

EFFICIENT MULTI NETWORK DATA COMMUNICATION OVER VISIBLE LIGHT COMMUNICATION (LIFI) USING ADAPTIVE LMS ALGORITHM

V.Suganya

ECE dept M.E (Communication system)

P.R. Engineering College Vallam

Thanjavur, India

suganji70@gmail.com

Miss.R.Ramya B.E M.Tech

ECE dept M.E (Communication system)

P.R. Engineering College Vallam

Thanjavur, India.

Abstract—The focus of this project will be visible light communication. This paper process a sending the data blinking the LED. The LED is next generation data communication known as visible light communication (VLC). The proposed system is efficient data transmission system through visible lights. The transmitting and receiving data will be powered from a solar power. The Transmitting data will be received by photodiodes. Then get the data in personal computer. The solar panel is can converted a modulation of light signal into an electrical signal. There is a without external power requirements. The VLC communicationsystem used for the advantages like fast switching, high power efficiency, and safe to human vision.

Keywords: Visible Light Communication, Light Emitting Diode, Solar panel, Data Communication, photodiodes, PC

I INTRODUCTION

The visible light communication is an optical wireless communication technology. Which uses a spectrum of wavelength from 380 nm to 750 nm is standardized by Institute of Electrical and Electronics Engineers. The VLC using the Light Emitting Diode. The LED depending upon below properties such as low cost, energy efficient, long life time and high brightness. The home based on lighting such incandescent lamps and fluorescent lamps are replaced by LEDs. The LEDs are used in many places and lighting devices for traffic lights, indoor and outdoor lights more number automobiles etc. The LEDs is working conditions for On-Off transient time and which offers a high data rate communication such as area of hospitals and airplanes because of the health, environmental hazards etc.

This section first covered from a visible light communication. The VLC is used in Light Emitting Diode, the data transmission important modulation techniques used in the intensity modulation.

II SYSTEM IMPLEMENTATION LEVEL

A: Data Transmission

The data source of information is transmitted from serial port to microcontroller. The serial port is two mode of communication.

1. Serial communication
2. Parallel communication

The input to the transmitter is the text data fed from a sending end device, the computer. The data is fed to the microcontroller (PIC16F877A) in its ASCII equivalent form from the computer through a RS232 module using UART protocol.

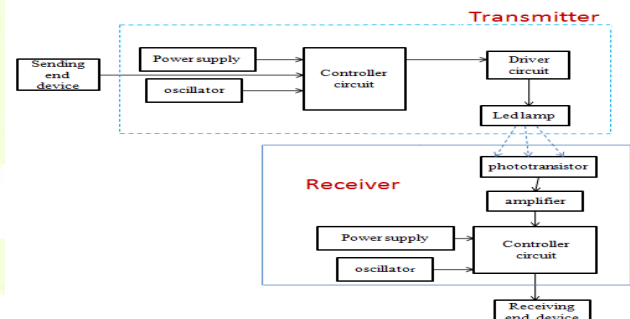


Figure 1: Data Transmission

B: Serial Communication

Using the serial communication: when using the serial communication we transmit multi bit word bit after bit (when at any given moment only one bit will pass) Transmit the word 10011101 using serial communication.

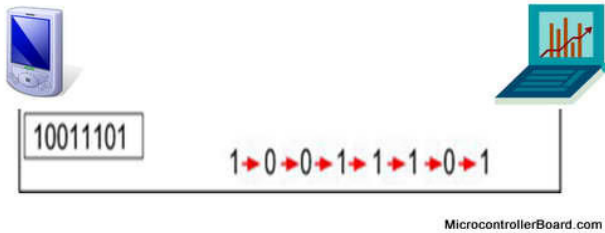


Figure 2: Serial Communication

C: Parallel Communication

Using the parallel communication: when using the parallel communication However the number of bits will be, Transmitter at once from one computer to the second computer. Transmitting the word 10011101 using parallel communication.

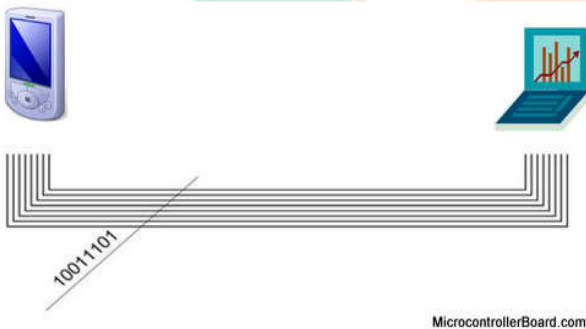


Figure 3: Parallel Communication

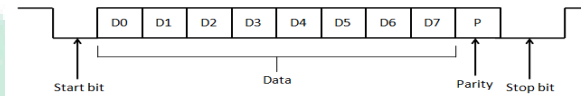
There are several serial communication standard like RS232, SPI, I2C etc. which as RS232 is an asynchronous method. That means it does not have a synchronizing clock line. One way data requires only one conductor line. Since it is a two-way communication, there are two lines between the two devices. One for sending data is called the Transmitter, and one for receiving data is called the Receiver. The communication is Full duplex. That means data can be sent at the same time data is being generally other serial communication like SPI and I2C are used for short range communication like between two ICs placed on the same board or system. While RS232 based serial communication is used for short range as well as long range communication (cables length longer than 2 meters). High ideal of long range communication.

D: Optical Channel

Visible Light is used as the medium for data transmission. Communication has a few advantages over standard wireless transmission. The frequency spectrum bandwidth of visible light ranges from 430 THz to 750 THz. This is much larger

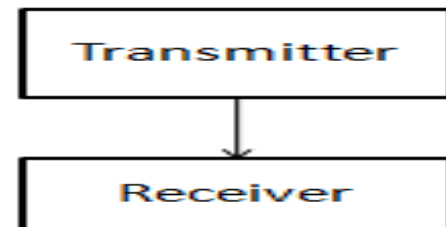
than the radio frequency bandwidth, which ranges from 3 kHz to 300 GHz. With a larger bandwidth it is feasible to accommodate more users and potentially achieve higher transfer rates because each user can be given a larger portion of the bandwidth to transfer information.

Data frame format for UART protocol

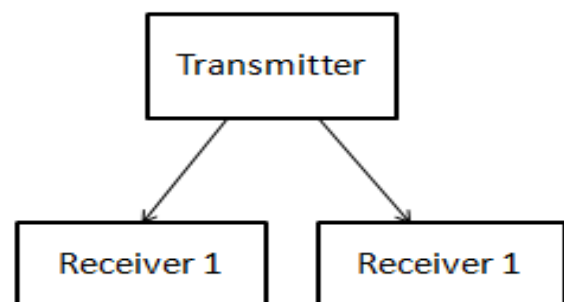


The major advantage that visible light systems have over other communication systems is its abundance. Light sources are everywhere, and more efficiently used by increasing its simultaneous functionality by transmitting data in addition to lighting an area.

E. Transmitter



Peer to peer



Broadcast system

The transmitter, although incorporating analog parts, is mostly digital when processing the actual data itself. Most of the data manipulation is done on a computer program made for use in conjunction with the C2000 Piccolo Launch pad being used to transmit data.

F: LEDs

Light Emitting Diode (LED) is long life time device. The range of very low power consumption is 3.3Mv.High data rate transmission. Any interference does not loss of data. The LEDs is future life replaced by other light source.

G:Flow Chart

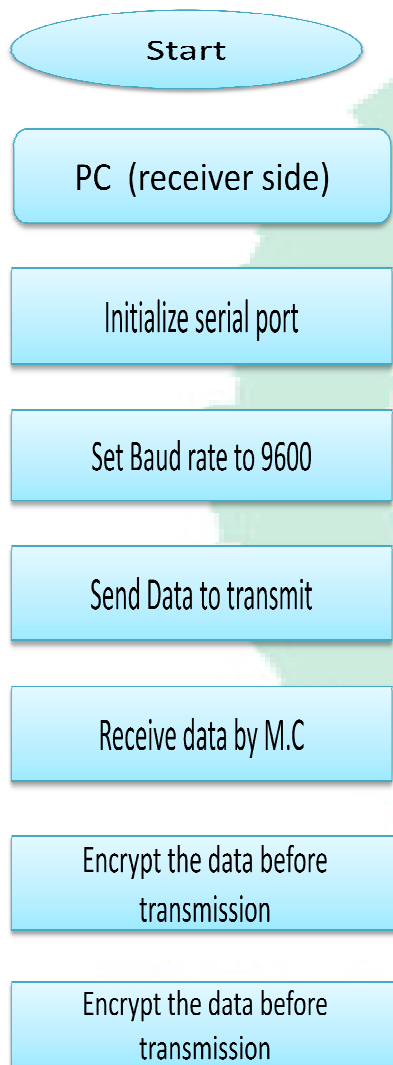


Figure 4: Flow Chart

The MOSFET than devices LED lamp which is a reading with surface mount device (SMD). Low power LED with total power is 2.5W.The data transmission set baud rate is 9600.The data is first encrypted after transmitted to the LEDs. In general, a VLC system primarily contains two parts one is the transmitter module another one is receiver module that is peer to peer system. Our proposed system along with peer to peer (point to point) system demonstrates (point to multipoint's) system.

II PROPOSED SYSTEM

The data source or information is typing the personal computer sending the data serial port to microcontroller. Than get the data LCD display to blinking The LEDs.The blinking data is high frequency. So they will not be visible to the human eye.

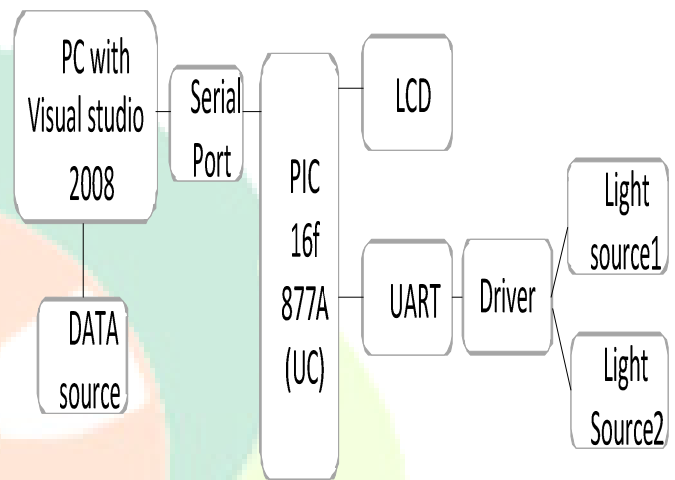


Figure 5: Data Transmission in LI-FI

A. Initial LEDs Design

For our initial step in designing the transmitter and receiver for the visible light system we decided to design and test the analog schematics for both end systems. Before reaching the analog components, in the transmitter the digital data will be converted to a continuous analog signal. The following figure representing the remaining analog components for the transmitter. The batteries are being used AAA 1.5. with four being used for a total of 6 volts. This set of batteries will be used to power the Op-Amp on the receiver. The second form of power in our VLC system comes from the USB output of the computer the DSP is hooked up to and the AC/DC converter.

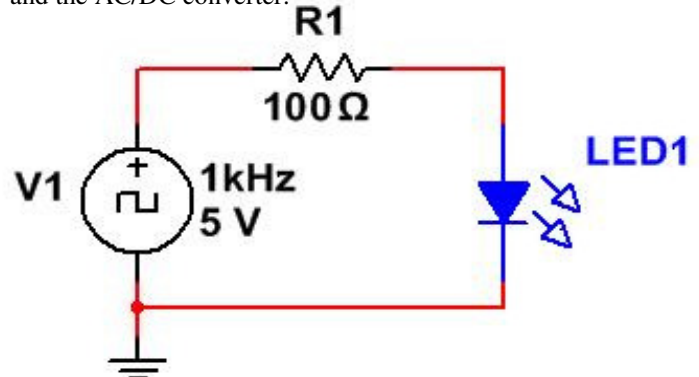
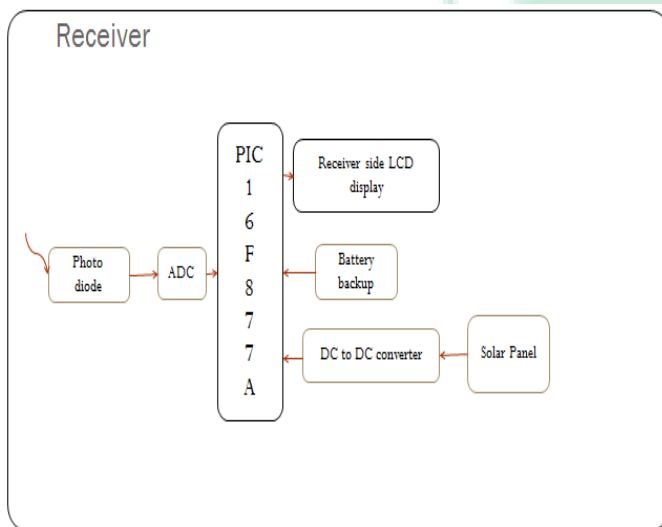


Figure 6: Basic Visible Communication Transmitter

By using the computer as the power source for the DSP there is no need for more batteries in our system which save on space and money.

B: PHOTO DIODES



A photodiode is a semiconductor device that converts light into current. The current is generated when photons are absorbed in the photodiode. A small amount of current is also produced when no light is present. Photodiodes may contain optical filters, built-in lenses, and may have large or small surface areas.



C: UARTPort

UART standards for Universal Asynchronous Receiver and Transmitter. It is a very popular serial communication interface with provides full duplex communication between two devices. UART are using two data lines are sending (TX) and receiver (RX).Ground /Reference of both devices should be made common. As the name indicates it is an asynchronous communication interface, which means that it doesn't need to send, CLOCK along with data as in synchronous communication. UART is communication interface used by our old computer's RS 232 port. Some of the Microchip's PIC Microcontroller has build in USART Module. USART stands for Universal Synchronous

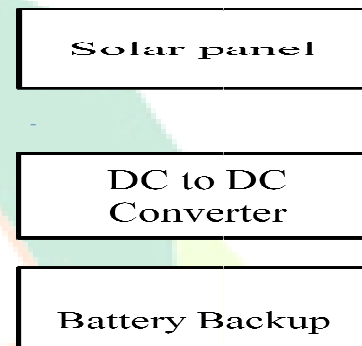
Asynchronous Receiver Transmitter. and it can be configured in following modes.

UART- Asynchronous (Full duplex)

USRT Master - Synchronous (Half duplex)

USRT Slave – synchronous (Half duplex)

D:Solar Panel



The primary storage is used in solar power. Secondary storage is 230V power supply.The solar power is can convert the modulated light into an electrical signal without the need for power supply. The solar batteries stored power range in 8hours No power in solar batteries after used in automatically the transformer power supply. The solar power any noise or interference used in DC to DC converter, passed through the power can be stored in batteries The solar batteries is(6V1.3AH/20HR).Constant voltage charge is 25°c.

III NOISY ANALYSIS

While some ringing was present ,it was not enough to keep the square wave from being distinguishable .The frequency was increased more until the square wave could not be seen at the output. The following figure represents the receiver's output when the transmission frequency was set to 6kHz

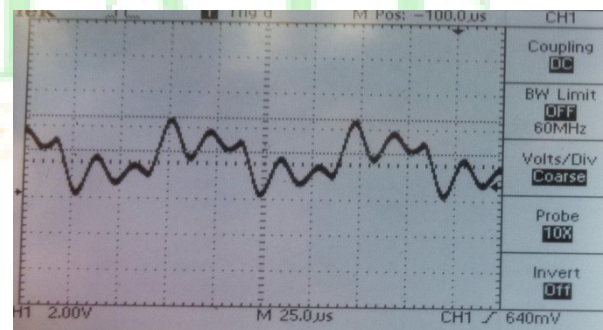


Figure 7: Noisy Transmitter Output

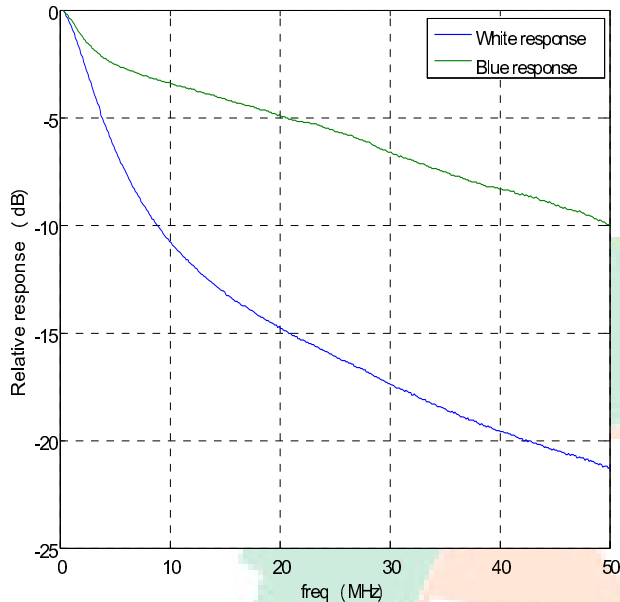
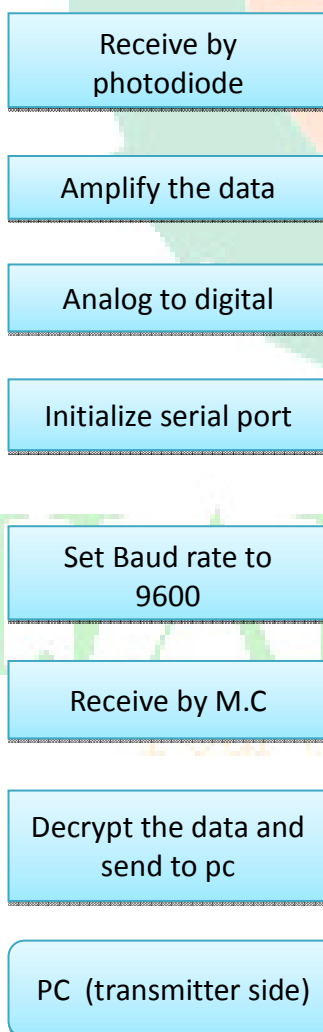


Figure 8: Measured LED small signal Bandwidth

Receiver Chart



A: Future Work

The main challenge in implementing the proposed system is the interference due to other lighting sources and the distance achieved between the transmitters with the maximum range of 60 cm. The end device side connected to the Zigbee transmitter and power supply side connected to the Zigbee receiver than sending to the data in visible lights.

B: Conclusion

This project I implement a low cost VLC system indoor and applications. It demonstrates that the system is capable for communication in a power efficient manner. The system is also capable of functioning distances comparable to the distance between workspaces and overhead lighting. The presented system can be rapidly implemented and provides personalized entertainment and service by wireless media. Visible light communication (VLC) using LEDs can become a available option for last mile access and ubiquitous availability.

REFERENCE

1. G. Pang, "Information technology based on visible LEDs for optical wireless communications," in TENCON
2. S. Haruyama, "Visible light communication," Journal of Japan Society of Mechanical Engineers, vol. 107, pp. 710-711,
3. J. Vučić, C. Kottke, S. Nerreter, K.-D. Langer, and J. W. Walewski, "513 M bit/s visible light communications link based on DMT- modulation of a white LED," Journal of Light wave Technology, vol. 28.
4. A. Khalid, G. Cossu, R. Corsini, P. Choudhury, and E. Ciaramella, "1-Gb/s transmission over a phosphorescent white LED by using- adaptive discrete multitone modulation," Photonics Journal
- [5] H. Elgala, R. Mesleh, and H. Haas, "An LED model for intensity-modulated optical communication systems," IEEE Photon. Technol. Lett., vol. 22, no. 11, pp. 835-837, Jun. 2010
- [6] S. Dimitrov and H. Haas, "Information rate of OFDM-based optical wireless communication systems with nonlinear distortion," J. Light. Technol., vol. 31, no. 6, pp. 918-929, Mar. 2013.
- [7] J.-B. Wang, Q.-S. Hu, J. Wang, M. Chen, and J.-Y. Wang, "Tight bounds on channel capacity for dimmable visible light communications," J. Lightw. Technol., vol. 31, no. 23, pp. 3771-3779, Dec. 2013.
- [8] L. Zeng et al., "Improvement of data rate by using equalization in an indoor visible light communication system," in Proc. IEEE ICCSC, May 2008, pp. 678-682
- [9] L. Zeng et al., "High data rate multiple input multiple output (MIMO) optical wireless communications using white LED lighting," IEEE J. Sel. Areas Commun., vol. 27, no. 9, pp. 1654-1662, Dec. 2009