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Creating Value, Leveraging Knowledge
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Li-Fi for Next Gen Communication

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1 Abstract

Today's world of ubiquitous Internet access for shopping, banking, gaming, and other purposes has resulted in radio spectrum congestion due to growing demand for wireless communication. Li-Fi (Light Fidelity) is a 5G visible light communication (VLC) system that has been suggested as a remedy. Light-emitting diodes (LEDs) are used in Li-Fi to achieve high data rates by transmitting data through visible, infrared, and ultraviolet light. Professor Harald Haas of the University of Edinburgh devised this technology, which improves productivity, accessibility, safety, and frequency range over conventional Wi-Fi.

Our research uses Li-Fi technology to study the characteristics of latency and speed in data transfer, with an emphasis on how different LED intensities and wavelengths affect performance.

Contents

2 Problem Statement

Secure and reliable data transmission using Li-Fi in diverse environments.

3 Introduction

The quick development of technology and the ubiquitous existence of the Internet in contemporary life have completely changed the way we carry out everyday tasks like gaming, banking, shopping, and online payments. However, because of the radio spectrum's congestion brought on by this unparalleled connectedness, creative solutions are needed to keep up with the growing demand for wireless communication. Li-Fi (Light Fidelity), a revolutionary 5G visible light communication (VLC) technology that uses light-emitting diodes (LEDs) to transport data, is one such promising alternative.Professor Harald Haas of the University of Edinburgh devised Li-Fi, which transmits and receives data at incredibly fast speeds by encoding it with light and changing its intensity. By using the visible, infrared, and ultraviolet spectrums, this technology provides a wide frequency range that greatly exceeds that of conventional Wi-Fi (wireless fidelity). Li-Fi's main benefit is that it uses inexpensive LEDs to provide high data speeds, which makes it a more cost-effective and accessible option than Wi-Fi.Light waves have superior productivity, safety, accessibility, and frequency range than radio waves, which makes Li-Fi a desirable solution for a variety of applications. Li-Fi has shown impressive performance in lab conditions, and its real-world use is expected to alleviate Wi-Fi's capacity limitations, particularly in crowded regions. Li-Fi's ability to be incorporated into the current lighting infrastructure, such as streetlights and car headlights, also creates new opportunities for vehicle-to-vehicle communication and widespread Internet access.Li-Fi has many obstacles to overcome before reaching its full potential. These include service disruptions brought on by opaque surfaces, interference from other light sources, and expensive implementation costs.

The purpose of this study is to summarise the advantages, disadvantages, possibilities, and risks of Li-Fi technology, with an emphasis on performance measurements. Through an examination of the data transfer rates and latency attained by various LED arrangements, our goal is to offer an understanding of the real-world use of Li-Fi and its potential to supplement or even replace Wi-Fi in certain settings. Our results add to the expanding body of information about Li-Fi and demonstrate how it could soon completely transform wireless communication.

4 Literature Survey

A comparative study of wireless protocols with Li-Fi technology

Objectives	Comparative study of various wireless communication protocols,including Li-Fi, Wi-Fi,Bluetooth,UWB, and ZigBee.
Method Used	Comparison based on IEEE standards,data transmission speed, frequency, and network topology using comparison tables and charts.
Limitations	LiFi relies on line-of-sight communication and cannot pass through walls, which restricts its usability compared to radio frequency based technologies.

Table 1: Research Objective, Method, and Limitation

An Overview of LiFi: a 5G candidate Technology

Objectives	Comprehensive review on Li-Fi as a promising candidate for 5G communication systems.
Method Used	The paper reviews existing literature on LiFi, SWOT analysis, comparison tables, and technical discussions on its workings and data transmission rate.
Limitations	High initial costs,line of sight requirements,dependency on light sources .

Table 2: Objectives, Method, and Limitation

A survey on LiFi technology

Objectives	Paper aims to explain LiFi technology,highlighting its ability to transmit data using LED light bulbs.
Method Used	Technical analysis including architecture,modulation techniques,comparative Analysis,and data transmission methods.
Limitations	Ambient light interference,installation of LED bulbs capable of data transmission and compatible receiving devices .

Table 3: Objectives, Method, and Limitation

A review of LiFi technology

Objectives	Paper aims to highlight the need for lifi over wifi, the working methodology, and trace the evolution of visual light communication (VLC).
Method Used	Technical explanation of LiFi technology,use of LEDs and photo detectors for data transmission.
Limitations	Flickering due to rapid on and off , limited range and infrastructure requirements.

Table 4: Objectives, Method, and Limitation

5 Functional Block Diagram