A SURVEY ON CHALLENGES AND OPPORTUNITIES OF SMART VEHICLES IN INDIA

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ABSTRACT

This paper deals with the survey of smart connected vehicles which based uninterrupted internet and remote sensing feature. The smart city is an embedded with high end processors and sensors to provide better comfort to the user which is capable of communicating information either wired or wireless connections. Internet of things is an ongoing emerging technology which helps the world for better pavement for the automation and real time data monitoring, performing control action repeatedly. Outcome of the survey tells us the purpose of replacement of existing traditional vehicles by anonymous vehicle in the Indian society. This paper lists various opportunities and challenges faced by smart connected vehicle. the main aim of this paper is to inculcate the concept of smart connected vehicles in smart city for India.

Keywords:

Internet of Things(IOT), Vehicular ad hoc networks (VANETs), Internet of vehicles(IOV), Mobile Ad hoc Networks (MANETs), Road side unit(RSU),Electronic control unit (ECU).

INTRODUCTION:

In a smart city, all the instance should be smart to meet the current trends. Recent improvement is current era is smart embedded processor and wireless machine to machine communications. The intelligent instance is known as objects of the real world provide safe and convenient environment with all intercommunication and interoperations, which is known as internet of things, one among the objective of IOT is smart vehicles which plays a safe and convenient role in travel. Smart vehicles enhance safety by electrically interacting with other vehicles and the driving environment creates a privacy space for the user. Advanced information system in each vehicle provide wide range accessories to user. All the recent computer topologies with the internet contributes a safe driving experience. The main vision of the Internet of Things (IOT) is to equip real life physical objects with computing and communication abilities so that they can interact with each other for the social good. As one of the important members of IOT, Internet of Vehicles (IOV) has seen rapid development in communication technologies. Increasing in automobile sector is characterized by a sophisticated network of computers linked to one another and to the Internet. Some track and report on internal systems and vehicle usage. Others features help govern such functions as steering and braking, others features are integral to on-board navigation, communication, information and entertainment systems. Vehicles soon will be equipped with functionality to be in constant communication with surrounding vehicles and transportation infrastructure to improve safety.

An automobile with an advance electronics such as microprocessor, microcontroller to provide better drivetrain to improve stability, breaking, general comfort from risk free driving, enabled with enhanced GPS navigation and message passing between other vehicles is smart connected vehicle.

fig.1 smart transportation

Name	Description	Example
No automation	Human driver completely controls the vehicle	N/A
Driver assistance	Individual activities that assist steering or acceleration/deceleration are partially automated	Park assist
Partial automation	Several, simultaneous activities that assist steering or acceleration/deceleration are partially automated	Traffic jam assist
Conditional automation	In certain driving scenarios, all dynamic, non-strategic, driving activities (e.g. vehicle control but not route choice) are automated but human is expected to intervene when requested	Automated motorway driving
High automation	In certain driving scenarios, all dynamic driving activates are automated and vehicle can cope without human intervention except when requested	Urban automated driving
Full automation	Always and everywhere, all dynamic driving activates are automated with no need for human intervention	Full end-to-end journey

Table.1 level of automation

It is important to note that the level of automation can vary from zero to full automation. NHTSA classifies vehicle automation in six levels based on the technology that has been implemented and year at which the automation has implemented [1].

VEHICULAR AD HOC NETWORKS:

Now, vehicles can easily transfer information's related to safety, efficiency, custom data to other nearby vehicles using vehicular ad hoc networks (VANETs). These VANETs follow machine to machine communication networks. The real time application data offers safe and efficient travel to the vehicle user, offline data ensure smart behaviour of the vehicles and general transport authorities. All ECU can improve vehicle performance and enhance diagnostics capabilities, but they have proved vulnerable to hackers.

Vehicular Ad hoc Networks (VANETs) belong to a subcategory of traditional Mobile Ad hoc Networks (MANETs). The main feature of VANETs is that mobile nodes are vehicles endowed with sophisticated "on-board" equipment's,

traveling on constrained paths such as roads and lanes, and communicating each other for message exchange via Vehicle-to-Vehicle (V2V) communication protocols, as well as between vehicles and fixed road-side Access Points known as wireless and cellular network infrastructure, in case of Vehicle-to-Infrastructure (V2I) communications [2]. For this reason, vehicles and RSUs are necessary to form a vehicular network [3]. Figure 2 shows an example of a vehicular network. As shown, there are communications among vehicles, and between vehicles and the infrastructure. In addition, using the infrastructure, vehicles are able to access to Internet. Future networked vehicles represent the future convergence of computers, communications infrastructure, and automobiles [4]. Vehicular communication is considered as an enabler for driverless cars which has the following advantages minimize latency in communication link, support short messages delivery and present lower deployment cost with independent range communication facility. In smart vehicles there is strong need of vehicular communication and routing protocols based on the priority. Message passing, traffic maintenance and general purpose internet access. VANET is a spontaneous ad hoc developing and deploying application which is characterized by rapid changing topology, high mobility, one and one interaction. Self- organization of nodes and moment is characterized by MANETs and VANETs.However, due to driver behaviour, and high speeds, VANETs characteristics are fundamentally different from typical MANETs. VANETs are characterized by rapid but somewhat predictable topology changes, with frequent fragmentation, a small effective network diameter, and redundancy that is limited temporally and functionally.

fig.2 VANET

GSM, UMTS, Wi-MAX limited Wi-Fi and new and specific technology are used in various application such as Wireless Access in Vehicular Environments, IEEE 802.11/p. VANET follows no fixed architecture and topology. One of the major challenges in the design of vehicular ad-hoc network is the development of a dynamic routing protocol that can help disseminate the information from one node (vehicle) to another

OPPORTUNITIES OF SMART VEHICLE IN INDIAN ECONOMY:

Upcoming years number of equipped with embedded connectivity will rise by 300% of sales. The technology will transform the way communicate and interact within products and services while we travel and will create a multi-billion dollar opportunities for ecosystem [5].

1. Predictive Maintenance and Inventory Management.
2. Over-The-Air Updates.
3. Infotainment Services.
4. Product Differentiation and Customer Retention**.**

Fig.3 smart transportation infrastructure

NETWORK OPERATOR OPPORTUNITIES:

1. Network Operators leading the way.
2. Rise in Average Revenue Per Driver (ARPD).
3. New Revenue Models

HARDWARE MANUFACTURER OPPORTUNITIES:

1. Telematics Control Units (TCU).
2. Storage and Processing.
3. Biometrics.

SERVICE OPPORTUNITIES:

1. Insurance Firms.
2. Mobility-as-a-Service.
3. Safety and Security.
4. Advertising.

CHALLENGES FACED BY SMART VEHICLE IN INDIA:

India's push into the driverless race is been driven by the TATA group and Mahindra group along with a slew of start-ups and engineering schools. The technology continues to evolve, but we have to develop regulations, insurance models, and even more guidelines for technology that never existed before.

The major challenges faced for implementation of smart vehicle is,

Indian roads: a true deep challenge faced. Tata consultancy's Tata Elxsi is developing a smart car platform. The vehicle still has the original alternative system so that the driver can take response if the autonomous system of the car fails.

Investment: Developers in India have also given up a head start to global giants who are pouring billions into smart vehicle platform. Especially Ford Motor co., tesla Inc., etc., invested heavy amount but not yet given a worthy smarter vehicle. A setup of one car can cost $75000.

Traffic in India: After analysis of last year India traffic, Uber co-founder reported that India will place last in smart vehicle project. Not only traffic people driving is too bad. this was also stated by the Uber co-founder. Even if traffic fatalities are cut in half by autonomous vehicles, the moral outrage over a single death at the hands of machine will exist. Radar and LIDAR technology are used to detect obstructions in dark far better than human eye, but it didn't

seem to work in this situation. Thus a question rises whether human is needed to avoid this accident or these smart vehicles will be built to perform at nearly high perfect levels in order to overcome this problem.

Security and privacy issues: security in connected vehicles in still a tedious task to handle due to the growth of technologies. The connected vehicle suffers from hackers and privacy issues but the security in India related to hackers is bit of 5 to 10%. Where else in other countries suffer from 30 to 60% of hackers.

FUTURE WORK:

Eliminating all possible downgrades is a tedious task, some of the downgrades are only limited improvements were made in safety due to mix of conventional and autonomous vehicles, vehicle owner ship still remains persistent problem, providing user comfort in large vehicles is very difficult, self-driving cars and taxis increase empty car transport, crowding in pedestrian and cyclist path so it requires more advanced smart parking system and cost of the connected cars are bit higher than that of normal cars. The main problem in the smart vehicular transport is it requires special governance in traffic system and proper maintenance of vehicles.

CONCLUSION:

Era of smartness with uninterrupted internet provides better comfort for the user. This paper widely revels the smart driverless car technology. VANET technology is an uncertain piece of tech for smart connected vehicles. The survey has been performed in various fields based on the Indian economy which are key factors for smooth driving experiences. The ubiquitous availability of connected devices can enable the development of effective infrastructure-free approaches for solving problems in Smart Cities. Since there are lot of drawbacks in implementing this technology in India, it has certain opportunities provided to the people. there are lot of researches are taking place in this space thus the challenges faced by this upcoming technology will be overcome.

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