Abstract

The Internet of Things (IoT) is an uprising technology that is expected to transform our lives. Internet now a day has already connected people’s life and recently it is connecting ‘Things’ to make consistent communication and intelligence pooling. IoT is an upcoming technology that has enormous potency to make over the world and is changing the way we live. The uses of Low cost Internet connected devices and sensors have created new Possibilities in the field of communication. Today we are already seeing possibilities of connected cars, driverless cars with the application of IoT in the automotive sector which was previously being seen as a futuristic theoretical concept. The application of IoT is also seen in the car ecosystem covering parking, environment and supply chain. Evolution and developments has been discussed on Internet of Things with regard to the sector related to automotive that provide a perspective on the various areas such as- Vehicle communications, Connected Car services and applications, IoT based Supply Chain Management, IoT in Intelligent Transportation and New Generation Cars, where tangible progress is being made.

1. INTRODUCTION

IoT is a disruptive technology where cyber world meets the physical world. It is autonomous communication between inanimate objects, in order to benefit human beings.
IoT encompasses all technologies in SMAC (Social, Mobile, Analytics and Cloud). Automotive industry is on course to a disruptive transformation using developments around smarter vehicles and related infrastructure. IoT is at the heart of this digital transformation in Auto sector. It connects people, machines, vehicles, auto parts, and services to streamline the flow of data, enable real-time decisions, and improve automotive experiences. Leading automotive manufacturers, suppliers, and dealers have started investing heavily in Internet of Things and are gaining returns in the form of ultra-efficient inventory management, real time promotions that grow sales, reduced operational expenses and increase in revenue. They are beginning to change their business processes and recognize that, in time, IoT will touch every area of automotive operations and customer engagement. Tesla motors is a big example in the Internet of Things domain. In addition to being a luxury car, performance vehicle, the car is one big IoT device with a lot of IoT properties inbuilt. Applications are developed that use data collected by connected cars in many ways. For example, traffic control systems can provide real-time data collected from connected cars to avoid traffic jams and accidents, automotive components manufacturers can benefit from data about wear and tear to pre-order the components to be replaced and notify customers before there are equipment failures. Car sharing mobile apps can use real-time location data to encourage car pools. Also, in insurance systems, premium rates would be based on geo location of vehicles and driving behaviour of drivers.

1.1. Connected Car Ecosystem

IoT has a significant impact on automotive industry. Automobile manufacturing companies, telecommunication service providers and software companies are coming together to build the Connected Car. A connected car is a car which using its on-board sensors and internet connectivity enhances the in-car experience of its users. Connected car, just doesn’t mean the capacity to surf the internet on the move, but the communication between cars, communication of cars with other devices. As of date, there are only a small number of cars which are internet enabled but it is expected that the number will rise considerably in less than a decade’s time. And seeing the lifestyle experiences required by today’s generation and the exposure to smart phones will definitely help the connected cars market to grow exponentially. The Connected car services and applications along with other developments on IoT in Automotive sector are discussed below.

2. CONNECTED CAR SERVICES/APPLICATIONS

2.1. Vehicles and Smart phones Integration

In today’s fast-paced world, people need to be both mobile and online for most of the time with no exception when it comes to being on-board of a car or even when being the driver. Using the On-Board Diagnostics OBD/OBD-II port, (which is like computer which monitors emissions, mileage, speed, and other useful data) information regarding engine and other crucial vehicle parameters can be displayed on the driver’s smart phones and same can be sent to service provider for analysis. Alerts related to the car like Open doors, Lights ON and Hand brake ON and performing actions on certain vehicle parts such as
Lock/Un-lock vehicle doors, roll windows up/down and AC temperature +/- are becoming seamless.

2.2 On-Board Diagnostics for Predictive maintenance

In today’s fast-paced world, people need to be both mobile and online for most of the time with no exception when it comes to being on-board of a car or even when being the driver. Using the On-Board Diagnostics OBD/OBD-II port, (which is like a computer which monitors emissions, mileage, speed, and other useful data) information regarding engine and other crucial vehicle parameters can be displayed on the driver’s smartphones and same can be sent to service provider for analysis. Alerts related to the car like Open doors, Lights ON and Hand brake ON and performing actions on certain vehicle parts such as Lock/Un-lock vehicle doors, roll windows up/down and AC temperature +/- are becoming seamless.

2.3 Safety: Real Time Driver Monitor

To encourage efficient and safe driving, drivers are screened and evaluated on driving habits. Advanced sensor based technologies to detect and monitor behaviour and fatigue levels of driver are emerging which makes the cars more intelligent for avoiding accidents on roads. Systems are being developed for real time monitoring of vehicles which controls the speed of the vehicle and fatigue level of the driver to prevent accidents. The primary components of such a system, as shown in Fig.2, will be microcontrollers along with some sensors like eye blink, gas, impact sensors, alcohol detecting sensor and fuel sensors. GPS and Google Maps API’s is used to track the location of the vehicle which can sent to a predefined number in the system.

2.4 Biometrics Information for Driver identification

Biometrics refers to the physical, biological or behavioural characteristics of a person. It can be used to identify and authenticate a driver. Biometric identifiers include face recognition [6], fingerprints or voice recognition. Voice samples [12] of a driver can also be used to provide a hands free experience for navigating through the apps in a connected car environment. Biometric data can be used as a powerful anti-theft protection tool for increased safety. Cameras and sensors within the car can be useful for such biometric based driver authentication and also for comfort features inside the car by quickly changing car settings like seat position, mirror settings etc. to accommodate different driving patterns of the people authorized to use the car. Real time health parameters of a driver like pulse rate and breathing patterns can be monitored with the help of sensors attached on the steering wheel and seatbelt which in turn can be used to monitor their stress levels, other health conditions and prevent accidents.

2.5 Electronic Smart Toll Collection

Electronic Smart Toll Collection system on Toll plazas is used to collect the road toll charges in a convenient manner without any traffic jams and delay. This system relies on roadside sensors such as RFID readers or Automatic number plate Recognition cameras. Another telematics based solution uses GPS [9] and cellular network to provide Electronic...
toll collection services. Also, smart card/tags can be used to identify vehicle details and for payment [36].

2.6 Intelligent traffic control with priority for emergency vehicles

Intelligent traffic control systems in city traffic strive to give priority to selected type of users, such as public transport, VIP users, and emergency services [13]. Traffic light control system uses RFID tags attached to the vehicles. Priorities can be assigned to different types of vehicles. RF readers are installed on the road intersections considering the traffic density on the roads. On the two intersecting roads, two linked lights [14] are installed, RF reader will store the details of all the vehicles that pass from that road. For usual traffic, the traffic light controller follows the round robin sequence of the traffic lights. As an emergency vehicle such as an ambulance is detected, the controller generates the green signal for the lane with emergency vehicle, leaving the round robin sequence.

2.7 Geofencing and Speed

Monitoring: The geofencing and speed monitoring applications [34] can be used to inform the car owner if the vehicle has gone out of the predefined geographical area or is being driven faster than a preset threshold speed [6]. Speed of the vehicle can be measured with speed sensors [45] and geofencing can be achieved with the help of GPS. This can be used for parental control or for remotely monitoring the use of company cars.

3. MODULES OF PROPOSED SYSTEM

3.1 Driver Identification

Driver identification is required to map the car and driver and to extent it for licence verification and safety measurement. The Biometrics allows a person to be identified and
authenticate, based on a set of recognizable and verifiable data, which are unique and specific. This is the process of comparing data for the person's characteristics to that person's biometric "template" in order to determine sameness. The reference model will first store the data in a database or a secure portable element like a smart card then compared to the person's biometric data to ensure authenticity.

3.2 Process Flow:

![Process Flow Diagram](image1.png)

3.3 Driver License Verification

Driver identification data must be sent to Regional Transport office through internet for license check.

![Driver License Verification](image2.png)
3.4 Penalty on violating Traffic Rule
With the continuing growth of highway construction and vehicle use expansion all over the world, highway vehicle traffic rule violation (TRV) detection has become more and more important to avoid traffic accidents. Using intelligent transportation systems (ITS) and vehicular ad hoc networks (VANETs) speed of vehicle can be measured. For any violation system would directly send the data to relative transport authority.

3.5 On Emergency Contact nearest ambulance service to transfer the patient to a nearest hospital
During an accident, the vehicle should send the data to nearest Ambulance service and on receiving the same the Ambulance service will identify the vehicle location through GPS. Ambulance service will also notify the nearest hospital about the incident and search for assistance.

4. FUTURE SCOPE
Towards the improvement of proposed system identity of all the riders will be detected using Face detection and verified from central server. It will store details of all riders and in local storage. In case of emergency, details of the riders including Name, Address, Blood group and location will be transferred to nearest Ambulance and intimation can be provided to local guardian’s contact number. For proper functioning of the system, central repository of citizen is required.

5. CONCLUSION
This paper outlines developments on IoT in Automotive sector such as Driver Identification, Vehicle communications, IoT in Intelligent Transportation; IoT based Automotive Supply Chain Management and New Generation Cars. As cars get smarter and connected with the other cars, smartphones and things, suitable analytical processing can be applied to the operational parameters, allowing OEM’s, automobile drivers as well as road safety authorities to get better visibility about the automobile's performance as well as the overall traffic situation, allowing for timely actions.

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