LiFi based Navigation System

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Bachelor of Engineering

in

Computer Science

by

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CERTIFICATE

This is to certify that the project Synopsis entitled ***"LiFi based Navigation System"*** is a bonafide work of ***"Sumedha Subhash Shirsat (15102017), Poojitha Shivram Dangeti (15102004), Rashmi Sunil Gaikwad (15102008)"*** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of ***Bachelor of Engineering*** in ***Computer.***

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Abstract

Li-Fi (Light-Fidelity) is transmission of data using visible light by sending data through a LED light bulb that varies in intensity faster than the human eye can follow.The term Li-Fi refers to visible light communication (VLC) technology that uses light as a medium to deliver high-speed communication in a manner similar to Wi-Fi. 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, the main idea is to create internal navigation systems for the bigger areas to create automatic navigation for the visitors (who are visually impaired) using Li-Fi technology.

Introduction

The Li-Fi technology can transfer the data through LEDs. It is a high speed and low cost wireless communication system, compared to Wi-Fi. It can provide high security, large bandwidth, and low cost. Li-Fi uses common household LED (light emitting diodes) light bulbs to enable data transfer, boasting speeds of up to 224 gigabits per second.

Light Fidelity (Li-Fi) is a bidirectional, high speed and fully networked wireless communication technology similar to Wi-Fi. The term was coined by Harald Haas and is a form of visible light communication and a subset of optical wireless communications (OWC) and could be a complement to RF communication (Wi-Fi or Cellular network), or even a replacement in contexts of data broadcasting.

Li-Fi can be considered better than Wi-Fi because there are some limitations in Wi-Fi. Wi-Fi uses 2.4 5 GHz radio frequencies to deliver wireless internet access and its bandwidth is limited to 50-100 Mbps. This technology has been proposed as a solution to the RF bandwidth limitations. 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. Moreover, most indoor locations would have a sufficient amount of light sources and provide additional security since Li-Fi cannot penetrate through walls.

Objectives

Achieving seamless interoperability with other networks in a way such that it can be operated in the indoor environment. Driving illumination grade LEDs at high speed Overcoming the line of sight. This project will emerge as a promising technology in upcoming era by providing the navigation for visually impaired using LI-FI.

Literature Review

Proposed by the German physicist Harald Haas, Li-Fi is a high speed bi-directional fully connected technology that provides transmission of data through illumination using LED light bulb where the visible light is in between 380 nm and 750 nm corresponding to a frequency spectrum of 430 THz to 790 THz. The LEDs require low power for their operation and have very high

switching ON and OFF speeds that cannot be tracked by the human eye. As a medium of wireless communication, Li-Fi offers several advantages over traditional radio frequency.

Efficiency: The energy cost for data transmission of Li-Fi is considerably lower than that of RF, because it uses LED light that has a long lifetime, consumes less energy and is highly efficient. Therefore, Li-Fi becomes a promising candidate for green communication.

High Speed: The higher bandwidth of Li-Fi is exploited for high-speed data transmissions boasting speeds of more than 10 gigabits per second that make it more than sufficient for downloading movies, games, music and all in very less time.

Safety: Li-Fi do not have any interference issues similar to radio frequency waves that interfere with airplanes instruments and equipment in hospitals, and is potentially dangerous in hazardous operations, such as power/nuclear generation or oil and gas drilling. It uses also LED light that is more suitable for indoor applications because it is safer for eyes compared to conventional laser-based VLC.

Security: Since visible light waves cannot penetrate through walls, Li-Fi signals in adjacent rooms or apartment units would not interfere with each other, which enhance communication security by preventing eavesdropping on in-room or in-building communications.

Free Band: Li-Fi makes use of free band that is unlicensed and currently largely unused for communication.

Cheaper: The front-end components of both transmitters and receivers are relatively simple and cheap devices and do not require frequency mixers or sophisticated algorithms.

On the other hand Li-Fi is facing a few challenges which need to be overcome. The main downside is that the visible light cannot penetrate through obstacles; somebody simply walking in front of LED source can easily block it. In addition, we have to deal with changing weather conditions because Li-Fi link data rates are degraded by shot noise if the photodiode receiver is exposed to direct sun-light for example, which leads to limit high data rate Li-Fi communication mostly to indoor environments. Furthermore, the achievable data rate falls sharply with increasing distance and the line of sight is preferred because the signal will be stronger on direct light even if Li-Fi is perfectly capable of data communications from reflected light. For these reasons, Li-Fi will not replace high-speed RF communication, which will always be used in situations where long-range, non-line-of-sight and/or outdoor links are required. Indeed, Li-Fi and RF communication are complementary technologies.

Problem Definition

We are proposing novel approach for college organization. We are using LIFI module in our project. If user wants to find some particular destination within collage, he/she will enter his/her query. This data is transmitted to server through LIFI. Server will fetch required data from database. This data is sent to user through LIFI. Data will be displayed on user‘s mobile. This is efficient technique for searching location.

Proposed System Architecture/Working

It is possible to encode data in the light by varying the rate at which the LEDs flicker ON and OFF to pass different strings of 0s and 1s. The modulations is so fast that the Human eye doesnt notice. There are bulbs used across the world, which needs to be replaced with LEDs 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 conncted 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.

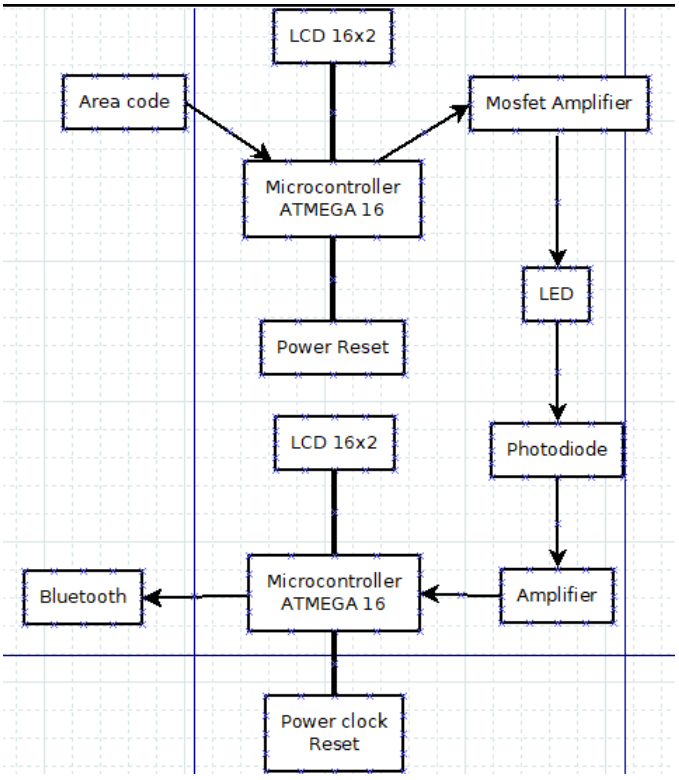

Figure 1: Block Diagram

Activity Diagram

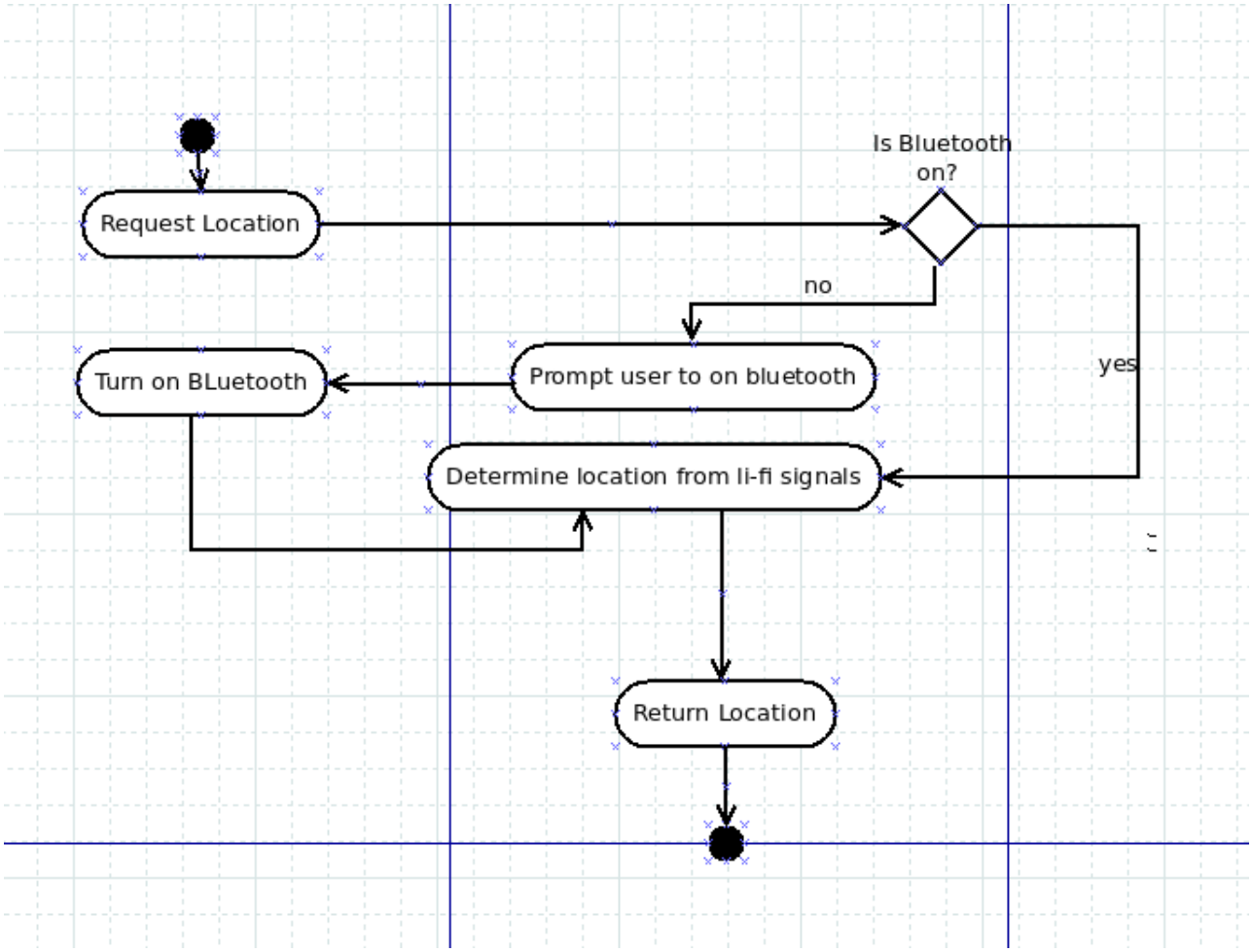

Figure 2: Activity Diagram

Use Case Diagram

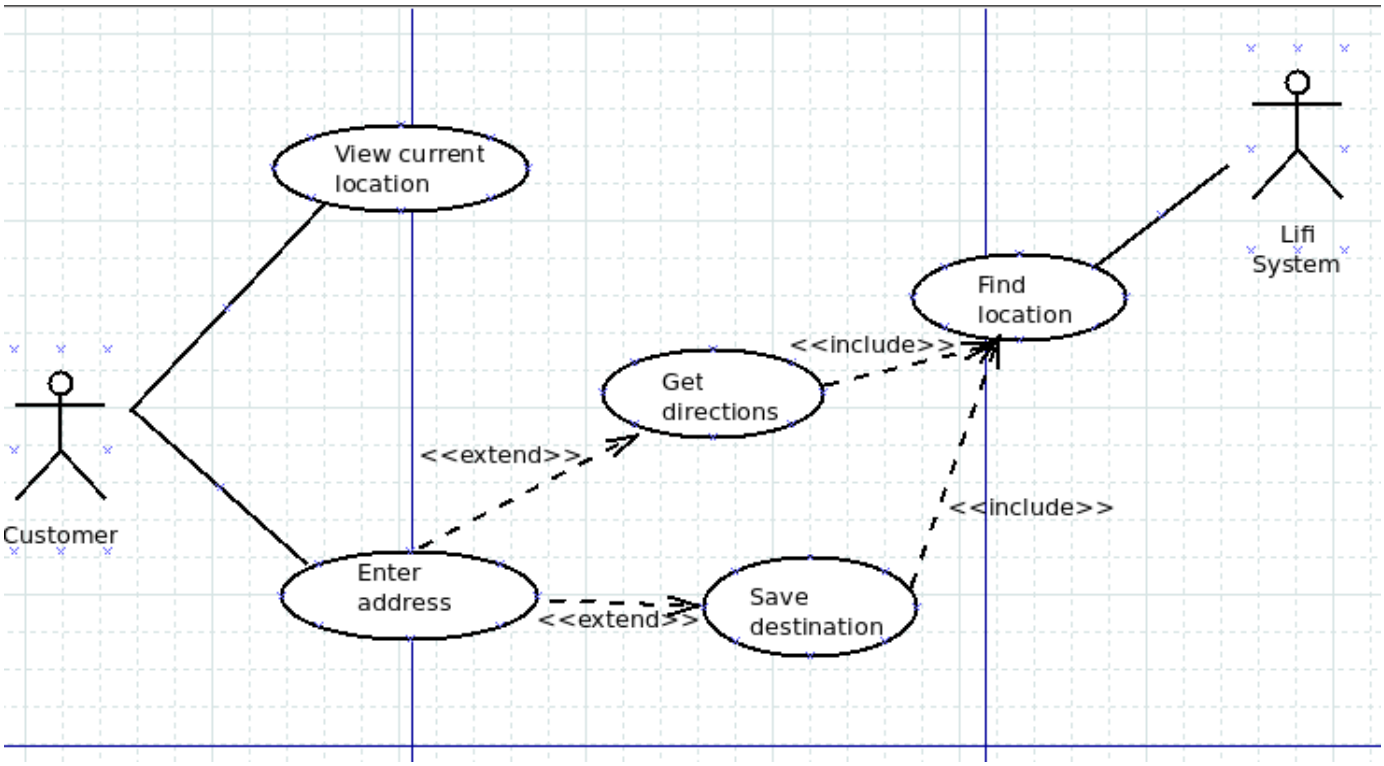

Figure 3: Use Case Diagram

Technology Stack

1.Bascom

2.Navigine

3.SPP

Dependancies

AT-mega 16

Photo detector

Capacitor

Resistor

Mosfet Amplifier

Diodes

Summary

With the growing technology and increasing use of the net services, prospects area unit terribly high that use of Li-Fi technology are shortly in apply. The construct of Li-Fi is spreading thus quick because it is simple to use, it's attracting interest of individuals. the utilization of Li-Fi technology provides a awfully golden chance to interchange or to administer various to the radio based mostly wireless technologies. Because the range of individuals and also the access of web is incre asing on such an outsized scale , accessing web through Wi-Fi can shortly be lean because the usage is increasing however the information measure remains an equivalent. During this Report paper we have a tendency to conclude that the chances area unit varied and might be explored more this technology is in producing method to provide each bulb to become a Wi-Fi hotspot to transmit wireless information.

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