Data and Voice Communication at Very High Speed using LI-FI

Srikanth M K
Visvesvaraya Technological University Belgaum, Karavali Institute of Technology, Mangalore

Abstract— We are living in the era of modernization. In the 21st century more people are highly depend on electronic and communication. Now a day's more people are depending on Internet to accomplish their work through wired or wireless network. As number of users gets increases, proportionally the speed of wireless network decreases. Though Wi-F can give the speed up to 150mbps, it is still insufficient as more and more users are tapped in with their devices. To overcome this problem of WI-FI, we are introducing concept of LI-FI. LI-FI is new emerging technology to provide the connectivity to new localized wireless network environment. LI-FI is the term which is coined for fast and cheap wireless communication system, which is an optical version of WI-FI. The main principal of this Li-Fi is we can transmit the data through light illumination by using light-emitting diode. Data through illumination taking fiber out fiber optics by sending data through switching LED bulb on and off within nanoseconds which is too faster than human eye that can follow. By using this Li-Fi technology a one-watt LED light bulb provide net connectivity to four computers. The LED bulb should be kept on to transfer the data. The light waves can't travel across the wall which is made up of short range, this make a more secure from hacking. Direct line of light is not compulsory to transfer the signal. The term Li-Fi was first coined by Professor Herald Haas in TED Global talk Visible Light Communication. He is from the University of Edinburgh in the UK. Very simply , If the LED is on then it transfer digital 1, if it's off then it transfer 0, Haas says that "They can be switched off and on very rapidly", which gives better opportunities to transfer the data.

Key words: LI-FI, LED bulbs, TED

I. INTRODUCTION

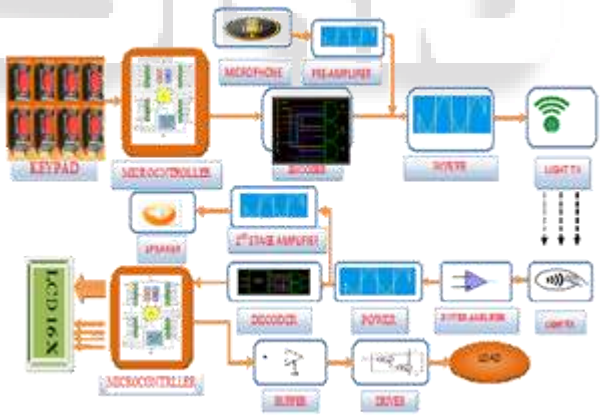
Now a day WI-FI is more widely used network in office, public, home etc. Due to this number of users are increasing exponentially every year as the number of user increases, the speed of the network decreases. As the number users are tapped to the same network connection it will become air traffic. The data rate transmitted through such a network is slow. Often it is more difficult to use such a slow network. The radio waves are media to transmit the data but these radio waves are hazardous to living things. Even data transmitted through radio waves has some security issues. Long range communication is difficult or impractical in communication using wires.

As the number user tapped to the same network data rate decreases. Even data transmitted through radio waves has some security issues. In order to overcome this, LI-FI came into existence. LI-FI is a wireless communication which allows service such as long range communication. Long range communication is difficult or impractical in communication using wires.

The name LI-FI came is due to the same working as WI-FI, where we use light Visible Light Communication which is used for high speed communication. In this the data is transmitted in the way of light rays or VLC that has been generated using LED light by taking fiber out fiber optics. The strength of the light can be varied by varying the amplitude, if we decrease the amplitude the intensity increases. The intensity of the light varies rapidly so that human eye cannot observe or follow it.

The term Li-FI was first coined by Professor Herald Hass in TED Global talk Visible Light Communication. He is from the University of Edinburg in the UK. Dr. Hass surprised the people by streaming an HD video using LED lamp at TED Global talk in 2011. It can be explained very easily as, if the LED is switched ON then we are transmitting digital 1 and if the LED is switched OFF then we are transmitting a digital 0. LED light can be switched OFF and ON very rapidly; which gives better opportunities to transmitted data. LED light can be switched ON and OFF quickly because reaction time of LED is very less that is less than one microsecond which cannot be noticed naked eye this will appear to be continuous beam of light and hence offering permanent connectivity. Till now it is implemented by only colorless LED bulbs. Research is taking University of Oxford and the University of Edinburg transmission of parallel data using multiple LED; where each LED transmits different data.

II. CONSTRUCTION AND WORKING OF LI-FI TECHNOLOGY



A. Block Diagram Explanation:

1) Power Supply Unit:

The supply unit required two different voltage level, +12V and +5V. The +5V and +12V voltages are supplied by specially designed power supply.

2) Switches:

In electrical engineering, a switch is an electrical element that can break an electrical circuit, interjecting the current or distracting it from one conductor to another. A switch may be directly influenced by a human as a control signal to a system. By design operated switches can be used to control the gestures of machineries

3) Buffers:

Buffers do not disturb the logical state of a digital signal (logic 1 input results in a logic 1 output whereas logic 0

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input results in a logic 0 output). Buffers are generally used to offer extra current drive at the output but can also be used to standardize the logic present at an crossing point.

4) Drivers:

This segment is used to drive the relay where the output is accompaniment of input which is smeared to the drive but current will be amplified.

5) Relays:

It is an electromagnetic expedient which is used to drive the load associated across the relay and the o/p of relay can be coupled to controller or load for further processing.

6) LI-FI Transmitter:

Light transmitter has two stages pre-amplifier and power-amplifier. The preamplifier takes low signal and amplifies it to sufficient voltage level. The microphone is biased through resistance R1. R1 changes its internal resistance with respect to sound waves. The amplifying signal sufficiently then it transmit the signal.

7) LI-FI Receiver:

The LI-FI RX consists of pre-amplifier and power amplifier. In preamplifier it takes low level signal transmitted through LDR and amplifies it. In preamplifier stage it amplifies low level voltage sufficiently. The LDR is biased through resistance R7 and the voltage divider circuit is formed by the resistance R1 and R8. The received signal from the transmitter is used to drive the U1 IC LM358.

B. Advantage:

1) No effect to the human body.
2) 2. Data can be transmitted through existing sockets of light fixture.
3) Problem of RF communication can be overcome.
4) Energy consumption is less.
5) Security high.
6) As the number of user increases data speed will be same.
7) More number of channel available without interfacing with external sources.
8) Data transmission is very high.

C. Disadvantage:

1) While transmitting the data light should be in the line of sight.

III. Application and Future Enhancement

A. Application

1) Smart lighting in which each light is used as a source to transfer the data at a faster rate.
2) Mobile connectivity, the data connection can be taken to long distance as it is wireless connection.
3) Hazardous environments, as the radio waves are harmful to human body but VLC are not harmful to the body.
4) Hospitals & healthcare, as VLC are not harmful to the living thing it can be used in healthcare and hospital.
5) WI-FI spectrum relief, as the number of user are tapped to the same connection the data rate decreases whereas in LI-FI data rate will not decrease.

B. Future Enhancement

There is number of application using LI-FI which can be improved further. If the technology is come to practical then every LED light can be used to transmit the data at very high speed without any disturbance. So it is an Eco-friendly system it don't have any effect on nature as well as for living things. By using this technology we are moving towards the safer, greener, cleaner and dazzling future. This can be used in hospital and healthcare because data is transmitted through VLC so there is no harm to human body. Even it can be used in underwater communication, defense and hazardous environment.

IV. Result/Conclusion

There is number of application using LI-FI which can be improved further. If the technology is come to practical then every LED light can be used to transmit the data at very high speed without any disturbance. So it is an Eco-friendly system it don't have any effect on nature as well as for living things. By using this technology we are moving towards the safer, greener, cleaner and dazzling future. This can be used in hospital and healthcare because data is transmitted through VLC so there is no harm to human body. Even it can be used in underwater communication, defense and hazardous environment. As the number of user increases the speed of the network decreases so by using this we can overcome this problem. Research is going on to send the data in parallel by using multiple lights at various intensities. The one drawback is while transmitting the data light should be in the line of sight.

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