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HARDWARE IMPLEMENTATION OF TCP/IP OVER VLC FOR Li-Fi COMMUNICATION

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Abstract- **Conventional RF communication becoming more and more crowded by existing wireless communication technologies like Wi-Fi, Bluetooth etc. There is a need for new communication technologies that are not using RF. Visible light communication (VLC) is fast emerging as a new technology that can serve as an alternative to many wireless communication technologies.VLC is capable of higher bandwidths than RF technologies. Also VLC does not cause any radiation hazards.VLC is also immune to electromagnetic interference and hence can be used in applications where most RF technologies cannot be used. Above all, in many cases VLC can be used with ambient light and hence the cost of implementation is also low. In this project ,we implemented a TCP/IP communication device that can do full duplex communication over VLC. For the implementation of this project a embedded Controller will be used that will acts as a VLC bridge, which is capable of receiving TCP/IP data from conventional networks like Ethernet and send the data over VLC.**

Keywords: TCP/IP, UART, Microcontroller, VLC circuit.

INTRODUCTION

The visible light communication (VLC) refers to the communication technology which utilizes the visible light source as a signal transmitter, the air as the transmission medium, and the appropriate photodiode as a signal receiving component. Visible light communications (VLC) can provide cable free communication at very high bit rates as high as 100Mbps. In addition, it has a major advantage that it causes no interference to RF-based devices. This made wireless communication possible in RF hazardous areas such as hospitals and space station. In addition to these two key advantages, safety, simple installation procedures and band licensing-free characteristic also helped to increase VLC's potential to be developed as an alternative, or even a new standard to the wireless communication scheme's.VLC uses white Light Emitting Diodes (LED), which send data by flashing light at speed. undetectable to the human eye. In this case, high speed data can be carried by the modulated light from the LED, which makes information transmission possible . When signals reach the receiver through the indoor wireless channel, the photodiode will convert the optical signals to electrical ones and the original information will be recovered. The visible light communication based on LED is a novel developing technique in the optical wireless communication field.

DESIGN AND IMPLEMENTATION :

A.System architecture:

The input data from TCP/IP(server) transmitter is first coded into a string of pulse electrical signals by microcontroller unit (MCU) though the interface circuit. Then, the electrical signals drive LED source directly through a LED driver circuit, in which electronic to optical conversion is achieved. Because of the high on-off speed characteristic of LED, people cannot perceive the twinkling phenomena so that both lighting and information transmitting can be realized simultaneously. The generated optical signals carrying original information then delivered into the indoor wireless channel. At the receiver, phototransistor will detect the optical signal and do the optical

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to- electronic conversion. Then the detected weak electrical signals are delivered into a receiver circuit which contains preamplifier for signal amplification to meet the need of the following signal processing. The output data from receiver circuit will be decoded into primary signal, and then sent to the PC receiver through the FT-231X interface . The prototype was designed to demonstrate serial communication between a server and a pc with FT-231X interface. The electrical data from the computer is converted into optical data using LEDs and transmitted over light; the optical data is captured by the receiver, converted into electrical data by the phototransistor and sent it to the client computer.

B.System design:

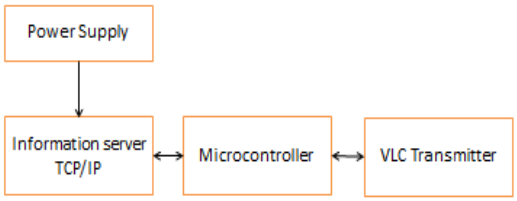

Figure 1. Block Diagram of transmitter

Transmitter

Every kind of light source can theoretically be used as transmitting device for VLC. However, some are better suited than others. For instance, incandescent lights quickly break down when switched on and off frequently. These are thus not recommended as VLC transmitters. More promising alternatives are fluorescent lights and LEDs. VLC transmitters are usually also used for providing illumination of the rooms in which they are used. This makes fluorescent lights a particularly popular choice, because they can flicker quickly enough to transmit a meaningful amount of data and are already widely used for illumination purposes. However, with an ever-rising market share of LEDs and further technological improvements such as higher brightness and spectral clarity, LEDs are expected to replace fluorescent lights as illumination sources and VLC transmitters.

Receiver:

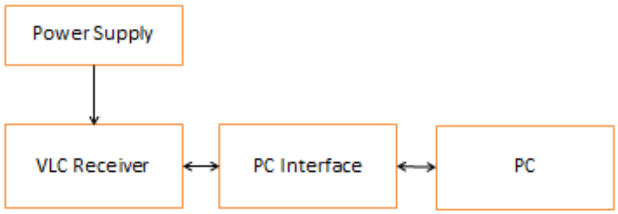

Figure2: Block Diagram of receiver

Receiver

The receiver consists of an optical element to collect and concentrate the radiation onto the receiver photo detector; phototransistor convert visible light into an electrical signal biased the phototransistor operates in the photoconductive mode generating a current proportional to the collected light. This current is of a small value and a preamplifier is used to convert it into a voltage. This preamplifier should have low distortion . The resulting voltage is then applied to a low-pass filter to remove any high frequency noise.Then the resultant signal is passed to a FT231X interface chip to convert USB signal for UART signal for interface with the PC.

C. System Implementation

The current prototype is shown in figure3. It consists of PIC18LF45K22 microcontroller,TCP/IP server, white LED for transmission of data, LED driver circuit in order to limit the current through the LED also it performs electronic to optic conversion, and Phototransistor for detecting the data from the visible light. We proposed an optical indoor wireless communication system that used white LED s for transmitting data. We developed a practical implementation of VLC and demonstrated it experimentally. One of the most important steps towards standardization was made with the establishment of the Visible Light Communications Consortium, a group of mostly Japanese based companies that agreed on sharing information towards the development of this new technology. VLC presents itself as a promising technology for the future of wireless communications. It is a ubiquitous technology, generating no interference to human life or existing electronic devices .V LC uses white Light Emitting Diodes (LED), which send data by Flashing light at speed. Christo Ananth et al. [3] proposed a system in which FASTRA downloads and data transfers can be carried over a high speed internet network. On enhancement of the algorithm, the new algorithm holds the key for many new frontiers to be explored in case of congestion control. The congestion control algorithm is currently running on Linux platform. The Windows platform is the widely used one. By proper Simulation applications, in Windows we can implement the same congestion control algorithm for Windows platform also. The Torrents application which we are currently using can achieve speeds similar to or better than —Rapid share (premium user) application.

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Figure3.Experimental setup

III. RESULTS AND CONCLUSION:

In this project we implemented a low cost VLC system for indoor applications. We have demonstrated that the system is capable for communication in a power efficient manner. The system is also capable of functioning at distances comparable to the distances between workspaces and overhead lighting. The presented system can be rapidly implemented and provides personalized entertainment and services by wireless media. Visible Light Communication (VLC) using LEDs can become a viable option for last mile access and ubiquitous availability. Visible Light Communication (VLC) present fascinating challenges for using appropriate techniques to construct cheap processing units and high brightness LEDs, Where LEDs lighting technology is being considered as the next generation lighting devices. VLC using LEDs would be promising technology for ubiquitous communication. The technology promises a great mix of importance, from high energy saving using Solid State Lighting technology and high rate data transmission in indoor applications to traffic safety in outdoor environment. The optical wireless communication system is a very good replacement for the regular communication systems .Visible Light Communication is a rapidly growing segment of the field of communication. There are many advantages in using VLC. There are also many challenges. VLC will be able to solve many of the problems where people have been facing for many years, mainly environmental and power usage issues. V LC is still in its beginning stages, but improvements are being made rapidly, and soon this technology will be able to be used in our daily lives. It is intended that this research will provide the starting steps for further study and development on TCP/IP server to PC interfaces where white LEDs can be used for data transmission. In spite of the research problems it is our belief that the VLC system will become one of the most promising technologies for the future generation in optical wireless communication.

REFERENCES

[1] Komen and M. Nakagawa, "Fundamental analysis for Visible light communication system using LED lights," IEEE Trans. On consumer electronics, vol. 50, pp. 100 107, 2004.

[2] D.C.O'Brien, "Indoor optical wireless communications: recent developments and future challenges," in Free-space Laser Communication IX ,San Diego, CA, USA, 2009,pp. 74640b-1 2

[3] Christo Ananth, A. Ramalakshmi, S. Velammal,B. Rajalakshmi Chmizh, M. Esakki Deepana, "FASTRA –SAFE AND SECURE", International Journal For Technological Research In Engineering (IJTRE), Volume 1, Issue 12, August-2014,pp: 1433-1438

[4] D .C .O'Brian et al., "Visible light communications: challenges and possibilities", in Proc, IEEE PIM RC 2008, pp.1-5,2008. M.Kavehrad, "Sustainable Energy Efficient Wireless Applications Using Lights," IEEE Common. Mag., vol.48, no. 12, Dec. 2010, pp.66-73.

[5] F.J.Lopez Hernandez, "Low-Cost Diffuse Wireless Optical Communication System based on White LED", in Proc.IEEE ISCE'06, Sept. 2006, St.Peterburg, Russia, pp. 1-4.

[6] Muhammad Saadi, Paramin Sangwongngam, et al. "Global Efforts in Realizing Visible Light Communication Systems and its comparison with other Short Range Wireless Communication Networks", NTBC end year conference 2011, December 15-16-2011.

[7] Kwonhyung Lee, John.Barry, "Indoor Channel Characteristics for Visible Light Communication", IEEE Communications Letters, 2011.

[8] Kenyan Cui, Gang Chen, "Line-of-sight Visible Light Communication System Design and Demonstration", CSN DSP, pp. 621 -625, 2010.