© 2018 IJSRST | Volume 4 | Issue6 |Print ISSN: 2395-6011 | Online ISSN: 2395-602X

National Conference on Smart Computation and Technology in Conjunction with The Smart City Convergence 2018

Intelligent Transportation System Contingent on Internet of Things

Navya Bhatia*[1], Surabhi Sharma[2], Saloni Kumawat[3]

*[1] Department of Computer Engineering, Poornima Institute of Engineering & Technology, Jaipur, Rajasthan, India

[2] Department of Computer Engineering, Poornima Institute of Engineering & Technology, Jaipur, Rajasthan, India

[3] Department of Computer Engineering, Poornima Institute of Engineering & Technology, Jaipur, Rajasthan, India

ABSTRACT

Due to population growth, the problem of traffic management and congestion are also increasing at an alarming rate. Therefore, in order to oversee the mentioned problem, we require a system which provides with the help of advanced technologies. Intelligent Transportation Systems (ITS) is the coherent application of computer, electronics, vehicle sensing communication technologies and management strategies to help in monitoring and managing traffic flow, reducing congestion, providing optimum routes to travelers, enhancing productivity of the system, and saving lives, time and money. This paper comprises of ITS architecture, its lead enabling technologies, ITS user services and applications. In addition to this, it also includes IoT's role in implementing the ITS with the help of agent technology, its benefits and world-wide pioneers of ITS.

Keywords: Internet of Things (IoT), Intelligent Transportation System (ITS), Sensors, Embedded Electronics, User services, Applications, Architectures, Enabling Technologies, RFID, Wireless Sensor Networks, Agent Technology, ITS Techniques.

I. INTRODUCTION

With increasing number of vehicle ownership, it has become very difficult to manage the existing transportation system and it leads to various problems like congestion, inflation in accident rates and delay in reaching destination. ITS is boon to provide solution to these problems.

Intelligent transportation system (ITS) is a application or a platform which seeks to yield services related to different means of transport and traffic management and enable various users to be well informed and make safer, more synchronized, and 'smarter' utilization of transport networks. ITS is the application of computer technology to the transport sector. ITS systems gather data related to the transport system, process it, and then use the processed data to improve the management of the transport system. It gives the transport user with more and important information on which their transport decisions are based. It is being implemented and used in the developed countries like Japan, Europe etc since last two decades in some or the other way. This area is considered as a part of the Internet of things. Crucial information generated by the vehicle on roads and presented to the traveler. This collected data analyzed to obtain the traffic flow condition so as to predict the traffic flow. Thus, advanced traffic monitoring is

unrolling into an Intelligent Transportation based on IoT.

II. ARCHITECTURE

Mobile Computing, Wireless Communications and remote sensing has led to the development of ITS as promising technology which endow the distribution of different applications related to safety of road, traffic monitoring. The high level architecture of ITS includes following three communication domains. These are –

A. In vehicle Domain

Connected vehicles are provisioned with electronic control unit(ECUs), wireless-enabled on-board units (OBUs), a trusted platform module (TPM) and an application unit (AU). ECUs collect information about the vehicle's location, speed, heading, vehicle size, etc. and the context of its immediate environment (e.g., the number of neighboring vehicles, local road traffic conditions, etc.) and control its functionality. These ECUs link by exchanging messages with the OBU and AU, and form an in-vehicle network (also known as the on-board network). For running one or multiple applications, which are rendered by remote service providers (SPs), and exchange information with other nearby ITS entities using the communication capabilities of the OBU. For this reason AU is responsible.

B. V2X domain

The information gathered at the vehicles' OBUs, are exchanged with nearby ITS entities (e.g., OBUs, RSUs, etc.) using various vehicular communication technologies (V2X), including: (i) vehicle-to-vehicle (V2V) communications between neighboring vehicles (or OBUs) using a dedicated short-range communications (DSRC) technology;(ii) vehicle-to-infrastructure (V2I) communications between the surrounding OBUs and RSUs, and vice versa; and (iii) vehicle-to-pedestrian (V2P) communications between the OBUs/RSUs and the surrounding pedestrian as shown in Figure 1.

C. The infrastructure domain

It includes the trusted third parties (TTP), such as vehicles manufacturers, the service providers (SPs) and the trust authorities (TA). The fixed RSUs are generally not fully trusted and subordinated by the TA and can be considered as a bridge between the V2X and infrastructure domains[1].

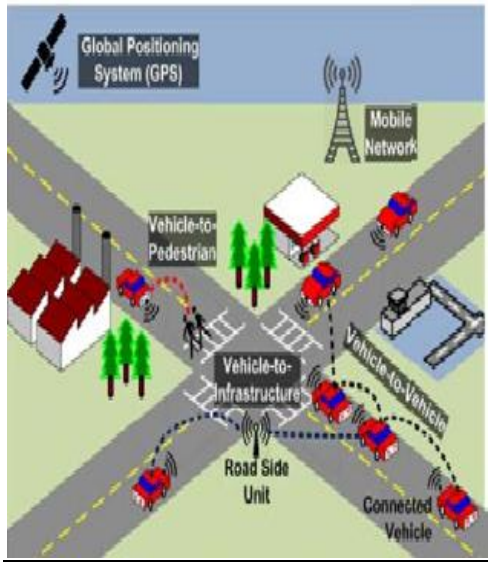

Figure 1. ITS V2X Communications

III. MAJOR BRANCHES OF ITS

There are various categories of ITS under which many applications are present such as-

1. Advanced Traveler Information System (ATIS) It helps in providing both en- route and pre-trip information to the driver and traveler to make better decisions regarding trip departures, optimum routes, and available means of travel. It does this through technologies, such as internet, telephones, cellular phones, television, radio, etc. Application are Real-time Traffic Information, Route Guidance / Navigation Systems and Roadside Weather Information Systems.

2. Advanced Traffic Management System (ATMS)

ATMS is one of the most widely used branches of ITS. It is a tool used by traffic police department to control traffic by monitoring the flow of traffic and making appropriate decisions. Applications are - Real-time

Traffic Status, Dynamic Traffic Control, Incidence Response.

3. Advanced Public Transportation System (APTS)

APTS is concerned with raising operational efficiency of all public transportation modes and increasing ridership by making the transportation system more reliable. Applications are- Real-time Status Information for Public Transit System, Automatic Vehicle Location

4. Emergency Management System (EMS)

This is the latest research field in ITS. It reduces the fatality rate in accidents by providing various technologies that helps in emergency conditions. Application are - GIS based Emergency Response Management System for Mysore City, India[2].

Apart from these major user service, there are some other subsidiaries of ITS which are as mentioned below-

5. ITS-Enabled Transportation Pricing Systems (ITS-ETPS)

Ex- Electronic Toll Collection, Variable Parking Fees.

6. Fully-Integrated Intelligent Transportation (FIIT)

There are some applications such as Collision Avoidance ,Intelligent Speed Adaptation

7. Commercial Vehicle Operations (CVO)

Real time applications are Traceability and safety of commercial vehicles such as trucks, vans, and taxis, CV electronic clearance, Automated road side safety inspection, On-board safety monitoring administrative process

8. Advanced Vehicle Control Systems (AVCS)

Example includes Collision Warning of the vehicles

9. Advanced Rural Transportation System (ARTS)

Provide Information about Remote roads via Radio[5].

IV KEY VALIDATING ITS STANDARDS

A. Wireless Communications-

Radio modem communication on UHF and VHF frequencies are widely used for short and long range communication within ITS. IEEE 802.11 protocols are used to accomplish the short-range communications of 350 m. Long range communications have been suggested using infrastructure networks such as WiMAX (IEEE 802.16), Global System for Mobile Communications (GSM), or 3G.

B. Global Positioning System (GPS)-

GPS receivers are embedded in vehicles on-board units receives signals from different satellites to determine vehicles position. Location can usually be determined to within ten meters. It is the technology used for navigation and route guidance systems.

C. Dedicated- Short Range Communications (DSRC)-

It is a short- to medium-range wireless communication channel specifically outlined for automotive uses. DSRC entitled two-way wireless communications between the vehicle (through embedded tags or sensors) and roadside equipment (RSE).

D. Wireless Networks

It provides rapid communication between vehicle and roadside but its range is of few hundred meters. WiBro is used along with WiMax for communication in South Korea.

F. Mobile Telephony-

3G and 4 G mobile telephone networks can be used for transiting information. It is easily available in the town and along major roads.

G. Radio wave/Infrared Beacons-

It uses 5.8GHz DSRC wireless technology. Japan'sVehicle Information Communications System (VICS) uses radio wave beacons on expressways and infrared beacons on roadways to communicate real-time traffic information.

H. Roadside Camera Recognition-

To identify vehicles license plate, cameras are used based on Optical Character Recognition (OCR) technology. This information retrieved is passed to back office servers in digital form , which assess and

post charges to drivers for their use of roadways within the congestion zone..Ex-London

I. Probe Vehicles or Devices-

Some countries use so-called "probe vehicles" that send their speed and location to a central traffic operations management center to identify congested locations. Ex.-Beijing

J. Sensing technologies-

Advancement in IT and telecommunication along with RFID(Radio Frequency Identification) has led to the improved Intelligent Transportation system. Sensors are placed onto the road to detect the RFID plate and count the number of vehicles[1].

V.INTERNET OF THINGS

IoT can be used to build a world where all intelligent objects of our everyday life are linked to the Internet and made to interact with each other with negligible human interference to reach a common goal. The term IoT is devised by Kevin Ashton. The building block of sensing and communication technologies of IoT are Wireless Sensor Network(WSN) and RFID-based network linked together through internet or other technology and protocol. Wireless network is connected to multiple RFID and sensors and work with each other to exchange data with the physical world to fulfill specific tasks.[4] Sensors management system and also sensors help to find out the vacant parking space nearby and mobile app is used to request the vacant parking slot and through this the driver gets to know about the available space over WIFI. In this way, the parking assistance is provided [3]. As shown in figure:

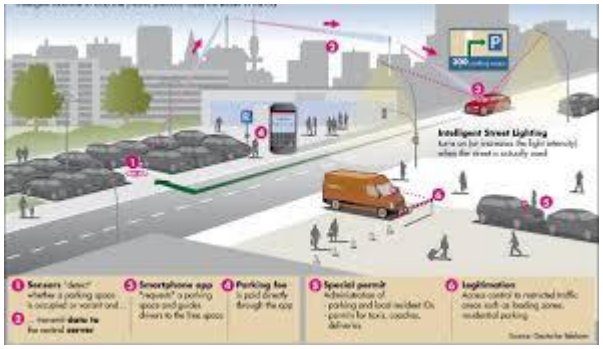

Figure 2. IoT based smart parking assistance.

VI.CONCLUSION

This paper highlights ITS as the most prominent and emerging area through which transportation monitoring can be done so as to reduce congestion, reduce accidents , increasing safety and throughput, information dissemination etc. It put together all the aspects of ITS relating to each other in one or the other way. Also ITS has never ending scope and it will evolve greatly in future.

VII.REFERENCES

The heading of the References section must not be numbered. All reference items must be in 8 pt font. Please use Regular and Italic styles to distinguish different fields as shown in the References section.Number the reference items consecutively in square brackets (e.g. [1]).