhattan model. This mobility model used to emulate the movement pattern of nodes i.e., vehicles on streets defined by maps. The objective is to provide a qualitative analysis of the LAR protocol in different city scenarios in Vehicular Ad hoc Networks. The simulation work has been conducted using the Glomosim 2.03 simulator. The results show that LAR1 protocol achieves maximum packet delivery ratio is 99.68 % and maximum average end-to-end delay is 7.319969 ms when the network is sparsely populated. Further, for densely populated network maximum achieved packet delivery ratio is 87.58% and average end-to-end delay is 0.017684 ms.

III. CONCLUSION AND FUTURE SCOPE

A systematic review of various works done in the field of vehicular cloud computing has been presented in this paper. Vehicular Cloud Computing is an interesting area of research these days and has become quite popular recently. The reason is its extensive utility in traffic congestion and collision avoidance. The paper summarizes all the works related to such areas and discusses them for their utility and limitations. In future other novel concepts of cloud computing can be applied on VANET like security, storage efficiency improvement, Software as a Service, etc and the performance can be compared with their traditional counterparts.

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