# Integrating Li-Fi Technology with in Urban Street Lighting

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***Abstract*:- The paper presents light fidelity (Li-Fi) based vehicle to vehicle communication. Vehicular networks is a key technology for efficiently communicating both user's devices and cars for timely information regarding safe driving conditions and entertaining applications like social media, video streaming, and gaming services, among others. Many accidents will be avoided by using this technology. The due reason might be because of sudden loss of driver's concentration, brake failure, and loss of stability. The systematic control method of road accident is implemented and the data regarding to traffic is transfers through Li-Fi. The communication happens through LED's. The proposed method is cost-effective and avoids vehicle collision with high data rates capabilities.**

***Keywords: Li-Fi, WiFi, LED based Street Light Controller***

## 1. INTRODUCTION

In wireless networking technology, that uses radio waves to provide wireless data transmission. Among the wireless communication the method of Wi-Fi plays an important role in high data transmission [1]. It has no physical wired communication between sender and receiver. By using electromagnetic wave data has been transmitted. It is actually a broadband network whose frequency range is between 900MHz to 60GHz.The primary differences between the two frequencies is the range and bandwidth that the bands provided. The 2.4GHz band provides coverage at a long range but transmit data at slower speed. The 5GHz band provides less coverage area but transmit data at faster. The range is lower in the 5GHz because higher frequencies cannot penetrate through solid objects like walls. When multiple devices are attempted to use the radio space, overcrowding occurs. Now a day, we required more amounts of data to access different kind of applications, in future everything will be controlled through data, so this will result in high need of radio frequency and that will affect all living things [2]. To overcome these types of problems Li-Fi is used here. Li-Fi is works based on VLC (Visible Light Communication).


Fig.1 Symbol of Li-Fi

It transmits data using light intensity modulation and which uses LED's at transmitting ends and Photo-detectors at receive end [3]. By using modulation and demodulation technique thousands of data transfers in high speed using Li-Fi. The source of light is visible to human eye even the speed of light is in single µs. The activity of 0s and 1s in led is not visible to the human eye. The signal received by photo detector and the data is converted to original. Here, the optical carrier is data transmission and illumination where the data communication is done using visible light waves [4].

## 2. EXISTING METHOD

Li-Fi based bidirectional wireless communication in v2v concept, is already excited in traffic light, the first car stop in the red signal, the package of data are received in the Li-Fi receiver of the car and they conveys this data to the car behind its using its tail light and the front of the another car, this procedure is repeated when the vehicles move away from each other and the communication link is lost.

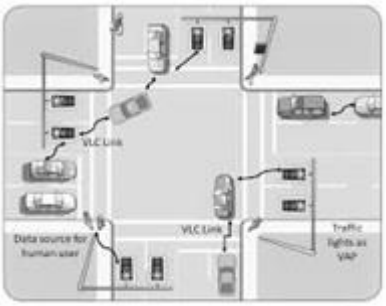

Fig.2 Schematic View of Street light system using Li-Fi

## 3. PROPOSED METHODOLOGY

The road conditions and the details which regarding to traffic are transfers from the transmitter to the receiver of Li-Fi. The receiver is placed in the headlight or tail light of the car A. The transferred data which is displayed over through the LCD display in the car. Imagine that how the data speed is transmitted. When the car 'B' is coming to the street light, the data, which is actually shared in car 'A', the same data which is transmitted to the car B. The data which can also transmitted even if the car is not stable. Because of the speed of Li-Fi transmission is actually 225 GHZps. The focus of light is at range of 6m-10m.So it is more possible, the data will transfer without any fail. If there is any accident in street A the data will transfer through the street light A to street light B and finally reaches the helpline which related to medical or anything. The vibration sensor, which is already added in the all car's for opening air balloon. So, the vibration sensor values are used as an alert data which is transfer through the street light A to street light B. And also, MEMS sensor is added, if there is any modulation in 3D axis (X, Y, Z) the data will

display on LCD. First time in Li-Fi two-way communication is established. The photo-detector, which receive the data and it help to show the data through LCD display. If there is any accident caused in street B, similar process is taken over by sharing the data via street light.


Fig.3 Li-Fi based Street Light System

## 4. SYSTEM IMPLEMENTATION

The implementation of system is designed for two street lights with two numbers of vehicles. The two street lights which was done by performing two-way communication. The one way of communication which uses led lights to transfer the data paralleled the data received at another end of communication using photo-detector. The data transmission is initiated from the car A and the data send via street light A to street light B and by using VLC the data received at car B.

### *4.1 TRANSMITTING SECTION*

The vibration sensor, which is added as input value for a transmitter. The Arduino UNO, which is a heart of this device. The both vibration sensor and MEMS sensor was fixed in the car. If the accident occurs, the vibration which is raised above threshold value the air balloon will open which is common in all cars. But here, in addition of air balloon the data which represents accident is transferred to the receiver in street light A. The transceiver is fixed in street light. Two-way communication is enabled here. The transmitted data from car which is received at street light and the transmitter in street light transfers the data to street light B receiver. The LED at transmission session is focused under the road. The car A is passed under the street light B the vibration sensor value which is display on LCD display at receiver section.

### *4.2 RECEIVER SECTION*

The MEMS technology based sensor, which is fixed with receiver module. In this module the LED and the photo-detector is fixed to enable dual communication. The photodiode detects the signal decode the information by the circuit, which leads to perform with the help of transmitting section. The process is repeated, the signal is focused under the clamp and nearby street light. The light which is focused on the road using clamp is actually varies the intensity of the light beam which carries a message to the vehicle. Here, the transmitter module transmits the data without any inference. Because the transmission speed of Li-Fi is 224 Gbps which makes very easy to transmit the data even the vehicle is under moving condition. The light from vehicle is used to transmit the data from car ‘A’ to street light system ‘A’. The data when reached street light B then the light focused to car B to transmit the data. These transmitted data detected using photodiode and which is acts as receiver at this section. Thus, the performance is done in the receiver.

## 5. CONCLUSION AND FUTURE WORK

The system which is proposed under Li-Fi method is actually reduced traffic collision and manage road activities. In future the self-performance of device is actually implemented to form a free network by performing automatic receiving and transmission in device for maintaining traffic congestion. So that the reason only Li-Fi is used at road maintenance to perform and transfer data at high rates. The street lights which performs as transceiver in future this same concept is more effective to establish V2Vcommunication.The under-water communication using visible light communication instead of using microwave frequencies is also effective. The future data computing is mostly depending on Li-Fi.

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