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Reliable Data Transmission Based On Visible Light Communication Using Li-Fi Module

S.J.Grace Shoba[1], K.Dinesh Krishna[2], P.Roshan Bernard[2], S.Diwakar[2].

Professor, Dept. of ECE, Velammal Engineering College, Chennai, Tamil Nadu, India[1]

UG Student, Dept. of ECE, Velammal Engineering College, Chennai, Tamil Nadu, India[2]

ABSTRACT: In recent years, there is a rapid development in the solid-state light-emitting diode (LED) materials which gave way to the next generation data communication known as visible light communication. VLC has a secured future and it acts as a match to the present RF communication by attaining larger bandwidth and high data rate.At present, the day to day activities uses a lot of LED-based lights for illumination, which can also be used for communication because of the advantages like fast switching, high power efficiency and safe to human vision. Hence, this project is centered on the transmission of data using the visible light which consists of the Light Emitting Diodes that sends video signals to the receiver. The receiver circuit consists of photodiode connected with the amplifier and pc to recover back the amplified version of the original video signal.

KEYWORDS: Visible Light Communication (VLC), Fragment System (FRVS) Algorithm.

I. INTRODUCTION

The history of visible light communications (VLC) dates back to the 1880s when the Scottish-born scientist Alexander Graham Bellinvented the photophone, which transmitted speech on modulated sunlight over several hundred meters. This pre-dates the transmission of speech by radio. Recently in Keio University, Japan, LEDs are used to transmit videos by visible light. A prototype of VLC had been presented by three undergraduate students atUniversidad de Buenos Aires in 1995, resorting to the amplitude modulation of a 532 nm laser diode of 5mW and photodiodes detector. Since then there have been numerous research activities focused on VLC.In 2006, researchers from CICTR at Penn State proposed a combination of power line communication(PLC) and white light LED to provide broadband access for indoor applications.[1]Data transfer by using the infra-red portion of the spectrum is already afforded. Latest research activities have been concentrated on achieving data transfer concurrently with enlightenment by means of using LED lighting tool. These energy-stingy and cost-effective LED devices are desired to be used for data transfer without using RF signals, especially in short ranges.The idea of illumination and data communication simultaneously by using the same physical carrier is firstly suggested by Nakagawa et al. in 2003 (Nakagawa Laboratory). Their studies [2- 6] pioneered many following research activities. Later on, the Nakagawa Laboratory team worked with the renowned Japan technology firms and they established the Visual Light Communication Consortium (VLCC). Following, many research activities have been done that the most outstanding is the European OMEGA Project. Eventually, in 2011, IEEE completed the release and visual light wireless communication gained a global standard with the name 802.15.7- 2011 [2]- IEEE Standard for Local and Metropolitan Area Networks--Part 15.7: Short-Range Wireless Optical Communication Using Visible Light Using Visible Light [7]. Though a standard of visual light communication has been released in 2011, dominant use of this technology will take further period.

VLC = Illumination + Communication[8]

Consider a flashlight which is used to send a Morse code signal. When functioned manually this is sending data using the light signal, but because it is blinking off and on it cannot be considered to be a useful illumination source, so it is not really VLC according to our definition. Now envisage that the flashlight is blinked on and off extremely quickly via

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a computer, then we cannot see the data and the flashlight appear to emit a constant light, so now we have illumination and communication and this does fit our definition of VLC. Of course, we would need a receiver capable of receiving the information but that is not too difficult to achieve.

Li-Fiis a term often used to describe high-speed VLC in application scenarios where Wi-Fi might also be used. The term Li-Fi is similar to Wi-Fi with the exception that light rather than radio frequency wave is used for transmission.Li-Fi might be considered as complementary to Wi-Fi. If a user device is sited within a Li-Fi light bulb, it might be handed over from the Wi-Fi system to the Li-Fi system and there could be an enhancement in performance.

II. LITERATURE SURVEY

1. A Dimmable LED Driver for Visible Light Communication (VLC) Based On LLC Resonant DC-DC Converter Operating in Burst Mode

The main focus of this work is the integration of the communication and power management functions of a 80W smart LED module. The luminair provides high-efficiency programmable ambient lighting and can also act as a networked sensor node to gather a variety of local measurements, which leads to improved safety, comfort and efficiency in future lighting systems. A dimmable LED driver based on the LLC resonant dcdc converter topology is proposed to implement an emerging communication scheme, Visible Light Communication (VLC). VLC capitalizes on the high switching-speed of LEDs and offers several compellingtransmission the data using the Variable Pulse Position Modulation (VPPM) protocol. A receiver circuit is considered to demodulate anddecode the observable light signal. The 50 kb/s system is successfully demonstrated on a 308 LED Luminair with a digitally controlled LLC dc-dc converter.

Author: Shuze Zhao, Jiale Xu

Publish: Power Electronics, IEEE Transactions on, vol. 26, no. 11, pp. 3410 –3422, nov. 2011.

2.Optimized LEDs Footprinting for Indoor Visible Light Communication Networks

Indoor access to the Internet via Visible Light Communication (VLC) technology is becoming an issue and in this sense system planning requires to look at the number of Light Emitting Diodes (LEDs) to be used. This task can be accomplished by looking at different performance metrics. We consider the problem of optimal footprint mapping by taking into account the achievable user rate when handover procedures take place due to user mobility. This problem is equivalent to theoptimal LEDs placement. In this regard, it is shown that several parameters influence system performance starting from the data rate of download, the speed of the user in the room as well the handover time. In this context we derive a mathematical tool for VLC network planning and show the performance that can be achieved as a function of different parameters.

Author: Stefano Pergoloni IEEE Student Member, Mauro Biagi IEEE Senior Member

Publish:2014 Sixth International Conference on,Oct 2014, pp. 1–6.

3.Inter-cell Interference Coordination for Multi-color Visible LightCommunication Networks

We report the inter-cell interference coordination for the indoor multi-color visible light communication network under lighting restraints. In the multi-color VLC system, soft frequency reuse-based interference coordination is adopted, which adjusts the AC powers of the cell-edge components and the cell-center components. To further improve the system throughput in the environment of dense LED deployment, we propose the dynamic scheduler for the inter-cell

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interference coordination. The dynamic scheduler comprises of two separate parts: the distributed algorithm that adjusts the power allocation and prepares the list of color resource usage restrictions in the neighboring cells, and the centralized algorithm that resolves the color conflicts and allocates the color resources in the network. Numerical results show the performance gain of the proposed dynamic scheduler for the cell-edge user equipments (UE).
Author: Kaixiong Zhou, Chen Gong
Publish:in *2015 IEEE International Conference on Communications (ICC)*, Jun.2015, pp. 5120–5125.

4.MNCRS: Industry Specifications for the Mobile NC
The Network Computer Reference Specification (NCRS) defined a network computer (NC) as a lightweight, ubiquitous, extensible, secure, and easy-toadminister system using widely deployed technologies such as HTTP, HTML, and Java to ensure universality. The Mobile Network Computer Reference Specification2 (MNCRS) extends the concept of a network computer to define a mobile network computer (MNC). The extension will define open standards that specify APIs visible to applications, network protocols, and server interactions. Naturally, these standards will have implications for software developers, original equipment manufacturers, operating system vendors, and service providers. Since the intent is to enable MNCs and servers from various manufacturers to interoperate, the consortium will adopt industry standards wherever possible, modifying existing technologies or inventing new ones only if necessary. Accordingly, mongoing convergence efforts with entities such as the NCRP and the Internet Engineering Task Force (http://www.ietf.org) are intended to avoid duplication of efforts in overlapping areas such as security, communications, tunneling, and boot sequence
Author: Gabriel Montenegro
Publish:"IP Mobility Support," C. Perkins, ed.,RFC 2002, Oct. 1996.

5. Achievable Rate with Closed-form for SISO Channel and Broadcast Channel in Visible Light Communication Networks
In this paper, we study the channel capacity and region for both the single-input-single-output (SISO) channel and broadcast channel (BC) in visible light communication (VLC)m systems, under the peak optical power, average optical power and electrical power constraints. Under the condition that the input signal is continuous, we develop a closed-form lower bound (termed ABG lower bound) and an upper bound for SISO channel using the entropy power inequality and Lagrangian function method. Moreover, a closed-form achievable rate region (termed ABG region) is derived for the VLC BC. Furthermore, for a multi-LED and multi-user VLC system, we propose an achievable rate expression for each user, and then investigate a VLC BC beamforming design problem by utilizing the obtained closed-form expression. The beamforming design problem is shown to be NP-hard, and we transform this problem into a convex semidefinite program (SDP) by using the semidefinite relaxation (SDR) technique. Numerical outcomes are obtained to assess the performance of the proposed ABG lower bound/region and the beamforming design.
Author: Shuai Ma, Ruixin Yang,
Publish:IEEE GlobecomWorkshop ,Opt. Wireless Commun., pp. 1-6, Dec. 2015.

III. EXISTING SYSTEM

In existing system use RF-based communication, so the interference and noise of the signal are high. The power consumption of the existing system is high compared to the proposed system. Installation cost and environmental hazards are high.Enormous radiation of Radio frequency waves affects pre-adolescent children, pregnant women, elderly humans, patients with pacemakers, small birds etc. The hacker can hack the data which is transferred through the radio frequency and because of the interference the data cannot able to receive at the receiver side. But in the proposed system all the disadvantages are overcome by using Li-Fi.

LIMITATIONS OF EXISTING SYSTEM
This communication is radio frequency method so this is generated radioactivity.
1.High cost.
2.More noise.

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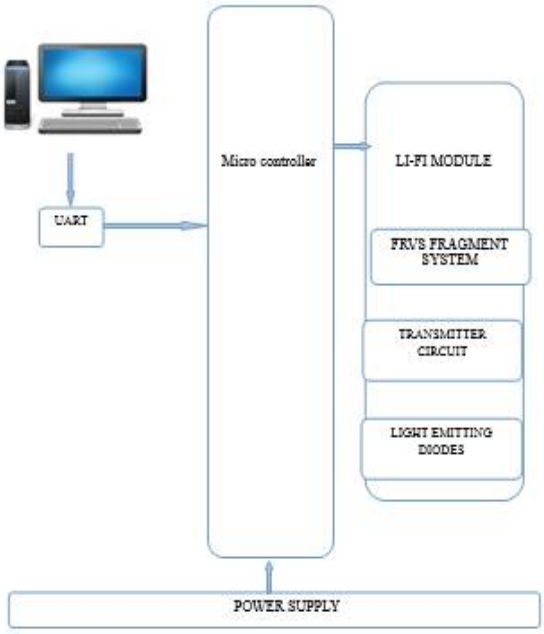
3.Power loss.

IV. PROPOSED SYSTEM

In the previous projects,audios and text has been transmitted using Li-Fi technology.In this project,we are transmitting the video signals using Li-Fi technology.The proposed system can be used in situations where a household has many appliances with video output such as TV, PC, Hi-fi radio and phone systems. It consists of a transmitter, free space channel and the receiver. In the receiver side, a photodiode is used as they have the advantage of having a large surface area, which is used to target light easier. The photodiodecan able to receive the light data from transmitter side PC and recover circuit used to retrieve the original data and the original data we can able to see on the receiver side PC. Thus, installation cost and environmental hazards areless in this proposed system. In addition, the timer-based schemes areclassified into the two schemes: packet-based and FRVSs.

TRANSMITTER BLOCK DIAGRAM



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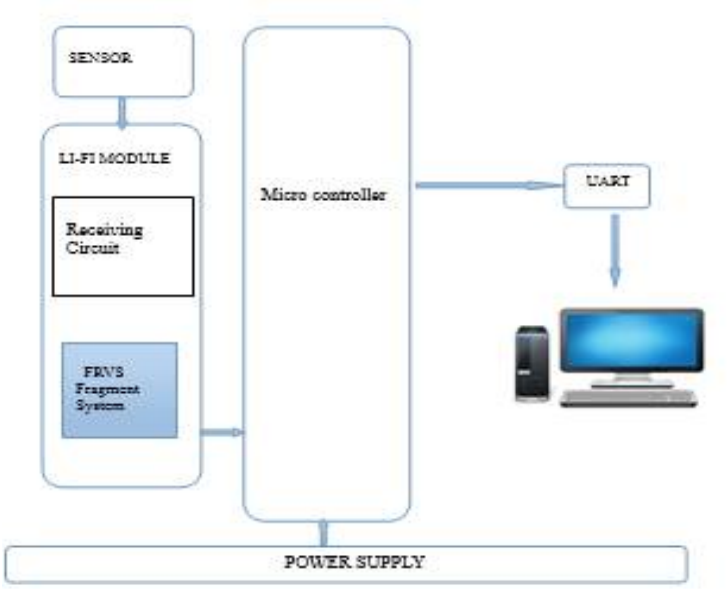
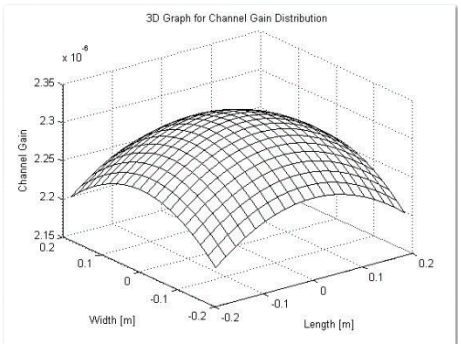
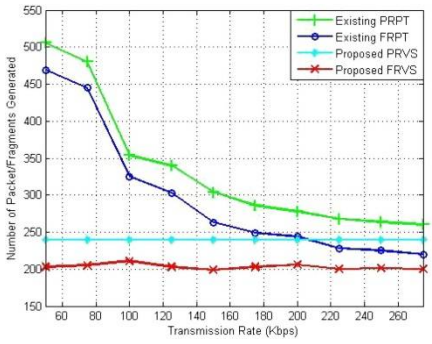
RECEIVER BLOCK DIAGRAM

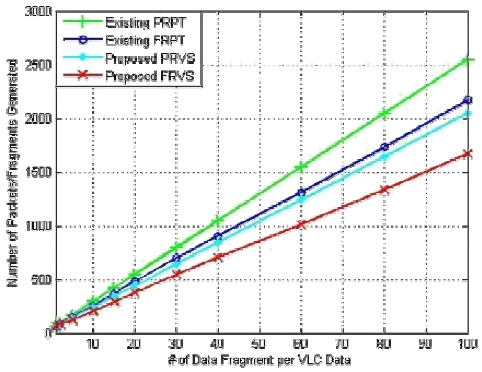


FRAGMENT ALGORITHM (FRVS) AND WAVEFORM



Comparison with the different data transmission rates Impact of the number of fragments per VLC data





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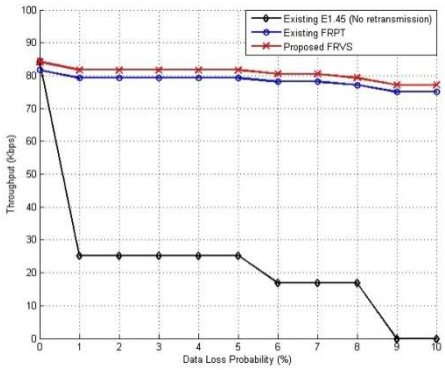
Impact of data loss probability on throughput



V.RESULT

We proposed a new reliable transmission schemes forVLC data packets over LED-based lighting control networks. Inthe proposed schemes, differently from the existing timer-based retransmission schemes, the VLC server initiates the errordetection and data retransmission to reduce the delay required foridentifying an error. Hence, after a single VLC data transmission is completed, the VLC server sends a control message to identifywhich data packet or fragment is lost. If some fragments are lost, the VLC server performs the retransmission procedure. If it does not happen, the VLC server starts the next VLC data transmission. The proposed schemes are classified into packet-based andFRVSs.From the performance analysis by simulation, it is shown that the proposed reliable transmission schemes can effectively performthe error recovery operation in networks associated without the loss of packet

REFERENCES

[1] IEEE 802.15.7: 'Standard for local and metropolitan area networks – part 15.7: short-range wireless optical communication using visible light', 2011
[2] Rajagopal, S., Roberts, R.D., Lim, S.K.: 'IEEE 802.15.7 visible light communication: modulation schemes and dimming support', IEEE Commun. Mag., 2012, 50, (3), pp. 72–82
[3] Mehdi, R., Riad, A.B., Mohammad, E.C-.B.: 'A new modified MPPM for high-speed wireless optical communication systems', ETRI J., 2013, 35, (2), pp. 188–192
[4] Rashed, A.N.Z.: 'High efficiency wireless optical links in high transmission speed wireless optical communication networks', Int. J. Commun. Syst., 2014, 27, (11), pp. 3416–3429
[5] Elgala, H., Mesleh, R., Haas, H.: 'Indoor optical wireless communication: potential and state-of-the-art', Commun. Mag., 2011, 49, (9), pp. 56–62
[6] Chow, C.W., Yeh, C.H., Liu, Y.F., et al.: 'Mitigation of optical background noise in light-emitting diode (LED) optical wireless communication

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systems', IEEE Photonics J., 2013, 5, (1), pp. 1–7
[7] Lim, S.K., Karl, R., Kim, I.S., et al.: 'Entertainment lighting control network standardization to support VLC services', IEEE Commun. Mag., 2013, 51, (12), pp. 42–48
[8] 'Professional Lighting And Sound Association'. Available at http://plasa.org/, accessed 01 September 2016
[9] ANSI E1.45: 'Unidirectional transport of IEEE 802 data frames over ANSI E1.11 (DMX512-A)', 2013
[10] ANSI E1.11: 'Asynchronous serial digital data transmission standard (DMX512-A) for controlling lighting equipment and accessories', 2008
[11] ANSI E1.20: 'Remote device management (RDM) over DMX512 networks', 2006
[12] ANSI E1.17: 'Architecture for control networks (ACN)', 2011
[13] ANSI E1.31: 'Lightweight streaming protocol for transport of DMX512 using ACN', 2009
[14] 'MATHWORK'. Available at http://www.mathworks.co.kr/, accessed 03 September 2016