LI-FI: IMPLEMENTATION AND ANALYSIS OF VISIBLE LIGHT COMMUNICATION SYSTEM

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Keywords:

Li-Fi, Wireless Communication, Visible Light Communication, Wi-Fi, LED

Introduction:

Li-Fi represents Light Fidelity. The idea is extremely innovative and was given by the German physicist Harald Haas in 21st century (2011) TED (Innovation, Amusement, Plan) Global Talk on Visible Light Communication (VLC). Li-Fi is a remote optical systems administration innovation that uses light emitting diodes (LEDs) for transmit information. Li-Fi uses light as channel to send the information in high-speed like in other technologies which are currently using and act in accordance with the IEEE standard IEEE 802.15.7 is a rapid, two way communication and completely organized remote correspondence innovation based standard like Wi-Fi's IEEE 802.11. In the era of data communication, Li-Fi is an innovative idea in wireless communication system which makes usage of Light Emitting Diodes (LEDs) or Light Amplification by Stimulated Emission of Radiation (LASER) for the transmission of information wirelessly. Transmission of information is one of the most significant everyday requirements in the quickly developing world. The photo detector receives the information through the light and is responsible for converting the received optical signal into electrical signal.

Objectives:

The main objective of the project is to create an application that transmits data that might be in the form of text or audio using Li-Fi technology for adapting to the restricted bandwidth issue we faced in radio frequency signals. For better, productive, secure and a quicker connectivity, visible light communication is used. One of the advantages of using Li-Fi over Wi-Fi is that it avoids radiation produced by Wi-Fi. At the same time the project also lets us to use more efficient light source i.e., LED. The goal of our project is to transfer data with faster speed which is not easy to achieve through Wi-Fi and see whether transmission is possible through various mediums or not. Li-Fi can be a better option for Wi-Fi which considers light as a medium to transmit information. The goal of our project is to exchange information with high speed which isn't anything but difficult to accomplish through Wi-Fi and see whether transmission is feasible through different mediums or not.

Methodology:

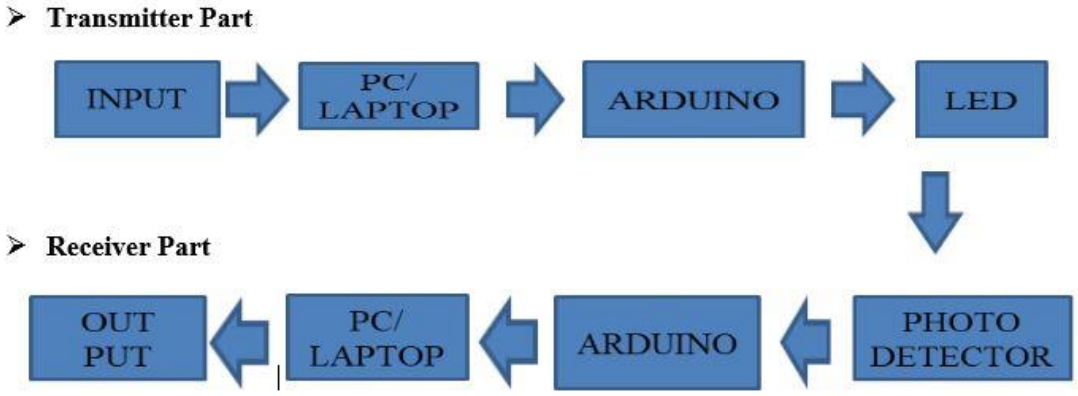

Fig 1. Block Diagram of LI-FI

The block diagram consists of two parts, which are receiver and transmitter. In the transmitter part, the amplifier circuit amplifies the input signal provided in the form of light. Different types of photo detectors can be used to detect the transmitting light and convert the binary information into electrical form. The photo detector receives the information through the light and is responsible for converting the received optical signal into electrical signal. The double stage amplifier along with amplification removes the noise. Thus, the analog signal output can be seen on the output device in the form of text.

Conclusion:

In Tera Term application, the characters typed will be converted to respective ASCII value and fed to the Arduino board. The ASCII value will be transmitted in the form of light and received by the receiver at the other end. The led flicker in accordance to the type of character typed. The flickering is too fast but can be observed through human eye. The text signal can be effectively transmitted and received at a distance of 10 cm. Distance can be further increased with increase in the intensity of the light .A single white led and a phototransistor is connected to the Arduino board. Since there are two such Arduino boards, this is a bidirectional communication system which can simultaneously transmit and receive the text data. In this project, a design and implementation of wireless data transmitter and receiver device based on Li-Fi technology is done and is tested successfully. It has high data transmission rate and is more secure than WiFi since light cannot pass through opaque structures, the internet cannot be breached by users in other rooms or buildings. Researches are undertaken for improving the Li-Fi technology and to make it available in our daily lives as it provides reliable communication in low cost.

Scope for future work:

The scope of Li-Fi is vast. Li-Fi is an emerging technology and hence it has vast potential. The area of Li-Fi is very broad in the manner of hospitals, academics, airlines and more. It can be used in the places where it is difficult to lay the optical fiber like in hospitals and nuclear power plants. In operation theatre, Li-Fi can be used for modern medical instruments. In traffic signals Li-Fi can be used. We can communicate with the LED lights of the cars and reduce the traffic congestion by implementing thousand and

millions of street lamps to transfer data. In aircraft, Li-Fi can be used for data transmission without interfering with radar communication. A portable Li-Fi can be brought into existence using the said principles, with which we can transmit and receive data at very high speed rate. This can be used in a smart phone which has a photo detector in it. Consider a series of LEDs in the smart mobile nearer to the light detector and as how a Wi-Fi option is provided in the mobile, if an option known as LiFi is present, if we turn it ON the LEDs which are placed nearer to the light detector which is working as a normal LED on the phone will start acting as a portable Li-Fi where these LEDs will do the operations as mentioned above and the photo detector which is in the mobile will sense it and data will be transmitted in which ever place we are.