

Wi-Fi Combined Visible Light Communication for Intelligent Transportation System



P. Rajasekar, R. Usha Nandhini, R. Nivethika, Reshma Chandran, S. Pavithra

Abstract: Communication based on visible spectrum is a mode of communication wireless technology using the visible spectra by typical transmitters and receivers. This technology, in developing Intelligent Transportation is a cost-reaction method. Currently Radio Frequency (RF)-based technology is used for road safety application and ripping out this method entirely by replacing it with VLC is not particularly feasible, so that the idea is retrofitting system that currently uses to work with combining both RF and VLC technologies. Here paper presents the specific technologies of wireless methodology for the Intelligent Transportation, which helps to minimize the occurrence of road accidents, optimize the road traffic and improve the safe of devices and roadside users. Application based on communication of vehicles, and vehicle to infrastructure has emerged the best solutions to improve traffic safety. It is on, visible light communication with big potential of simple design for functional efficiency and large area distribution along with usage of Wi-Fi. The intention of this survey on a wide field, Intelligent Transportation Systems functioning with Wi-Fi and Li-Fi is discussed with its real time uses, technologies in communications.

Keywords- Visible Light Communication, Wi-Fi, Intelligent Transportation System, Application, Road safety

I. INTRODUCTION

Heavy increase of traffic on roads in metropolitan towns and cities of the various countries are experiencing greenhouse emissions, traffic blockage and accidents leading to lose precious human. Recent studies prediction With the enormous volume of traffic flow, important factor is to introduce smart, journey time and accidents [3][4]. Modes of communications, like Vehicle-Vehicle, Vehicle-Infrastructure (V2I) and reverse of V2I mode investigated to reduce accidents. Using of these modes of communication with present advanced vehicle transportation has a high capacity to enable many utilization for safety on road in advance, passenger information, services of manufacturer, and optimization in vehicle traffic. The committee by European Union for mobile communication to Twenty-Two (20-20) Information Society.

The ITS [7] considered using smart technologies to decrease the accident occurrence. The aim is to increase the of the smart road information management and thereby reduce the CO2 emission.

ITS provide detailed infotainment access in real smart communications continuously collect traffic information and process to other networks, can enable an efficient access of traffic management, increasing efficient road transmission. The database management system is used to adjust based on the nearby traffic flow. Therefore, a different clear opinion of the ITS is the perfect distribution. However, based on effective traffic management system, Summarization of technical methods involved in intelligent Transport method [8]: Intelligent road for communication between various devices.

To improve transportation conditions, safety, and services, like microwave and radio wave, for sharing transferring the data among nodes. This communication mode has various a different types of ad-hoc networks but different in the cases like types of packet, infrastructure and resources [9].

Computational science used in ITS by providing a development in block structural diagram, platform and software for application which is real-time. The platform means including [11]. This is making up of four parts,

Advanced Driver Assistance System solves safety problem in transportation [12] is an example of this technology [13]. Floating Car data transmission in FCD works. Networks like CDMA, GPRS, UMTS, and GSM are used by floating data/cellular data works [14]

Sensing technology is a efficient technology in which embedded sensor is been used.

Wireless sensor networks have a so many sensor points represent greater difference in transportation system [15] end to end delay and synchronization are critical for this type of systems [16]. Its application are in vehicle detector, vehicle passage for communication and reception of signals for measuring earth's magnetic field [17]. Vehicle Video Detection is alternative for traditional loop detection system [18].

In radio modem communications, data transferring between locations, mostly the distance of devices from 10 to 40 mile range, using both frequency types that is Ultra High Frequency and Very High Frequency. Fleet management, automated meter reading, telemetry applications, SCADA applications use this technology. Information broadcast along with the weather changing [19].

LED-based VLC system is a new technology that used in environment of vehicular usage, already used infrastructures such as traffic lights that based on LED. Vehicle to anything communication elevates the collaboration among transport infrastructure, pedestrians,

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and vehicles, which and helps to improve telecommunication and safer telecommunication which would be a better safety of ground transportation system[8]. The restpart of this literature survey is elaborated as follows. Section II states the overall literature survey contains a discussion about the common issues, and solutions, section IV gives more future extension.

II. PROPOSED METHOD

A. Short range communications

As per the term smart Transport System is used to describe complex system in which the transportation vehicle movement experience with making road systems safer and better drainage capacity.

This is possible due to the information the integration with infotainment system applied to the field of transport.

In short Range communication describe method of communication takes place over channel of DSRC, which produce a necessity communication by introducing 802.11p for WAVE BSS and operating mode. Advantages of, security and multichannel operations for other upper layer applications[20]

Traffic safety system time having a connections on the line access request from channel to channel access. Unpredictable behavior is the main drawback in ITS [21].

In long Range communication [23] combined working of cellular network and DSRC solutions for better communications. This will describes each technological limitations and DSRC-cellular architecture which is hybrid. The main challenges is network selection issues were vertical handover .

The technology which is wireless, chosen properly has severe interferences in complete DSRC system to open road to develop an ITS application using digital technology combined as spread spectrum along having reception with diversity [24] .

In short Range communication mainly based on the the basic of technologies with shows some drawbacks like on using the centralized way and perfectly avoiding a collision.

Special Interests Group started bluetooth communication technology for communication which in ITS for capturing travel time, number, the protocol used by this technology broadcast a 48B MAC address[26].

B. Long range communications

Long range communication includes microwave access for WiMAX, Mobile Communication for Global System, 3G meant for providing long distance wireless access over [27]. WiMAX comprises two set of address 802.16-2004 (IEEE 802.16d) for WiMAX fixed and 802.16-2005 (IEEE 802.16e) for mobile WiMAX. The range is 30 miles and 70Mbps data rate [28].

Network technology that is ad hoc networks for vehicle is one of the wireless networks for communication among vehicles running on roads. On highways, VANET has more reliability. One of the drawbacks of VANET is conventional routing not suitable. But in this paper [29] Determines reliable routes with a renewed mechanism. Demerit for this paper is low latency.

In long Range communication [30] widely developed technique is used in cellular network, deals with the communications between device-device, provide a solution information . Uniform capacity performance is available across all links between vehicle and infrastructure. High mobility is a major drawback [59].

Zigbee technique used ITS is new method with low cost, wireless PAN standard, low power with device designed to reach the needs of various sensors and other devices [32].

In long Range communication [33] deals with the and trilateration method. Its demerit is precision lacking.

In long Range communication [34] presents the design of area information system (GIS) based on web service technology, like addresses which is duplicate, planning routes , display maps, without intermixing GIS instruments.

A new method described in [35], cloud computing based geographical area using the dynamic route.

In long Range communication [36], communications based on LTE which is device-device (D2D) developed to a new method for wireless communications along short-range in beyond and advanced 4G networks. For this CVN solution is used with architecture which is for vehicular environment. To support CVN, NS3 extensions is implemented.

Wi-Fi is technology that become a predominant method by accessing the internet wirelessly, in [37] describes the use of Wi-Fi indirect device to device communication. In this, performance-energy through experimentation novel trade-off of the No defined power with Wi-Fi having direct saving protocol.

In [38], presents cellular networks using LTE and Wi-Fi direct with a supporting protocol for communications between devices. In this supported with minor modifications over LTE network to the standard procedures without any change in infrastructure. The reasonable transmission rate is an advantage by this method and end delay is major issue using this method.

In long Range communication [39], gives a knowledge of using internet by visible light communication..

In long Range communication [40], a method of the communication on road with visible light mechanism and system using the, which is found by the subtraction of the frames arranged in consecutive pattern.

III. COMMON ISSUES AND SOLUTIONS

From the survey, some of the common shortcomings were observed and pointing out the solution as follows.

Data rate: in every technique main objective is to give awareness to public or vehicles or authorities about the problems in the fast method, so designing a system with high data rate is required here.

Spectrum: most of the intelligent transportation works on RF medium, which is band limited, a new eco-friendly technology suggested.

Complex infrastructure: Another issue is, the design of the system, which will be difficult in outdoor conditions and for vehicles to carry huge onboard units. For this simple design with small size or an existing infrastructure is suggested.

IV. RESULTS AND DISCUSSION

The Computer simulation results and their performance is analyzed. The output results shows the traffic signal and vehicles and it is mainly.

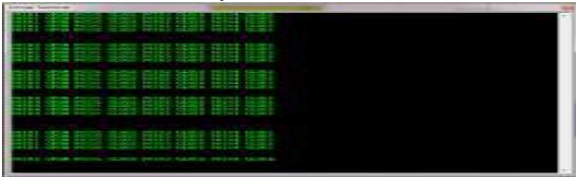


Figure 1 Simulation result for normal traffic condition

Table I: Bit Error Ratio (BER) for Miller and Manchester codes

Sl.No	Communication	Distance	BER for Manchester	BER for Miller
1.	I2V	20	$< 10^{-7}$	$< 10^{-7}$
2.	V2V	1		
		2		
		3		
3.	I2V2V	21		
		22		
		23		

Hardware Implementation Result



Figure 2 Transmitter for I2V mode Hardware setup



Figure 3 Transmitter for V2V mode Hardware setup



Figure 4 Receiver for I2V and V2V Hardware setup



The following figures shows the hardware setup using lifi technology. The lifi transmitter and receiver is used. The

Transmitter section is mainly used to send the data and the receiver section is used to receive the data.

V. CONCLUSION

The Intelligent Transportation technology combined many technologies and provide the perfect solution to reduce and avoid problems caused by road traffic to both human and properties, causing public issues. The field of an intelligent transportation system which covers many technologies, offering benefits like improved safety, efficiency, mobility and accessibility for areas like arterial, data collection, environmental issues, and traveler information. Some common limitations are data rate and system design. Traditional technologies failed to compact it all, to overcome these limitations combined Wi-Fi and Li-Fi technology is proposed. This paper is mainly used for future research to understand overview for new technologies for transportation system.

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