Image and Data Transmission Using Visible Light Communication Li-Fi

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ABSTRACT

The Li-Fi technology is a fast developing wireless technology in recent years and it is one of the source to transmit the data from one end to another end using LED light, operating on principle of visible light communication . Li-Fi technology is one of the emerging field that enhances the power of wireless communication. Li-Fi technology, discovered by the German physicist-Harald Haas, University of Edinburgh. In this paper image and data is transmitted and it is done by transmitting data through LED light. The data is generated by one PC then it is transmitted through LED and these data can be received by photo Diode and display on another PC. Data transmission using Li-Fi is faster as compared to other wireless technology such as Wi-Fi, Bluetooth, infrared etc.

Keywords : Light- Fidelity (Li-Fi) Visible light communication (VLC), Light emitting diode (LED) , Photo Diode, Personal computer (PC), LCD Display.

I. INTRODUCTION

In modern age, as the need of high speed data communication is increasing so as to satisfied this demand, a technology called as Li-Fi can be used. The research and discovery of this technology is done by the German physicist-Harald Haas, University of Edinburgh. Wireless communication is done using electromagnetic wave, that are prone to noise their can be distortion in data transmission due to multipath reflection. This technology can overcome this problem of scattering of waves and minimize the skin effects of the RF waves. Li-Fi can play a major role in relieving the heavy loads that the current wireless system which face a new and unutilized bandwidth of visible light to the presently available radio waves for data transfer. A much larger range of frequency is can be used nearly 300 THz, compare to that of radio frequency communication nearly 300 GHz.

II. PROPOSED SYSTEM

In this project the whole system divided into two part transmitter section and receiver section. The figure 1, shows block diagram of transmitter section and figure 2, shows block diagram of receiver section. The proposed system uses data communication is done between one PC to another PC using Li-Fi technology.
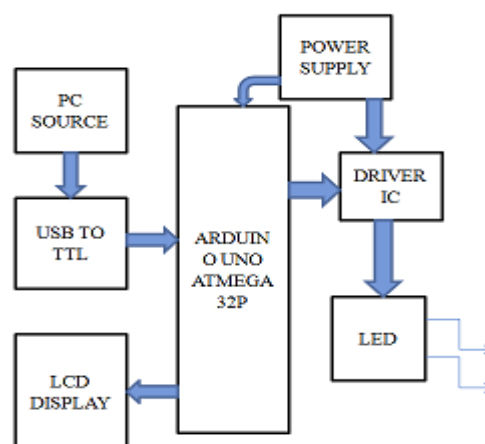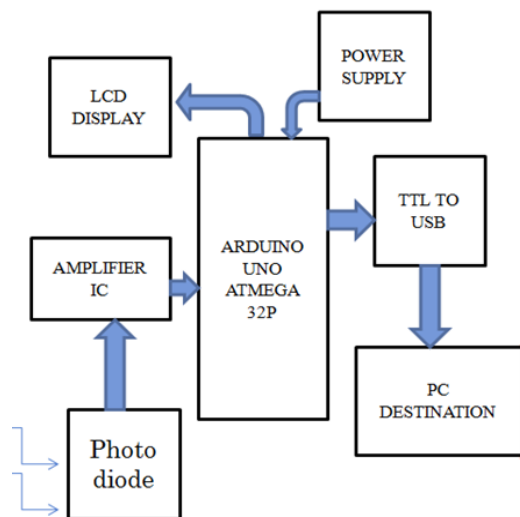

Figure 1: Block diagram of transmitter section.

Figure 2: Block diagram of receiver section.

i. TRANSMITTER SECTION

Transmitter section consist of main control unit using Arduino uno is a development board and very easy to used. We are using MAX232 used as USB to TTL converter it is transmit the data bit stream serially. Transmitter PC encoded data and image and it is send by the USB to TTL converter to development board. The image or data is encoded by using Base64 technique. L293D is used drive the LED panel, as the sinking capacity of Arduino is low.

ii. RECEIVER SECTION:

Receive section consist of same development board and it uses the photo diode or photo receiver. It accepts the light energy and convert into the electrical energy and it is fed to the operational amplifier IC LM324 operated as a comparator. The output of comparator is applied to the Arduino uno and its TTL output applied to MAX232 which is used as TTL TO USB converter and data will be decode Base64 technique and decoded data display by receiver PC.

III. HARDWARE DESCRIPTION

i. Arduino uno ATmega328p

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The ATmega328 has 32 KB with 0.5 KB used for the boot loader. It also has 2 KB of SRAM and 1 KB of EEPROM [12].

Figure 3: Arduino Uno Atmega 328P

ii. Driver IC L293D:

The L293 and L293D devices are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed High-Noise-Immunity Inputs Output Current 1 A Per Channel (600- mA for L293D) Peak Output Current 2 A Per Channel (1.2 A for L293D) to provide

bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, led, solenoids, DC and bipolar stepping motors, as well as other high-current and high-voltage loads in positive supply applications.

Note that the L293 device can be used as a simple driver for a LED to turn on and off in direction, and can also be used to drive a LED in directions.[13]

iii. PIN Photo diode:

BPV10NF is a PIN photodiode with high speed and high radiant sensitivity in black, T-1¾ plastic package with daylight blocking filter. Filter bandwidth is matched with 870 nm to 950 nm IR emitters. Package type leaded Package form: T-1¾, Radiant sensitive area (in mm2) 0.78 Leads with stand-off High radiant sensitivity, High bandwidth- 100 MHz at VR = 12 V

Fast response times.[11]

Figure 4 : Pin Photo Diode

IV. SOFTWARE DESCRIPTION

The software language required for this system are as follows.

1. Embedded c
2. VB.net language

For programming of Arduino uno Atmega328p, c programming language using Arduino compiler software is used. The Arduino has been designed to enhance developer's productivity, also enabling faster and more efficient program development.

Arduino introduces a flexible window management system, enables us to drag and drop individual windows anywhere on the visual surface including support for Multiple Monitors.

The Graphical user interface (GUI) coding needs VB.Net language. Visual Basic is a legacy third generation event Driven programming language and integrated development environment (IDE) Microsoft. Microsoft intended Visual Basic to be relatively easy to learn and use. Visual Basic was derived from BASIC (Beginner's All-purpose Symbolic Instruction Code) and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects.
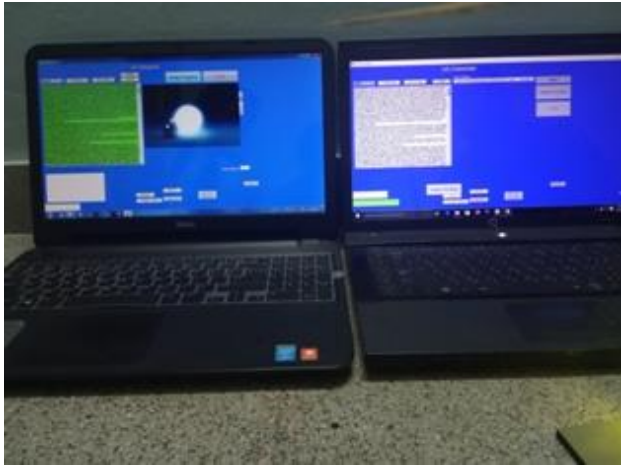
V. RESULTS AND DISCUSSION

EXPIRIMENTAL SETUP

EXPERIMENTAL RESULT

Above figure shows the experimental setup and transmit image as well as data from one PC to another PC is successfully done.

VI. CONCLUSION

In this project, It is concluded that the data as a text and image is transmitted and received from one PC to another PC is successfully done by using visible light communication this concept of Li-Fi technology can be work on indoor application. Hence after making this project it is concluded that Li-Fi is faster than the Wi-Fi.

VII. FUTURE SCOPE

1. Indoor fast communication.
2. Every LED bulb using as Li-Fi hotspot.

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