Visible Light Communication (Li-Fi)

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Abstract - *The most trendy technology is Wi-Fi. As internet users nearly double each year, there is a huge radio spectrum load that leads to congestion. A new Li-Fi technology has evolved to improve bandwidth, efficiency and speed. Li-Fi represents Light Fidelity. It is a light-based bidirectional and wireless communication mode. It uses the visible spectrum that is unused and reduces the radio spectrum load. Li-Fi can simply be used as Wi-Fi, but light is used as a medium instead of radio waves. Data is transmitted here using light, the intensity of which varies faster than the capture of the human eye. Li-Fi uses transceiver LED bulbs or LASER instead of using modems. In this paper, an attempt is made to prove how the latest Li-Fi technology is better than Wi-Fi, as well as an attempt to show how Li-Fi is very similar to Wi-Fi and how light emitting diode is used to transmit data that gives us more speed and flexibility than Wi-Fi technology.*

Key Words: Li-Fi, Wi-Fi, LED, VLC, Frequency, Light Fidelity

1. INTRODUCTION

In daily life without the use of communication, it is almost impossible to go through a day. Communication can be defined as the process of information exchange between two or more individuals by means such as words, actions, signs, etc.

A communication system's purpose is to transmit information signals through a channel of communication.

There are three communication system types:

a)   Analog Communication System.
b)   Digital Communication System.
c)   Optical Communication System.

Analog Communication is a communication branch that deals with the transmission and reception of continuous wave signal information. A sinusoidal signal, for example, is in nature continuous. With continuous time, it has a continuous amplitude. It might be transferring an analog source signal using an analog modulation method like FM or AM, or not modulating at all. Digital communications is the transmission of data physically over a point-to-point or point-to-multipoint medium. Copper wires, optical fibers, wireless communications media, and storage media are examples of such media. Often the data is represented as an electro-magnetic signal, such as a signal of electrical voltage or an infra-red signal. Using optical (light) signals is a modern alternative to sending (binary) digital information via electrical voltage signals. Digital circuit electrical signals (high / low voltages) can be converted with LEDs or solid-state lasers into discrete optical signals (light or no light). Similarly, light signals can be translated back into electrical form by using photodiodes or phototransistors to introduce gate circuit inputs.

Wireless communication schemes such as Wi-Fi especially use radio / microwave frequencies for the data transfer, mainly as high-sensitivity recipients are possible, and broad coverage is available at low frequencies and in high-frequency viewing lines. However, because of the limited available spectrum, radio frequency can support only a limited bandwidth.

Li-Fi(Light Fidelity) transmitters are not only for wireless communication but also for illumination that can be implemented either with blue phosphorous LEDs or with color blending through colored LEDs. Further possibilities for signal modulation and detection in Li-Fi systems can be provided with luminaires with multicolored LEDs. Li-Fi(Light Fidelity) is used to transmit information at a very large velocity by using the visible light portion of the electromagnetic spectrum. In contrast with established wireless communication forms such as WLAN that are used to transmit data with traditional radio frequency (RF) signals. LI - FI is the data transmission system for Visible Light Communications (VLC).

2. UNIQUENESS OF PROJECT

In the present method, the disadvantage is that Wi-Fi provides,

1)High radiated radio waves are used for communicating data between two devices.

2)Secured data transmission is not available here, but WPS encryption can also be performed in many ways.

3) It also damages your health when transmitted by the radio wave.

4)Signals are also a major interference.

The system is proposed to overcome these inconveniences,
1)No interference with radio frequency signaling because this communication is entirely light-dependent.

2)The technology is based on a simple cum illumination technique.

3)This LI-FI data speed is extremely fast in comparison with other communication methods.

4) Because communication is based on the most commonly used part of the electromagnetic spectrum for communication with visible light.
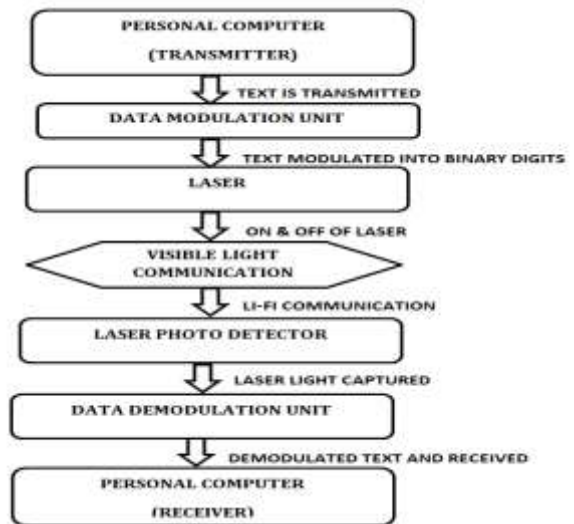
5)As, data transmitted by light to cause health problems. An image compression and decompression algorithm is the algorithm used.

3. PROPOSED WORK SYSTEM

3.1 BLOCK DIAGRAM
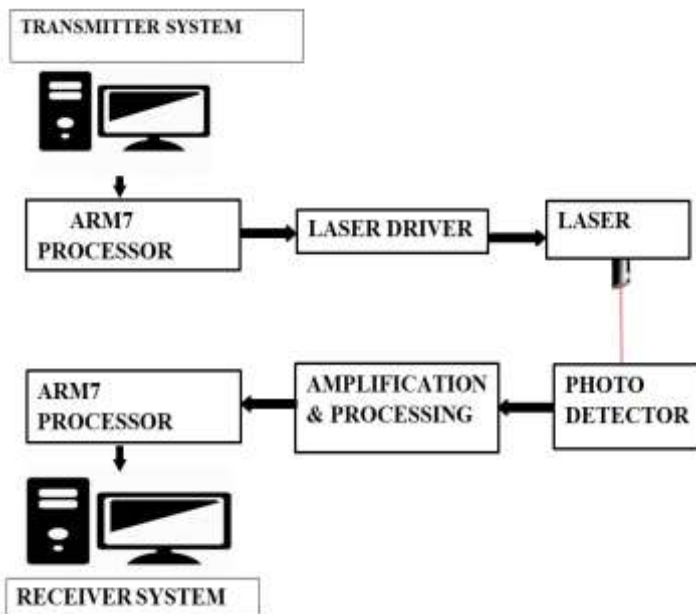
3.2 DATA FLOW DIAGRAM


Block Diagram Description:

A) Transmitter side:

1) Personal Computer is used to transmit the data serially.

2) In this system, ARM7 processor is used to transmit the data serially at transmitter side. ARM7 is used to modulate the input signal.

3)LASER driver is used to control the LASER bulb. LASER driver controls the LASER lamp. When LASER is ON it is considered as binary '1' & when the LASER is OFF it is considered as binary '0'.
4) LASER bulb is used to transmit the data. Here high intensity LASER is used as transmitter.

5) In transmitter part the text is said to be transmitted by transmitting an text from pc via data modulation unit and through LASER bulb. Text can be converted to digital signals of 0s and 1s in data modulation unit and provides series of pulses such that text can be converted into digital signals of binary bits.

B) Receiver side:

1) Photo detector is used to detect the data. The working principle of a photodiode is, when a photon of ample energy strikes the diode, it makes a couple of an electron-hole. Therefore, holes in the region move toward the anode, and electrons move toward the cathode, and a photocurrent will be generated.
2) In this system the ARM7 processor is used to demodulate the received data. Amplification & Processing is done by OP-AMP circuit.
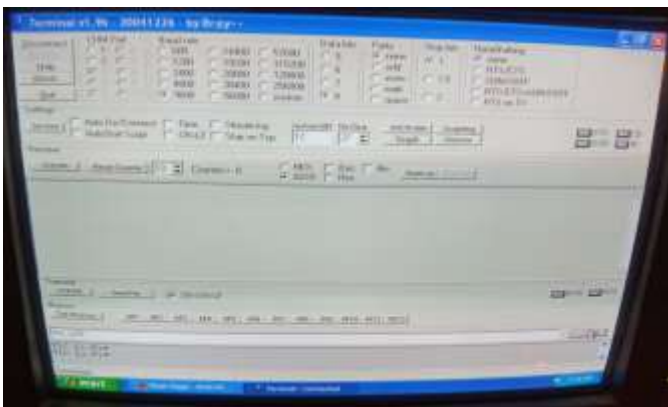3) The goal of receiving part is to receive the text that is transmitted from the transmitter part successfully.
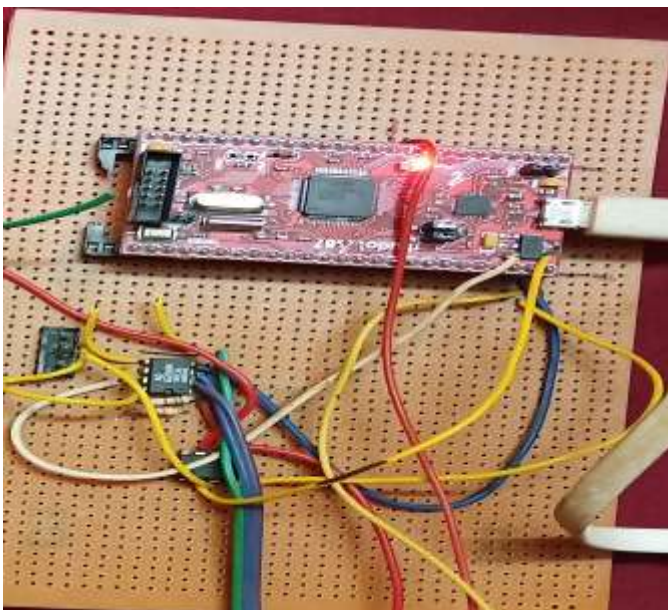
4. RESULT

4.1 PROPOSED MODEL TRANSMITTER
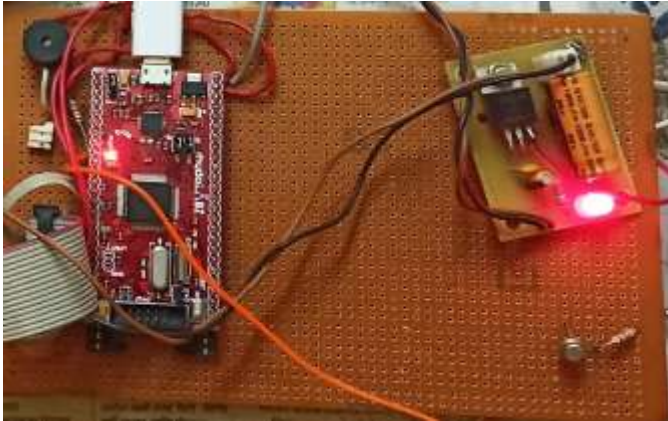
PERSONAL COMPUTER

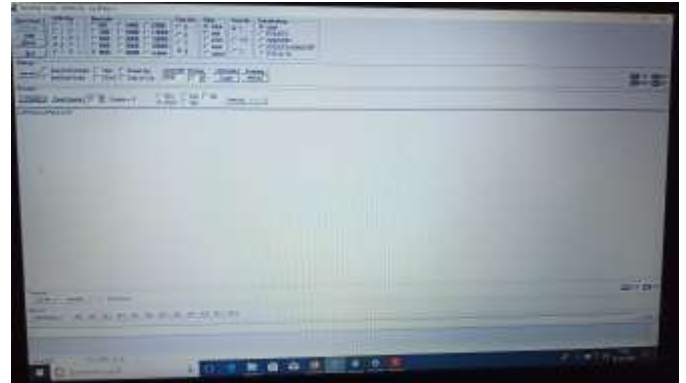When text is sent. "VLC Li-Fi" is sent
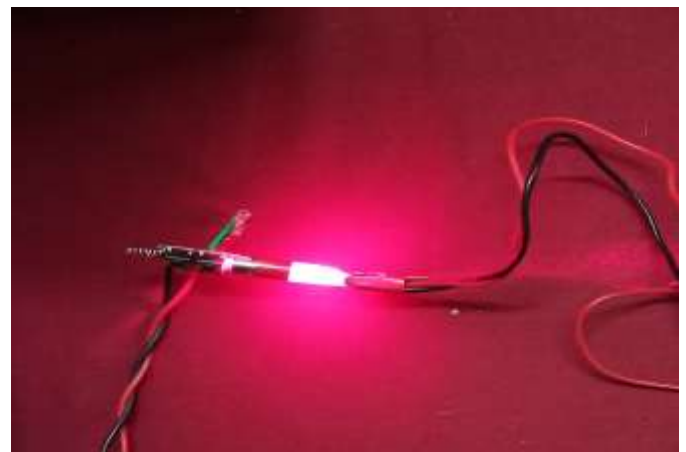

RECEIVER

PERSONAL COMPUTER

When text is received. "VLC Li-Fi" is received.

LASER TRANSMITTER AND RECEIVER

5. CONCLUSIONS

This technology is still being investigated and will surely be an advancement in communication.

When Li-Fi is compared with Wi-Fi, it has low speed than Li-Fi. Li-Fi security is much better than Wi-Fi. Li-Fi will thus be a better technology to access the Internet in the next few years.

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