

# Home Automation System using Li-Fi Technology

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**Abstract:** Light fidelity is a upcoming technology for high speed data transmission and controlling home appliances. Visible light communication is the technology used in Li-Fi that uses Light emitting diodes. The evolution of Li-fi is to overcome the rate of speed and security in Wi-Fi. The photo diode in this will convert the flashes into electrical signal and it is amplified to provide output. The optical carrier for data transmission is between 400 THZ and 800THZ. The main advantage of Li-Fi is high density, high speed and high accuracy.

**Keywords:** Transmitter, Receiver, Visible light communication, Light Emitting Diode, Relay, Pic microcontroller, Wireless communication, Photo diode

## I. INTRODUCTION

The application of monitoring systems and automated traffic data collection has been a growing interest which is referred as ITS (Intelligent Transportation Systems) [1]. PDR technique uses Wi-Fi mapping system to measure the momentary location. The main benefits for service provider Wi-Fi mapping is to value the scientists [2]. The application of using Wi-Fi in urban scenarios and used in particularly for Indoor positioning. Human communications and machine-to-machine schemes are broadband communications realized by a popular technology such as Wi-Fi [3]. The visible light spectrum is used for light communication is a form of wireless communication [4]. It is also used in underwater wireless optical communications, when compared to VLC, UVLC will have non-linearity effect due to scattering, turbulence of water medium and absorption [5].

Data transmission is the process of transmitting the digitalized analog signal or data signal bitstream. The data are represented as an electromagnetic signal such as radio wave, microwave, infrared and an electrical voltage signal. It is transferred over a communication channel.

Channels used are wireless communication channels, storage media, copper wires, computer buses, optical fibers. Data will be transmitted in form of digital messages originating from a data source. It belongs to electrical engineering and tele communications data also been send through non-electronic signals such as optical, acoustic, mechanical. Data transmission is used in computer

networking equipment such as wireless network access points, modems, local area network, repeater hubs. Voice transmission is used in voice transmission alternatives, wireless communication, private telephone systems, computer telephone integration, public switched telephone network. Voice will be converted from sound to electrical signals which can be transmitted through cables or transmission

media. Data and voice can be using device control. Wireless communication is used for transmitting data and voice. It is the transfer of information. The information carried from sender to receiver over a well defined channel. The channel has a fixed frequency bandwidth. Wi-Fi communication has security vulnerabilities, high costs and is influenced by physical obstructions, climatic conditions. Li-Fi is known as light communication transmission of data at high speeds over the infrared spectrum, visible light and ultra violet. The transmission of visible light is performed using only LED lamps. It uses radio frequency to transmit data. The advantage of using Li-Fi is the ability to safely function in areas, wider bandwidth and high transmission spreads.

Li-Fi can transmit multiple gigabits, is more reliable and more secure than radio technology such as Wi-Fi or cellular. It can achieve high data transmission as the LED bulbs have high intensities. Application of Li-Fi is traffic management and road safety, medical applications, underwater communication, industrial areas, elegant lighting and aviation

## II. EXISTING SYSTEM

In this paper, we analyze the concept of voice transferring from one mobile to another mobile. Wi-Fi connectivity is the connection which can be used to as a link to share data among devices [6]. WLAN standard communication which can be used to share the voice from one mobile to another and receive the data from the user and send the data to another user [7]. The VOIP (Voice Over Protocol) is the data transferring voice telephony over mobile is supported using service provider such as GSM or by IP service provider at low cost. The GSM voice channel is the world's most widely used mobile network [8]. Wireless fidelity is the wireless way to handle networking. This technology is used to connect computers anywhere in office without the need of wires. Wi-Fi allows to connect to the internet from virtually anywhere at the speed of up to 54mbps [9].

Manuscript received on February 10, 2020.

Revised Manuscript received on February 20, 2020.

Manuscript published on March 30, 2020.

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The PCs and handsets empowered with this innovation to send and get information of a base station innovation to send and get information base station. Wi-Fi goes past remotely associating PCs, it likewise interfaces individuals. This means of communication between mobile phones using Wi-Fi in P2P (peer to peer) or wireless area network at no cost [10].

### III. PROPOSED SYSTEM

#### A. Li-Fi

Li-Fi Light fidelity is known as Li-Fi. This is very new technology which is proposed by German Physicist Harold Hos .Li-Fi is updated version of Wi-Fi. The transmission of data I' s done through wireless optical networking technology with Light emitting diodes. Li-Fi is similar to Wi-Fi but this uses a visible light communication technology(VLC) there is a medium to deliver high speed communication. The main advantage of Li- Fi is high efficiency, better bandwidth and high security than Wi-Fi which is already experimented.

#### B. Architecture of Li-Fi

Li-Fi is the future data transmission which is fast and cheap. The visible light communication Li-Fi uses visible light of electromagnetic spectrum as optical carrier for transmission.Fast pulses of light is used to transmit information in medium.

The major components of Li-fi system contains the following A) Bright LED is used as transmission source switching ON and OFF of LED will generate 1's and 0's. B)Receiving element is silicon photo diode which is having good response to visible light. A new data stream is generated by encoding light with flickering rate of LED. The LED acts as sender will modulated light data signal. The output of LED appears to be constant because of flicker at phenomenal speed. It is difficult for human eye to detect this frequency.

#### C. Principle of operation

Light discharging diode can be turned ON and OFF quicker than the human eye can identify .The working pace of LED is short of what one smaller scale second. The information transmission is by utilizing paired codes. Turning ON a LED is 1 promotion OFF is 0.The information encoding in light is by fluctuating the gleam ON and OFF to give various strings.The modulation speed is high which cannot be noticed by human eye. A light sensitive data receives signal and converts into original data. The optical carrier for data transmission of visible light is between 400THZ and 800THZ. The LEDs high speed is achieved by using data greater than 100 Mbps.

#### D. Block diagram of Li-Fi

Li-Fi system has both transmitter and receiver. The transmitter section is modulated with input signal of specific time period that sends the data using LEDs in binary form .The photodiode is used to receive flashes at receiver end. The transmitter segment comprises of info, clock circuit, LED bulb. The information can be in any structure like content, voice and so on. The time intervals are provided with timer circuit. The photodiode is used as amplifier. The

photodiode will convert the flashes into electrical signals and it is amplified to provide output. The data cannot be accessed in absence of light this will result in high security.

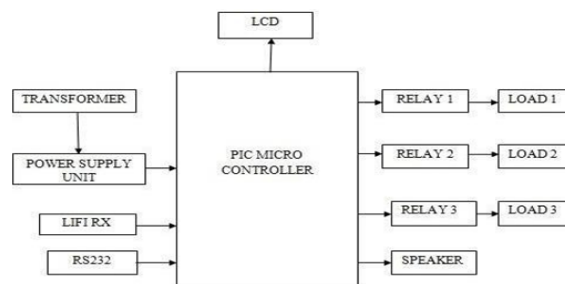


Fig. 1.Block diagram of Li-Fi

#### E. Power supply

The air conditioner voltage, regularly 220V rms, is associated with a transformer, which steps that air conditioner voltage down to the degree of the ideal dc yield. A diode rectifier at that point gives a full-wave corrected voltage that is at first sifted by a basic capacitor channel to deliver a dc voltage. This subsequent dc voltage as a rule has some wave or air conditioning voltage variety. A controller circuit evacuates the waves and furthermore continues as before dc esteem regardless of whether the information dc voltage changes. This voltage guideline is generally gotten utilizing one of the mainstream voltage controller IC units.



Fig.2. Power Supply

#### F. Transformer

The potential transformer will step down the force supply voltage (0-230V) to (0-15V and 0-9V) a level. On the off chance that the auxiliary has less turns in the loop, at that point the essential, the optional curl's voltage will diminish and the current or AMPS will increment or diminished rely on the wire check. This is known as a STEP-DOWN transformer. At that point the optional of the potential transformer will be associated with the rectifier.

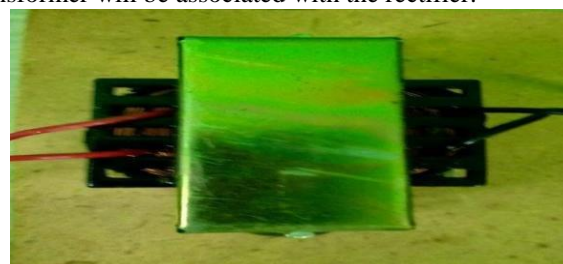


Fig.3. Transformer

**G. Keypad**

In a key cushion it has a one or more than one keys are set in a PCB. And all the keys are generally grounded. This is the primary contrast to contrasted with lattice keypad. This key cushions having greatest 8 quantities of keys in excess of 8 keys are can't be associated on the grounds that it's anything but a proficient one. In the event that we need progressively, at that point 8 keys implies, at that point no one but we can work it a lattice keypad.

**H. ARP Voice board**

APR9600 voice chip as the center of the circuit and understands the capacity of auto recording and playback. It utilizes power enhancer chip JRC286D to enhance the sound and improve the volume. The voice recording and playback circuit is generally utilized in regular day to day existence. For instance, the leaving message and reaction of the phone, game machine, and toy voice recording and playback, reading a clock of the clock or caution, selling items and control of the family unit apparatus, and so on. The planned circuit control is simple ,great sound and huge volume. It very well may be recorded and played for ordinarily and has solid capacity of movability. The designed circuit control is easy.



**Fig.4. APR Voice Board**

**I. Liquid crystal display**

It is a level board show or other electronic visual presentation that utilizes the light-adjusting properties of fluid precious stones. Fluid gems don't transmit light straightforwardly. LCDs are accessible to show self-assertive pictures (as in a universally useful PC show) or fixed pictures with uninformed substance, which can be shown or covered up, for example, preset words, digits, and 7-fragment shows as in an advanced clock. They utilize a similar essential innovation, then again, actually subjective pictures are comprised of countless little pixels, while different showcases have bigger component.



**Fig.5. LCD**

**J. Introduction to pic**

The microcontroller that has been utilized for this undertaking is from PIC arrangement. PIC microcontroller

is the primary RISC based microcontroller created in CMOS (complimentary metal oxide semiconductor) that utilizes separate transport for guidance and information permitting concurrent access of program and information memory. The principle bit of leeway of CMOS and RISC mix is low force utilization bringing about a little chip size with a little pin tally. The principle bit of leeway of CMOS is that it has insusceptibility to clamor than other creation methods.

**K. Relay**

Hand-off is an electrically worked switch. Current coursing through the curl of the transfer makes an attractive field which pulls in a switch and changes the switch contacts. The loop current can be on or off so transfers have two switch positions and they are twofold toss (changeover) switches. Transfers permit one circuit to switch a second circuit which can be totally discrete from the first. For instance a low voltage battery circuit can utilize a hand-off to switch a 230V AC mains circuit



**Fig.7. Relay**

**IV. RESULT AND DISCUSSION**

**4.1 Hardware Implementation**

The figure.8 shows that the hardware implementation of the data and voice transmission using device control. The above implementation consists of PIC microcontroller, transformer, relay, keypad, LCD, APR-voice board, LED, power supply board. Transformer is connected with power supply and it will transmit the data to PIC microcontroller. It transmits the data to the lightning-fidelity. Then the light gets transmitted to photo detector. The photo detector interfaced with the controller and it will check the transmitting and receiving data. The relay board is transmitted with the power supply. The relay board is used for the purpose of operating the fan, light, water mergial pump, automatic door open-close circuit.

**4.2 Door Output**

The figure 9 shows the device control command for the given data. At the initial stage the LCD will display data mode or voice mode. At the initial stage, we transmit the data to the controller. It will control the device-door. Then LCD displays the data mode.

The data is fixed and the first controller of door is pressed. Hence data will be transmitted and the function of LCD is to display the function line, 'DOOR OPEN'.

After displaying the LIFI will transmit the data to the photo detector. Then it will receive the function and control the door. The light will display the function light door open, again we press the same control the LCD will display as 'DOOR CLOSE'. E.g. Useful for Huge Malls, Hotels, Restaurant.



Fig.9. Door output

#### 4.3 Fan Output

The figure 10 shows the device control command for the given data. At the initial stage the LCD will display data mode or voice mode. At the initial stage, we transmit the data to the controller. It will control the device-Fan. Then LCD displays the data mode. The data is fixed and the first controller of Fan is pressed. Hence data will be transmitted and the function of LCD is to display the function line, 'FAN ON'. After displaying the LIFI will transmit the data to the photo detector. Then it will receive the function and control the door. The light will display the function light is 'FAN ON', again we press the same control the LCD will display as 'FAN OFF'.



Fig. 10.Fan output

#### 4.4 Pump Output

The figure 11 shows the device control command for the given data. At the initial stage the LCD will display data mode or voice mode. At the initial stage, we transmit the data to the controller. It will control the device-Pump. Then LCD displays the data mode. The data is fixed and the first controller of pump is pressed. Hence data will be transmitted and the function of LCD is to display the function line, 'PUMP ON'. After displaying the LIFI will transmit the data to the photo detector. Then it will receive the function and control the Pump. The light will display the function light is 'PUMP ON', again we press the same control the LCD will display as 'PUMP OFF'.



Fig.11. Pump Output

#### 4.5 Light Output

The figure 12 shows the device control command for the given data. At the initial stage the LCD will display data mode or voice mode. At the initial stage, we transmit the data to the controller. It will control the device-Light. Then LCD displays the data mode. The data is fixed and the first controller of pump is pressed. Hence data will be transmitted and the function of LCD is to display the function line, 'LIGHT ON'. After displaying the LIFI will transmit the data to the photo detector. Then it will receive the function and control the Pump. The light will display the function light is 'LIGHT ON', again we press the same control the LCD will display as 'LIGHT OFF'.



Fig.12. Light Output

### V. CONCLUSION

This paper proposes a transmission of data and voice through light fidelity to support the high speed transmission. The data transfer speed of Wi-Fi is 150mbps ,Li-fi has the speed of 1Gbps.though the coverage distance of light fidelity is about 10 meters, they will provide more secure data transfer.Light communication can be achieved by using light with the help of LED bulbs. Li-Fi has some of the advantages such as less interference and can pass through sea water and it is used in under sea explorations, airlines and home premises for data transfer and internet browsing.

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