International Journal of Scientific Research and Review ISSN No.: 2279-543X
Volume 07, Issue 03, March 2019 UGC Journal No.: 64650

Indoor Navigation System for Visually Impaired Using LI-FI Technology

Nagumotu Sree Jyothi , Venkatesh Narapusetty, Neha Deka, Padmaja.S, Prof. Sugandha Saxena

Department of ECE, REVA University, India

ABSTRACT

Indoor Navigation is a convenient way of guiding people specially for visually impaired. In our paper we have proposed a navigation system for the visually impaired using Li-Fi technology. Li-Fi stands for Light-Fidelity, which explains how to a high speed wireless communication , visible light communication technology is applied. To increase the coverage area of wireless networks in places such as Indoor home, business, office environment Li-Fi is used. Through the light in a room using Li-Fi technology data for smart phones, laptops can be transmitted in future. Li-Fi is the transmission of data through a LED light and the intensity is too fast. LED emits light through the transmitter part and a light detector detects it in the receiver part. Li-Fi is very economical, short range and low reliability. The main objective of our project is to provide a fair means of movement to the blind in the indoor space.

I. INTRODUCTION

Li-Fi is a high speed wireless communication similar to Wi-Fi. Li-Fi when compared to Wi-Fi, can be considered better than Wi-Fi because of some limitation in Wi-Fi. We can transfer the data through LEDs which are inexpensive using Li-Fi technology. It is low cost and high speed wireless communication system, compared to Wi-Fi. Li-Fi uses a free environmental friendly spectrum and is not affected by any noise as seen in Wi-Fi. Using Li-Fi in an indoor environment is quite safe as there is no possibility of light penetrating through walls. A digital string of 1 can be transmitted if the LED is ON, the user can transmit a string of 0 if it's OFF. This is related to switching process which is very fast, which gives the transmitting data an instant opportunity. Li-Fi require LOS (line of sight) for communication. The light from the LED is detected by using a light detector and the data is change to its original form to get the required output. Using this technology the problem of radio band crisis like in Wi-Fi can be negotiated. Thus providing a technology that deals real –time, useful navigation information that enables a user to make timely and appropriate decisions on which route to follow in an indoor area.

II. BACKGROUND

II.1. Visible Light Communication

Visible Light Communication is a promising technology where data communication take place through visible light between 400-800 THz. VLC works on data transmission through visible light and which is an environmental friendly spectrum. Use of LED lighting, VLC can be used as a replacement for radio waves. But

for indoor positioning the methods used make estimates from the radio wave strength or position of the wireless LAN access point or use wireless active tags. These methods doesn't work well on positioning part because of many obstacles present in the environment or the surroundings. Thus making visually impaired difficult for proper positioning. Thus using LED lights we have applied visible light communication technology. It becomes possible for accurate position when we use visible light communication.

II.2. Problem Statement

People with visual disabilities, are often challenged by places they move in. This specific project helps the visually impaired to move within indoor space and make them independent. Li-Fi makes use of environmental friendly spectrum and has nothing to disturb it. Moreover, most of the indoor locations provides secured way of data transmission since Li-Fi doesn't penetrate through walls and would have sufficient amount of light sources. It also supports high speed data transmission which rates nearly to 15 Gbps. Thus providing a real time navigating system to travel autonomously.

III. METODOLOGY

LiFi technology involving in transmission of data starts by sending data through the LED. The data is directly given through the computer, which gets encoded into a number of electrical signals by the controller through the interface circuit. Then the signals drive the LED bulbs thus electric signals get converted to optical signals. The optical signals are delivered to the receiver through the wireless channel. The intensity of light determines the rate of data received. At the receiver the optical signals are received by the photodiode, which is responsible for converting optical signals to electrical signals. The output data will be decoded to original signal. A constant voltage is provided for avoiding high spikes of current. Finally the processor processes for the final output.

IV. BLOCK DIAGRAM

IV.1. Transmitter

The transmitter part involves flickering of the LED lights. LED in use consumes very low power. The flickering is produced through the switching circuit. The switching circuit process the data into 1 and 0 , i.e binary. The flickering is too fast and results in the transfer of data. Basically transmitter involves change of electrical signals into optical signals.

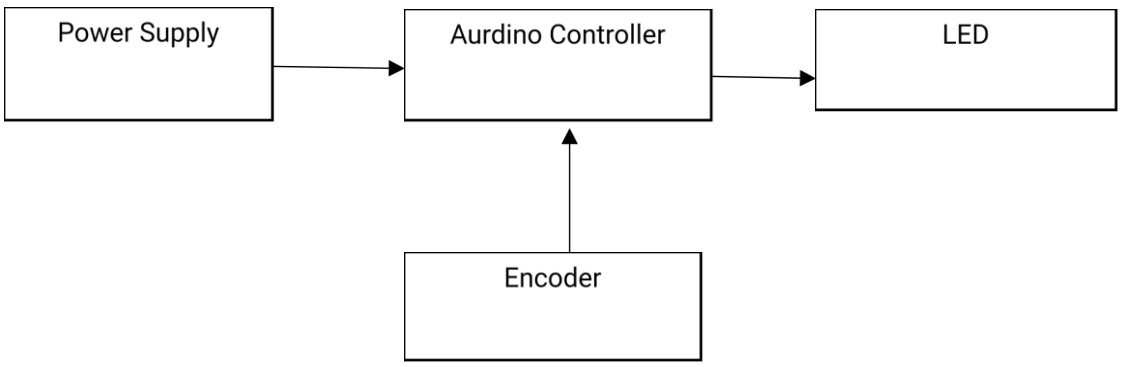

Fig.1. Transmitter Part of Indoor Navigation System.

IV.2. Receiver

The receiver part involves of receiving the optical signal through the photodiode. The photodiode converts the visible light into an electrical signal, here the signal strength is proportional to the intensity of light. The signals that are of less strength is preamplified.The data is send further to the controller and given to voice circuit. Thus the whole circuit will help the visually impaired to navigate through the indoor space.

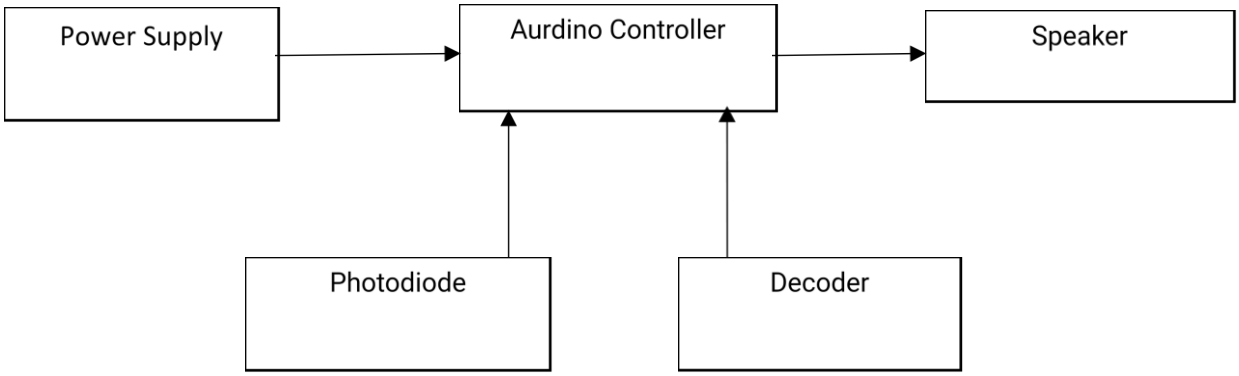

Fig.2. Receiver Part of Indoor Navigation System.

V. CONCLUSION

The use of LiFi technology provides a way for ubiquitous communication and an alternative for WiFi. This also ensures of avoiding radio band crisis and also harmful radiations emitted by the use of WiFi. Lifi technology has a huge impact on secure data transmission which can be used in mobile phones, computers and in any other digital devices. The advancement of it can lead in the usage of LiFi hotspots. In this paper we refer the technology as the basis for the navigation of the visually impaired by guiding him with the voice message while entering any rooms.

REFERENCES

[1] Fahad Zafar , Rajendran Parthiban, Vineetha Kalavally, Dilukshan Karunatilaka,“ LED based indoor visible light communications: State of the art” ,IEEE Communications Surveys & Tutorials,Vol.17, No.3, 2015.

[2] M. Pravin, T. V. P. Sundararajan, “ VLC Based indoor blind navigation system ”, International Conference on computing, communication and networking technologies (ICCCNT), 2018.

[3] Myoung-geun Moon, Su-il Choi, “Indoor position estimation using image sensor based on VLC”, International Conference on Advanced Technologies for Communications, 2014.

[4] Shivaji Kulkarni, Suhas Shirol, Amogh Darekar, “A survey on Li-Fi technology”, International conference on Wireless communications, signal processing and networking (WiSPNET) ,2016.

[5] Thomas Gallagher, Elyse Wise, Binghao Li, Andrew G Dempster, Chris Rizos, Euan Ramsey-Stewart, “Indoor positioning system based on sensor fusion for the blind and visually impaired”, International Conference on Indoor Positioning and Indoor Navigation (IPIN), 1-9, 2012.

[6] Hui Liu, Jing Liu, Houshang Darabi, Pat Banerjee, “Survey of wireless indoor positioning techniques and systems”, IEEE Transactions on Systems, Man, and Cybernetics, Part C (Reviews And Applications) , 2007.