Dr.S.Prabhavathi et al. International Journal of Recent Research Aspects ISSN: 2349-7688, Special Issue: Conscientious Computing Technologies, April 2018, pp. 36-39

PDA For Physically Impaired Using Li-Fi

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Abstract- **The main aim of this paper is to highlight the importance of how could the latest technology Li-Fi (Light Fidelity) which was discovered by Mr.Harald Haas professor at edinburg university be made helpful for the physically impaired people. PDA (Personal Digital Assistant) for the physically impaired people using Li-Fi, this paper is used to enlighten the life's of the physically impaired people. Wi-Fi could also be used but taking health issues and economical issues into consideration Li-Fi is being used which has the advantages of eco friendliness and does not cause any health issues. This paper is basically the combination of the Voice Communication using Li-Fi & Data Transmission using Li-Fi. Li-Fi does not make use of any external resources for its operation, it just needs the available light (E.g.: -bulb's) as its medium for communication with some external circuitry. Physical impairment is the biggest problem of India which cannot be eliminated. Many people lose hopes on life because of physical impairment, but to help these types of people this project has been designed. This project acts as an assistant for the physically impaired people and helps them live their life conveniently. This project can also be developed using Wi-Fi but Wi-Fi uses radiations for its operation and radiations are harmful to the health and can still spoil the health of the physically impaired people, hence Li-Fi is used, Li-Fi is a from the family of Visible Light Communication (VLC) which is another type of wireless communication. Li-Fi is completely eco-friendly and provides complete security, as it uses visible light for its operation. This Personal Digital Assistant (PDA) can be designed at low cost by just using simple two microcontrollers of 8-bit with some external circuitry.**

Index Terms- Li-Fi, VLC, Wi-Fi, PDA.

1. INTRODUCTION

sensitive than the normal people taking this factor into consideration Wi-Fi is not being used, because Wi-Fi completely uses radiations for communication which may affect human health. Li-Fi uses visible normal light that is used in our day to day life for communication, which cannot be hazardous to health. Comparing with the Wi-Fi, Li-Fi offers greater transmission rate i.e., >1Gbps speed where Wi-Fi offers just 150Mbps. The speed of Wi-Fi reduces as the number of users going on increases; this is not in the case of Li-Fi, because every Li-Fi receiver has an independent Li-Fi transmitter.

In this paper the working principle of the Li-Fi is explained clearly with the help of basic circuit as shown in figure 1. How actually this Li-Fi is implemented in this project is explained by the figure 2 and figure 3 which are PDA receivers and PDA transmitters.

II. LITERATURE SURVEY.

The Li-Fi is capable of transmitting and receiving the signal interms of multi giga bits per second as the distance decreases the signal strength may be ~300THz of the visible light spectrum. This range of visible light consumes less power and needs less cost for implementation. Using simple LED's and PD's also this type of system can be implemented and when implemented the system presents mechanism to mitigate flicker and support dimming as defined in the IEEE 802.15.7 which is a visible light communication standard.[1]
Other VLC technologies and Wi-Fi when compared with Li-Fi suffers from more noise contamination so when referred using the below references it is found that the Li-Fi circuit can act as a noise remediation for other technologies which is going to act as an key issue for the above discussed problem.[2]

III. WORKING OF LI-FI.

Li-Fi stands for Light fidelity. The Li-Fi uses Visible Light as a medium for the communication, the main components for the Li-Fi systems are the LED (Light Emitting Diode) and PD (Photo Detector). Consider the figure 1, which is the basic circuit of Li-Fi, the basic principle of Li-Fi is clearly explained by the image. The very first thing required is the message that has to be transmitted which is applied on to the signal processing unit (SPU).

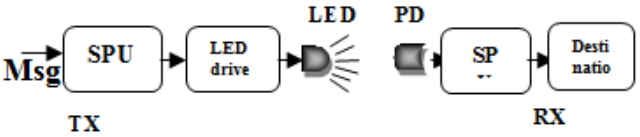


Figure 1: Basic circuit of Li-Fi

The SPU converts the physical message it may be in audio or video or text format into the electrical signal and then into bits, which is then applied onto the LED. The LED blinks according to the bits applied i.e., if LED is ON it indicates that the applied bit is one, if LED is OFF it indicates that the applied bit is zero. This is at the transmitter side. At receiver side a Photo Detector is used to decode this light signal in the form of bits again. These bits are applied onto the Signal Processing Unit (SPU) which converts the bits back into the

electrical signal and this electrical signal is converted back into the physical quantity and given to the destination.

IV. WORKING OF PDA

The simple block diagram to understand the working of the personal digital assistant is shown below. The block diagram is divided into two sections PDA transmitter and PDA receiver. The PDA transmitter as shown in the figure 2 consists of the two inputs one is the keypad which will be used to control devices and is placed near the hand of the patient for him to feel convenience to press the key depending on which the respective device will be turned ON and second is the MIC, MIC is used to communicate through voice and this MIC is placed near the neck of the patient so that the patient may feel convenient to speak and later the voice will be transmitted to the loudspeaker so that patient's assistant can hear this voice. The Keypad is connected to the microcontroller; for controlling the device. The microcontroller is programmed to generate codes depending upon the key pressed. The program is written in 'C' for the simplest execution and easy understanding. The Microcontroller (MC AT89C51 ATMEL) is of 8-bit, it consists of 40 pins packed in the form of dual-in-line package. This microcontroller works on the crystal frequency of 11.592MHz frequency. The generated codes by the microcontroller is applied on to the DTMF (Dual tone multi frequency) encoder (IC-95089) which is going to convert the 8-bit digital codes into the analog signal for transmission.

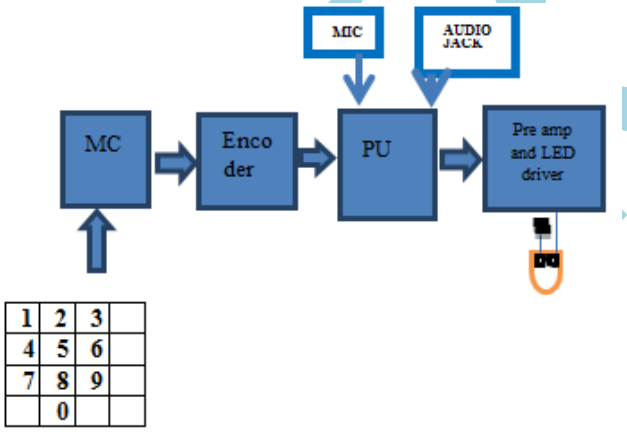


Figure 2: PDA transmitter

This analog signal is later applied on to the Processing Unit (PU) which will amplify and removes the unwanted part by making use of an amplifier and filter.

This signal is later applied onto the Pre-Amplifier for further amplification and LED driver to drive the LED that is connected at the output of Pre-Amplifier and LED driver. Finally the LED blinks depending upon the signal applied.

The PDA receiver section as shown in figure 3 a photo detector is used decode the light that is emitted from the LED and convert the light signal that was emitted by the LED into electrical signal. This electrical signal is now applied on to the Processing Unit (PU) which is going to amplify and filter out the unwanted signal. The sorted signal is applied on to the Low Pass Filter (LPF). From LPF the signal is again given to the decoder for controlling the device as well as to the loud speaker to listen to the voice that was transmitted.

The decoder converts the analog signal into digital codes which will be applied on to the MC (AT89C51) which is programmed to control and display which device is being controlled depending on the key pressed. These codes are applied on to the buffer and driver to enhance the signals and applied on to the relay which are acting as switches and will be on depending on the codes applied on to them and drives the output devices those are connected to the relay. The 2X16 LCD display is used to show which device is turned on and which design is turned off.

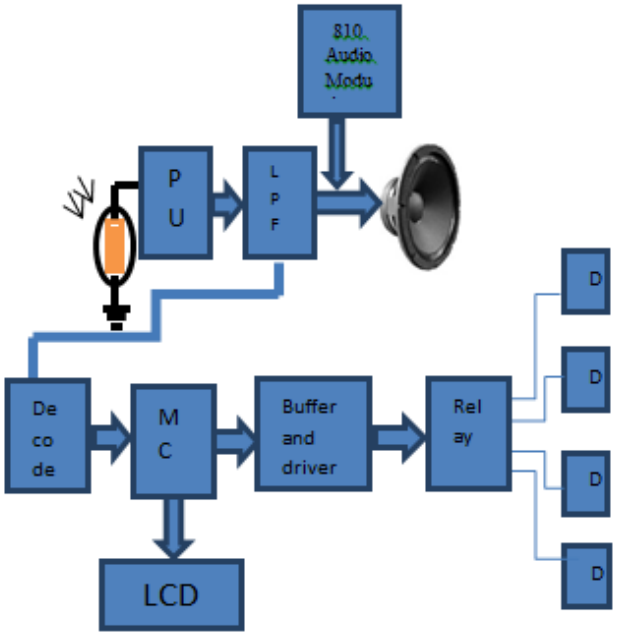


Figure 3: PDA receiver

V. COMPARISON OF VARIOUS OTHER WIRELESS MEDIUMS SPEED WITH LI-FI.

MEDIUM	SPEED
Wi-Fi	150Mbps
Bluetooth	3Mbps
IrDA	4Mbps
Li-Fi	>1Gbps

VI. LIMITATIONS OF LI-FI.

1) The problem is that the light can't pass through objects, so if the receiver is in advertently blocked in any way, then the signal will immediately cut out. If the light signal is blocked, or when you need to use your device to send information you can seamlessly switch back over to radio waves.

2)Network coverage and reliability and are the major issues to be considered by the companies while providing VLC services.
3)Interferences from external light sources like sun light normal bulbs; and opaque materials in the path of transmission will cause interruption in the communication.
4)High installation cost of the VLC systems can be complemented by large-scale implementation of VLC though adopting VLC technology will reduce further operating costs like electricity charges, maintenance charges etc. [4]

VII. APPLICATIONS OF DATA TRANSMISSION OF LI-FI

1)Smart Lightening for buildings.
2)Mobile Communication.
3)Hazardous Environment.
4)Vehicle and transportation.
5)Defence and security.
6)Hospitals and Healthcare.
7)Wi-Fi spectrum relief.
8)Aviation.
9)Under water communication.[3]

VIII. EXPERIMENTAL RESULTS

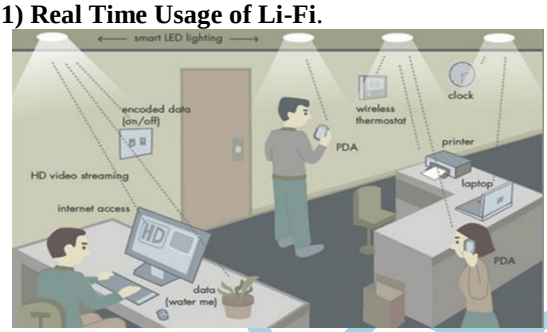
Case 1: If normal LED's are used; the distance covered will be approximately 3-4 feet without darkness. If it is tested in dark room the coverage will be around 9-10feet with the output power of 300nW.
Case 2: By using set of LED the range remains approximately the same, but the coverage area can be increased. The output power offered will be 250mW with a coverage area of 5-6 feet.
Case 3: If the distance of transmitter and receiver is varied that is far from both units then the output power will go on decreasing. The output power offered will be 180Mw. With a coverage area of 7-8 feet
Case 4: if white LED is used we can increase the distance upto 10-15 feet

IX. CONCLUSION

It is possible to improve the transmission rate through parallelizing communication by using MIMO (multiple input multiple output) principle. Completing standardization is challenging in that technical requirements and other regulations, such as eye safety and illumination constraints, have to be combined. Coming to the advancements the Li-Fi speed is going to be >10Gbps in future which is promised by the consortium.
If this technology can be put into practical use, 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 a growing number of people and their many devices access wireless internet, the airwaves are becoming increasingly clogged, making it more and more difficult to get reliable high-speed signal. This way solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn't allowed such as aircraft or hospitals. One of the shortcomings however is that it only work in direct line of sight.

X. APPLICATIONS OF LI-FI.

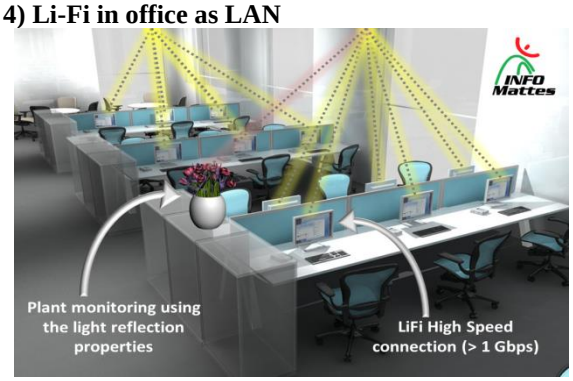
1) Real Time Usage of Li-Fi.



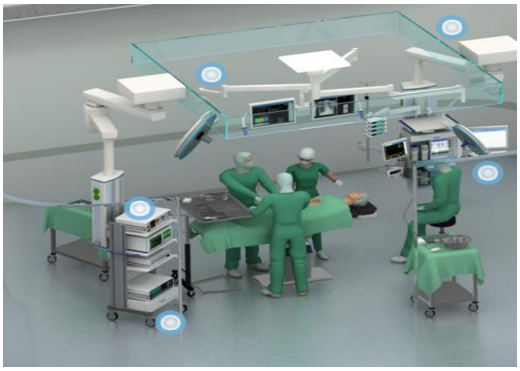
2) Li-Fi in Cars

3) Accident Prevention and traffic control

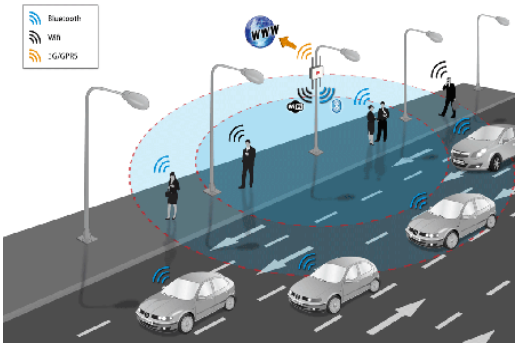
4) Li-Fi in office as LAN



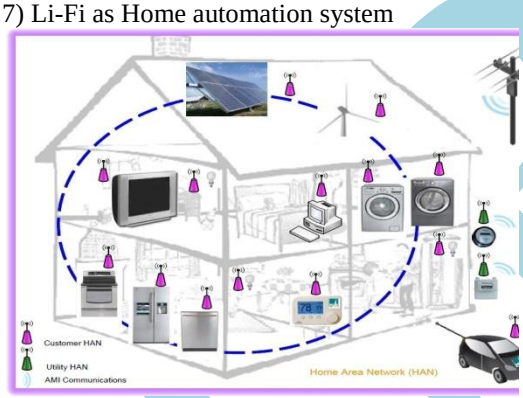
5) Li-Fi in Hospitals



6) Street Lights



7) Li-Fi as Home automation system



XI. REFERENCES

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