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Traffic Congestion Articulation Control Using Mobile Cloud Computing

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Abstract – Traffic congestion is the biggest problem in both the traffic tools whether adhoc mobile networking or general road traffic system. The continuous advancement in the automotive industry changes the definition of the vehicles. Now vehicles are now coming with equipped sensors and other processing as well communication capabilities. VANET considered as a distinct type of Mobile Ad Hoc Networks, which avoid the jam and articulation situation and moreover save the time by getting guidance from the GPS system about the shortest path from the various algorithm. Even it guide about the road safety issue and destination. It reset the shortest path through various algorithm again and again so that user will not get stuck in the traffic jam. This paper outlines the VANET definition, its architecture and protocols from a research point of view. Although, VANET are a subset of MANET but they are also the future of Intelligent Transport Systems.

Key Words – Ad-hoc networks, sensors, things, vehicular ad hoc networks, New-technology, Cloud-Computing, Sharing-Resources, Auto-detect, Traffic clear.

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1. INTRODUCTION

Mobile communication techniques have entirely changed the automotive industry. Now communication between different devices are possible. It has developed a new paradigm in the traffic networking. The concept of Vehicular Ad-hoc Networks (VANET) came into limelight which has opened new possibilities to avail the use of fault and congestion free traffic applications. VANET refers to a network created in an ad-hoc manner where different moving vehicles and other connecting devices come in contact over a wireless medium and exchange useful information to one another. A small network is created at the same moment with the vehicles and other devices behaving as nodes in the network. Whatever information the nodes possess is transferred to all other nodes like in different topologies. In the same manner all the nodes after transferring their set of data receive the data being transmitted by other nodes. After accumulating all of such data, nodes then work to generate useful information out of the data and then again transmit the information to other devices [2][4]. The communication between devices expands in such as way where nodes are free to join and leave the network i.e. it is an open network. The new vehicles being launched in the market are now coming with equipped on board sensors which make it easy for the vehicle to easily join and merge in the network and leverage the benefits of VANET. VANET is a variation of MANET (Mobile Ad-hoc Network). MANET comprises of nodes which communicate without central network and where nodes are equipped with networking capabilities. VANET on the other side has emerged as a challenging and more liable class or variation of MANET. The freedom of nodes to enter or leave the network in VANET calls for different routing protocols than MANET [3]. This inter vehicle communication leads to passing and receiving of information so as to increase traffic efficiency, detect road conditions, detect the congestion and jam ,decrease collisions, detect emergency situations and overall increase the efficiency of the network. VANET transfers the information to distant devices as well with the help of multi hops [6]. VANET used a Dynamic topology. In the dynamic topology the speed and direction of vehicles changes constantly therebyresulting in intermittent connectivity. In the Intermitted connectivity the Connectivity between devices changes very frequently like connection between two devices exchanging information can disconnect anytime. It have different Mobility Patters which are actually large section of vehicles follow a certain patterns to move which is generally a function of traffic signals, speed limits, highways, streets, road conditions etc. These patterns when observed help in the creation of routing protocols for VANET.and these patterns are defined by various algorithm .It is assumed that the nodes in VANET are capable of possessing an unlimited amount of power as well as storage capacity. Now days in all latest vehicle there

is On board sensors. VANET also forms a very important part in Intelligent Transport Systems.

Traffic jam position occurs when a volume of traffic generates demand for space greater than the available road capacity; this point is commonly termed saturation or articulation point. There are a number of specific circumstances which cause articulated intensify congestion most of them reduce the capacity of a road at a given point or over a certain length, or increase the number of vehicles required for a given volume of people or goods. Most of the traffic jam result in to traffic incidents, congestion and wastage of time. Traffic research still cannot fully predict under which conditions a "traffic jam" (as opposed to heavy, but smoothly flowing traffic) may suddenly occur. It has been found that individual incidents (such as accidents or even a single car braking heavily in a previously smooth flow) may cause ripple effects which then spread out and create a sustained traffic jam when, otherwise, normal flow might have continued for some time longer. Using cloud computing features we may minimize traffic jam position in cities.

2. PROTOCOLS FOR TRANSMISSION

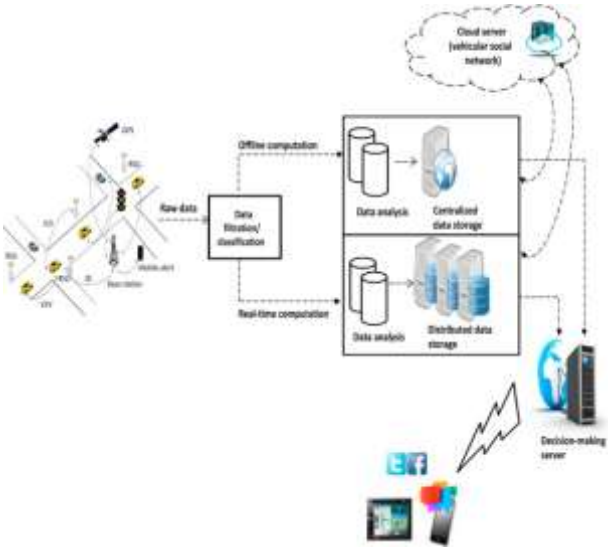
VANET runs on the communication system that takes lies between different vehicles. The data being gathered and exchanged by the vehicles requires some protocols or rules through which transmission can take place in a systematic and organized way. The data exchange between nodes in a VANET happens by routing protocols. These protocols define how a packet of data will be distributed among different nodes. On the basis of senders and receivers involved, two types of protocols are used for VANET communication they are unicast and broadcast.

3. PROPOSED MODEL

In VANET there we required numerous which basically require sources information such as intelligent transportation systems (ITS) environment, vehicle information, roadside unit , base station (BS), traffic infrastructure (traffic lights, CCTV camera, web camera), GPS data etc. The above-mentioned sources are deployed with a huge number of sensors and a processor that produces enormous data. Apart data are also generated through various mobile devices interacting with VANET. The amount of data that has been generated is of precious data and could be used for various applications, and those data contain lots of benefits.

The data is enormous so Data science would be the possible powerful system-level solution for ITS.

The database is designed such that it maintain the large, diverse, and complex datasets that are generated from various data sources in vehicular networks, including sensors, GPS, and other available source information for effective use on VANET applications. The focus is on GPS datasets and various sensors deployed on the vehicles, for which values are relatively easy to understand. Nevertheless, there are overwhelming technical challenges in collecting, processing, and analyzing these datasets, which demand new solutions in the vehicular network. In the proposed architecture, unstructured or raw data that are collected should be analyzed first through a filtration process as shown in Fig. 1.1.



For data acquisition, the information from various vehicles and its sources are subdivided into data pre-processing and data post processing. First, because data may come from a diverse set of sources, various sensors are deployed in the vehicles and GPS datasets. In general, data collection refers to a tool that obtains raw data from a specific data production environment. Similarly in the proposed model, raw data is obtained from the vehicle and its sources. In addition, after accumulating the raw data, there is a need for a high-speed transmission mechanism to transfer the data into the appropriate data-storage system for further analyses. The vehicular environment requires special assistance for high-speed transmission.

The collected raw datasets might contain many meaningless data; redundancy is common in most datasets collected from sensors deployed to monitor vehicles and various data compression technologies can be used to address this issue. The data acquisition technique is a pre-processing mechanism where collected datasets are filtered, as shown in Fig1.1. The data obtained are classified and further data validation takes place. Thus, it is conceived that pattern matching, data prediction, and data detection on comparing with historical data provides data validation in vehicular networks a vehicular cloud server is the backup or restores the necessary valid information.

4. CONGESTION FREE TRAFFIC SYSTEM

The major function of traffic lights is to control the jam and to coordinate the traffic moves smoothly

and safely as possible so that there should not be traffic congestion and pedestrians also cross the roads safely. In traffic control system still we used electro-mechanical signal controllers. Unlike computerized signal controllers, electro-mechanical signal controllers are mostly have control signals that are wired to them correctly. Apart from movable parts, electrical relays are also used. In general, electro-mechanical signal controllers use dial timers that have fixed, signalized intersection time plans. Generally it have fixed time slice Cycle lengths of signal that intersections are determined by small gears that are located within dial timers. Cycle time span gears range from 35 seconds to 120 seconds. If a cycle time span gear in a dial timer results in a failure, it can be replaced with another cycle time span gear. Since a dial timer has only one signalized intersection time plan, so it can control phases can be signalized intersection in one way only. Many old signalized intersections still use electro-mechanical signal controllers, and signals that are controlled by them are effective in one way grids where it is often possible to coordinate the signals to the posted speed limit. They are however demerits of it Today traffic jam in many cities is major problem. Using cloud computing we can reduce this problem. The Computerized Traffic Signal System employs a distributed system design, by implementing intelligent units at all on-street locations and an Advanced Traffic Management System at the Traffic Operations Centre. This design provides a means of auto timer change in any of traffic signal point as and when camera detects the traffic jam position. It will be decided by computer system when to cross the limit of vehicles in same direction. Advanced system will send the instruction to all related traffic point for increase or decrease time of green/red signals to control the traffic jam.

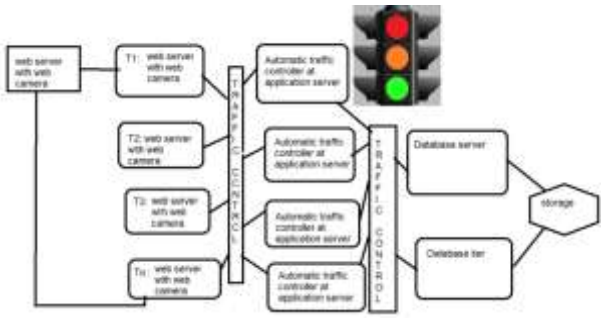
In this cloud-computing based model, T1 to TN are traffic signals point. When excess number of vehicles cross any traffic point (this will recorded by web camera and a report will be sent to the cloud based control point application server), then application server immediately increase the timer of the present red signal position such as by one minute or more depending on the traffic. This act can control traffic jam position in next point of traffic signal. Cloud based Database server collects the total movement of traffic. This will help planning of traffic control in particular area of city.

Logic of traffic auto control:

If vehicle> 150 in T1Then application server increases 1 minute for the red position in T1

If vehicle>200 in T1

Then application server increases 2 minutes for the red position in T1 (this logic may apply for all traffic point)



5. CONCLUSION

VANET gives numerous applications so as to make the road travel experience more efficient, safer, convincing, effective, easy and pleasant by decreasing traveling time, road congestion, increasing road capacity, avoiding congested areas and emergency situations et. Generally metropolitans cities areas are overcrowded and the the traffic control in that particular area a big problem. Using proposed cloud based web control model of traffic control we may minimize this problem.and vanet system will surely minimize the saturation and articulation point in traffic jam.

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