World Applied Sciences Journal 35 (11): 2276-2280, 2017
ISSN 1818-4952

DOI: 10.5829/idosi.wasj.2017.2276.2280

Improving Performance in Transportation Using VANET with Internet on Things

[1]H. Nazini and [2]T. Sasikala

[1]Anna University, Chennai, Tamil Nadu, India
[1]Jeppiaar Srr Engineering College, Omr, Padur, Chennai, Tamil Nadu, India

Abstract: A VANET is a known emerging technology where it is proven that communication is also possible between vehicles (of any type) with use of various computing systems both in vehicles and its supporting infrastructure.In today world, another greatest evolving technology is IoT. This IoT is going to be connected with every possible technology to make it available alive at any time anywhere. With these techniques, a new architecture is defined as PC-WTR (Passenger Count based Waiting Time Reduction), where the passengers waiting in the stops will know the seat availability in the bus in prior before reaching the point. This helps the passengers in analyzing the status of bus to decrease their waiting time. This paper improves the performance of vehicle which in turn will support the public in better decision making. It also helps the transport the department in reporting (by recording the reports), analytical analysis and forecasting. Hence the frequency of vehicle services can be either increased or decreased which will help in forecasting the future services.

Key words: Internet On Things · VANET · PC-WTR

INTRODUCTION

VANET Application is broadly categorized into safety and Non-safety applications. Safety applications are very important because it provides information to users that directly relate to users & safe their lives. The role of DSRC [1] frequency band is important for vehicles to communicate with other vehicles and infrastructure.

Vehicle communicates with each other through adhoc manner, while vehicles may access infrastructures such as BS or AF directly for information interaction in V2I communication mode. Sometimes, vehicles may connect through routing with RSO's or other vehicle's serving as fixed or mobile gateways, and the corresponding communication mode is referredto as HV communication. A traffic control system which can collect traffic information from individual cars & Share the road traffic information over a wide of Networks (WAN), which will dynamically control the traffic signaling cycle. Due to high cost and infrastructure installation problems such system is difficult to deploy over all areas of large cities. The main purpose of such systems is to relay traffic information on time to reduce the journey time. On the other hand the waiting time of passenger is also an important factor in this type of system.

Public transport, especially the bus transport, has been well developed in many parts of the world. The bus transport services reduce the private car usage and fuel consumption, and alleviate trafic congestion.Many public bus services are run to a specific timetable giving specific times of departure and arrival at waypoints along the route. These are often difficult to maintain in the event of traffic congestion, breakdowns, on/off bus incidents, road blockages or bad weather. Predictable effects such as morning and evening rush hour traffic are often accounted for in timetables using past experience of the effects, although this then prevents the opportunity for drafting a 'clock face' timetable where the time of a bus is predictable at any time through the day.

The level and reliability of bus services is often dependent on the quality of the local road network and levels of traffic congestion and the population density.

Corresponding Author: H. Nazini, Anna University, Chennai, Tamil Nadu, India.
E-mail: h.nazini@gmail.com.

Services may be organized on tightly regulated networks with restrictions on when and where services operate, while other services are operated on an ad hoc basis in the model of share taxis.

Increasingly, technology is being used to improve the information provided to bus users, with vehicle tracking technologies to assist with scheduling, and to achieve real time integration with passenger information systems that display service information at stops, inside buses, and to waiting passengers through personal mobile devices or text messaging.

As known many cities are trying to band pollution causing vehicles not only for environmental benefits but also for traffic reduction benefits. When this act come into existence, most of the cars (Personal,rented cars (call taxi)) has to be stopped for travel. At that situation the people have to utilize bus transport in a large population. Theauthor is going to analyze the traffic intensity in terms of passengers count. Hence the traffic intensity of the passengers will get increased statistically.Also there is fluctuation in bus frequency which unanimously increased in morning or evening, and average (or) even below average on other timing. These criteria must be removed for better performance.Hence, a novel approach of PC-WTR is defined to solve this problem to increase the efficiency and performance of current existing system.

Related Work: In the daily operation of public transport systems, mainly that of buses, the movement of vehicles is affected by different uncertain conditions as the day progresses, such as traffic congestion, unexpected delays,and randomness in passenger demand, irregular vehicle-dispatching times, and incidents. Many passengers are often late to work, students are late for classes because they decide to wait for the bus instead of just simply using an alternate transportation. This is because people are highly depressed in driving in heavy traffic and atleast they can have a relaxed travel by using bus transports.

A Real Time Bus Monitoring and Passenger Information system [2] is implemented with a standalone system designed to display the real-time location(s) of the buses in city. This research enabled the tracking devices to obtain GPS data of the bus locations, which it would then transfer it to centralized control unit and depict it by activating symbolic representation of buses in the approximate geographic positions on the route map. In this paper [3] provides an empirical investigation of actual and perceived waiting times at bus stops in the case of a large bus network with the use of duration models.

Long waiting times at bus stops and low occupancy of buses were the main problems suffered by bus users and bus operators, respectively. The objectives of this study [4] were to analyze the punctuality of stage bus operation in mixed traffic, passenger's waiting time and to assess the characteristics of bus operation punctuality for various traffic and bus operation conditions.

A control scheme for the operation of a bus system running along a linear corridor, based on expert rules and fuzzy logic is proposed in [5]. The parameters of the fuzzy controllers were tuned through a particle swarm optimization (PSO) algorithm. That is, the control strategies aim at keeping regular headways between consecutive buses, with the objective of reducing the total waiting time of passengers. The proposed control systems rely on measures of the position of each bus, which are easy to obtain and implement by means of emerging automatic vehicle location devices through Global Positioning System (GPS) technology.

A bus arrival time prediction system based on crowd-participatory [6] sensing is proposed. They interviewed bus passengers on acquiring the bus arrival time. Most passengers indicate that they want to instantly track the arrival time of the next buses and they are willing to contribute their location information on buses to help to establish a system to estimate the arrival time at variousbus stops for the community.

An embedded system using GPS (Global Positioning System), GSM (Global System for Mobile Communication) and Microcontroller [7] for tracking the bus is proposed. The real time co-ordinates obtained from the GPS will continuously monitor a moving vehicle and report the status of the vehicle on request to passengers. The GPS/GSM unit is mounted on the bus sends the data to the central monitoring system microcontroller using the GSM module and displays bus location name on the LCD. The position like Latitude and Longitude of a vehicle from remote place is sent by the GSM module to the Server and then the server calculates the arrival time of the bus and sends to the requested user through GSM module.

Proposed System: Most of the papers concentrate on reducing the waiting time of the passenger based on the arrival time of the bus, traffic intensity and also

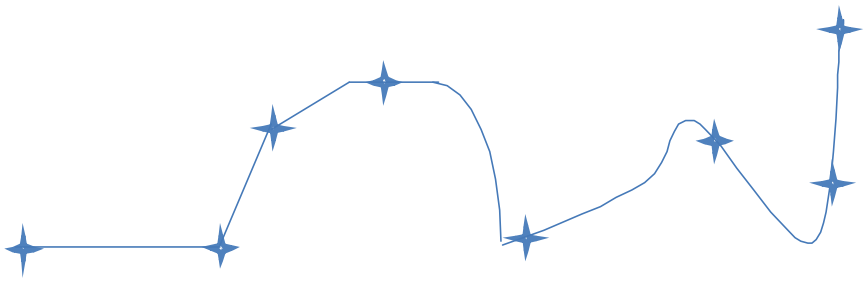

Fig. 1: Bus Route Creation

considering the road conditions. But we proposed a different system PC-WTR, where the passenger count is the basic criteria for reducing the waiting time for the passengers.

Consider a case that the buses at appropriate bus stop on approximate time at each point. Even though the bus is arrives at time, the passengers have to wait for next bus because the bus is totally occupied by the previous stops passengers. Hence there is no space to accommodate the extra passengers although the bus has arrived at right time to right place. This is another perspective of increase in the waiting time of the passenger.

To overcome this scenario we have proposed a new method where we can also consider passenger count in each bus must be relayed to people those who travel along those points.

Bus Route Creation: As known we can generate several routes for the same source to destination points. Since we are considering bus transport, there can be only a fixed path between the source and destination. This may get altered only when there is a massive change in the road conditions due to uncertainties. The GPS helps us to get the position of each node and the path required to reach the destination. They generally follow a standard route through which the buses travel along multiple links with multiple nodes.

By generating a graph in which the nodes represent bus stops and link between each node will help us in calculating the expected time of arrival of bus between each pair-nodes.

Calculating Expected Time of Arrival: The basic idea behind the calculation of expected arrival time is the distance between the nodes (pair–point) from Fig 1 and speed at which the buses traverse along the selected route.With this we have to analyze the road conditions to involve any delay in the calculation.

The first thing is to get the current position of the bus from GPS> and also the position of the next reaching node. With this the distance is obtained between each pair-point and check for any traffic due to any accidents, road damage, and etc. Then the speed at which the bus travels is also noted. Each bus has a unique id, route id, location, and speed as attributes that are gathered from on-board devices for further calculations.

Now the expected arrival time can be calculated easily from above details.

Calculate Passenger Count: A passenger count is nothing but the total number of passengers who travel in a particular bus. Initially the counter will be zero for any bus before it starts travel. Consider a case that we have a single entry and a single exit in order to have clear analysis of passengers count. Once a passenger enters into the bus and swipe their travel card, the passenger count increases by one. Similarly if any passenger exits out then the counter must be reduced by the total of exits. This is achieved through sensors at doors. This count information must be updated after every pair-point and relaying to the next consecutive points.

By observing these values, the passenger waiting at each point may decide

- Either they look for any connection bus to reach to their destination if the bus is full or
- Select other alternate transports like taxi, rental cars, train, etc.
- May wait for next bus that bus have minimum count at some earlier stops

Table 1: Analysis of Passengers Count

Bus Route No.	Bus Current Stop	Expectd Time of Arrival	Actual capacity	Total No. of Passengers	No of Exiting Passenger at Next Stop

Table 2: Trace Passenger on every Entry and Exit

Bus Route No.	Bus Unique ID	Bus Current Stop	No. of Entries per Stop	No. of Exits per Stop	No. of Passengers Count per Stop

Table 3: Display information at Bus Stops

Bus Route No.	Expected Time of Arrival	Current Bus Stop	Total No. of Passengres	Exiting passengers at Stop

- Finally to the worst, they would imagining that their bus may show lesser count before the bus reaches to their point.

Trace Passenger on Every Entry and Exit: This is the very important phase of this architecture where the passenger count is actually calculated. Every person who is travelling on the bus has their own travel smart cars. Once they swipe and enter the destination point, the counter is increased by one against the particular stop. On the other hand some passengers may get down at the same stop. Now the counter also decreases by n number of exits. There may be ups and downs in the counter on every entry and exit at every point or stop. Hence, separate care must be taken because there should not be any congestion or overloading in passengers count. This table is maintained separately for every single bus with unique id.

The passengers who are travelling along specific routes will require only the Bus Route No., the Expected Time of Arrival of that bus, Current Stop, Total No. of Passengers from previous stops, No. of Passengers Exiting in next stop. Thus by combining the Table 1 and Table 2, we can display only the following table with needed information to the passenger waiting along in bus stops.

CONCLUSION

In today's world there is a massive increase in the population of people going to work in offices. Instead of travelling in cars, autos and motorbikes people has started using the bus as a safest mode of transport on road side. To handle this massive increase in the usage of this transport traffic information alone is not enough to manage it. Hence we discussed a new approach where not only expected time of arrival is enough for passengers but also giving them the total number of passengers travelling along the path using PC-WTR methodology. This has definitely helped passengers to take early decisions instead of waiting for hours and hours for buses.Thus the overall performance of the system has been increased.

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