Wireless Data Transmission using Visible Light Communication

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Abstract- [1]VLC (visible light communication) is an interesting background for the communication and the technology becoming more easily available due to advancement.[1] It sounds very interesting to send data through light has already approved by many researchers. Light may be connected in different topologies to increase the distance of communication. [1]Existing infrastructure may also used for VLC which is further plays an vital aspect for its popularity. VLC could replace the RF communication. [1]Transmission of data using visible light by sending data through the light bulb that varies in intensity faster than the human eye and Receiving through photo-detector. If the LED is on state, the photo detector registers a binary one; otherwise it's a binary zero. This paper deals with the wireless data transmission using visible light communication technology.
While the LI-FI based system are used to transfer the data from one computer to another. The main components of this communication system are high brightness LASER which acts as a communication source and silicon photo diode serving as the receiving element of the device. [2]The data from the sender is converted into the intermediate data representation, i.e. byte format and is then converted into light signals which are emitted by the transmitter. The light signals which is received by photo diode at the receiver side. The reverse process takes place at the destination computer to retrieve the data back from the received light.

Keywords- Li-If, High-Brightness LASER, photo diode ,Visible light communication(VLC)

I. INTRODUCTION

[1]Now a day's interested for this kind of communication is increasing and technology becoming more popular due to its advancement. Li-If stands for 'light-fidelity'.
Li-IF is a new way of wireless communication that uses LASER lights to transmit data activities in the fast world.[3] The main technological development that made VLC possibly cheaper, high power lights of high quality, capability of switching at the high frequencies which is undetectable to human eye. Hence have high security than RF communication schemes. [3]Since light can be used to produce data rights higher than 10 megabits per second which is faster than our broad band connection. VLC system employ visible light for communication that occupy the Line of sight(LOS).
[1]spectrum ranges from 380 nm to 750 nm corresponding to a frequency spectrum of 430 THz to 790 THz which are higher in compression to radio based system.[1] Visible light utilized to transmit data which can be utilized to enhanced version of WI-FI. Laser used should be highly efficient to manage data at high frequencies rates. The goal of the project is to create a system for transmitting high speed data through LASER which can be detected by a photo-diode embedded in an integrated circuit (IC) due to its impact size and high sensitivity. In the next section, the system design and the experiment setup is been described.

II. PROPOSED SYSTEM

This proposes a Li-IF based system to transfer data from one device to another device using visible light spectrum. The proposed system consists of Li-IF transmitter and receiver circuits with LASERS, photo-detector, battery, connecting wires and USB or COMM port.[3] Hence,the sending device will select some data to the transmitter circuit by the sender's device. The LASER'S in transmitting circuit will transmit this data and the photo detector of the receiver circuit will receive this data from the light source and will send it to the receiving units of the devices which in interpret and obtain the final data that was send by the sender.[4]In this pro-type the audio is also send by the transmitter by using microphone and received by the audio speaker which equipped in receiver section. So that visible light can also be used audio purpose instead of using text transmission. So this proposed system will converges, the transmission of both text and audio which are provided in the system design.

BLOCK DIAGRAM :

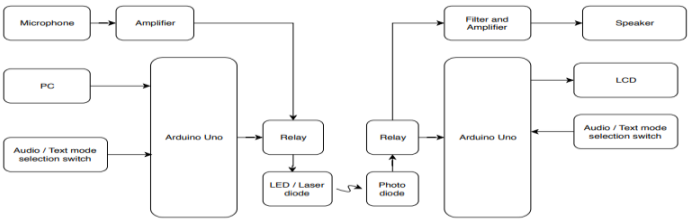

Fig.1:Block diagram.

III. SYSTEM DESIGN

The experimental set up and practical block diagram of VLC communication has been designed .[4] In the present prototype, an optical which a photodiode of dimensions and responsively of 0.45 A/W is used. Photo diode generates a voltage according to the intensity of light fallen on the photo diode. Hence Photo diodes are widely used to generate electric solar power and now it can be utilized for data communication also.

[1]In the developed system, a digital square waveform is been transmitted with the help of LASER and received by the optical receiver. The transmitted signal is received at the receiver is obtain with some noise which further may be passed through a filter to get the accurate signal.

VLC can be used both for data transmission and illumination. It uses visible light spectrum range from 380nm to 780nm. Since, Air is used as a transmission medium. [1]It has many advantages in compression of the present RF communication system like high band width, low power consumption, can use existing infrastructure, high security and many others.

A. Transmitter:

LASER: LIGHT AMPLIFICATION BY STIMULATED EMISSION OF RADIATION.

[5]While LASER, will emits the light as a result of striking the atoms and complex them to release the similar photon. The light emitted by the LASER consist of various colors. while the layout beam produced by the LASER consist of a single color.

B. LIGHT SOURCE:

The most important requirement that a light has to the meet in order to serve communication purposes is the ability to be switched on and off repeatedly in very short intervals. Hence LED and LASER illumination exist everywhere, it is expected that the LED illumination device will act as a lighting device and a communication transmitter simultaneously everywhere in a near future.

Typically, red, green, and blue LASER's will emit a bond of spectrum, depending on the material system. The white LASER's drawn much attention for the illumination devices. Comparing the LASER illumination has many advantages such as best utilization, high efficiency, environment –friendly manufacturing, design flexibility, long life-time, and better spectrum performance.

Laser works on the principal of stimulated emission and LED works on the principle of Electro-luminance. While laser emits light as a result of striking the atoms and complex them to release the similar photon.

C. Receiver:

[1]Optical received used, is manufactured by Texas Instruments and Receiver can be different types like optical receiver IC, photo diode, solar panel etc depending on the type of use.

Due to above stated and many other advantages we can employ this system at many places to transmit and receive data which is also cheaper and durable than the existing RF technology. The receiver consists of an optical receiver which senses the transmitted signal and further we can use a filter to the unwanted noises.

IV. EXPRIMENTAL SETUP OF WIRELESS DATA TRANSMISSION

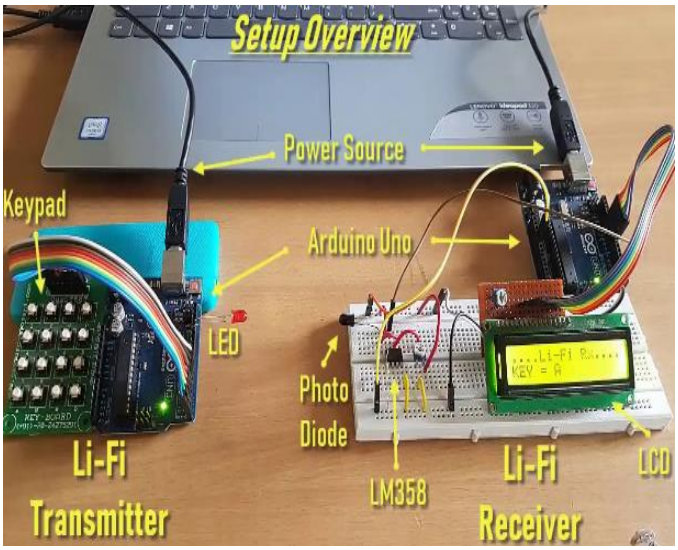

Fig.2:Text data transmission.

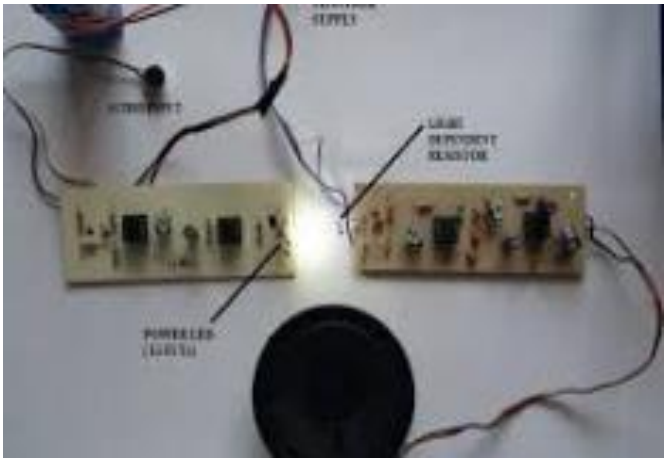

Fig.3:Audio data transmission

SOFTWARE DETAILS:

[5]Optical receiver that is mentioned the highly sensitive receiver and has a less effect of ambient light and noise source. The data reading module, data interpretation module and data display (GUI) are implemented in this software module.

The software that performs the task of selection of data to be sent, reading the data to be sent the data conversion at the sender's side.[6] First, the user selects the COMM port to

which the circuit is connected and the other required settings for communication. [7]Then the user interface appears which allows to communicate with the receiver and send text, audio. The data to be send is sent is selected by the user and the software reads this data. Then, this data is to be converted into byte format so that it can be send to the transmitter circuit.
[3]The Encryption can also be performed on this recited data. Finally, this data is send in the form of light through LASER. At the receiver side, the receiver circuit captures the light signals, converts them into bit sequence and sends this bytes of data to the software. This plain of text is the received data. The received data is then displayed on the receiver's device as output.Fig3.2 shows the transmitted data and received data, this verifies that the optical data can be transferred via LASER efficiently at a medium distance with line of sight (LOS)

V. APPLICATION

- Intelligent street light system.
- Special road system to pass priority vehicles fatly.
- Providing data in flight
- Industrial and school/college.
- Household application and many other can achieved using VLC.

VI. ADVANTAGES

[3]LI-FI works on visible light technology. Since homes and offices have already have light bulbs for lighting proposes, the same source of light can be used to transmit data. [1]Hence, it is very efficient in term of costs as well as energy, light must be ON to transmit data, so when there is no need for light, it can be reduced to a point where it appears OFF to human eye, but is actually still on and working.

- Visible light's large frequency spectrum bandwidth
- There is no EMI.
- Visible light communication requires much less power compared to RF communication
- Visible light cannot penetrate through the walls, so Indoor Visible light communication is comparatively secure.
- Visible light usually poses no health hazards to human body and eyes

VII. CONCLUSION

[3]In this paper, a real time audio broadcast prototype off the self LASER are used, it is envisaged that using commercial LASER lamps would results in higher distance of transmission. It is shown that transmission of high quality audio with the medium distance can be achieved.
The improvement can be made by using adding focusing lens between the transmitter and receiver. In the data transmission prototype, the encoding and decoding can be used in transmitter and receiver part to reduce the error in transmission of data. In addition, to the data transmission rate could be enhanced by using fast switching LASER's.[5] The test were carried out indoor under ambient light conditions .Large coverage of area for transmission can be obtained by using LASER light.

VIII. REFERENCES

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