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Li-Fi based Text Transmission

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A B S T R A C T

Wireless technology plays an important role in communication in many parts of the planet, reaching even the foremost remote locations. Wi-Fi or WiFi is getting used widely as a way of communication for both texts moreover as multimedia. When three antennas are employed in Wi-Fi, a transmission speed of 450 Mbps is achieved. With the advancement of technology, we are slowly switching towards a brand-new technology called Li-Fi. Li-Fi or Light-Fidelity makes use of an actinic ray for communication purposes. Li-Fi has made notable progress in each field of communication because it provides a faster rate of transmission, greater security, and lesser interference due to which an enormous limit of remote information transmission can be possible. This paper aims to transmit text within the kind of Hexadecimal characters via light as a carrier. This makes use of IoT with Arduino and therefore the high flickering light emitted from the LED is employed as a source to transmit the text data to the destination where the photodiode receiver will receive and decode the information. This makes data transmission faster and more efficient.

Keywords:Wi-Fi, Li-Fi, Visible light, Carrier, IoT, Arduino, LED and LDR.

1. Introduction

The world is advancing in all forms of the technology, where everything is digitalized and everything is available on internet. For communication purposes Wi-Fi and LAN are widely used all over the world, Wi-Fi is the most efficient and prominent mode of communication but it can also be improved. Li-Fi is a new technology which uses visible light waves for data transfer and communication with improved speed and efficient and with more privacy.

2. Literature Survey

The invention of L-Fi have may improvements over the currently existing communication W-Fi technology. People are already using Wi-Fi and don't have any problem with it, but it cannot remain the identical because the always growing population leading to more Wi-Fi users. Li-Fi could also be a communication technology which can deliver a bidirectional, high speed, network and mobile speed communications using LED bulbs accustomed provide both illuminations still as data transmission. It is considered to be self-controlled and invisible to the attention.[1][2]

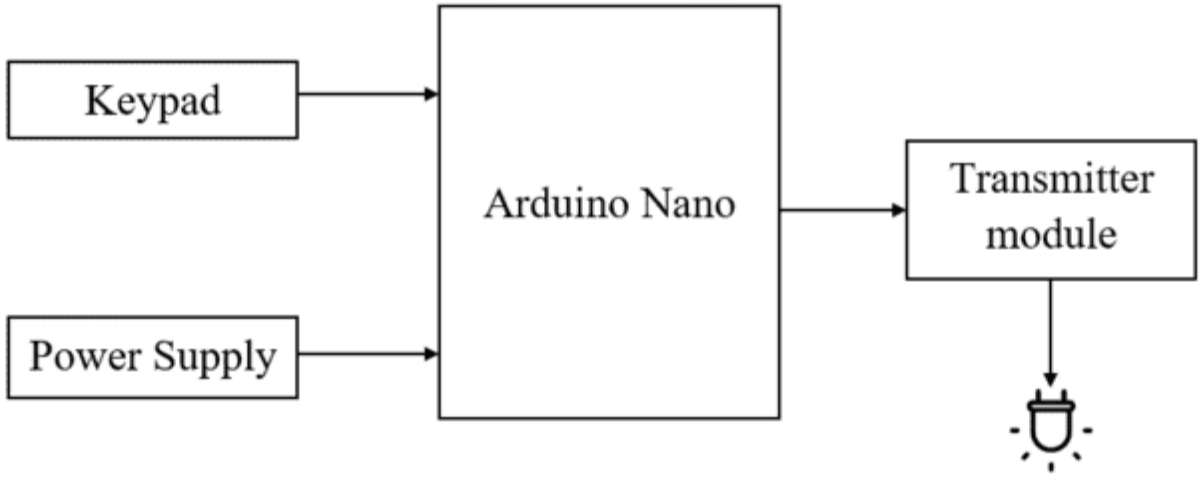
Light Emitting Diodes (LEDs) switch On and Off faster than the human eye can detect since the operating speed of LEDs is very less like less than 1 microsecond, thereby causing light to appear as continuously On. The modulation process is so rapid that humans cannot even notice it. A light-sensitive photodetector will receive the signals at the destination and convert it back into original data. This method of transmitting data rapidly through light is technically referred to as Visible Light Communication (VLC) and the term Li-Fi has been inspired by Wi-Fi as it has the capacity to compete with Wi-Fi.[3][4]

Wi-Fi is used for coverage in buildings, whereas Li-Fi is ideal for high-density wireless data coverage in confined areas. These two technologies can be considered complimentary. The low-cost nature of LEDs and lighting units allows a lot of opportunities to make use of this medium. Li-Fi takes out the fibre from fibre optics as it sends data through light waves. In Li-Fi technology Amplitude Modulation takes place so, it is considered to be 80% more efficient compared to Wi-Fi. Wi-Fi transmits data within a range of 10 to 20 meters. That's why Li-Fi is fast and efficient for short-distance communication.[5]

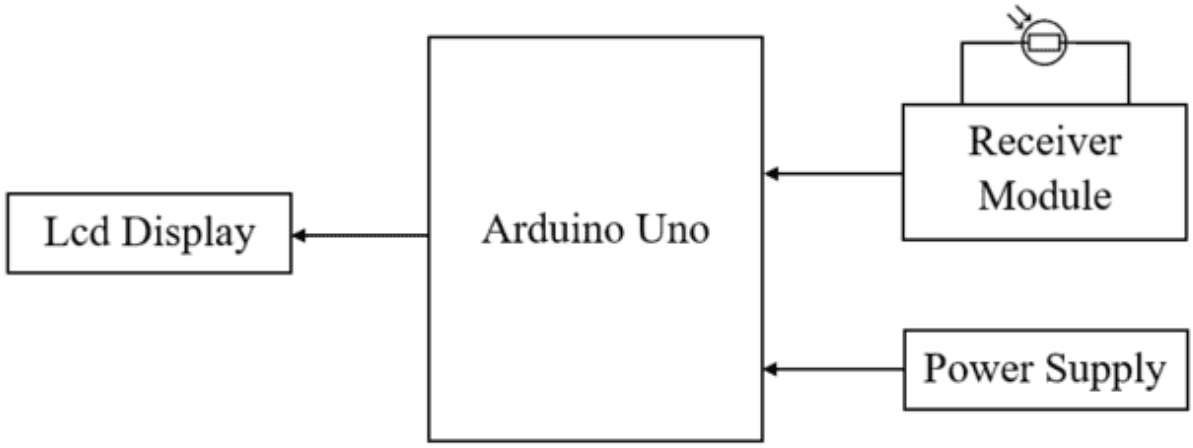
Li-Fi uses WVSN (wireless visual sensor networks) technology to get connected to other devices and controlled by a user via user interface from anywhere and anytime through cloud computing. By using these data transfer will be more efficient via visible light communication.[6][7]

3. Block Diagram

Sender –



Receiver –



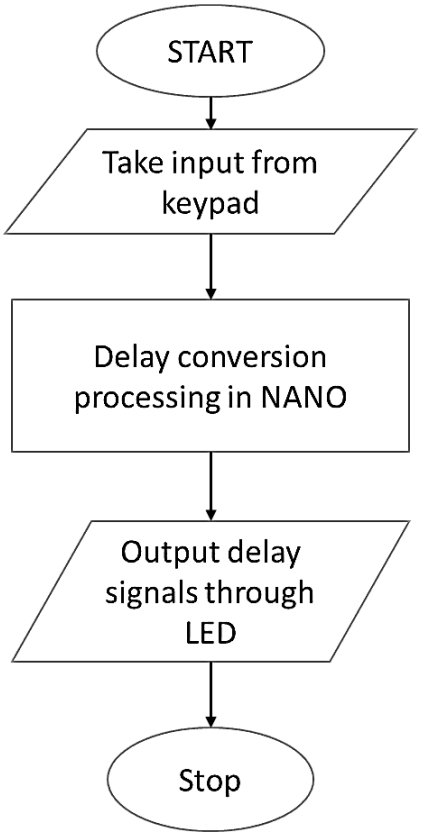
4. Working

The objective of Li-Fi based communication is to beat some disadvantages of this existing communication system, which is Wi-Fi. Wi-Fi can transmit data at a median speed of 10 Mbps, whereas Li-Fi can transmit data at aspeed of quite 100 Mbps. Li-Fi technology makes use of actinic radiation having a frequency of 430 THz-770 THz, which is relatively above radioemission frequency of three kHz-300 GHz. LED (Light Emitting Diode) is employed because the source of sunshine to transmit data. LED is employed as a substitute for radio waves because it includes a good lifetime, high brightness, low power consumption, less radiation emission, small size and fewer cost. A 4x4 hex keypad is employed to type the information to be sent and it's interfaced together with the LED to the Arduino Nano microcontroller at the sender's end. At the receiver's end, there'll be a light detecting resistor to detect the incoming light from the LED. LCDs (Liquid Crystal Display) is used at output to display the specified character pressed in keypad. Figure-1 to start out communication.

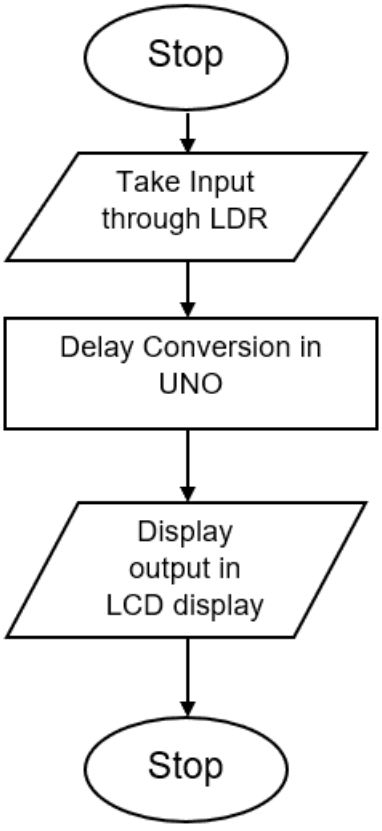
When a key is pressed on the 4*4 hex keypad, it is immediately converted to binary via Arduino code running in themicrocontroller. Whichever key is pressed, the same value is displayed in the serial monitor window in Arduino IDE for reference purposes in case changes are to be made. At the same time, that value is sent from the LED at a very high speed by the flickering of the LED to achieve a fast rate of transmission. The LED will be ON for binary value '1' and OFF for binary value '0' and this way, transmission occurs. We won't be able to see this flickering as it occurs at a very high speed and it appears as just a flash of the LED. At the receiver end, the light detecting diode detects this light energy and converts into electrical energy in the form of binary. The same process is done in reverse at this end and analog text data is obtained from the binary and displayed in the LCD as output.

5. Methodology

SENDER



RECIEVER



6. Conclusion

Li-Fi is an alternate technology which is best suited to replace Wi-Fi in future, the technology can be further explored and if it is used then every tube light and led bulbs can be used to access internet.

Using the methodology mentioned above one can easily achieve data transfer or internet access using light for a short range like restricted to a room, with some modifications and research a series of light for different rooms and corridors can be achieved.

This technology can be explored further in the future and if it is put into practical use, then every light bulb and light tube can be used as access to the internet

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