

LI-FI BASED BLIND INDOOR NAVIGATION SYSTEM

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Abstract: The main aim of our project is transmitted the data through the VLC communication. LI-FI is transmission of data using visible light by sending data through LED light. This system has regulated the speed which human eyes has not be perceived its blinking. This system can be demonstrated as bidirectional VLC system, high speed communication similar to WI-FI. The main idea of our project is to create internal navigation system, using Arduino software and Arduino hardware. The transmission of data can acts as transeiver, where LED and photodiode were in same line of sight. It is visually impaired using LI-FI technology.

Keyword: LI-FI, LED, photodiode, VLC, Arduino software, Arduino hardware.

Introduction:

In this era of wireless technology, the Wi-fi is useful for general wireless coverage within buildings while Li-Fi is ideal for high density wireless data coverage in confined areas where there are no obstacles. since visible light is present everywhere. Light fidelity(Li-Fi) is a bidirectional ,high speed and fully networked wireless communication technology similar to Wi-Fi. Li-Fi can be considered better than Wi-Fi because there are some limitation in Wi-Fi. the Li-Fi technology can transfer the data through LEDs. It is high speed and low cost wireless communication system, compared to Wi-Fi. Indoor navigation is convenient to everyone and it is especially indispensable for the visually impaired. Li-Fi makes use of a free, unlicensed spectrum and is not affected by RF noise. Indoor location would have a sufficient amount of light source and provide additional security since Li-Fi can not penetrate through wall. If LED is ON use can transmit a digital string of 1,if it's OFF then user can transmit a string of 0.it can be switched ON and OFF very quickly, which gives instant opportunity for transmitting data. Li-Fi require line of sight for communication. Light dependent resister offers infinite resistance in darkness and offers very few ohms then there is light. The light from the LED is detected by using photodiode and the data is send to the Arduino.

VLC Principle:

VLC radio transmitter and receiver modules based on intensity modulation/direct detection is shown, which consists of digital to analog con-vertor, transconductance

amplifier, low pass filters and high speed LED sin the transmitter section and photodiode, transim pedance amplifier, analog to digital convertor in the receiver section. The LED converts an electrical signal to optical energy that provides illumina-tion as well as communication. Information is line-encoded and modulated by the DAC, and then conveyed on the optical signal by modulating the amplitude or some other feature of the LED light. At the receiver, the Photodiode converts the received optical power to an electrical signal, which is then amplified, demo- dulated and decoded by the TIA Amp, LPF and ADC to recover the use message bits.

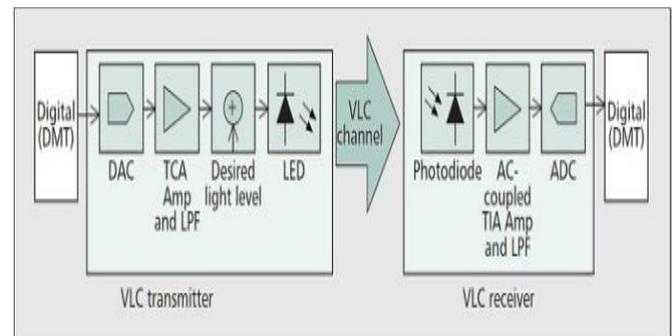


Fig. Block diagram of a VLC system

Working:

It is possible to encode data in the light by varying the rate at which the LED's flicker ON and OFF to pass different strings of 0s and 1s. The modulations is so fast that the Human eye doesn't notice. There are bulbs used across the world, which needs to be replaced with LED's ones that transmit data. is fed into the LED light bulbs, it send data to photodiode. High brightness LED acts as a communication source. serves as receiving element. The variations detected by the photodiode is sent to the Arduino of the receiver side. The code dumped to the receiver Arduino sends the logic '0' and '1' to the processing software using the serial port. The data is present in the serial port is received by the processing software. The processing software has coding to read the data present on the serial port and display the original data that is sent from the transmitter and display it on the processing terminal. The errors of this system depends on the baud rate and sensitivity of the receiver. There should be external disturbances for this system.Light of sight

propagation is required for the error less reception of the data. The receiver unit demodulates the encoded binary data and give the response in the form of voice to the person. The receiver unit consist photodiode which receives the information from the LED connected to the transmitter the information consist of location and whenever receiver module comes in the range of that transmitter area then corresponding location message is send to the receiver is stored in the APR and processed further to intiate voice to guide the person and vibretor motor to navigate the person which can assist visually impaired people at indoor places.

Transmitter module– generates the ON-OFF pattern for the LED's.

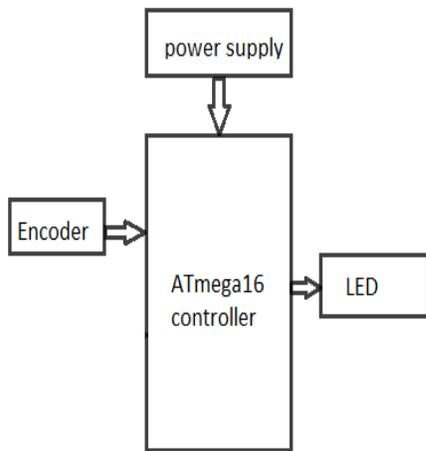


Fig. Transmitter section

Receiver module –detecting the ON-OFF state of the LED's.

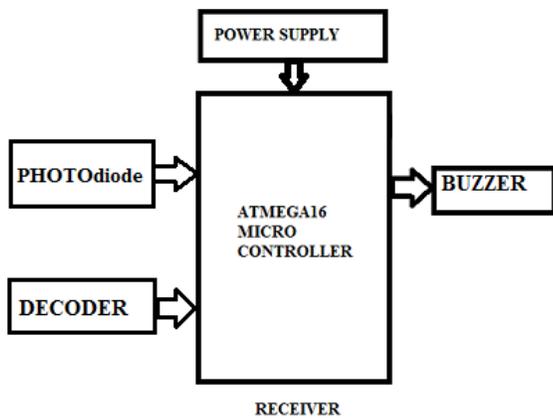


Fig. Receiver section

Hardware Required

Atmega 16 is an 8 bit high performance microcontroller of Atmel's mega AVR family with low power consumption. Atmega16 is based on enhanced RISC architecture with 131 powerful instruction. Atmega16 work on a maximum frequency of 16 Mhz. Atmega16 has 16 KB programmable flash memory, static RAM of 1 KB, EEPROM of 512 bytes. Atmega16 is a 40 pin microcontroller. There are 32 I/O lines which are divided into four 8 bit ports designated as PORTA, PORTB, PORTC, and PORTD. Atmega16 has various in-built peripherals like USART, ADC, Analog comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals.

Transmitter Signal

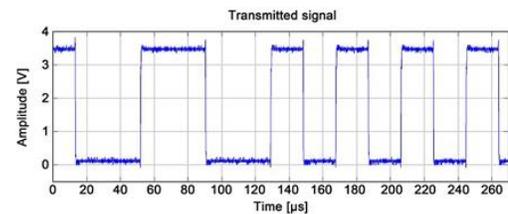


Fig. Example of a signal propagated from the transmitter

Receiver Signal

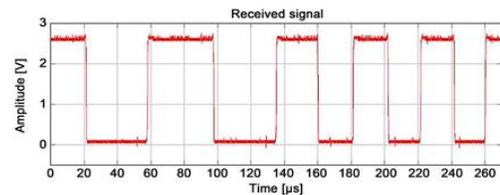


Fig. Example of a signal propagated from the receiver

Software

Arduino programs may be written in any programming language with a compiler that produces binary matching code. Atmel provides a development environment for their microcontrollers, AVR studio and the Atmel studio

The Arduino project provides the Arduino Integrated development environment (IDE), which is a cross-platform application return in programming language C/C++.

The Arduino IDE supports the language C/C++ using special rules to organise code. The Arduino IDE supplies a software library called wiring from the wiring project provides many input and output procedures.

Software simulation of the prototype:

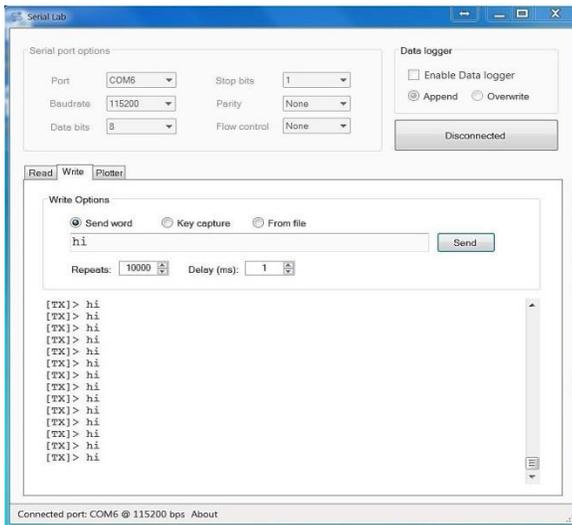


Fig. Data string which is transmitted from the pc on serial ports.

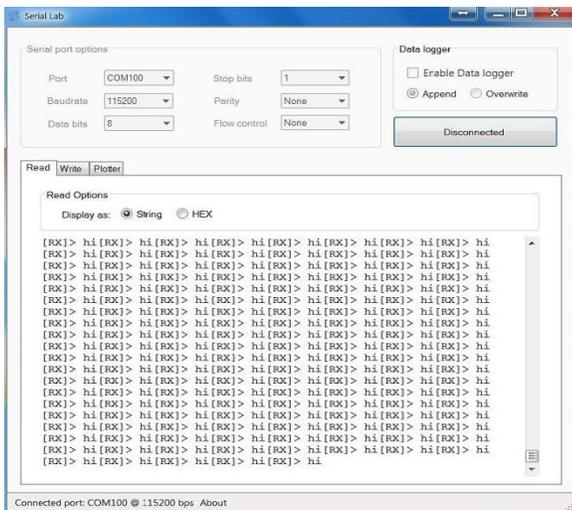


Fig. Data string which is Received from the pc on serial ports

Conclusion:

Therefore, by using this system, we can obtain a better speeds than WI-FI. The radio band crisis problem can also be solve by employing the further existing system with this technology. In this paper by providing the navigation for visually impaired using LI-FI.

Future Scopes:

This technology can be improved further and can be used to transmit the data to the mobile phones and computers

that does not used radio waves transimission, home automation, monitoring activities and LI-FI hotspots.

References:

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