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LATEST IOT APPLICATIONS IN VANET

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ABSTRACT

Wireless communication among IOT enabled vehicles in VANET is the latest trend in intelligent transportation system. It involves collecting the data through sensors and computes the data which helps in sharing useful information in real world applications. IOT enabled vehicles can acquire real time information from environment which helps to achieve effective traffic management and safe driving. IOT enables the vehicles to communicate in real time for social well being as well as for critical information exchange. In future IOT enabled devices will dominate our roads which offer accident free zones. This paper focuses on the latest IOT trends being prevailed in the field of vehicular networking.

KEYWORDS: Intelligent Transportation System, Internet of Things, Wireless Communication, Vehicular Networking, VANET.

INTRODUCTION

The future of the transportation system lies in the intelligent and integrated use of Information technology. The vehicles can be made smart enough to communicate over wireless network using embedded microchips and sensors. IOT will make the future vehicles smart enough like robots which can effectively handle critical situations like road accidents, traffic congestions etc. IOT based vehicles have the capability to collect the information and can share it among the neighboring vehicles. It helps in updating the road related information among the vehicles. Many investors are really interested in the design of IOT connected vehicles that are smart enough to respond to real time scenarios. It is expected that by the

year 2025 about 85% of the cars manufactured will be IOT enabled smart cars. Automotive industry have given widespread importance to the growing trend of smart cars and this will lead to a drastic change not only in private owned vehicles but also in public transportation system. WIFI enabled cars with camera, GPS and sensors will make them intelligent enough to respond in a well programmed manner.

Automotive Industry has designed connected cars in two ways-Embedded and tethered. Embedded cars make use of antennas and chip set while tethered cars use hardware that enables the drivers to connect through Smartphone. Today we have been equipped with many apps like Google maps and other navigation tools that let us replace even GPS. These apps help in identifying the current status of traffic in nearby areas and can act accordingly. Moreover WIFI enabled cars helps in automatic updation of apps in real time. Also the data shared by the smart vehicles can be used to analyze the performance of car in highways and city scenarios and more and more updations can be made in next release.

Driverless cars are the latest trend of innovation in automotive Industry. These cars will hit the road in the upcoming years. Today customers can easily get smartly crafted self driving cars controlled through WIFI and smart phones. IOT enabled smart cars with self driving features will make our lives faster, easier and more comfortable than now. We will be able to focus more on our work rather than spending much of our time in driving ,finding parking slots and a great deal of frustration can be avoided in heading over a traffic jam.

It is expected that by the year 2021 the IOT enabled vehicles will hit the road and will cut down the rate of road accidents, they can maintain proper spacing between v3ehicles and can communicate their position to avoid collisions and traffic jams. IOT will effectively cut down fuel cost, time and also help in identifying parking slots in advance by sending the information to nearby vehicles. They are highly adaptive and responds to changing environments. In future the human error will br of less importance and hence it is the responsibility of the manufacturer to develop technically perfect vehicles with high end protocols and devices that makes their product highly sophisticated and trust worthy.

On Board Diagnostics

OBD is used for self diagnostic and reporting capability. It is a computer based system which involves monitoring the operation of various inputs and outputs i.e the performance of various components are being focused upon. Various On Board Devices are available in

market today, which will help the driver in getting the status of the vehicle components. It uses standardized digital communications port to provide real time data. It also has Diagnostic Trouble Codes that helps to identify the malfunctioning of vehicle parts and rectify the problem easily. A basic OBD system consists of an Electronic Control Unit, which uses input from various sensors to control the actuators to get the desired performance.OBD are of two types: OBD-I and OBD-II.

OBD-I

OBD-I refers to the first generation OBD systems which were developed throughout the 1980s. These early systems use proprietary connectors, hardware interfaces, and protocols. A mechanic who wanted to access diagnostic information typically had to buy a tool for every different vehicle make. OBD-I scan tools that support multiple protocols are supplied with an array of different adapter cables.

OBD-II

In the early 1990s, Society of Automotive Engineers (SAE) and International Standardization Organization (ISO) issued a set of standards which described the interchange of digital information between ECUs and a diagnostic scan tool. All OBD-II compliant vehicles were required to use a standard diagnostic connector (SAE J1962), and communicate via one of the standard OBD-II communication protocols.

New IOT Devices for Vehicles

Reliance Jio has a new IoT product coming up: 'Jio Car Connect', an On-Board Diagnostic (OBD) device that can be plugged into a car's OBD module to record and track engine and other vehicular related data. Once plugged in, the device records data from the vehicle's sensors and displays it on a mobile app. This data is mainly used for diagnosing issues within a vehicle's system, since the OBD device records vehicle information, acceleration (Rate Per Minute), throttling/revving, instances of braking, fuel/battery efficiency, trip duration, among others.

Jio's OBD device is still on a testing phase and will also beam WiFi inside a car, since the device apparently runs on a Jio SIM card.

Vehicular data collection

This will provide each vehicle with a virtual identity via an IP address, and allows interconnection with other connected cars. The device can also be used to record traffic details and share alerts in real-time in case the car gets into an accident. This device records vehicular data, and can be generated on-demand. For example, a historical data of the car denoting its working condition and efficiency can be shared with a potential buyer; this data can also be shared with RTO or an insurance company.

Trak N Tell GPS device

Gurgaon-based Trak N Tell is a GPS based product that enables car owners to track their vehicles using their smartphones. The vehicle can be turned off or immobilized to prevent theft.

MapmyIndia car tracking device

MapmyIndia had launched a plug and play device called DriveMate that connects to cars via the OBD port and provides location, ignition and status reports, alerts of the vehicle via Android, iOS and Windows Phone apps.[1]

Intelligent Vehicles

Vehicles are equipped with multi interface cards and sensors which effectively reduces travelling time and eliminate traffic congestion. On board wireless devices like IEEE 802.11p which is specially designed for vehicular environment, UMTS, Bluetooth technology are being used in VANET. The sensors such as on Board radars perform forward crash avoidance, too close warning, approaching too fast warning and adaptive cruise control. These types of radars are available in some model cars such as Toyota, Nissan and Honda.

A smart vehicle is equipped with the following devices and technologies:

(i) A CPU that implements the applications and communication protocols

(ii) A wireless transceiver for data transmissions among vehicles (V2V) and from vehicles to RSUs (V2I)

*(iii)*a Global Positioning Service (GPS) receiver for positioning and navigation services

(iv) Different sensors lying inside and outside the vehicle to measure various parameters.

(v) An input/output interface for human interaction with the system.

VORAD Safety Systems –a highly sophisticated radar based system that introduced a forward and side sensor intended for large vehicle use. It provides additional driver safety and convenience with automated cruise control.[4]

The AlwaysAlert -helps avoid accidents- It helps the drivers maintain safe following distances.

SmartCruise-Reduces Driver Fatigue. It electronically communicates with diesel engines to match speed with traffic flow.

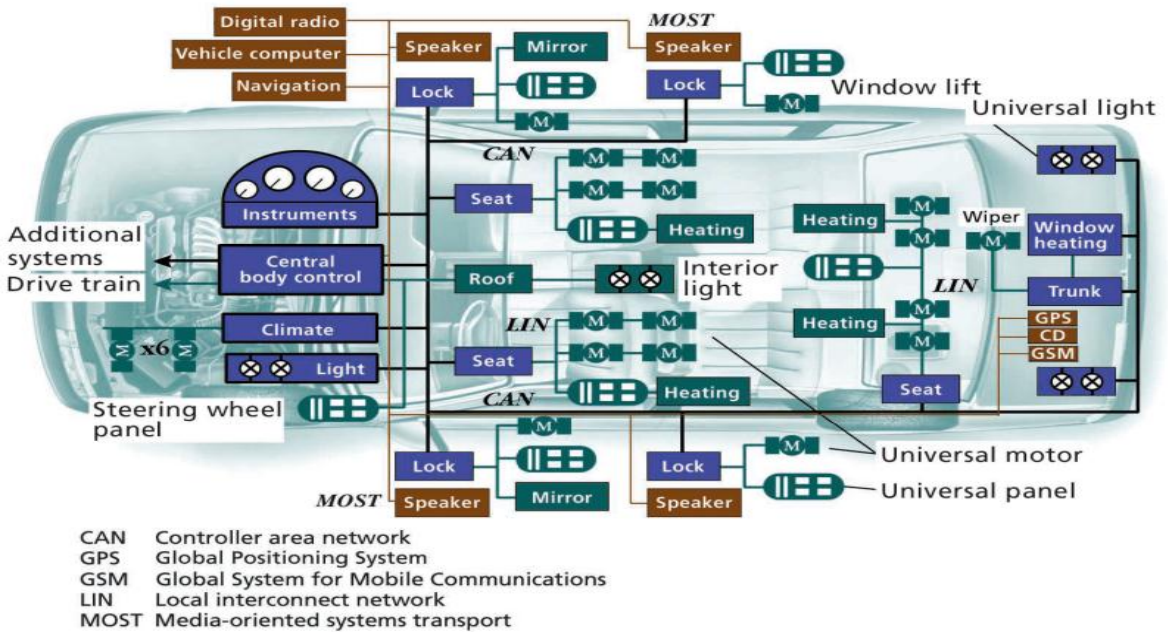
BlindSpotter – Warns driver of obstacles in their blind spot.

In 1999 Mercedes-Benz advertised an automatic curse control for S class to track moving vehicles 150 meters in front of vehicle. Jaguar, owned by Ford, announced an automatic curse control for about 1,400 pounds The Jaguar system sets 45 meters as a safe distance between vehicles traveling at 80 kmh.

BMW's Connected Drive ensures intelligent parking assistance system and makes the maneuvering easier, faster and effortless. ConncetedDrive parks the vehicle automatically, parallel or perpendicular to the street. It works by measuring potential spaces while driving past them at a low speed. If the driver uses Parking assistant, Active Park Distance Control (PDC) offers additional protection against damage with the Lateral parking aid.[9]

Audi's AudiConnect offers lot more features in vehicle assistance. Features such as Geofencing and Custom alerts, parking position, remote vehicle services, assistance and security services such as stolen vehicle locator and online road assistance are well offered by Audi. The latest version offers three new features: ConnectCare which helps assistance and security in emergency situations, ConnectPrime that offers more navigability and stay informed and ConnectPlus offers live updates and entertainment.[10]

In the forth coming years we will be driving new smart and intelligent vehicles with functionalities such as data communications and sharing, safety messages and alerts, automatic parking facility, positioning information with the help of onboard equipments and sensors.



Bosch developed the Controller Area Network, one of the first automotive control and widely used vehicular networks. CAN is a high-integrity serial data communications bus for real-time applications, operating at data rates of up to 1 Mbit/s and having excellent error detection and confinement capabilities. The enhanced version of CAN, called *CAN with Flexible Data-Rate* (CAN FD), supports payloads higher than 8 byte per frame.[3]

The use of Visible Lighting Communications (VLC) provides a valid technology for communication purposes in VANETs. It can achieve high data rates, while also providing illumination.

Recent advances in the area of ITS have developed the novel Dedicated Short Range Communication (DSRC) protocol, which is designed to support high speed, low latency V2V, and V2I communications, using the IEEE 802.11*p* and WAVE standards. DSRC uses the 5.850-5.925 GHz band for the use of public safety and private applications.

LTE is the upcoming 4G cellular network with high data rate support for multimedia services, and robustness to high speed. The use of small cells will be massively deployed for increasing coverage areas; as a result they can be good candidates for V2I communications due to their reduced cost.

Latest solution exploits the use of LTE technology in VANETs. In,[2] the authors propose LTE4V2X approach, for the framework of a centralized vehicular network, whose effectiveness has been proven with respect to decentralized protocols. LTE4V2X uses both

the IEEE 802.11*p* and 3GPP, LTE to provide an efficient way to periodically collect messages from vehicles and send them to a central server. As a result, the use of heterogeneous wireless network architectures achieves seamless data connectivity among separated vehicular clusters.

CONCLUSION

This paper briefs information about the latest IOT applications that were implemented in the vehicles that support the Intelligent Transportation System. In the upcoming years vehicle manufacturers will come up with latest IOT technologies that help in the assistance of drivers for free and effortless driving by enjoying the ride without even worry about the traffic related problems. It becomes a competitive world of vehicle manufacturers in implementing the latest IOT techniques and people will be choosing their vehicles by checking the IOT manuscripts for vehicles while choosing them in near future.

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