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Advanced Data Communication for Mobile Li-Fi Technology

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ABSTRACT

The main theme of my project to provide data transmission without wired connection or Wi-Fi technology instead of using wireless medium of light spectrum(i.e)LI-FI. Physicist Harald Hass who was born in German coined it. The data which has to be transferred on android Li-Fi application to personal computer or laptops. Initially the normal data transmission conveyed by USB Potable cables and Wi-Fi hotspots in Mobile to PC medium. I have making use of the efficient and future oriented light way communication(LED light emission) for the better communication which uses only light spectrum waves having better availability for the future environments in wireless communication standards and avoids loss of data. We can interact to mobile to mobile ,laptops, computers in better low cost in higher performance level using this light rays. WiFi is currently emerging wireless communicable technology but soon it cause for shortage of radio spectrum and radio waves used up. The lack of that radio waves overcome by light based transmissions (LED Visible Light transmission).This technology provides better platform for future of wireless transmissions. The previous method of wireless communication uses Radio waves so there is possible to shortage of this in future. To overcome we can use this Light spectrum of waves and it will be the better future scope for fixed infrastructure communication. Through this communication of LED bulbs we can maintain a continuous data interactions in wireless medium. Li-Fi behaves as the optical wireless medium of Wi-Fi.

Keywords : Li-Fi, Wi-Fi, LED, LDR, Wireless, Transmission

I. INTRODUCTION

The Light Fidelity (Li-Fi)-The future technology in Wireless communication and it uses Visible light Communication (VLC) technology which is a new way to create wireless communication links using the LED light networks. The Li-Fi communications protocol are defined by the internationalist standard IEEE 802.15 established since 2011 by the IEEE comity. This is the same comity that has defined previously the Local Area Network 802.3 and Wi-Fi 802.11 standards. For numerous specialist, Li-Fi is major burst through technology for the mobile Internet community and for the connected objects province. Li-Fi is the term some have used to label the fast and cheap wireless communication system, which is the optical way of version over Wi-Fi . Li-Fi is typically implemented using white LED light bulbs at the downlink spreader.

These devices are usually used for brightness only by applying a continuous current. However, by quick and delicate variations of the current, the optical output can be made to vary at extremely elevated speeds. This very property of optical current is used in Li-Fi setup. The outfitted procedure is very simple, if the LED is on, you broadcast a digital 1, if it's off you transmit a 0. The LEDs can be switched on and off very quickly, which provides better opportunities for transmitting information. Hence all that is required is some LEDs and a regulator that code data into those LEDs. All one has to do is to vary the rate at which the LED's sparkle depending upon the data we want to encode. Additional enhancements can be made in this method, like using an array of LEDs for parallel data communication, or using mixtures of red, green and blue LEDs to alter the light's frequency with each rate of recurrence encoding a different data channel. Such advancement promise a theoretical rate of 10 Gbps – meaning one can download a full high-definition film in just 30 seconds. LEDs are differs from normal lamps because of usage of semiconductors. This quality gives them the capacity to switch-on and off within few nanoseconds

or billionth of a second. transformed in terms of data rates, this corresponds to 1 Gbits/s. In order to compare, at best Wi-Fi can reach 100 Mbits/sec data rates and ten times lower. Thanks to the Li-Fi technology, the 14 billion lamps in the world will become regularly green mobile internet masts that will permit to respond to the impressive increasing demand of mobile connectivity. In addition, this will allow reducing the electromagnetic contamination generated by the numerous radio wave solutions developed until now. Light is naturally safe and can be used in places where radio occurrence is often deemed challenging, such as aircraft cabins or hospitals. So visible light communiqué not only has the possible of solving the issues over lack of spectrum space, but can also enable novel application. The visible light band is unused; it's not regulated and can be used for message at very high speeds.

II. METHODS AND MATERIAL

1. Visible Lifht Data Communication

The visible way of light communication (VLC) is "A probable illumination to the worldwide wireless spectrum shortage" Li-Fi (Light Fidelity) is a rapid and low-priced visual version of Wi-Fi, the technology of which is based on Visible Light Communication. This data communiqué medium, which uses visible light between 400 THz (780 nm) and 800 THz (375 nm) as optical transporter for data communication and illumination. It uses fast pulses of light to transmit information wirelessly. The main components of this communication system are 1) a elevated brilliance white LED, Which acts as a communiqué source and 2) a silicon photodiode which shows fine answer to visible wavelength region serving as the receiving element? LED can be switched on and off to generate digital strings of 1s and 0s. Data can be prearranged in the light to produce a new data stream by varying the flickering rate of the LED.

2. Working of LI-FI

In easy provisions, Li-Fi can be consideration of as a light-based Wi-Fi. That is, it uses light as an alternative of radio waves to transmit information. And instead of Wi-Fi modems, Li-Fi would use transceiver en suite LED lamps that can light a space as well as transmit and receive information. Since simple light bulbs are used, there can technically be any number of admittance points. This technology uses a part of the electromagnetic range that is still not to a great extent utilized- The Visible Spectrum. Light is in fact very much part of our lives for millions and millions of years and does not have any major ill result. Moreover there is 10,000 times more space available in this spectrum and just counting on the bulbs in use, it also multiplies to 10,000 times more accessibility as an infrastructure, globally.

It is likely to encode data in the light by varying the rate at which the LEDs flicker on and off to give dissimilar strings of 1s and 0s. The LED intensity is modulated so speedily that human eyes cannot notice, so the output appears constant. More sophisticated techniques could dramatically enlarge VLC data charge. Teams at the institution of higher education of Oxford and the University of Edinburgh are focusing on similar data transmission using arrays of LEDs, where each LED transmits a different data stream. Other groups are using mixtures of red, green and blue LEDs to modify the light's frequency, with each occurrence encoding a different data channel.

Li-Fi technology is based on LEDs for the convey of data. The transfer of the data can be with the help of all kinds of light, no matter the part of the band that they belong. That is, the light can belong to the invisible, ultraviolet or the detectable part of the spectrum. Also, the speed of the internet is incredibly high and you can download movies, games, music etc in just a a small number of minutes with the help of this knowledge. Also, the technology removes limitations that have been put on the user by the Wi-Fi. You no more need to be in a region that is Wi-Fi enabled to have access to the internet. You can basically stand under any form of light and surf the internet as the connection is made in case of any light existence. There cannot be anything better than this technology.

3. Existing System

The existed system of wireless communication is based on the wiFi. It uses radio spectrum waves to communicate on its medium. Since we are increased in the numbers of WiFi users and hotspot based communication links. So the chance of shortage in radio waves

We can handle that problem using this way of wireless transmission. The wireless communication can be done through the less secured way through this technology. Wireless-Fidelity, which handles radio, waves to perform its interactions. Some other devices are also there for this communication rather than wifi.

They are Infrared, Wi-max ,Wi-Gig, Bluetooth,,etc. The data that are to be transmitted is modulated along with the radio waves at the transmitter. At the receiver side, received signal is demodulated from the radio waves to retrieve the data.

4. Drawbacks in Existed System

- ✓ When the data transmission is carried out in crowded area, there is so many interference between the radio waves.
- ✓ The data rate through this technology is lower and it requires more bandwidth.
- ✓ It provides lesser security for the data.
- ✓ Communication between android mobile to persnal computer not efficiently done in wireless medium.
- ✓ Handling towers for radio spectrum requires cost and specimens for higher level for maintaining only so communication needs to be enhanced.
- ✓ Easily slows down or remains if another person intrudes towards it.

5. Comparisons

S.NO	LI-FI VS WIFI		
	FEATURES	***Light FIdelity***	***Wire less FIdelity***
1.	Operation	Transmits data by LED bulbs	Transmits data by radio waves (routers, towers)
2.	Inference	Not have issues in this waves	Radio waves have issues by near devices ,access points.
3.	Technology	Visible Light, IRcompliaint devices	WIFI, WIgiR WIMAX, WLAN 802.11 devices standards
4.	Data Transfer	About 1 Gbps	WLAN- 150 Mbps, WiGig/GigR provides more .
5.	Frequency	10,000 times frequency spectrum of radio	2.4Ghz, 4.9GHz, 5GHz
6.	Coverage distance	about 10 to 12 meters (extends about light availability)	about 32 meters based on antenna and without issue state
7.	Components	Lamp driver, LED bulb, photo detector, Li-Fi modules	Routers to be installed ,subscriber devices (laptop, PDA's ,PC)
8.	Merits	Less interference, passes through salty seawater, works in dense regions	In WiFI, RF signals can not be blocked by the walls and hence need to employ techniques to achieve secure data.
9.	Privacy	Light is blocked by walls and hence provides more secured data transfer.	RFsignal can not be blocked by the walls and hence need to employ techniques to achieve secure data.
10.	Applications	Used in Airlines, undersea, explorations, operations, theaters in the hospitals, office and home premises for data transfer and internet browsing.	Used for internet browsing with the help of Wifi kiosks or Wifi Hotspots.

6. Proposed System

The mobile application for Li-Fi to be created and to transmit the data to LED provided for Communication we have to transmit the data to bulb in wireless medium. so using Bluetooth for sending the data to light emitting diode bulb. The light after receiving the data from the mobile Li-Fi application it transmits the data to the LDR resistor to receive the data in Receiver side. Finally the data sent from the sender from mobile which appears (i.e) received on the personal computers or laptops The transmitted data captured and then provides effective communication.

7. Benefits over Proposed System

- ✓ Provides Security and privacy from intruders.
- ✓ Better availability for fixed infrastructures .
- ✓ High transmission speed
- ✓ It uses Low costs LED's and LDR's.
- ✓ Handover problems overcomed
- ✓ Loss of Data not occurs in Li-Fi based communication though Android application.
- ✓ Better Transmission power.
- ✓ Reduced signal to Noise ratio.
- ✓ Secured since light does not penetrate to walls.
- ✓ Energy efficiency.
- ✓ Low cost optimizatation
- ✓ Easier interactions for mobile to PC.

8. Proposed Mobile LI-FI Application

Android application is used to type the message and display the message. An wireless connection is connected to the android mobile to transmit data from the application to the transmitter module.

Once the message is sent to the transmitter module(LED) ,Using microcontroller it is converted into signals and transmitted through Li-Fi technology using LED lamp.

The transmitted data detected by LDR provided in the communication medium. This uses CSK algorithm of light dimming which posses transmission to terminal which was connected in PC's and Laptop.

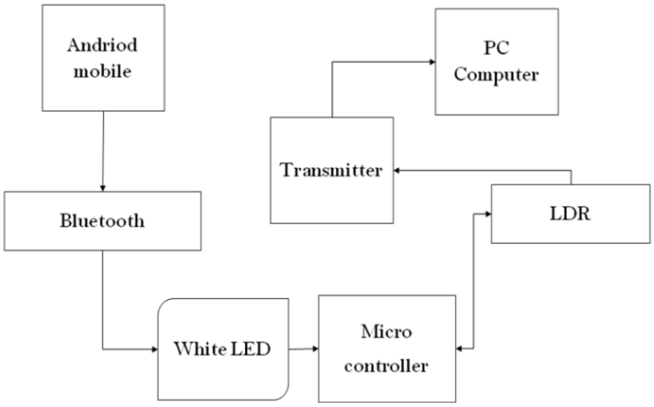


Figure 1. Block Diagram

9. Modules

In this I have implemented the following modules to be handled for the wireless communication.

- ✓ Transmitter side
- ✓ Receiver side
- ✓ Photo conversion
- ✓ Data conversion

a) Transmitter

- In the transmitter module, the user sends data from the android phone to transmitted module of wireless medium.
- Then the data from the android mobile is transmitting to the LED Bulb. It stores the given information.
- Finally the data sent from the users which convert the signals of electromagnetic energyand transmitting through Li-Fi technology.

b) Receiver module

- Light Dependent Resistor(LDR) is used to receive the transmitted data from the bulb which carries data and retransmit using microcontroller to LDR
- By the way of Visible light communication, the data is transmitted by using white LED.
- At last the white LED is glow the data is transmitted from transmitter side to receiver side.

c) Photo conversion module

- The data are converted from digital-to-analog converter and sent to the receiver side.
- These signals are ampLi-Fied with the light emitted from the Pulse width modulation.
- The signals received from the light using photo diode and converted back to streams of data and sent to receiver mobile by using White LED.

d) Detection Module

- Photodetectors are sensors of light or other electromagnetic energy. A photo detector has a p–n junction that converts light photons into current.
- It detects the information transmitted form the LED and conversion analog to digital values carried by this module.
- Finally the user sent data received in the laptop or PC's in the modules of terminal used for it.

10. Android Application Creation

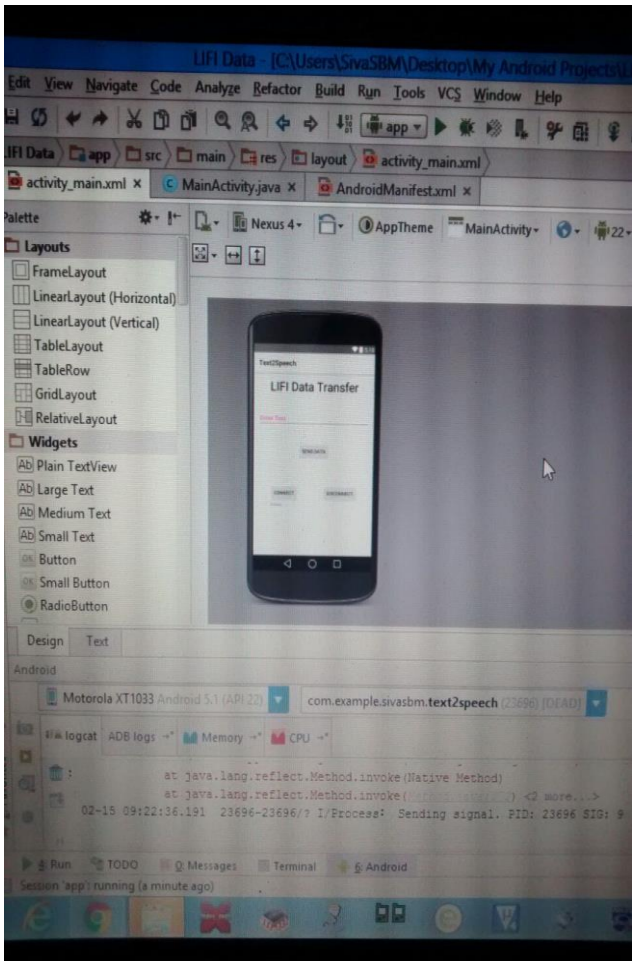
I had created a android application using the ANDROID STUDIO for the data to be transmitted to light using wireless way of communication. In my application the text button and connectivity button and disconnect button are there and text field which carries lots of information to be ready to send or transmission. In this picture you have see the structure of mobile application and the connection with the kit for the transmission here some codes for android application.

III. RESULTS AND DISCUSSION

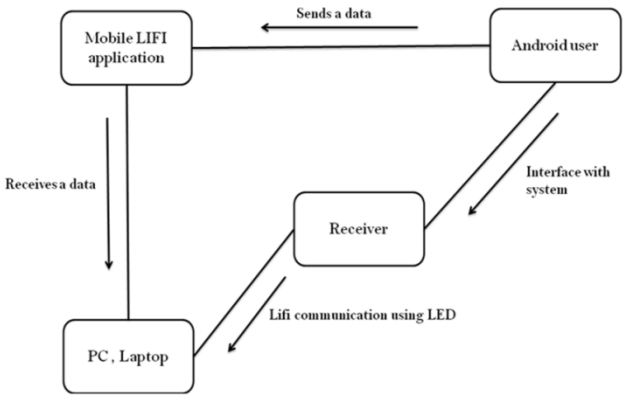
A. Android Application Creation

I had created an android application using the ANDROID STUDIO for the data to be transmitted to light using wireless way of communication. In my application the text button and connectivity button and disconnect button are there and text field which carries lots of information to be ready to send or transmission. In this picture you have seen the structure of mobile application and the connection with the kit for the transmission here some codes for android application .

B. CREATION DIAGRAM SCREENSHOT



C. Interaction In Collaboration Diagram



D. Algorithm Technology

Color shift keying (CSK) algorithm is use to encoded a color intensities emitted by White LEDs.

In Li-Fi based system, Dimming based modulation schemes are most commonly used modulation

technique. It is achieve by controlling the On-Off level of LED.

- On-off keying (OOK),
- Pulse Width Modulation (PWM),
- Pulse position modulation (PPM).

They are the main dimming based modulation schemes which can be implemented in Li-Fi based technology.

E. KIT AND FEATURES IN PROJECT

SOFTWARE DESCRIPTION

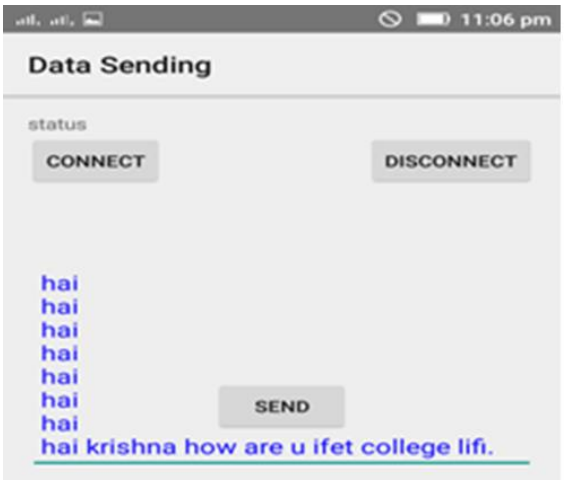
Android Bridge terminal is a flexible command-line tool that lets you connect with a device (an emulator or a connected Android mobile). The adb command facilitates a variety of device actions, such as installing and debugging apps, and it provides right of entry to a Unix shell that you can use to run a range of commands on a device.

Terminal emulator is a program that makes your Android phone act like an older formed PC's terminal. It is useful for accessing the Linux command line shell that is assembled into every Android mobile. This lets you run various Linux command line It is a client-server program that includes three components:

- **A Client**, which sends commands. The client proceeds on your development machine. You can invoke a client from a command-line terminal by delivering an adb command.
- **A Daemon (adbd)**, which runs commands on a device. The daemon runs as a background process on each device.
- **A server**, which manages communication between the client and the daemon. The server runs as a background progression on your development machine.

This is some features about software module of terminal which acts for wireless transmission. The application screenshot of both application and terminal are given below.

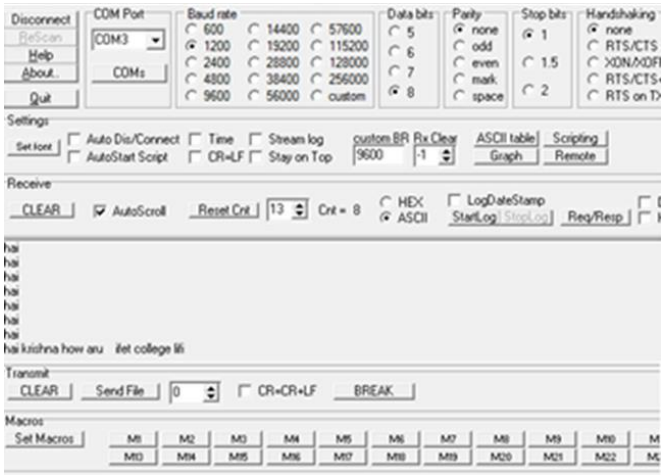
F. MOBILE APPLICATION SCREENSHOT



G. KIT SCREENSHOT

This is pictorial representation of kit. It has LED bulb around there.

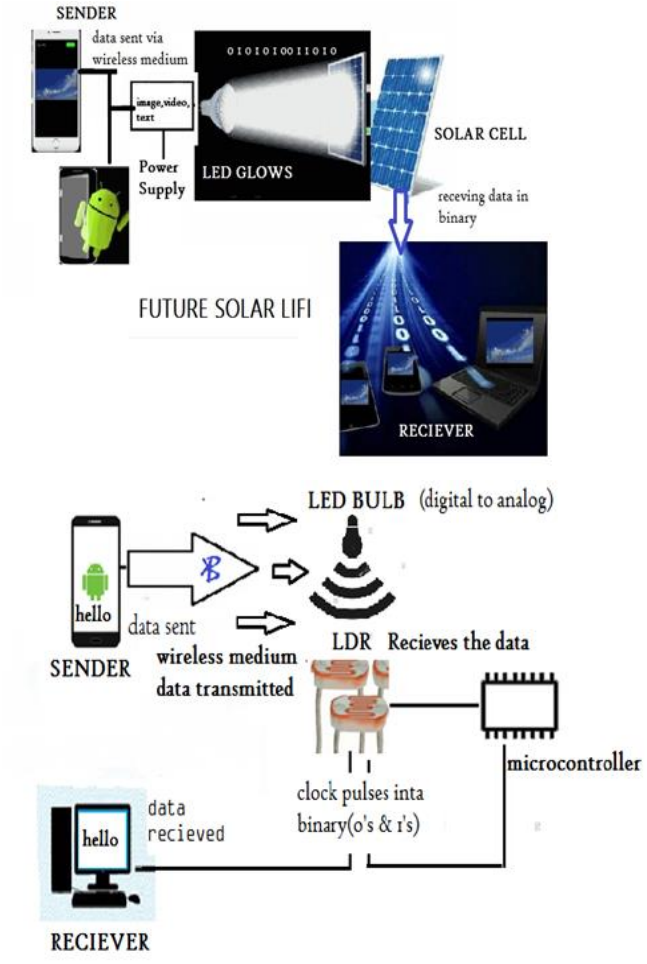
H. SCREENSHOT OF OUTPUT DATA RECEIVED



I. FUTUERE SCOPE

Li-Fi technology is a idea that stands out in the casing of producing a sustainable and conservable power that can meet our daily needs linking network based communication. Since networking is an important factor in our common lives, Li-Fi can be a replacement technology for Wi-Fi and hence can impact the population at bulky. The implementation of this technology will allow us to transform the millions of LED lightings we have into a powerful technology for communication. Also along with the added advantage of Li-Fi technology as conservative at wireless masts it also emphasizes on confidentiality and safety. The privacy is given a positive edge because the user can set the jurisdiction to the light on the wireless device. And hence keeping the data secured and private. As light is opaque in nature, these concepts apply well. Apart from the daily handling, Li-Fi can be widely used as an application for Air and Space craft, military uses, Expedition checks like ROV's, sophisticated medical equipments, power plants, and also at a large point of view as a warning system for natural disaster.

J. FUTURE ENHANCED DIAGRAMS



IV.CONCLUSION

I conclude that Li-Fi is the future based technology. Through this light communication we can access and communicate faster than radio waves. It uses Light spectrum waves for connectivity. Overcoming shortage of radio spectrum waves and loss of data in wireless communications this medium of technology have better scope for our future house ,office infrastructures. To do effective and low cost level transmission with absence of wired connection this provides perfect solution for it. The drawbacks of WiFi fulfilled by Light Fidelity(LI-FI). To develop and communicate through light source this method used. Connectivity between Andriod to PC's and Laptop undertaken by this application in wireless medium. We can increase the ranges of connectivity LED Bulb source with better available resources. Finally Li-Fi based communication is the better platform for future Wireless communications and Transmissions.

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