ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

TEXT TRAMSMISSION FROM MOBILE TO ARDUINO USING LIGHT SIGNAL

Ragavi P
Assistant Professor, Department of ECE
Velalar College of Engineering and Technology
Erode, India
ragavip93@gmail.com

Aswin Krishna KV
Department of ECE
Velalar College of Engineering and Technology
Erode, India
aswinkrishnakv10@gmail.com

Brindha D S
Department of ECE
Velalar College of Engineering and Technology
Erode, India
brindhads7720@gmail.com

Gayathri E
Department of ECE
Velalar College of Engineering and Technology
Erode, India.
gayathri13032000@gmail.com

Jayasri V S
Department of ECE
Velalar College of Engineering and Technology
Erode, India
vsjayasri123@gmail.com

Abstract—A Li-Fi is a new wireless technology to provide the connectivity within network environment. Li-Fi stands for light-fidelity and Li-Fi proposed by the German Physicist Herald Haas. It provides transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. It's the same idea behind infrared remote controls but the far more powerful device. And the Haas says his invention, which he calls DLIGHT; it can be produce data rates faster than 10 megabits per second, which can faster your average broadband connection. The LED is used in different areas of everyday life. It can use the lighting capability to transmit the data from
one to another. The massive use of Li-Fi may solve some bottleneck of data
transmission in Wi-Fi technology. Finally the authors have also tried to explore
the future scope of this new technology for using visible light as the carrier in
data transmission and networking.

Keywords: LED, Li-Fi Technology, Wi-Fi Technology, Data Transmission,
Visible Light.

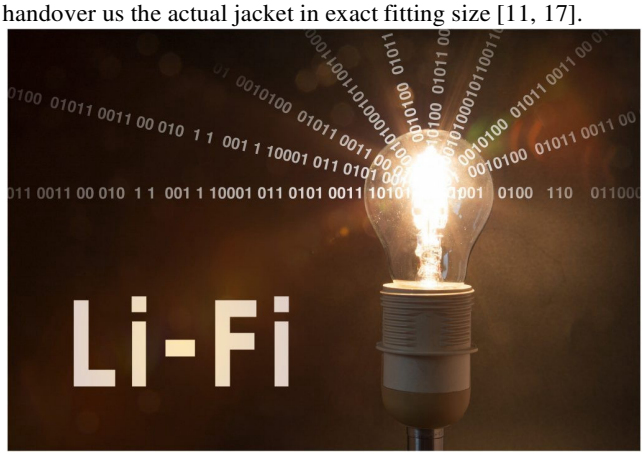
INTRODUCTION

Li-Fi is comprises of frequencies and wavelengths range, from the infrared through visible and down to the ultraviolet spectrum and it include some gigabits. The gigabits class communication speeds for short, medium and long ranges and both the directional data transfer using line-of sight, reflections and much more activities [1, 3]. A German Physicist Herald Hass invented the transfer of data through light fidelity [15]. The invention will be supplanted for Wi-Fi, the data transmitted at the range of 500Mbps. This technology uses all kind of light spectrum like white light, infrared. The Li-Fi is not a limited to LED or Laser technologies or to a particular receiving technique. Li-Fi is a framework for all of these providing new capabilities to current and future services, applications and end users [2]. Nowadays Wi-Fi is very useful technology in all the public sectors like home, cafes, airport, paying guest rooms, colleges, etc. Due to this radio frequency is getting blocked day by day, at the same time usage of wireless data is increasing exponentially every year. Everyone is likes to use wireless data but the capacity is going down [12]. But the wireless radio frequencies are getting higher, complexities are increasing and RF interferences continue to grow. In order to overcome this problem in future we re using this Li-Fi technology in 2011. The Li-Fi is a wireless communication system in which light is used as a carrier signal instead of traditional radio frequency as in Wi-Fi [18, 20]. Assume walking into a complex there unavailable to reach the GPS signals but the complex is equipped with ceiling bulbs that create their own 'constellation' of navigation beacons. As our cell phone automatically receives these signals, and its switch on our navigation software to use this information to guide us to

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

while the image matches our orientation and body gestures fora digital fitting and when we walk into the store, the clerk handover us the actual jacket in exact fitting size [11, 17].



LITERATURE SURVEY

The most of the people are using Wi-Fi Internet devices, which will be useful for 2.4-5GHz RF to deliver wireless Internet access surrounded our home, offices, schools, and some public places also. We are quite dependent upon these nearly ubiquitous services [7, 15]. While Wi-Fi can cover an entire house, school, the bandwidth is limited to 50-100 megabits per seconds (Mbps). It is a most current Internet services, but insufficient for moving large data files like HDTV movies, music libraries and video games. The most of the dependent upon 'the cloud' or our own 'media services' to store all of our files, including movies, photos, audio and video devices, games, the more and most bandwidth andspeed should be needed to access this data. Therefore RF- based technologies such as today's Wi-Fi are not the optimal way. In addition, Wi-Fi may not be the most efficient way to provide new desired capabilities such as precision indoor positioning and gesture recognition. The optical wireless technologies, sometimes called visible light communication (VLC), and more recently referred to as Li-Fi. On the other hand, offer an ntirely new paradigm in wireless technologies in the terms of communication speed, usability and flexibility, reliability. VLC is the possible solution to theglobal Wireless spectrum shortage. technology is a fast and cheap optical version of Wi-Fi. It is a based on Visible Light Communication [12, 18]. The VLC is a data communication medium using visible light between 400THz to 375THz as optical carrier for the data transmission and illumination. The data is encoded in the light to generate new data stream by varying the flickering rate, to be clearer, by modulating the LED light communication source [4]. This is a whole new spectrum of possibilities as compared to the radio waves spectrum and is 10000 times more in size. Visible light is not injurious to vision and are a mandatory part of an infrastructure,

therefore abundantly available and easily accessible. Comparing the number of radio cellular base station
s (1.4 million) to the number of light bulbs
(14 billion) installed already the ratio is coincidently same i.e. 1 :10000
The Arduino board features a serial communication interface(which includes a Universal Serial Bus (USB) controller on most models) which was used for loading programs from a personal computer to the board. The Arduino IDE was used to program the Arduino. The Arduino via the code was madeto perform various tasks like switching on or off the LED onthe transmitter's circuit and as well reading the analog signalread from the photodiode in the receiver's circuit.
In order not to make the system less bogus and redundant, the Arduino board was used as the micro-controller as well as the Power Supply Unit (PSU) for the circuits. It supplies a voltage of about 5 V from its port when connected to the PC via the serial connector cable and also acts as the virtual ground [8].

A. Hardware Implementation

The Li-Fi data transmission system is set up such that a single Micro Controller - Arduino board is used to encode, decode and supply power to the transmitter and receiver circuits. After the design and calculations of the resistor values in the transmitter and receiver, all the components of the circuit were implemented on a breadboard carefully with the aid of jumper wires and a multimeter was used to test the continuity of the circuit from point to point.
1) The Hardware for the transmitter was designed and implemented utilizing the accompanying steps:
2) The transmitter circuit design was drawn after design calculations were completed. The software used for drawing the circuit schematic layout is the Proteus 8 Professional Design Tool.
3) After designing the circuit layout, the components were acquired and then connected on the breadboard using jumper wires where necessary.
4) Next, the circuit after a series of tests on the Breadboard is transferred into a Vero board of appropriate size carefully.
Then finally, the components were soldered appropriately and then retested.
In other to ensure the proper testing of the system and circumvent its proneness to errors, the transmitter and receiver circuits were implemented on a single breadboard and the LED and photodiode were in close proximity to one another.
After several tests, the components on the breadboard were then soldered carefully using the same circuit configuration on separate Vero boards. A multimeter is used after soldering to detect dry joints, bridging of joints and test for continuity of lines on the Vero board. This helps to reduce the strain of constructing the circuit and detecting causes of error before using the circuit.

B. Software Implementation

The only implementation of software design carried out is the creation of the application that decodes the sent message from the transmitter and displays it on its output window. The application is a Java application created using Net beans Programming interface. The Arduino library was imported to the Net Beans IDE as this is an external library specially designed to ensure the Java application can communicate with the Arduino microcontroller effectively.
The Graphical User Interface (GUI) developed from the program has a connect button and a system-generated port list so as to give the user flexibility in the selection of ports on the Receiver PC. The application is opened through its link

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

stored in the Net Beans IDE used to create it. The application prompts the user to connect the Arduino microcontroller to one of the ports from the drop-down list of ports. The port tobe chosen can be determined by carefully viewing the port number from the Arduino IDE used to upload the

microcontroller encoding program onto the Arduino board. The port to be connected to is automatically chosen. Any error in connecting to the right port would impede the user from viewing the message sent from the first computer. After successfully connecting to a port, a message is displayed to acknowledge that a port has been chosen correctly. The 'Connect' button now becomes locked and changes to 'Disconnect' to prevent the user from changing the port when a message is being received and thus disruptingthe decoding process.

C. Implemetation Procedure

The practical execution of the work comprises of the following parts:

1) Data packaging and encoding: This is done by the Arduino connected to the transmitter. It converts the text to bits and sends sequentially as a Low or High voltage signal.
2) Hardware control;
3) Transmission synchronization;
4) Transmission decoding: This is done by the photodiode which converts the light signal to an analog signal of varying magnitude and then passesit to the amplifier for amplification and differentiation of the bits.
5) Error handling: This is performed by the automatic gain controller which is immediately after the photodiode. It ensures that a "1" is clearly differentiated from a "0" bit.

At whatever point a user needs to send information (data) to another user, the following steps will occur:

1) The Arduino program is uploaded onto it chip via the serial port and the port number is noted.
2) After successfully uploading the program, the Arduino serial monitor is opened and the text to be sent is typed in the text box of the Arduino serial monitor indicated in Fig. 4 (which was used to avoid making the process tedious). The sent text was "Li Fi System". 3) The system module will buffer it and begin transmitting it through the LED which acts as the input to the channel.
4) The Arduino connected to the receiving PC will receive the data transferred over the LED to the channel i.e. the photodiode and the double stage amplifier, which in turn decodes it.

The received text is then displayed using the Java GUI application designed .

WORKING PRINCIPLE

This communication schema is transmission of 'Data through illumination' [6]. The intensity of the LEDs is varied by changing the current passed through them at very high speeds. However, this will show ON-OFF activities of LED lights and enables data transmission using binary codes. When the LED is ON, logically it represents the '1' is transmitted and when the LED is OFF, logically it represents the '0' is transmitted [4, 8]. This method is used to rapid pulses of light to transmit data is called Visible Light communication (VLC).

DESIGN OF LI-FI

The Li-Fi architecture is consists of numbers of LED bulbs or Lamps. The many wireless devices such as mobile phones, laptops, PC's, Internet based devices, some server devices etc. [10]. The important factors we could show to while designing Li-Fi as following [6]:

a) Line of Sight
b) Represented of Light
c) LED & the better performance use fluorescent light

As a figure shows the contents must have proper integration with server and Internet network, so that it is easily possible to work efficiently

VI WORKING OF LI-FI

The block diagram of Li-Fi is working on Simple System [15, 16]. On this system, light emitter on one end, for example, an LED, and a photo detector on the other. The photo detector registers a binary one when the LED is on; and a binary zero if the LED is off. To build up a message, flash the LED numerous times or use an array of LEDs of perhaps a few different colors, to obtain data rates in the range of hundreds of megabits persecond. Light-emitting diodes can be switched on and off faster than the human eye can detect, causing the light source to appear to be on continuously, even though it is in fact 'flickering'. The on-off activity of the bulb which seems to be invisible enables data transmission using binary codes: switching on an LED is a logical

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

'1', switching it off is a logical '0'. By varying therate at which the LEDs flicker on and off, information can be encoded in the light to different combinations of 1's and 0's [9, 16].
The data can be encoded in the light by varyingthe flickering rate at which the LEDs flicker on and off to generate different strings of 1s and 0s.The LED intensity is modulated so rapidly that human eye cannot notice, so the light of the LEDappears constant to humans [15].
The method of using transmit information wirelessly is technically referred to as Visible Light Communication (VLC), though it is popular called as Li-Fi because it can compete with its radio based rival Wi-Fi connection devices within room [19]. Many other sophisticated techniques can be used to dramatically increase VLC data rate. The LED data rate is directly transmits a different data streams [6]

APPLICATION

a) Li-Fi is cheaper than Wi-Fi.
b) No License is needed for the Li-Fi.
c) It can be used in Medical instruments.
d) It can also use in chemical department.
e) It can be used in petroleum plants.
f) It can use Li-Fi in hospital and aircraft.
g) Millions of street lamps can be transferred to Li-Fi lamps to transfer data.
h) The Visible light spectrum is a free spectrum band.
i) It uses in Education System.
j) It uses in Radio broadcast System.

CONCLUSION

Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented technologies. The Li-Fi is now attract a great deal of attention, not least because it may offer a real and efficient another to radio-based wireless. The increasing number of people and their devices access wireless Internet, the air waves are becoming gradually more crammed, making it more difficult to get a consistent, high-speed signal. This wonderful technology be used practically, then may be in future each and every bulb can be used something like a Wi-Fi hotspot to brighter future. Every bulb can be used something like a Wi-Fi hotspot to transmit wireless data and we will proceed toward the cleaner, greener, safer and brighter future. The concept of Li-Fi is currently attracting a great deal of interest and very efficient alternative to radio-based wireless. As agrowing number of people and their many devices access wireless Internet.

REFERENCE:

1] B. Ekta and R. Kaur, "Light Fidelity (LI-FI) - A Comprehensive Study", *International Journal of Computer Science and Mobile Computing,* Vol.3, Issue 4, pg. 475- 481, ISSN 2320 – 088X,April-2014.
[2] R. Mahendran. "Integrated LiFi (Light Fidelity) for smart communication through illumination", 2016 International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), 2016.
[3] H. Haas, "Wireless Data from Every Light Bulb.", *Internet: http://bit.ly/tedvlc,* Aug. 2011 [Dec 30, 2017]
[4] D. Tsonev, S. Videv and H. Haas, "Light Fidelity (Li-Fi): towards all optical networking", Proc. *SPIE 9007, Broadband Access Communication Technologies VIII conference*, December 18, 2013.
[5] S. Dimitrov and H. Haas, "Principles of LED Light Communications: Towards Networked Li-Fi", *Cambridge, United Kingdom: Cambridge University Press*, 2015.
[6] M. Watts, "Meet Li-Fi, the LED-based alternative to household Wi Fi," *Wired Magazine*.
[7] T. Lain, "Forget Wi-Fi, boffins get 150Mbps Li-Fi connection from a lightbulb The Register", *Internet: http://www.theregister.co.uk/2013/10/18/forget_wifi_chinese_boffins_get_150mbps_lificonnection_from_a_lightbulb*, 2013. [Dec 30, 2017].
[8] Badamasi, Y.A., "The Working Principle of an Arduino." *11th International Conference on Electronics, Computer and Computation (ICECCO),* Abuja, 29 September-1 October 2014.
[9] A. Malvino, D. J. Bates, "Electronic Principles", *7th Edition (2007)*, ISBN 0-7-063424-6, New Delhi, India.