



## Wireless Communication and Home Automation Using LI-FI

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### ABSTRACT

This paper presents a design system implementation of new home automation system that uses Li-Fi as a network infrastructure. This technology is based on Visible Light Communication (VLC). LI-FI is a term of one used to describe visible light communication technology applied to high speed wireless communication. It acquired this name due to the similarity to WI-FI, only using light instead of radio. WI-FI is great for general wireless coverage within buildings and Li-fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues, so the two technologies can be considered complimentary. This project aims to demonstrate the use of Li-Fi in wireless communication and home automation.

**Keywords:** LED (Light Emitting Diode), Wi-Fi (Wireless Fidelity), Li-Fi (Light Fidelity), VLC (Visible Light Communication), RF (Radio Frequency).

### I. INTRODUCTION

Light Fidelity (Li-Fi) is future technology which replaces the Wi-Fi. Because Li-Fi overcomes disadvantages of Wi-Fi like Data Transfer speed of Li-Fi is more than 1Gbps while in Wi-Fi it is about 150 Mbps. Li-Fi uses light as a carrier but Wi-Fi uses radio Spectrum. Li-Fi is a transmission of data through illumination sending data through a LED light bulb that varies in intensity faster than human eye can follow. This sort of communication can be called as Visible light communication (VLC). Using this technique, the user can transmit the data through light from one device to another. Li-Fi technology works on a simple digital principle which is nothing but led is ON a digital data 1 can

be transmitted and if it is OFF digital data 0 can be transmitted .So, in this project work we are going to switching the LED s very quickly .These fast switching can be achieved by PWM technique to transmit digital data stream containing strings. To acquire this, we are programming the microcontroller to vary the duty cycle of the PWM signal which has the task of regulating the current in the LED. The biased current is fed to LED driver unit. The power of LED is varied according to the waveform of data signal. At the receiver side photodiode sensor produces a current proportional to the received instantaneous power. From this data can be filtered and it can be used to control application system like fans, lamp and so on. Home automation

system can be designed and developed by using a single controller which has the ability to control and monitor different interconnected appliances such as power plugs, lights, temperature and humidity sensors, smoke, gas and fire detectors as well as emergency and security systems.

## II. METHODOLOGY

Li-Fi is a Visible Light Communications (VLC) system. This means that it accommodates a photo-detector to receive light signals and a signal processing element to convert the data into 'streamable' content. An LED light bulb is a semi-conductor light source meaning that the constant current of electricity supplied to an LED light bulb can be dipped and dimmed, up and down at extremely high speeds, without being visible to the human eye.

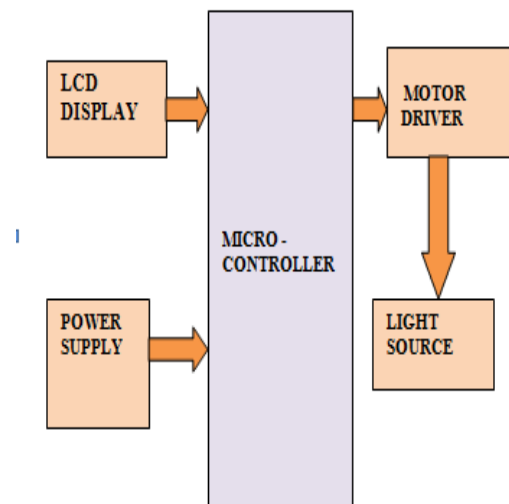
For example, data is fed into an LED light bulb (with signal processing technology), it then sends data (embedded in its beam) at rapid speeds to the photo-detector (photodiode). The tiny changes in the rapid dimming of LED bulbs is then converted by the 'receiver' into electrical signal. The signal is then converted back into a binary data stream that will be applied to the home appliances to switch them ON-OFF.

The Li-Fi market is projected to have a compound annual growth rate 82% from 2013 to 2018 and to be worth over \$6 billion per year by 2018. Visible light communication (VLC) works by switching bulbs on and off within. The light waves cannot penetrate walls which makes a much shorter range, though more secure from hacking, relative to Wi-Fi. Direct line of sight isn't necessary for Li-Fi to transmit a signal; light reflected off the walls can achieve 70 Mbits/s.

## III. BLOCK DIAGRAM

### A. Working Of Transmitter:

Figure 1 shows the transmitter of wireless communication and home automation using LI-FI. It consists of microcontroller, display device, power supply and white LED as a light source. LEDs can be switched on and off to produce digital strings of different combinations of 1s and 0s.



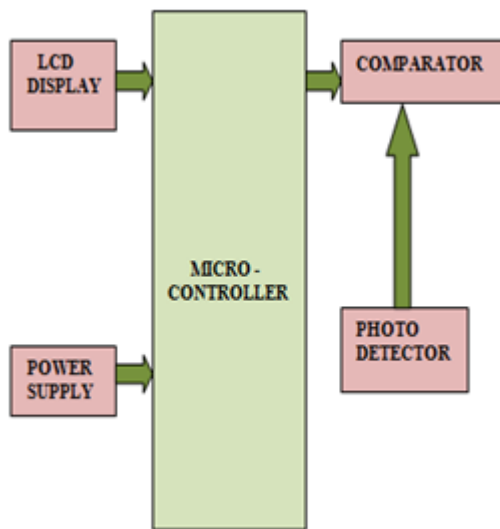
**Figure 1.** Transmitter Section

To produce a new data stream, data can be encoded in light by changing the flickering rate of LED. The lamp can be used as a sender or source, by transmitting the data with the LED light as signal. The LED results as a constant to the human eye by virtue of the fast flickering rate of LED. The 14 pin LCD display device is used to display the data that is being send from the transmitter in the form of characters/numbers etc. The motor driver is used here to take the low current signal from microcontroller and amplifies it into a large current that can be used to drive the relay circuit. The L293D IC receives signal from microcontroller and transmit the relative signal to the motor. It has two voltage

pins one of which is used to draw current for working of L293D and other is used to apply voltages to the motor. The L293D switches its output signal according to the input received from microcontroller.

### B. Working Of Receiver:

The receiver section consists of comparator, photo-detector, LCD Display and power supply. Light acts as a transmitting media between transmitter and receiver. The photo detector is used as a sensor. The output of the sensor is being applied to the comparator, which in turn compares the signal of the sensor to its reference voltage



**Figure 2.** Receiver Section

and produces a digital binary output. The digital data is applied to the relay circuits which in turn are used to control home appliances.

### IV. CONCLUSION

In conclusion, the concept of LI-FI has been introduced along with existing techniques and classical trends used for home automation purpose. This project aims to propose a cost efficient solution

for wireless communication and home automation. The design guidelines and detail working of system components were thoroughly explored. In this paper the data is transfer through LI-FI. This technology is not only free to use but also safe and secure to excess.

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