A Real Time Wireless Data Transmission using Visible Light Communication

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Abstract-Li-Fi is a label for wireless-communication systems using light as a carrier instead of traditional radio Frequencies [1], as in Wi-Fi. Li-Fi has the advantage of being able to be used in sensitive areas such as in Aircraft without causing interference. However, the light waves used cannot penetrate walls. It is typically implemented using white LED light bulbs at the Downlink transmitter. These devices are normally used for illumination only by applying a constant current. However, by fast and subtle variations of the current, the optical output can be made to vary at extremely high speeds. This very property of optical current is used in Li-Fi setup. The operational procedure is very simple-, if the LED is on, you transmit a digital 1, if it's off you transmit a 0. The LEDs can be switched on and off very quickly, which gives nice opportunities for transmitting data. Hence all that is required is some LEDs and a controller that code data into those LEDs.All one has to do is to vary the rate at which the LED's flicker [2] depending upon the data we want to encode. Further enhancements can be made in this method, like using an array of LEDs for parallel data transmission, or using mixtures of red, green and blue LEDs to alter the light's frequency with each frequency encoding a different data Channel. Such advancements promise a theoretical speed of 10 Gbps – meaning one can download a full high-definition film in just 30 seconds.

Keyword-Photodiod, ATMega16, LiFi.

I. INTRODUCTION

Li Fi is a new wireless communication technology which enables a wireless data transmission through LED light. Li Fi is based on a unique ability of solid state lighting systems to create a binary code of 1s and 0s with a LED flickering that is invisible for human eyes. Data can be received by electronic devices with photodiode [3] within area of light visibility. This means that everywhere where LEDs are used, lighting bulbs can bring not only The light but wireless Connection at the same time. With increasing demand for wireless data, lack of radio spectrum and issues with hazardous electromagnetic pollution, LiFi appears as a new greener, healthier and cheaper alternative to WiFi. The term was first used in this context by Harald Haas in his TED [4] Global talk on Visible Light Communication. The technology was demonstrated at the 2012 Consumer Electronics Show in Las Vegas using a pair of Casio smart phones to exchange data using light of varying intensity given off from their screens, detectable at a distance of up to ten meters. In October 2011 a number of companies and industry groups formed the Li-Fi Consortium, to promote high-speed optical Wireless systems and to overcome the limited amount of radio based wireless spectrum available by exploiting a completely different part of the electromagnetic spectrum. The consortium believes it is possible to achieve more than 10 Gbps, theoretically allowing a high-definition film to be downloaded in 30 seconds. Li-Fi has the advantage of being able to be used in sensitive areas such as in aircraft without causing interference. However, the light waves used cannot penetrate walls [5].Later in 2012, Pure VLC, a firm set up to commercialize Li-Fi, will bring out Li-Fi products for firms installing LED-lighting systems. Moreover Li-Fi makes possible to have a wireless Internet in specific environments (hospitals, Airplanes etc.) where Wi-Fi is not allowed due to interferences or security considerations.

Justification and objective of carrying out the research work.

II. LIFI OVER WIFI

S.NO.	BASIS OF COMPARISON	WIFI	LIFI
1.	Security	Not secured (can be hacked)	Secured (cannot be hacked)
2.	Data transmission rate	Slower (uses radio waves)	Much faster (uses visible light)
3.	Range	Small	Large
4.	Traffic control	Less (signal become weaker as traffic increases)	More (due to high speed & easy availability)
5.	Where can be used	Within a range of WLAN infrastructure , usually inside a building	Anywhere , where light source is present
6.	Cost	Costly	Cheap
7.	Working concept	various topologies	direct binary data serving

III. BLOCK DIAGRAM

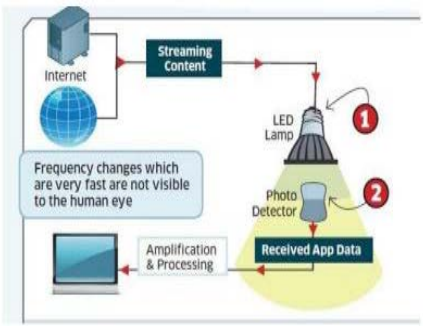

Fig.3.1: Concept of Working

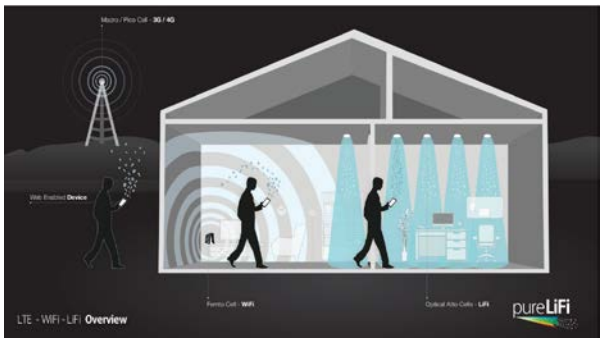

Fig.3.2: Implementation Concept

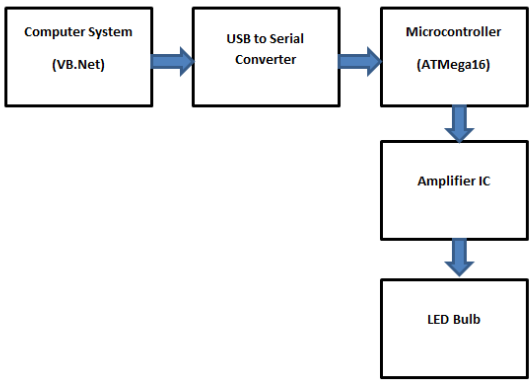

Fig:3.3: Transmitter Section:

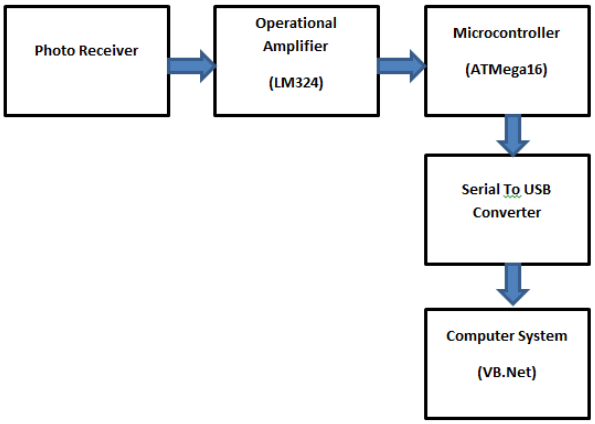

Fig:3.4: Receiver section

IV. WORKING

It is clear from the above block diagram that the transmitter end consisting of Computer software for data transmission via microcontroller using USB to serial communication system, which will be decoded into digital data by the microcontroller and again encode into digital bits transmission through LED bulb. At the receiver end a photodiode is attached with the system for digital light detection, further it will be amplified by the operational amplifier for sending to the microcontroller via serial transmission. The microcontroller attached at the receiver end will decoded into original format and display in on the LCD screen and parallelly it will transmit its data to the other computer system via usb to serial medium.

V. APPLICATIONS

- **Underwater communications:** Since radio waves cannot be used under water because these waves are strongly absorbed by sea water within feet of their transmission and this renders it unusable underwater but LIFI is suitable for underwater communication
- **Health sector:** Since WIFI is not safe to be used in hospitals and other various health care sectors because it penetrates human body. LIFI can be implemented and well suit in this sector.
- **Internet anywhere:** street lamps, light of vehicles can be used to access internet anywhere in footpaths, roads, malls, anywhere where light source is available.
- **Safety and management**: it can be used to update traffic information at almost every instant and it will be easy for traffic police to deal with traffic and catch the one who breaks the rule.

VI. COMPONENTS USED

A. Hardware components

The major components are given below.

- ATMega16 Microcontroller
- Photodiode Transreceiver Module
- ELCD-16x2 Display
- Motor Driver L293D
- DC Battery
- LM324 Opam
- Voltage Regulator
- USB to TTL Converter
- LED Bulb
- PCB

B. Software components

- AVR Studio
- PCB Artist
- Win AVR

C. Language used

- Embedded C

VII. CONCLUSION

The possibilities are numerous and can be explored further. If his 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, not least because it may offer a genuine 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 a reliable, high-speed signal. This may 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**.**

REFERENCES

[1] Hacking Exposed Linux: Linux Security Secrets & Solutions (third ed.). McGraw-Hill Osborne Media.2008. p. 298. ISBN 978-0-07-226257-5. S.No. Parameters Wireless Technologies Light Fidelity Wireless Fidelity 1. Speed for data transfer Faster transfer speed (>1 Gbps) Data Transfer speed (150 Mbps) 2. Medium through which data transfers occurs Used Light as a carrier Used Radio spectrum 3. Network topology Point to point Point to point 4. Operating frequency Hundreds of Tera Hz 2.4 GHz

[2] "Full-spectrum Fluorescent lighting: A review of its effects on physiology and health". Retrieved 2008-04-23.

[3] Graham Brooker, Introduction to Sensors for Ranging and Imaging, ScitTech Publishing, 2009 ISBN 9781891121746 page 87.4.4

[4] http://www.ted.com/conversations/17189/the_debate_about_rupert_sheldr.html?c=629643/

[5] Dana Blankenhorn (20 September 2010). "Super WiFi solves the Google carrier problem". ZDNet.

[6] Bookchin, Murray (1994). The Philosophy of Social Ecology: Essays on Dialectical Naturalism. Black Rose Books. pp. 119–120. ISBN 978-1-55164-018-1.

[7] Gray, Leon (2009). Virtual crime! : solving cybercrime. Berkeley Heights, NJ: Enslow Publishers. ISBN 0766033767

[8] Cadena, Richard (2006). Automated Lighting. Focal Press. pp. 56–58. ISBN 978-0-240-80703-4.

[9] New Chief Executive for the Engineering and Physical Sciences Research Council, 30 May 2007,

[10] http://www.ucl.ac.uk/news/news-articles/0705/07053002

[11] B. Lee, J. Cioffi, et al. (September 2007). "Gigabit DSL". IEEE Transactions on Communication. 55 (9): 1689–1692. Doi:10.1109/TCOMM.2007.904374 .

[12] Composition of Authority". Insurance Regulatory and Development Authority. Retrieved 18 December 2012.

[13] Hanson Kerry M.; Gratton Enrico; Bardeen Christopher J. (2006). “Sunscreen enhancement of UV-induced reactive oxygen species in the skin". Free Radical Biology and Medicine 41 (8): 1205–1212.

[14] Douglas, James M. (1988). Conceptual Design of Chemical Processes. McGraw-Hill. ISBN 0-07-017762-7.

[15] www.lificonsortium.org/

[16] the-gadgeteer.com/2011/08/29/li-fi-internet-at-the Speed-Of-light/