

Smart Road Navigation System Using Lifi Technology

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Abstract- This paper, presents a new method of road navigation which acts as an alternative to GPS and is named as smart road navigation system using LiFi technology. Light acts as a major source of vision, and our paper presents a concept of using visible light for communication instead of using harmful IR rays. LiFi is a wireless communication technology which uses light rather than radio waves to transmit the data and position between devices. Micro Controller simulates the suggested prototype here to investigate the options of using LiFi in road routing. The transmitter and receiver segments contain a Micro controller which is programmed using Arduino IDE. LEDs are used to information to cars which are moving in the transmitter segment. The receiver segment identifies the signal generated by the LEDs through LDR module in it. The LCD installed at the receiver side indicates the present location and diversions ahead to the user according to the received signal. So this technology is more useful for automatic motorway and wide-lane navigation.

Keywords- LiFi, VLC, LED, LDR.

I. INTRODUCTION

Over 2.5 quintillion bytes of data are created every single day. Wireless communication has become very crucial in our day to day life. Human life is totally dependent on wireless communication. In LIFI technology we transmit data with more speed in parallel bit. Li-Fi uses the Visible Light Communications (VLC). People who are travelling to rural areas cannot always find the correct path easily, majorly during the night time, due to the lack of visibility, nonfunctioning of GPS, since not everywhere in the remote areas we find the mobile network which directs today's navigation. During that time if there is an alternative mean which provides the right pathway and location to the traveller, this lessens the panic of the people taking the road trip. So, to handle this problem, Li-Fi can be installed in the streetlights. It is the recent technology that has emerged in the wireless communication field, here the data can be transmitted using visible light by sending it through LED bulbs that switches faster than the human eye can detect. Li-Fi technology is

wireless communication technology which is an improvised technology of Wi-Fi but it differs in many factors like, level of security, high bandwidth, high frequency, rate of transmission of data etc. This improves the road navigation for sure as it acts as an alternative to GPS and works better where GPS cannot work.

II. RELATED WORKS

This section gives an overview of the related research that has been done regarding Li-Fi technology and smart road navigation system.

“Li-Fi Technology: Data Transmission through Visible Light” [2018]

In this paper, the authors discussed about the technology in detail and how Wi-Fi is replaced by Li-Fi. Li-Fi is ideal for high density wireless data coverage in confined areas where there are no obstacles where Wi-Fi is used for general wireless coverage within buildings while. The author says that Li-Fi is a wireless optical networking technology that uses LEDs for transmission of data. In the present paper the authors will give a detailed study on Li-Fi technology, its advantages and its future scope.

“Outdoor Visible Light Communication for inter-vehicle communication using Controller Area Network” [2017]

In this paper, the author has developed outdoor VLC system based on Controller Area Network (CAN) which is used normally in a ship, cars, planes, product line control system, etc. for vehicle to vehicle (V2V) or indoor vehicle communication head light or back light can be used as common device. This principle has been explained using the application circuit. We found an outdoor VLC problem which is sun light noise and photo detector saturation problem. The signal demonstrates the circuit pulse fashion.

“Li-Fi the path to a new way of communication” [2017]

In this paper author looks at the different factors like the strengths and weaknesses, implementations, challenges, modulation techniques of the VLC and specific LiFi's new coined optical wireless communication technology, and summarizes most of the research and developments and applications achieved so far.

III. PROPOSED METHODOLOGY

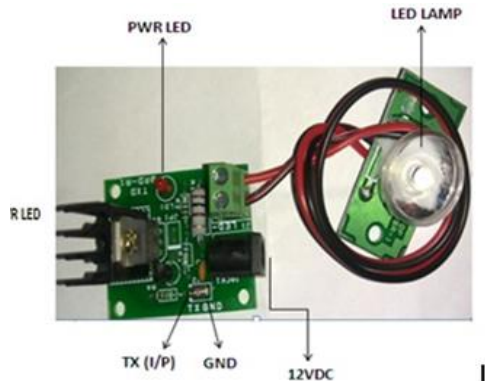


Fig 1: Transmitter section

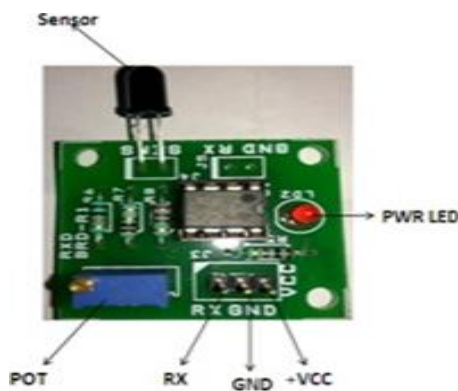


Fig 2: Receiver section

Transmitter

Transmitter circuitry fixed to the street light consists of the following components:

Light Emitting Diode (LED)

LED'S are special type of diodes, which emits light when activated. The electrons in it will recombine with holes when suitable voltage is applied and energy is released in the form of photons and the process is called as electroluminescence. The energy band gap of the semiconductor determines the colour of the light.

Voltage Regulator

This is used to generate a stable output voltage of a circuit for any changes in input voltage. We are using single voltage regulator in the transmitter for voltage regulation purpose and thus the circuit of the project is protected from being damaged.

Crystal Oscillator

To maintain standard clock pulse in the circuitry, by providing a stable frequency crystal oscillator is used.

Receiver

Receiver detects the flickering of light using photo detector and is able to receive the signal. It converts the flickering light of LED bulbs into electrical signal and this circuitry includes the following components.

Light Dependent Resistor (LDR)

LDR is a photocell that works on the principle of photo conductivity. The resistance of the resistor decreases when the intensity of the light falling on it decreases.

Buzzer

Buzzer is used as an optional component. In this circuitry this is used in order to indicate the user that the data has been transmitted and received successfully. When the buzzer is powered the oscillator generates the frequency and the buzzer vibrates to produce the sound.

Liquid crystal display (LCD)

We are using 20x4 LCD in our project in order to display the current locations and the diversions ahead to the user.

IV. WORKING

This project mainly focuses on the navigation where the cellular network will be less and where the GPS system cannot function properly. This project uses LiFi technology which is more advantageous than WiFi, and in this electromagnetic waves and we are using LED'S for illumination and data transmission purpose. The photo detectors register 1 for ON else its 0 for OFF and through the fast switching on and off of LED'S data is transmitted the intensity of the LED'S are varied such that it is invisible to human eye. The proposed design of the project consists of light poles with LED'S and transmit the data that is transmitted and passes it to the microcontroller and then it is converted to

information. When the vehicle passes under the light poles, the data from transmitter is transmitted to the receiver and then it is converted to digital form and the fetched data is displayed on the LCDs screen. The buzzer is activated after the successful data transmission.

V. HARDWARE RESULTS

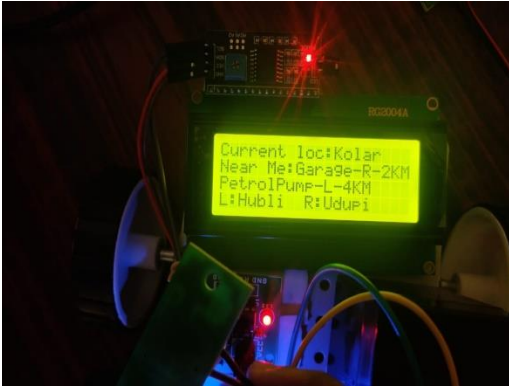


Fig 1: - Data transmitted showing Current

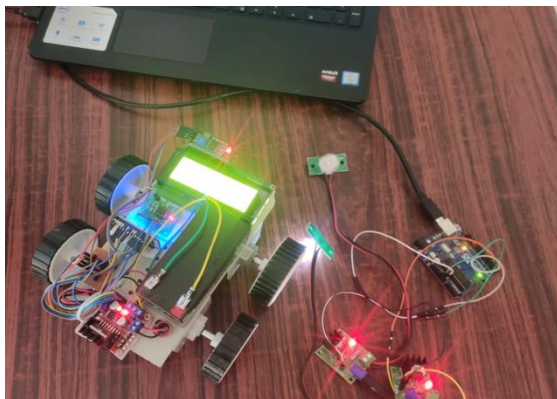


Fig 2: - transmitter and receiver section locations and nearby places



Fig 3: - results when there is no data received

VI. CONCLUSION

- Navigation use of the LiFi system has been successfully addressed.
- Li-Fi technology is rapidly growing as it is cheaper, more efficient and more versatile than Wi-Fi. The transmitting and processing of information takes place in the form of light energy used for motorway navigation.
- The idea of distributing information using the visible light spectrum enables light to be easily modulated such that receivers with light sensors can be selected at extremely high speeds of hundreds of megabytes per second, allowing the light source to relay data.
- Using Li-Fi systems offers a fantastic chance to replace cellular solutions focused on radio. This strategy has the potential to be immensely effective in handling traffic and thereby creating a smart city.

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