

**LI-FI SERIAL COMMUNICATION FOR DATA TRANSFER AND FILE TRANSFER IN
CONFERENCE HALL USING VISIBLE LIGHT COMMUNICATION**

VISIBLE LIGHT COMMUNICATION

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ABSTRACT— Light Emitting Diodes are set to penetrate many areas of everyday life. An interesting property of these devices in addition to their lightening capabilities is that they can also be utilized for data transmissions as well. The project aims to build a system which carries out communication using visible light that are employed for indoor illuminations. This work is designed as a prototype LI-FI system to transfer data's as well as Files. The idea is to send data's and file as serial data using UART serial communication from one PC to another PC. So the visible light communication is used at the transmitting ends and also for reception photodiodes are used at the receiving PC.

Index terms: LI-FI, VLC, LED, UART, photodiodes, power consumption.

I INTRODUCTION

Light plays an indispensable role of our lives. It is a part of the electromagnetic spectrum that is visible to human eye. Artificially created and naturally available light is abundant and its lies in the frequency range of 400-790THZ also its wavelength range of 380-750nm.since the introduction of the incandescent light bulb, till today, the concept of lighting is constantly in a phase of growth. Considering the tremendous speed of light, it is a useful tool for high speed requirements of communication especially over large distances. The medium of such a communication is an wireless. Light always propagate linearly but change in the medium, there is a deviation of light rays. This property of refraction is the basic nature of communication. But if the light deviates, the complete information transmitted is not sent to the receiver. So the total internal reflection comes into the picture.

Goals of System Design

- Achieve high speed data wireless Communication.
- Create wireless communication network using existing light resources in order to achieve low cost communication.

II VISIBLE LIGHT COMMUNICATION

The radio spectrum is highly congested and the demand for wireless data is much worse. Requirement of bandwidth for RF communication is rapidly exhausted. In the present day more bandwidth is found but its clearly not enough. Furthermore nodes are being added, cell splitting has been for long time but this is expensive. Also two nodes does not have double the capacity of one due to the interference effect, also doubling the infrastructure will not double the revenue. Moreover research on hazards of RF have found that extreme RF radiation have adverse effect on environment. Using visible light for data transmission entails many advantages and eliminates drawbacks of transmission via electromagnetic waves outside the spectrum. VLC is mostly used indoors and transmitted light consequently does not leave the room when the doors are closed and the curtains drawn, because light cannot penetrate solid objects such as walls or furniture. Therefore, it is hard to eavesdrop on a visible light based conversation, which makes VLC a safe technology if the sender intends to transmit confidential data. The most important requirement that a light source has to meet in order to serve communication purposes is the ability to be switched on and off again in very short intervals, because this is how data is later modulated.

II. PROPOSED METHOD

We have designed a prototype LIFI system to transfer data's as well as Files. Our idea is to send data and file as serial data's using UART serial communication from one PC to another PC using VLC. The project is mainly focused to develop an alternative to short range RF communication with high speed data transfer capability. The short range communications presently involves technologies such as Bluetooth, Wi-Fi etc. Furthermore Visible Light Communication (VLC) systems can form a network of interconnected LED Lamps. This network can be deployed in a large organization such as hospitals, shopping malls etc. Photo diode transistor is used to recover the data from visible light and inverting amplifier is used to get the data and processed by PIC controller connected to PC serial communication port. We have

developed an application that uses VLC, which enables transferring data between two devices.

A. TRANSMITTER

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 fluorescents 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. VLC will probably not be used for massive data transmission. High data rates as the ones referred to above, were reached under meticulous setups which cannot be expected to be reproduced in real-life scenarios. One can expect to see data rates of about 5 kbit/s in average applications, such as location estimation. The block diagram shown in fig1 the distance in which VLC can be expected to be reasonably used ranges up to about 6 meters.

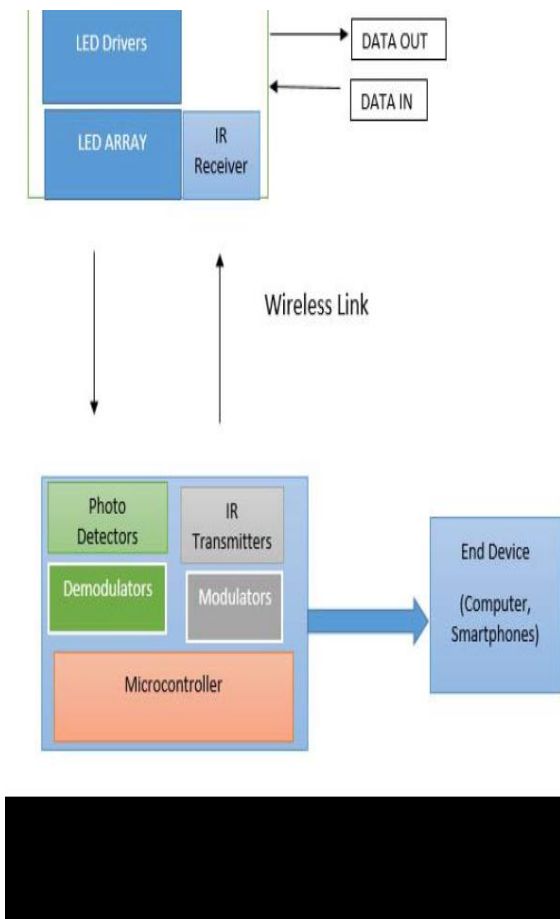


Fig1: block diagram of system architecture

B. MODULATION

In order to actually send out data via LEDs, such as pictures or audio files, it is necessary to modulate these into a carrier signal. In the context of visible light communication, this carrier signal consists of light pulses sent out in short intervals.

C. DATA

The DATA IN line as shown in Figure which is connected to LED Driver which drives the LED array. The data that is received from the UPLINK is picked up by photo detector receiver with a centre frequency of 38 K Hz. The received data is then transmitted through the DATA OUT line. DATA IN and DATA OUT line forms a part of network which can be connected to a router, modem or wired or wireless link which reaches out to the external world either through a telephone line or GSM mobile network.

D.LED LIGHT SOURCE

The LED lamp contains LED arrays which are the light sources which are driven by the LED Drivers. It includes a transmitter, receiver and a power supply unit. The LED's operates with DC supplies. Therefore a power supply unit which converts AC to DC is essential. LED's require low power for their operation and have very high switching speeds. Typical LED voltage curve is shown in fig2.

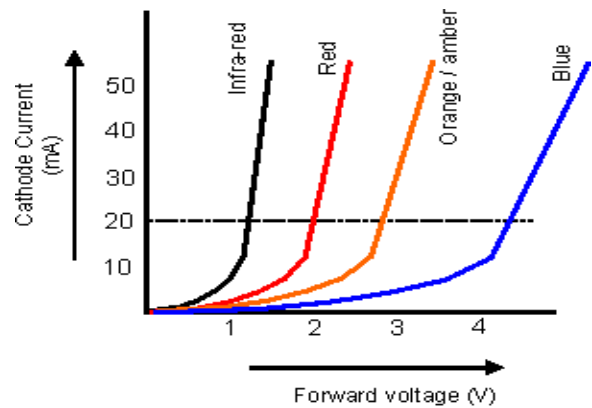


Fig2: typical (approximate) led voltage curves

E. DEMODULATION

It consists of the phototransistor as a light sensor, whose output is fed to a comparator built using low power OP-AMP. The Non Inverting terminal has a phase delay circuit. The comparator circuit makes the DATA IN into binary compatible levels. Even though the amount of light falling on the phototransistor varies, the comparator ensures that it is modified to a correct binary level which can be processed by the microcontroller

F. RECEIVERS

The most common choice of receivers is photodiodes which turn light into electrical pulses. The signal retrieved in this way can then be demodulated into actual data. In more complex VLC-based scenarios, such as Image Sensor Communication even CMOS or CCD sensors are used (which are usually built into digital cameras).

III RESULT AND DISCUSSION

Thus the project has provided all the process like the transferring data's from one pc to another pc using visible light communication by Proteus 8.0 professional software. It also serves as a secure link, as it avoids information getting leaked to the wrong end. The data can be of any form such as text, an audio, image or the video. This project shows how visible light can be used to transfer text data from one computer to the other computer shown in fig3. The computers are used as the end device. The computers with the help of Python can be used to interface software to the hardware.

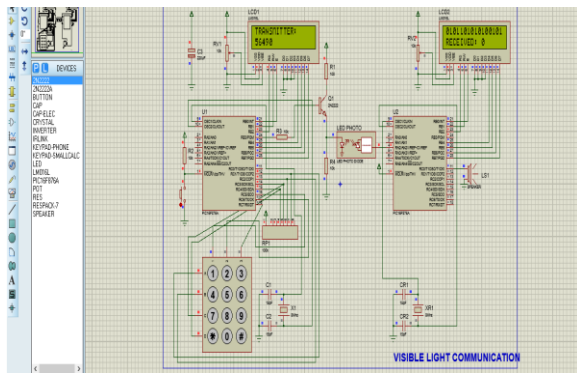


Fig3 system result

IV CONCLUSION

To conclude this project; LED's are majorly used for indoor lighting purposes. This project gives a new dimension to the very popular LED's as speed data transmitters. It can be viewed as a replacement to RF communication for short ranges to some extent. The phenomenon of data transfer using Bluetooth, WI-FI can be implemented using VLC's. VLC has no health hazards associated with it. A low cost communication system can be set up. Even though the LED's have a very high switching speeds, the receiving device should be speed enough to catch up the data emerging from the light source. Therefore data rates are decided by the light sensors that are used. Also Visible light is a natural broadcasting medium. On the other hand it also serves as a secure link, as it avoids information getting leaked to the wrong end.

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