

An Innovative and energy efficient Designing of communication System Based on Light Fidelity (LI-FI)

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ABSTRACT

Nowadays internet becomes a basic requirement and backbone of Information System almost for many people to fulfill their task either through wired or wireless network. With the latest up gradation and all around development of the Technology, It is forecasted that no of users using internet will be increased in many fold in near future , as a result there shall be a tremendous increases in their demand in wireless network, leads to decreases in speed proportionally. Although Wi-Fi has a speed of up to 150mbps as per IEEE 802.11n, but it is still too short for accommodating the huge demands of users. To overcome the demand of user, an innovative and energy efficient Technology is being developed known as Li-Fi. The concept is introduced by germen physist Harald Haas, who define LI FI as the technique to taking the fibber out of fiber optic by sending data through an LED light bulb which is used to flickers the intensity of light faster than the human eye can detect. In this technique a concept of LED and visible light is used for data transmission is being developed. The proposed technology shall be innovative having the advantages on WIFI in many fold on one hand and on the other, this will be energy efficient i.e. green Technology.

Index Term: [Wireless-Fidelity (Wi-Fi), Light-Fidelity (Li-Fi), Light Emitting Diode (LED), Green Energy, PPM, FSK. Photo Detector, Innovative, Energy efficient, Visible Light Communication (VLC), RS232, PIC Microcontrollers.]

I. INTRODUCTION: [LI FI]

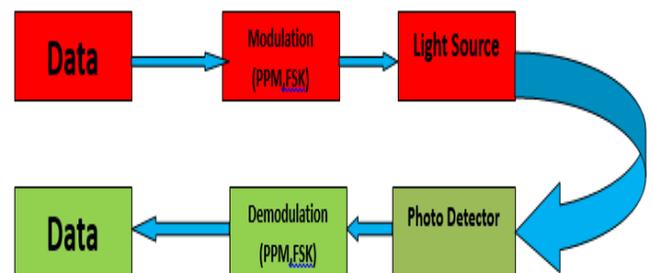
The LI-FI uses Visible light communication (VLC) is used as a data communications medium uses visible light between 400 and 800 THz (780–375 nm.) for data transmissions. An LED with Li-Fi technology can be used as a wireless network access point (AP). The Multiple APs each covering a particular area creates cellular network, allowing multiple users to move from one AP to the other without any disturbance in their high-speed data.

II. LED TECHNOLOGY

LEDs are the source of green light future resources that are used in equipment, electronic devices, and consumer

products. Their uses are in terms of their signaling, signage and illumination. These are used because of their small size, versatility, longevity, and most important feature - the high energy efficiency over other illuminating sources. Beside it is an innovative and Energy Efficient System. The Detailed scheme of the LI-Fi communication System is enclosed Figure-1

BLOCK DIAGRAM OF PROPOSED SCHEME



(Figure-1 the proposed communication System)

III. COMMUNICATION SYSTEM

THE communication system based on Li FI (An Innovative and Energy efficient system is consists of two units:

1. Transmitter unit
2. Receiver unit

IV. TRANSMITTER UNIT

The led's are acting as a transmitter unit fitted to the wall /ceiling. This led are driven by microcontroller. in the transmitter the modulated information can be collected through LED matrix.

The transmitter unit consists of following parts:-

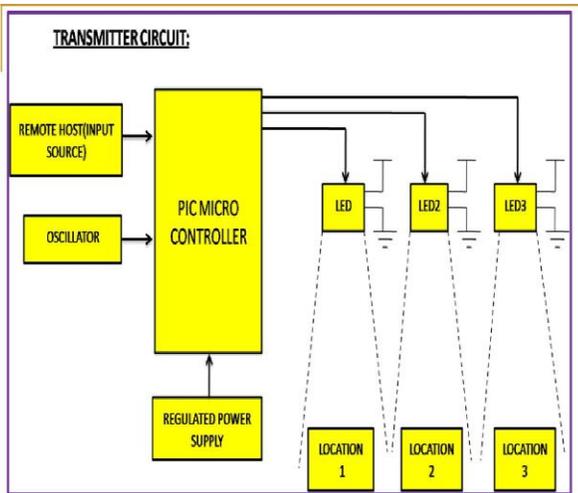
A. PIC MICROCONTROLLER:

PIC microcontrollers (Programmable Interface Controllers), are electronic circuits that can be

programmed to carry out a multiple tasks. They are used in most electronic devices such as alarm systems, computer control systems, phones etc. there are many types of PIC microcontrollers in market, PIC Microcontrollers are powerful fully featured processor with internal RAM, EEROM (Electrically Erasable Programmable Read Only Memory.) FLASH memory and peripherals .most important features of a PIC microcontroller is that it can be re-program as it uses flash memory.

B. OSCILLATORS

In general an oscillator is used to generate a clock signal. The clock signal changes between two or more states with the transition between the two states being very short (this transition is called an "edge"). The purpose of the clock is to manage that all the parts of the microcontroller will work together. The purpose of the clock is to know when different parts of the microcontroller are going to change state. This is accomplished by having parts of the chip that can only change state on a clock edge. By knowing the speed of the clock, and how many cycles a particular operation takes to accomplish we can estimate exactly when the result will be available.



(Figure-2. Transmitter circuit }

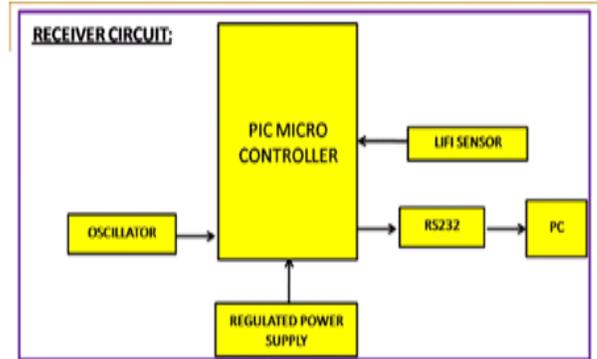
V. RECEIVER UNIT

The receiver unit consists of a li fi sensor that used to demodulates the coded binary data and then generates original data.

The transmitter contains a LED matrix which emits light. This light is the input for the receiver through

photo diode. A photo diode sense light and pass on the data to the microcontroller. The data is processed and according to that micro controller initiates the transfer of data using RS23 2 to Host computer.

The Li Fi sensor is a sensor which detects the light and then generate the data in the form of binary.



(figure 3. Receiver Circuit)

The receiver unit consists of following parts:-

A. PHOTO TRANSISTOR

A photo transistor which is used to receives the information from the LED matrix connected to the transmitter . The information is stored in t h e microcontroller and can be sent t o PC using a simple protocol of serial communication.

B. RS232

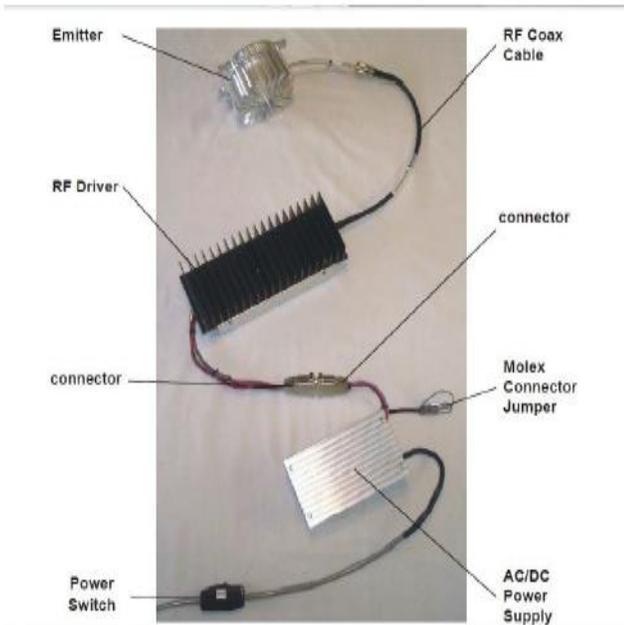
The RS-232 interface is the Electronic Industries Association (EIA) standard for the interchange of serial binary data between two devices. It was initially developed by the EIA to standardize the connection of computers with telephone line modems. The standard allows as many as 20 signals to be defined, but gives complete freedom to the user. Three wires are sufficient: send data, receive data, and signal ground. The remaining lines can be hardwired on or off permanently. The signal transmission is bipolar, requiring two voltages, from 5 to 25 volts, of opposite polarity.

C. PHOTO DIODE

A photo diode absorbs photons and charged particles to generate a flow of current in an external circuits. Photodiode ca n be used to detect the pres enc e or absence of of light and can also be calibrated for accurate measurements of intensities.

VI. IMPLEMENTATION

- 1 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.
- 2 Li-Fi 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



(Figure-4 Prototype of LI-Fi)

VII. ADVANTAGES

- Speed is high than WI FI.
- Require no license.
- Low maintenance cost
- Extremely energy efficient and Green Technology
- Contain no hazardous mercury materials
- Cheaper than WI FI.
- Versatility and longevity.
- Secured-Light does not penetrate through walls.
- May be used in street, park, plane, down to the sea.
- May replace WI-Fi one day completely
- Equipment cost shall be lesser as compared to BTS./WIFI equipment.

VIII. LIMITATIONS

- Cannot used in rural areas where are many obstacles.
- If the receiver is blocked the signals cut off.
- Reliability and network coverage issues
- Interference from external light sources
- High installation cost of VLC.

IX. CONCLUSION

Now Wi-Fi is getting overloaded day by day and so for short-distance high-data rate links, Li Fi seems useful to offload the excess demand of users. Large scale areas that are saturated with radio signals or the areas that doesn't permit them for many security reasons could implement and use Li-Fi as an alternate high-speed wireless network resource. Beside It is an energy efficient and green energy system. Further, It also do not have any harmful radiation like WI-FI.

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He has been selected and awarded by Govt. of Delhi as "Best Technical Teacher-2004". Also he has been conferred "Outstanding Teachers Awards" 2012 & 2013 respectively.

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