IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

Toll Booth Collection using Li-Fi

Shivani Sharma[1], Aayushi Shah[2], Saifalli Shaikh[3], Harsh Shirke[4], Prof. Gauri Bhange[5]

Computer Department, Sinhgad Academy of Engineering, Pune[1,2,3,4,5]

Abstract: This paper focuses on faster data transmit at toll plaza by using Li-Fi module which will reduce the problems that arise in ETC. The Li-Fi mechanism is implemented in every vehicle and at toll plaza. At the toll plaza, once the vehicle's Li-Fi transmitter is paired with the Li-Fi receiver, the system at toll plaza automatically identifies the vehicle details. This paper is based on Li-Fitechnology; the Li-Fi system uses Li-Fi which collects information of vehicle passing through the toll plaza and automatically debits the toll amount from prepaid account of vehicle owner, which in return reduces the traffic congestion and human errors. When the vehicle will pass through toll gate the amount of toll will automatically be reduced from its account and give deduction message to vehicle owner. This OWC technology uses light from Light-Emitting Diodes (LEDs). The light received by photodiode is converted to binary data and is fed to the microcontroller. The microcontroller is connected to the serial port of the PC. This gives a win condition for both toll authorities and toll customers.

Keywords: Li-Fi (Light Fidelity), LED, Transmitter, Photodiode

I. INTRODUCTION

Due to the growth in the number of vehicles, we need expansive roads to cater to thousands of vehicles moving across India that has become inevitable. However, the present situation of the current toll system has several drawbacks. Due to the limited number of toll booths and manually collection process, the average waiting time per vehicle is 10-15 minutes. This results in loses worth thousands of crores of Rupees in terms of fuel wastage. This long wait time often results in drivers getting irritated and in verbal spats and physical fights among people and the toll attendants. This paper finds a solution to problems regarding manually toll payment with the help of Li-Fi module. Automatic toll payment system uses li-fi technology which is constitutes a unique id and a li-fi module with user details, which is placed in the mobile. When the car crosses the toll booth it acts as a li-fi transmitter, while the toll booth acts as a receiver and receives details and payment.
The OWC technology uses light from light-emitting diodes (LEDs) as a medium to deliver networked, mobile, high-speed communication. Li Fi is a bidirectional, high speed and fully networked wireless communications system similar to Wi-Fi. It uses visible light communication. Li-Fi could lead to the Internet of Things with LED lights on the electronics being used as Li-Fi internet access points. In this paper, Section II shows the literature survey of previously published papers. Section III describes the architecture of the existing system and details about the proposed system. Section IV describes the methodology of the system, Section V gives the conclusion in brief. Last Sections read the Acknowledgement and References. We have using two way communication. Android application is used by users. Two-way communication involves feedback from the receiver to the sender. This allows the sender to know the message was received accurately by the receiver. Communication is also negotiated which means that the sender and receiver listen to each other, the messages then gathers information to respond. One person is the sender, which means they send a message to another person via face to face, email, telephone, etc. The other person is the receiver, which means they are the one getting the senders message. Once receiving the message, the receiver sends a response back. For example, Person A sends an email to Person B --> Person B responds with their own email back to Person A. The cycle then continues. This chart demonstrates two-way communication and feedback.

II. LITERATURE SURVEY

1. The National Automatic Toll Collection System For The Republic Of Poland

This paper presents an approach for wireless data communication between two systems through visible light. Use of visible light for wireless communication can solve issue of lack of radio wave spectrum space that will increase the data transmission rate. The proposed system demonstrates transmission and reception of data by switching LED on and off at very high intensity which is too fast to be noticed by human eye. This paper describes the design, fabrication, and capabilities of visible light based data communication, as well as the development of the LED and photo sensor based optical wireless communication system. The data is to be send from one PC to another PC using UART serial communication.

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940
International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

2. Automatic Toll Collection System Using RFID

Automatic Toll Tax systems have really helped a lot in reducing the heavy congestion caused in the metropolitan cities of today. It is one of the easiest methods used to organize the heavy flow of traffic. When the car moves through the toll gate on any road, it is indicated on the RFID reader that it has crossed the clearing. The need for manual toll based systems is completely reduced in this methods and the tolling system works through RFID.

3. Road Traffic Management and Safety Using Li Fi Technology

Li Fi is a bidirectional, high speed and fully networked wireless communications similar to Wi-Fi. It uses visible light communication or infra-red and near ultraviolet spectrum. This OWC technology uses light from light-emitting diodes (LEDs).Proposed application of VLC includes use of Li Fi technology at traffic signals.

4. Automatic Toll Payment With Vocatus Detection Using Li-Fi

This paper focuses on faster data transmit at toll plaza by using Li-Fi module which will reduce the problems that arise in ETC by RFID tags. The Li-Fi mechanism is implemented in every vehicle (four wheelers) and at toll plaza. Alcohol sensor is attached to every vehicle in-order to identify the drunken driver. At the toll plaza, once the vehicle's Li-Fi transmitter is paired with the Li-Fi receiver, the system at toll plaza automatically identifies the vehicle details and alcohol consumption details for fine payment along with toll fare.

IV. ARCHITECTURE

A. Existing System

In the existing system, the toll payment is with manually is linked to a prepaid account from which the applicable toll amount is deducted. A manual lane can process approximately 400 vehicles per hour in comparison to a free flow free way lane, with capacity approaching 2,000 vehicles per hour. To overcome from this problem we can proposed new system toll using Li-Fi.

B. Proposed System

The block diagram of the proposed system consists of three modules:

a. Toll Enquiry Module
b. Toll Monitoring Module
c. Car Detector Module

In the existing time, all vehicles which get manufactured are initially registered by their manufacturing company with the government authority. The registered vehicles display a vehicle registration plate and carry a vehicle registration certificate. These details get stored into the microcontroller embedded within the vehicle which is the actual data which gets transferred through Li-Fi to the toll plaza. When the vehicle approaches the toll gate, initially the IR sensors placed on either side of the toll booth detect the arrival of a vehicle as it interrupts the IR waves passing. This point of time, the gate closed and the vehicle's position is in such a way that the Li-Fi transceiver in the vehicle door and the Li- Fi receiver at the toll booth communicate where the former transmits the vehicle details stored in the microcontroller and the latter receives.
The Li-Fi receiver at toll booth updates the contents in the server and the database. Hence the vehicle details get stored and the fare amount gets deducted from the prepaid account of the user which is also notified to the user via SMS. This payment procedure is done the vehicle is free to move out of the toll plaza. All this happens within few seconds as Li-Fi is very fast in transmission. The user can change the one way or two way toll as per his requirements of travel.

C. Experimental Setup

Following are modules in the application.

a. Add users : In this module, system will add new users. Users will fill all details like name, vehicle number, license number etc.
b. Add toll booth : In this module, system will add new toll booth. Toll booth will register to application. After registration, login credentials will assign to toll booth.
c. Add vehicle : In this module, system will add new vehicle. Vehicle will register to application.
d. Add money : User can add money to his wallet. While paying toll, money will be deducted from wallet.

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940
International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

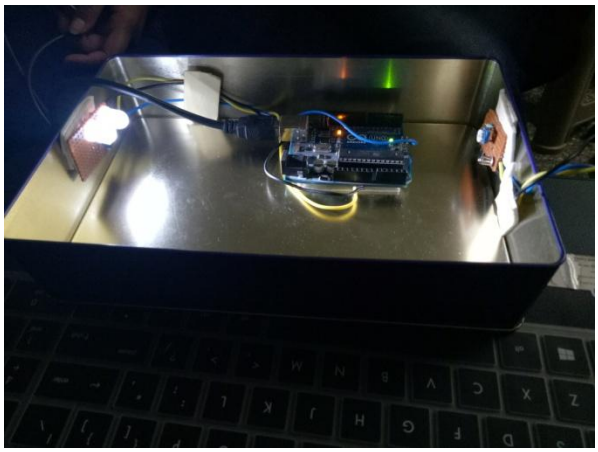
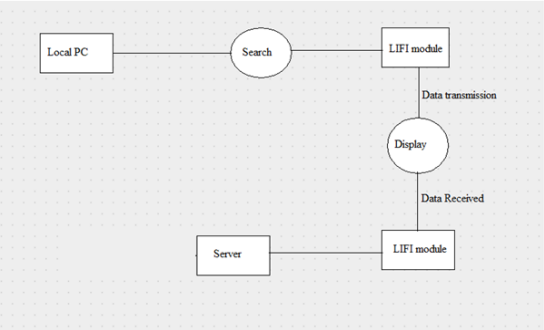


Fig. Experimental setup

Transmission through LIFI :

The principle of Li-Fi is based on sending data by amplitude modulation of the light source in a well-defined and standardized way. LEDs can be switched on and off faster than the human eyes can detect since the operating speed of LEDs is less than 1 microsecond. This invisible on-off activity enables data transmission using binary codes. If the LED is on, a digital '1' is transmitted and if the LED is off, a digital '0' is transmitted. Also these LEDs can be switched on and off very quickly which gives us a very nice opportunity for transmitting data through LED lights, because there are no interfering light frequencies like that of the radio frequencies in Wi-Fi. Li-Fi is thought to be 80% more efficient, which means it can reach speeds of up to 1Gbps and even beyond. Li-Fi differs from fibre optic because the Li-Fi protocol layers are suitable for wireless communication over short distances (up to 10 meters).



VI. METHODOLOGY

Step1. The user will login directly if he/she has an account or else they'll register first to create an account.

Step2. The admin will register the toll booth details and will fetch the user details. The admin can create,view,modify or delete the entries.

Step 3. As the vehicle comes in contact with the toll booth barrier,the vehicle and user information is transmitted via Li-fi.

Step 4. The vehicle is then authenticated and the toll amount is deducted from the user's wallet.

Step 5. After the transaction is completed, the toll barrier is lifted up and the vehicle can pass.

Step 6. The toll receipt is generated and the user can view it in his account.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

V. RESULTS

The admin can manage the list of toll booths,users,toll collections,etc as shown in fig 1.

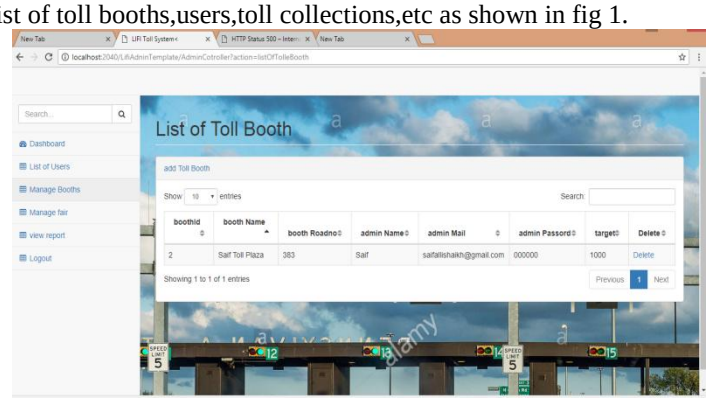


Fig. 1

User will login to application by entering login credentials to application. User will enter login id and password to application. It is shown in fig. 2

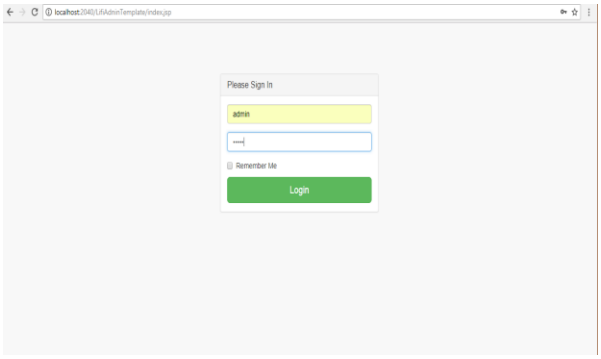


Fig. 2

User will add vehicle details while registration like add vehicle company, vehicle color, no. of wheels and vehicle number as shown in fig. 3 List of all toll booth will be displayed on application. List of user is also stored in database.

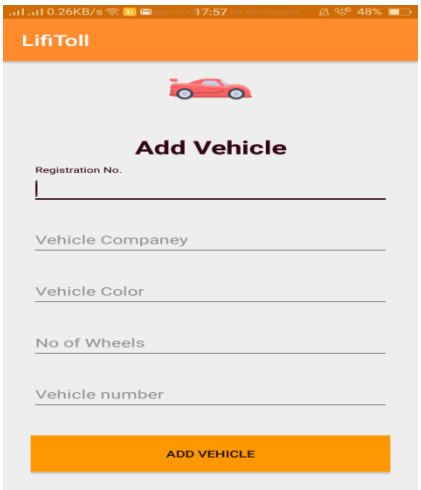


Fig.3

User will pay money through dummy wallet. Transaction history is shown below in fig. 4

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940
International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

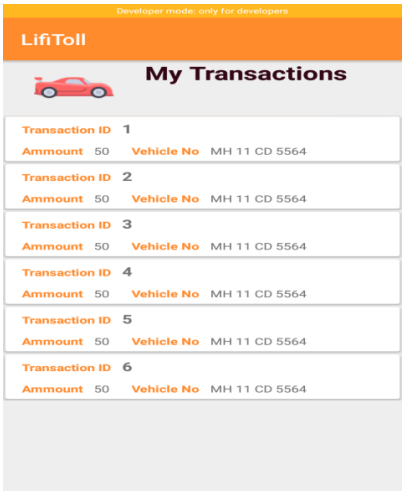


Fig. 4

Receipt will be generated after paying toll as shown in fig.5

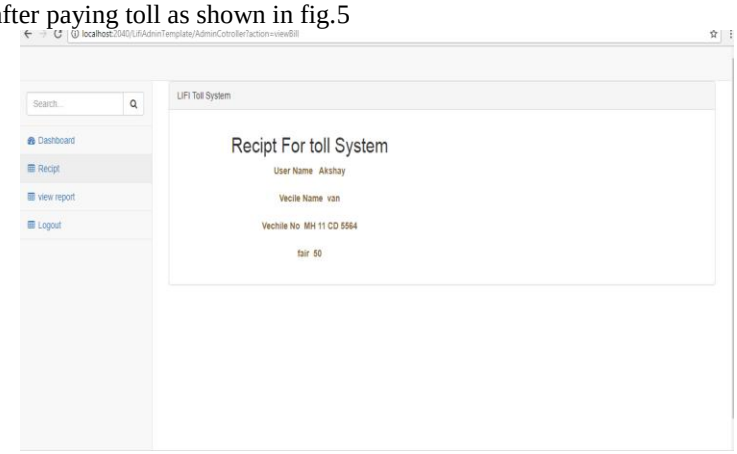


Fig. 5

VI. CONCLUSION

The use of Li-Fi technology along with Wi-Fi in automatic toll payment will be more efficient. This idea not only reduces the time for the users but also reduces the manual paper work that is being done at the present. Thus the use of Li-Fi will increase the speed of data transfer. And our paper can be extended with Gi-Fi technology which can be a replacement to Wi-Fi. Now Wi-Fi is getting overloaded and it used for short-range high-data rate links, it useful to offload the excess demand to Li-Fi. The idea of Li-Fi technology is currently attracting us and it offers tremendous scope for future research and innovation. As light is everywhere and free to use possibilities increases to a great extent to the use of Li-Fi technology.

ACKNOWLEDGEMENT

It gives us great pleasure presenting the project paper on “Toll Booth Collection Using Li-Fi“. We would like to take this opportunity to thank our guide **Prof. Gauri Bhange** for giving us all the help and guidance we needed.

REFERENCES

[1] Andy Flessner. Autolt v3: Your Quick Guide. O’Reilly Media, 2007.
[2] D. Tsonev, H. Chun, S. Rajbhandari, J. McKendry, S. Videv, E. Gu,M. Haji, S. Watson, A. Kelly, G. Faulkner, M.Dawson, H. Haas, and D. O’Brien, ―A 3-Gb/s Single-LED OFDM-Based Wireless VLC Link Using a Gallium Nitride µLED ,‖ IEEE Photon. Technol. Lett., vol. 26, no. 7, pp. 637–640, Apr. 2014.
[3] H. Haas, ―Wireless Data from Every Light Bulb,‖ TED Website, Aug.2011. [Online]. Available: http://bit.ly/tedvlc

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 7, Issue 5, May 2018

[4] Hussain, et.al. - ―A Prototype Model For Realistic Driving Environment System ‖International Conference on Emerging Technology Trends in Advanced Engineering Research(ICETT-2012), Published by IEEE Press and in IEEE Explorer, pp 52 - 57.Baselious Mathews II College Of Engineering, Sasthamcotta, Kollam, Kerala, India, Feb' 20th-21st 2012(ISBN 978-93-80624-62-4).

[5] Ivan Gudymenko et.al. ‖ A simple and secure e-ticketing system for intelligent public transportation based on NFC‖ Proceeding URB-IOT '14 Proceedings of the First International Conference on IoT in Urban Space ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering) ICST, Brussels, Belgium, Belgium 2014

[6] James J. Barbelllo. Handbook for parallel port design. Prompt Publications, 1999.

[7] Mohamed Mezghani ―Study on electronic ticketing in public transport for EMTA‖ May 2008

[8] PrachatosMitra, Retabrata Chatterjee, RonitRay,ParamarthaSaha, RajarshiBasu, SauravPatra, PritamPaul, BidrohiAnanyaBiswas,Department of Computer Science and Engineering,Institute of Engineering and Management,Kolkata, West Bengal, India, Drunken driving detection and prevention models using Internet of things, ©2016 IEEE.