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International Journal of Innovative Research in Technology, Science & Engineering (IJIRTSE)
ISSN: 2395-5619, Volume – 4, Issue – 2. April 2018

LI-FI TECHNOLOGY AND ITS APPLICATION IN VEHICLE COMMUNICATION

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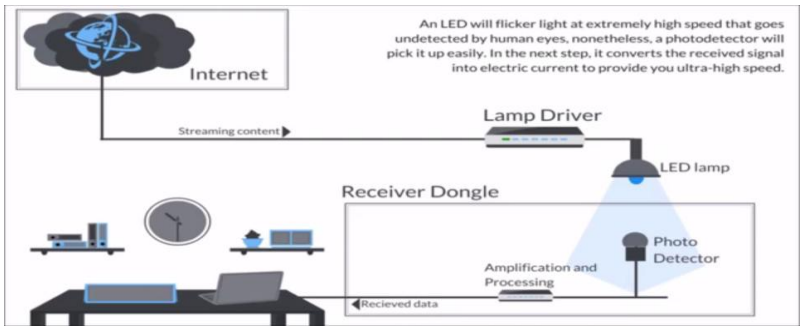
ABSTRACT

This project is proposed to design a wireless photonics communication system. Here the communication is established visible light rays. In this paper I present initial design and results of a small-scale prototype of light fidelity technology and its application in vehicle communication. Vehicle to vehicle communication is the most effective solution that has been used in order to reduce vehiclesaccidents. The proposed used of Li-Fi technology in this paper comprises mainly light emitting diode(LED) bulbs as means of connectivity by sending data through light spectrum as optical wireless medium for signal propagation. In fact,the use of LED eliminates the need of complex wireless network and protocols. The light rays will no effect any electromagnetic interference. So it is highly reliable and securable communication solution. To demonstrate the concept we used here microcontroller based systems for transmission and reception of data.

1. INTRODUCTION

Li-Fi technology is a paradigm for short range wireless technology to provide unprecedented connectivity within a localized data centric environment. Transfer of data from one place to another is one of the most important day-to-day activities. The current wireless networks that connect us to the internet are very slow when multiple devices are connected. As the number of devices that access the internet increases, the fixed band width available makes it more and more difficult to enjoy the high data transfer rate. A solution to this problem is by the use of Li-Fi. Li-Fi is a transmission of data through illumination, sending data through a LED light bulb that varies in intensity faster than human eye can follow. This type of communication can be called as Visible Light Communication (VLC) works by switching bulbs on and off within nanoseconds. Li-Fi is a 5G visible light communication system and it passes 220Gbps data , that uses light from light emitting diode(LED)as a medium to deliver networked ,mobile, high speed communication in similar manner as Wi-Fi.Li-Fi could lead to the internet of things,which everything electronics is being used as Li-Fi access points. Li-Fitechnology works on a simple principles which is nothing but LED is ON a digital data 1 can be transmitted and if it is OFF digital data 0 can be transmitted.So, in this project I am going to switching the LEDs very quickly. These fast switching can be achieved by PWM technique to transmit digital data stream containing strings.

2. BLOCK DIAGRAM



3. BLOCK DIAGRAM DISCRIPTION

Li-Fi or light fidelity is a high speed and wireless communication technology similar to Wi-Fi. It uses visible light rays to transfer data hundred times faster than Wi-Fi. This is because light has the capacity to transfer comparatively more data in less time than radio waves. Block diagram of Li-Fi technology consists of LED (light emitting diode) as light source and photo detector as light receiver. In the transmitter section LED encodes data from internet and decodes it into light. The LED light switch ON and OFF at very high rate too quick to noticed by the human eye. This was just like a binary code. If LED source provide a constant current to the LED bulbs, it provides the constant illumination or brightness. As we change the current that is flowing through the LED bulbs the illumination or brightness of the bulbs will change. If no current or minimum current is flowing through this LEDs, the brightness of this LED source will be minimum. And that will be treated as digital 0, this digital 0 will transmitted to photo receiver side. Similarly when the light bulb is ON or if maximum amount of current is flowing through this LED bulbs, then brightness of LED will be maximum and that will be treated as digital 1. Flickering the LED light source very rapidly, we can transmit the data in the form of 0s and 1s to the receiver. This light is received by the photodetector which converts the variation in intensity of light into electrical charges. These electrical charges are then converted to binary data send to the computer or mobile devices. Li-Fi technology was founded by Herold Hass.

Application of Li-Fi in vehicle communication

System Design:

1) A.5.9 GHz DSRC Wireless:Dedicated short range (1000) communication (DSRC) for Intelligent Transport System (ITS) has opened the door tohundreds of projects and applications of vehicle to vehicle communication around the world. In 1991 the US federal communication commission reserved licensed band width of 75 MHz spectrum around 5.9 GHz that allows information to be exchanged among the vehicles. This spectrum will provide very high rates with low latency and high security in matter of supporting this wireless communication between vehicles, set of standards were needed to ensure that vehicles understand each other , for example , IEEE 802.11p-2010 standards of wireless link for V2V communication.

2) Wireless Ad Hoc Networks:Vehicular Ad-hoc network (VANET) technology was introduced in 2000 as a specified application of mobile and hoc networks (MANETS). This network uses vehicles in road as a router or node in order to communicate at distance of 100-300m. This networks basically relay on W-Fi.

3) Without Wi-Fi or GPS: Vehicle to vehicle communication system that does not require a tracking global positioning system or even a Wi-Fi or 3G wireless connectivity. It was proposed to use programmable interface controller (PIC) sonar which sends40KHz short pulse of sound that is undetectable by human ear. The echo of signal will be detected by microcontroller. The distance is calculated by the time required for echo signal to be transmitted and received. This technology is demonstrated in the fig below. Communication between vehicles using sonar pulse. Several research works in literature for vehicle to vehicle communication using an advantage of light. As light frequency spectrum is huge it is beneficial to be adopted in a short-range wireless communication. Several research works have been attempted in literature for vehicle to vehicle communication using an advantage of light. As light frequency spectrum is huge, it is beneficial to be adopted in a short-range wireless communication. In this work, we aim to develop a cost effective yet inexpensive mechanism for vehicle to vehicle communication through theuse of an optical wireless communication medium, which is light.

Fig: Communication Between Vehicles using sonar pulse

4. CONCLUSION

In conclusion, the concept of Li-Fi had been introduced along with existing techniques and classical trends used for vehicle to vehicle communication and other applications. This project gives a new dimension to the very popular LED's as a speed data transmitters. It can be viewed as a replacement of RF communication for short range to some extent. As this technology aims to propose a cost effective solution to reduce accidents, the design guidelines and details of system components were thoroughly explored. If this technology can be putinto practical use, every bulb can be used something like a Wi-Fi hotspot to transmit wireless data and we will proceed toward the cleaner, greener, safer and brighter future**.**

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