



# International Journal of Engineering Research and Science & Technology

ISSN : 2319-5991  
Vol. 7, No. 2  
May 2018



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Research Paper

# DESIGN AND ANALYSIS OF INTELLIGENT DATA TRANSMISSION OVER VISIBLE LIGHT COMMUNICATION

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Received on: 31<sup>st</sup> March, 2018

Accepted on: 15<sup>th</sup> April, 2018

White Light Emitting Diodes (LEDs) in Visible Light Communication (VLC) is an emerging technology that is being researched so it can eventually be used for common communication systems. LEDs have a number of advantages, one of which is long life expectancy. However, like many emerging technology. VLC has many technical issues that need to be addressed. Proposed an optical indoor wireless communication system that used White LEDs like plug-in device. Developed a practical implementation of VLC and demonstrated it experimentally. In particular we focused on designing a prototype of VLC that can be used without having to make major changes to the present infrastructure with two types of protocol namely RS-232 and USB for data transmission.

Keywords: Data transmission, Design, Analysis, Visible light

## INTRODUCTION

Humankind has been utilizing light as a communication medium for many years, and light continues to be of great benefit in the field of communication. Fire has been used to make smoke signals on clouds; that is a kind of visual communication. After the invention of the electric light bulb by Thomas Alva Edison in the 19th century, new ways were developed to use light to communicate. The invention of the electric bulb led to the invention of the Signal Lamp, a visual signalling device used for optical communication

invented by Arthur C. W. Addis. Typically, the Signal Lamp uses Morse code to give information to the observer by making shutters mounted on the front of the lamp open and close.

The idea of using light as a communication medium was implemented by Alexander Graham Bell in 1880 with his invention of the photophone, a device that transmitted a voice signal on a beam of light. Bell focused sunlight with a mirror and then talked into a mechanism that vibrated the mirror. The vibrating beam was picked up by the detector at the receiving end and decoded back

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into the voice signal, the same procedure as the phone did with electrical signals. But Bell could not generate a useful carrier frequency, nor was he able to transmit the light beam from point to point. Obstacles in nature such as fog and rain which could interfere with the photo phone made Bell stop any future research into his invention. With the invention of Light Emitting Diode (LED), the idea of using light as a communication medium has started again. VLC uses white Light Emitting Diodes (LED), which send data by flashing light at speeds undetectable to the human eye. One major advantage of VLC is that we can use the infrastructure around us without having to make any changes to it. LEDs' ability to transfer information signals over light (light which is between 400 THz to 800 THz of frequency and whose wavelength is between 400 nm to 700 nm makes it a very good communication medium. Now the light we use in our daily life can not only be used for providing light but also for communication.

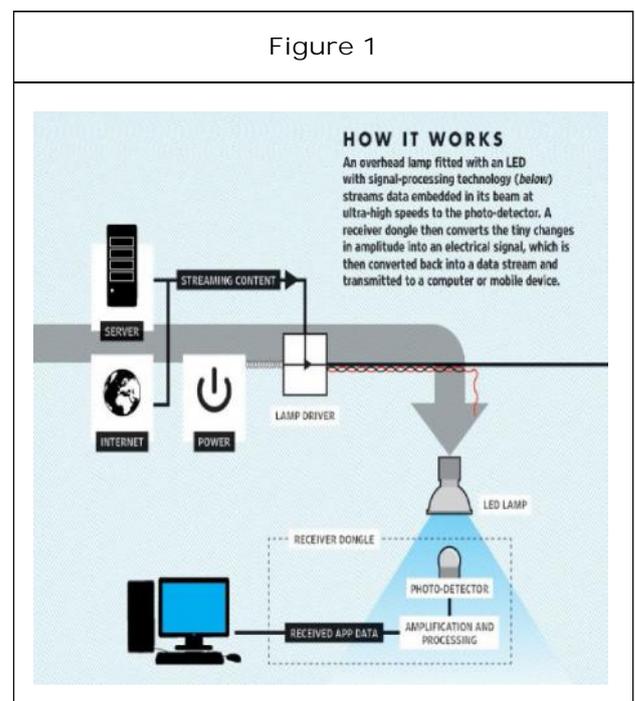
## MOTIVATION AND OBJECTIVE

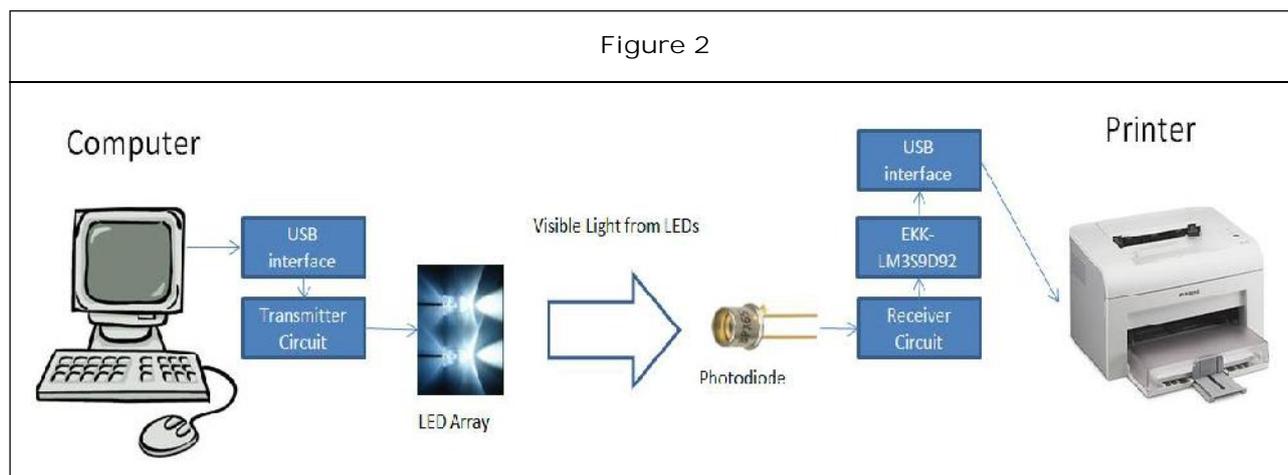
Upon detailed investigation of VLC research, it was found that not a lot of research has been done to develop this technology for commercial use. But because research into VLC is relatively new, the possibilities are wide open. A lot of research is being done to make this technology available for commercial use in various fields, including Internet access and vehicle-to-road communication using traffic signal lights. From our review of the literature, it became evident that work should be done to look into the possibility of designing a new model that could fit the present infrastructure for indoor applications.

## DESIGN AND ANALYSIS OF VISIBLE LIGHT COMMUNICATION

LiFi (Light Fidelity) is a fast and cheap optical version of Wi-Fi, the technology of which is based on Visible Light Communication (VLC). VLC is a data communication medium, which uses visible light between 400 THz (780 nm) and 800 THz (375 nm) as optical carrier for data transmission and illumination. It uses fast pulses of light to transmit information wirelessly. The main components of this communication system are 1) a high brightness white LED, Which acts as a communication source, and 2) a silicon photodiode which shows good response to visible wavelength region serving as the receiving element? LED can be switched on and off to generate digital strings of 1s and 0s. Data can be encoded in the light to generate a new data stream by varying the flickering rate of the LED. To be clearer, by modulating the LED light with the data signal, the LED illumination can be used as a

Figure 1





communication source. As the flickering rate is so fast, the LED output appears constant to the human eye. A data rate of greater than 100 Mbps is possible by using high speed LEDs with appropriate multiplexing techniques. VLC. data rate can be increased by parallel data transmission using LED arrays where each LED transmits a different data stream. There are reasons to prefer LED as the light source in VLC while a lot of other illumination devices like fluorescent lamp, incandescent bulb, etc., are available.

### CONCLUSION

This thesis demonstrated a solution to the problem of integrating Visible Light Communication technology with present infrastructure, without having to make major changes to that infrastructure. The proposed system was segmented into two parts with different interface protocols and was demonstrated practically. Visible Light Communication is a rapidly growing segment of the field of communication. There are many advantages to using VLC. There are also many challenges. VLC will be able to solve many of the problems people have been facing for many years, mainly environmental and power usage

issues. VLC 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 USB to TTL interfaces where white LEDs can be used for data transmission. In spite of the research problems it is our belief that the

### FUTURE WORK

At the end of this work, we also started to develop the third prototype as the future work. Its objective is to enable the communication between the computer and a printer using visible light. Prototype 3 is designed to integrate with prototype 2. The transmitter and the receiver circuits are the same except the EKK- LM359D92 evaluation kit is added to the receiver end. The function of EKK- LM359D92 evaluation kit is to convert the bit speed from Kbits to USB speeds with which the printer can be worked on Initial testing has been done with the chip but the work cannot go ahead because the needed software has yet to be developed. For the EKK-LM359D92 processor to work, it needs a software language to make it active so that it can be programmed to work with the receiver circuit.

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