



Light Fidelity Based Indoor Car Parking System

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Abstract: In contrast with past, people own mostly four wheeler vehicles in smart cities, especially during peak hours. The difficulty routes from not knowing where the parking places are available at the given time, even if this is known; many vehicles may follow a small number of parking spaces which in turn leads to consequential traffic congestion. To evade from this scenario we assemble most of the parking to be indoor in smart cities. The prime reason behind indoor parking system is that, to reduce time and attainment taken to depart from one place to another for parking. This indoor parking system uses Li-Fi to help drivers getting the real time status information and also to guide directions. By providing meticulous on obtainable parking areas and services. Li-Fi Based Indoor Car Parking System exploiting Visible Light Communication (VLC) technology to dispense the driver's accurate information concerning the parking slots available through an alert message to the smart phone.

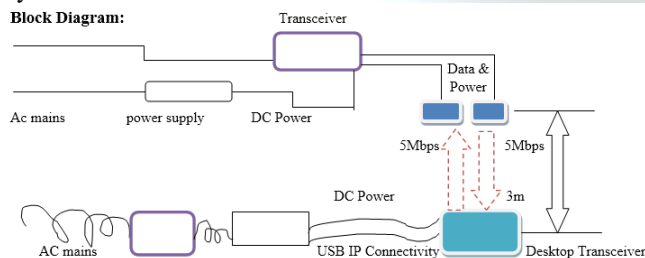
Keywords: VLC, GSM, LED

I. INTRODUCTION

A. Working principle

The working of Li-Fi is based on VLC, which uses visible light for data transmission. The visible light spectrum has wider range of hundreds of THz of free bandwidth, which is 10,000 times more than RF spectrum up to 30GHz. It uses LED to generate data stream which is connected to the internet or cellular system. As per the data stream the LED flickers at high rate which is not recognized by human eye.

Block Diagram:



The flickering of LED is regulated by voltage regulator and level shifter circuit. At the receiver side of the system photo detector is used. This photo detector senses light and converts into the respected pulses. These pulses are then amplified and processed to achieve the original data stream.

The distance achieved by system depends only on the potential of the light source that is LED lamp. The one among the major advantage of Li-Fi is the merging of illumination with wireless communication provides a measurable reduction in both infrastructure complexity and energy consumption.

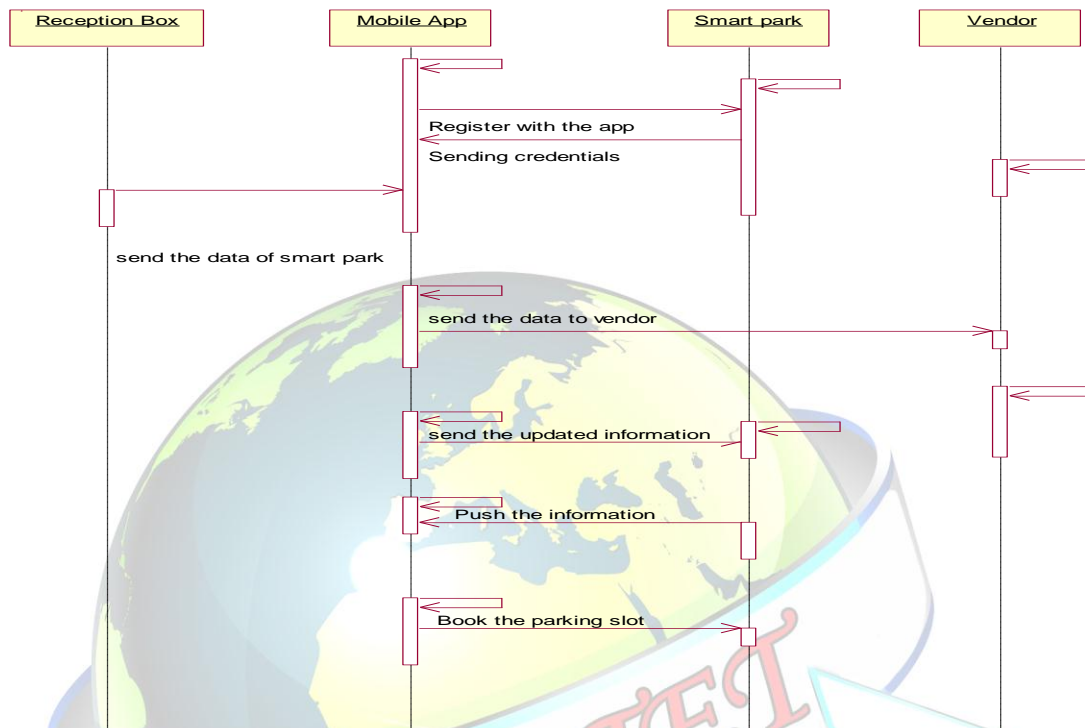
B. Li Fi

As LED is more commonly used source for room lighting, it is also used in Li-Fi as a data source more sophisticatedly and efficiently to generate data streams. As compare to the IR LED which generate a single data stream with 10-20 kbps speed, these LED's generates a thousands of data streams spreading all over the room where the light can reach with a very fast rate. The potential of these LED's can be increased by using some Luminaire Design Optimization techniques. Recently the R & D centre of pure VLC has achieved 3.5Gbps of data rate from a single color micro LED operating at 5mW with a 1m distance and 1.1Gbps of data rate at 10m at 5mW. So it can be concluded that by using three colors RGB LED's the data rates of more than 10Gbps can be achieved.

At the IEEE Photonics Conference in October, Li-Fi consortium showed off the progress of combining both emitters and photodiodes to detect light using available red,



green and blue LED's. By doing that the system could both send and receive data at aggregate rates of 110 Mbps.



Sequence Diagram

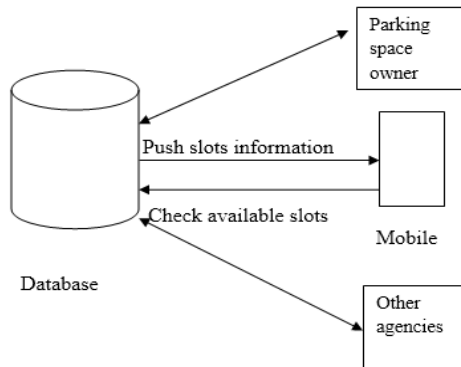
1. Firstly, the user has to download the app and register his details.
2. By the usage of the mobile app we send the credentials to user.
3. The Mobile App processes the information and also shares this information with the vendors.
4. On receiving the data from the Mobile application, vendors process the relevant information and push it back to the mobile application.
5. The Mobile app displays the nearby available parking slots to the user with realtime information and location, hence the user can book the slot in advance.

C. Light - Emitting Diode

Presently, there are two approaches to creating white light. Mixed-color white light which mixes the

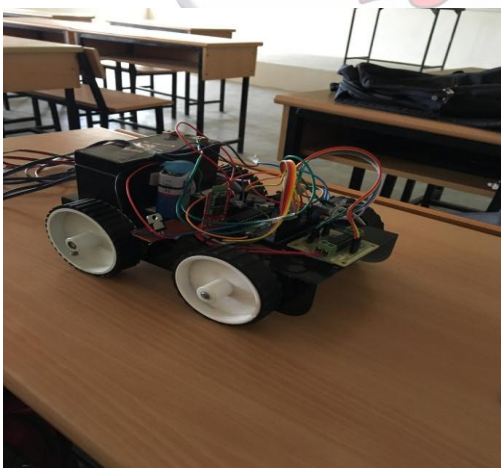
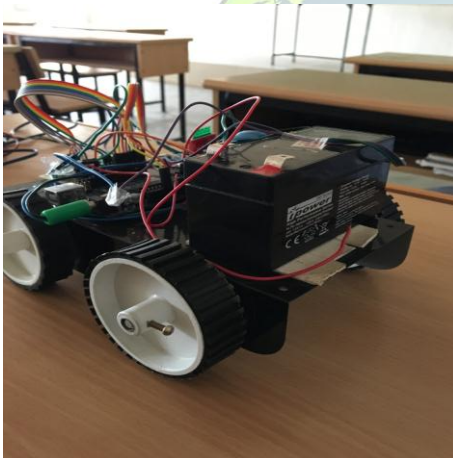
multicolor LED's and Phosphor-converted white light which uses phosphors together with a short-wavelength LED. The three scientists **Isamu Akasaki, Hiroshi Amano and Shuji Nakamura** produced bright blue light beams from their semi-conductors in the early 1990s, they triggered a fundamental transformation of lighting technology. Red and green diodes had been around for a long time but without blue light, white lamps could not be created. Despite considerable efforts, both in the scientific community and in industry, the blue LED had remained a challenge for three decades.

They succeeded in creating a bright source LED using excitation of a phosphor so that the blue light is converted to white light. For their achievement they are rewarded by Nobel Prize in Physics in 2014. This LED can be efficiently used as a Li-Fi source and reduces the cost of emerging Li-Fi market by having very long lifetime (100 000 hours).



Car Parking System Overview

D. Screenshots



D. Applications & Advantages of Li-Fi

The Various applications of Li-Fi system providing a reliable, secure, cheaper and ultra-high-speed communication infrastructure are as follows:

a) Smart Lighting: The Li-Fi transmitter is a great combination of data source producing thousands of data streams as well as light source producing a much brighter light. So it can be effectively equipped with street lamps serving multiple users and multiple users can talk to street lamps.

b) In Vehicles Light: We can use the Li-Fi in vehicles head lights and back lights developing an intelligent transport system where cars can talk to each other and also to the traffic lights providing statistics.

c) Undersea Water: Radio Frequencies can't propagate undersea water as its salty, high conductivity and due to a high attenuation but light does. Cables are creating threads in communication undersea water so they can be replaced with Li-Fi transmitters by which communication is freer to explore. Also they can send data to submarines, to surface as well as to divers with their head lights.

d) In Home Appliances: Li-Fi system can be integrated in home appliances like thermos, freeze, clocks, TV's etc. connecting to an Internet to reduce energy consumptions for intelligent energy management.

e) In Health: The wearable Li-Fi transmitter like LED ear rings, wrist watches etc. can allow to monitor your health issues more sophisticatedly and providing any health



concern changes to your family doctors by connecting to the internet and updating your information online.

f) Indoor Navigation: The Li-Fi system allows you for an indoor navigation where the LED lights sources are used like shopping malls, cinema theatres, government offices, work offices or any indoor locations.

g) In Hospitals: The Li-Fi transmitters can be enhanced in hospitals also where the RF wave does not. They can be used in different machines to communicate with each other for fast data interpretation.

h) In Petrochemical Industries: These industries do not allow RF because various radioactive chemicals are used for processing. The Li-Fi system can be used here as it uses a VLC.

i) Security: As the visible light cannot penetrate the walls the security can be achieved at higher levels.

II. CONCLUSION

As the electromagnetic spectrum shrinking continuously the Li-Fi system will go to provide a greener, safer, better and healthier future for communication system. When this system will be developed each light source can be used as a Li-Fi AP means where is a light there is a Internet. Also it will shape the better future for human kind by reducing the energy consumption, data as well as light at low cost, minimal cellular infrastructure and creating the employment opportunities at large scale. In short the Li-Fi system will be going to change the scenario of wireless communications in many greener ways.

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