Smart Human Vehicle Intraction System Using Lifi

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Abstract: **Our project is on Lifi system which plays a major role. The Lifi is the system where the data are passed through the light. This Lifi transmitter is kept on the street lights. The data from the control station is transmitted through the Lifi transmitter. The data to be transmitted is send from the microcontroller is encoded and passed to the Lifi transmitter. The command can be set as default or the command can be given using keypad and passed through the Lifi transmitter. The another section is the vehicle module , In this part the transmitted signal through the Lifi transmitter which is kept in the street light is received by the Lifi receiver and the data is processed using the decoder. And the decoded data is displayed in the display unit. The control station sends the data according to the place where it is placed. The data is stored to control the speed, controlling the horn, controlling the head light based on the location. The data received is automatically processed and control the system using the microcontroller, the microcontroller operates the motor driver when the speed of the vehicle is to be controlled, and the driver circuit is operated according to the needs to control horn and headlight.**

KEY WORD: Li-fi transmitter & receiver, microcontroller, street light, LCD display.

INTRODUCTION

Li-fi basically known as "light fidelity" is an outcome of twenty first century. The basic ideology behind this technology is that the data century. The basic ideology behind this technology is that the data can be transmitted through LED light whose intensity varies even faster than the human eye. As the transmission of the data takes through the light emitting diodes (LED's) the amount is comparatively small. In modern times, it is called as the optimized version of the Wi-fi. In simple terms, Li-fi can be thought of as a light based wi-fi. That is it uses light instead of radio waves to transmit information. And instead of wi-fi modem, li-fi would use transceiver-flitted LED lamps that can light a room as well as transmit and receiver information. Since simple light bulbs are used, there can technically be any number of access points. This technology uses a part of the electromagnetic spectrum that is still not greatly utilizes. The visible spectrum. Light is in fact very much part of our lives for millions and millions of years and does not have any major ill effect. Moreover there is 10,000 times more space available much more. The technology truly began during the 1990's in countries like in this spectrum and just counting on the bulbs in use, it also multiplies to 10,000 times more availability as an infrastructure, globally. The advantageous things are the wireless communication which decreases the cost enormously. HARALD HASS, who is considered to be the father of Li-fi from university of Edinburgh, UK says that the heart of this technology lies in the intensity and the potential of the light emitting diodes. The major reason which lead the modern man through this invention is that the confinement of Wi-fi to comparatively small distance. As there are more and more devices coming up day-by-day the signals are being clogged up due to heavy traffic, there arise a need for an error free transmission technology. And the solution to this problem was the Li-fi technology. It has been designed in such a way that it overcomes the disadvantages that occurs during the usage of Wi-fi. In general terms, li-fi works even under water thereby causing a great benefit to the military operations. The physicists envision that this technology would make a great difference between the assumption and the proof in the case. The demonstration took place using two casio smart phones. The data was made to exchange between the phones using light. Even through the distance was nominal, it is sure that there would be a rapid increase in the distance of transmission. As there is a limited amount of radio based wireless spectrum available a number of companies formed a consortium called li-fi consortium in order to promote high speed optical wireless system. The member of this consortium believes that a speed of 10Gps can be achieved in no time. If this would be possible then a high clarity image would take about 30 seconds to download.

WORKING PRINCIPLE

Li-Fi technology is a wireless communication system based on the use of visible light between the blue and red. Unlike Wi-Fi which uses the radio part of the electromagnetic spectrum, Li-Fi uses the optical spectrum. The principle of Li-Fi is based on sending data by amplitude modulation of the light sources in a well-defined and standardized way.

The principle is simple: the led turns on and off at high speed and is not visible to humans. This ribbon of on and off signals is interpreted to create binary streams of 0 and 1. Because there are no battling 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 speech of up to 1Gbps. Ia this the future Li-Fi differs from fiber optic because the Li-Fi protocol layer are suitable for wireless communication over short distance up to 10 meters. This puts Li-Fi in a unique position of extremely fast wireless communication over short distances. The technology has already attained IEEE standard certification and is currently being tested at the A Oledcomm head quarters.

WORKING OF LIFI

The working procedures is very simple, if the light is on then transmit a digital 1 if it is off transmit a 0. The led's can be switched on and off very quickly which gives nice opportunities for transmitting data.

Hence all that requires is some led's and a controller that a code data into those led's. all one has to do is to vary the rate at which the led's flicker depending upon the data the led's for parallel data transmission, or using mixture of red, green, and blue led's to alter the light's frequency encoding a different data channel.

DATA TRANSMISSION

as Wi-Fi hotspot and cloud computing are rapidly increasing reliable signal is bound to suffer. Speed and security are also major concerns. They are vulnerable to hackers as it penetrates through walls easily. Li-Fi is said to overcome this. This new technology is compared to infrared remote controls which send data through and led light bulb that varies in intensity faster than the human eye can see. In near future we can see data for laptops. Smart phones and tablets transmitted through the light in a room. Li-Fi is the light fidelity is a fast and cheap optional version of Wi-Fi, the technology of which is based on visible light communication.

VISIBLE LIGHT COMMUNICATION

There are many waves such as radio waves, infrared rays, Gama rays, ultraviolet rays, x-rays, visible rays. But at first radio waves, it is expensive and less secure. Infrared rays, due to eye safety regulation can only base with low power. Gama rays cannot be used as they could be dangerous. Ultraviolet light is good for place without people, but otherwise dangerous. Ultraviolet light is good for place without people, but otherwise dangerous for the human body.

The visible rays are safe to use larger bandwidth. Visible light communication is a data communication medium. Which uses visible light between 400 THz and 800 THz as optical carrier for data transmission and illumination? Fast pulses are used for wireless transmission. Communication system components are: 1.A high brightness white led which acts as a communication source.

2. Silicon photo diode which shows good response to visible wavelength region. Led illumination can be used as a communication source by modulation the led light with the data signal. The led light appears constant to the human eye due to the fast flickering rate. The high data rate can be achieved by using high speed led's and appropriate multiplexing techniques. Each led transmits at a different data rate which can be increased by parallel data transmission using led arrays. Many different reasons exist for the usage of led light in a spite of fluorescent lamp, incandescent bulb ect which are available.

DESIGN OF LI-FI

Li-Fi architecture consists number of led bulbs or lamps, many wireless devices such as PDA, mobile phones, and laptops. Important factors we should consider while designing Li-Fi as follows:

1. Presence of light must be line of sight.
2. Lamp driver where internet connection, switches and led lamps connected.
3. for better performance use led bulbs.
4. A photo detector received data.

Blockdiagram

CONTROL SYSTEM

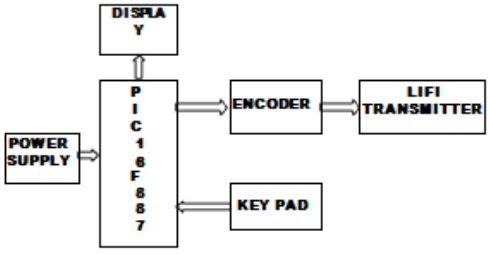
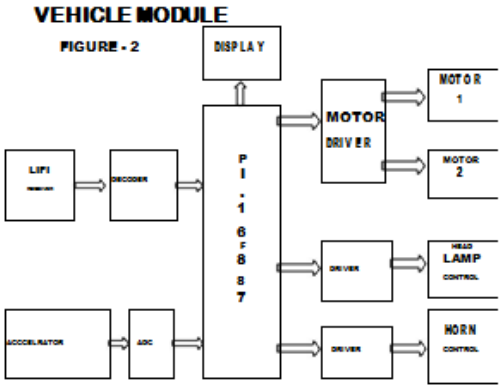


FIGURE-1



The above two figures 1 and 2 shows the two modules called control module and the vehicle module respectively.

DESCRIPTIONS: 1. ADC refers the analog to digital convertor 2. Li-Fi refers the light fidelity. 3. Drivers refer to motor, light, and relay driver respectively

EXPLANATION OF BLOCKS

MICRO CONTROLLER: The name PIC initially referred to "Peripheral Interface Controller".

- High-performance RISC CPU.
- Only 35 single word instructions to learn.
- DC - 20 MHz clock input
- DC - 200 ns instruction cycle
- Timer0: 8-bit timer/counter with 8-bit per scalar.
- Timer1: 16-bit timer/counter with pre scalar can be incremented during sleep via external crystal/clock.
- Timer2: 8-bit timer/counter with 8-bit period
- Register, pre scalar and post scalar.
- 10-bit multi-channel Analog-to-Digital converter.

Power Supply

- The 230V ac supply is converted into 12V ac supply through the transformer.
- The output of the transformer has the same frequency as in the input ac power.
- This ac power is converted into dc power through the diodes.
- Here the bridge diode is used to convert the ac supply to the dc power supply.
- This converted dc power supply has the ripple content and for the normal operation of the circuit, the ripple content of the dc power supply should be as low as possible.
- Because the ripple content of the power supply will reduce the life of circuit.

- So to reduce the ripple content of the dc power supply, the filter is used.
- The filter is nothing but the large value capacitance.
- The output waveform of the filter capacitance will almost be the straight line.
- This filtered output will not be the regulated voltage.

Relay Driver

- The relay driver circuit is enabled certain time duration only.
- such enable pulse is depended by delay programming of microcontroller.
- Here darling circuit has been two transistors made connection of cascade network.
- If input is set to base of the first transistor, then that is turn on and emitter current of that turn the another one.
- Hereby the circuit is closed through coil and second transistor.
- Now the energized coil is controls the contactors that are change the normally open to close and normally closed to open connection.
- The enabled signal is not essential after energized that coil because transistor collector current maintains the transistors in saturation state continuously.

Motor Driver

Lcd Display

- A liquid crystal display (LCD) is a flat panel display, electronic visual display, video display that uses the light modulating properties of liquid crystals (LCs).
- LCs do not emit light directly.
- They are used in a wide range of applications, including computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc.
- They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones.
- LCDs have displaced cathode ray tube (CRT) displays in most applications.
- LCDs are more energy efficient and offer safer disposal than CRTs.
- Its low electrical power consumption enables it to be used in battery-powered electronic equipment.

Analog to Digital Convertor

- ADC0808, ADC0809 Analog to Digital converter is a successive approximation type analog to digital converter.
- The successive approximation technique uses a very efficient code search strategy to complete n-bit conversion in just n-clock periods.
- The ADC0808, 0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter,
- ADC0808 equivalent to MM74C949
- ADC0809 equivalent to MM74C949-1
- 8-channel multiplexer and microprocessor compatible control logic.
- Easy interface to all microprocessors.
- 0V to 5V input range with single 5V power supply

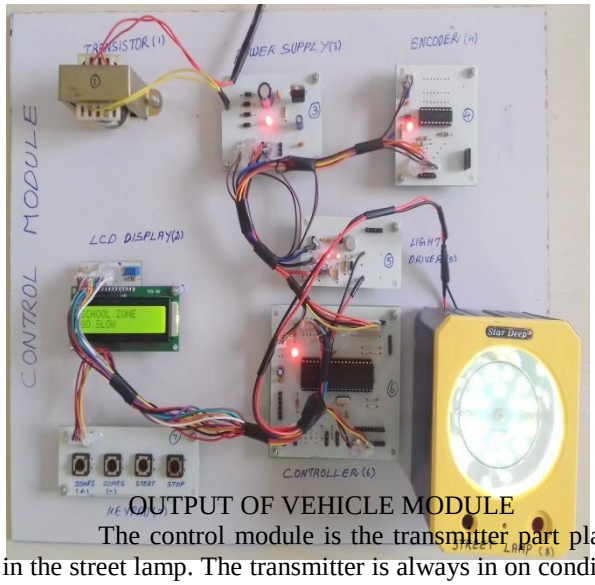
Advantages

- Li- Fi uses light rather than radio frequency signals so are intolerant to disturbances.
- Integrated into medical devices and in hospitals as this technology doesn't deal with radio waves, so it can easily be used in all such places where Bluetooth, infrared, Wi-Fi and internet are broadly in use.
- Security is a side benefit of using light for data transfer as it does not penetrate through walls.
- On highways for traffic control applications like where Cars can have LED based headlights, LED based backlights, and they can communicate with each other and prevent accidents.
- Using this Technology worldwide every street lamp would be a free data access point.

Li-Fi

- Li-Fi is the light fidelity speed of Li-Fi that transfer is greater than 1Gbps.
- The medium of data transferring is the light used as a carrier.
- The spectrum range is visible light spectrum has 10,000 time broad spectrum in comparison to radio frequency.
- The cost is cheaper than the Wi-Fi because free band does not need license and it uses light.
- The network topology used is point to point topology.
- The frequency that is operated is hundreds of TERA Hz.

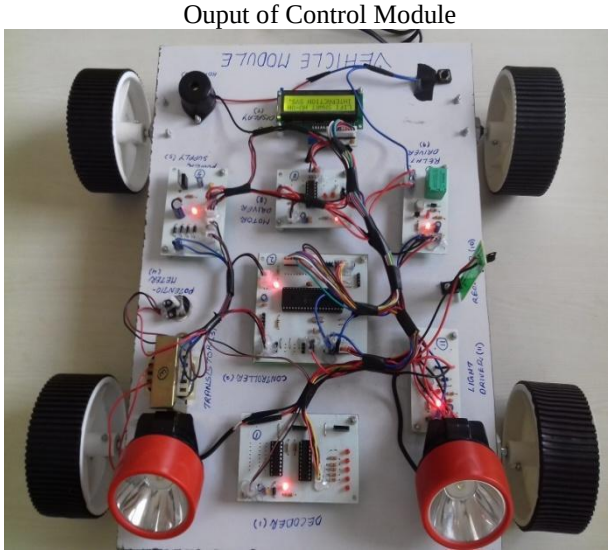
Output Analysis



OUTPUT OF VEHICLE MODULE

The control module is the transmitter part placed in the street lamp. The transmitter is always in on condition so by using CL100 the negative pin is connected to the ground only when it receives the signal from the transmitter. The BC456 supplies the positive supply

Ouput of Control Module



Working

First the power supply is given to all the components. Then the two pic microcontroller controls all the other devices of both modules. Then the encoder converts the digital signal received from the controller of control module to the light signal then given to street light to transmit the data. Then the signal transmitted from the street light is then received by the receiver of vehicle module and then given to the decoder which decodes the light signal to the digital signal that is given to the controller of vehicle module. Now both the transmitter and receiver are connected each other here the four zones place a role that are controlled by the key pad. That is according to the zones the function is controlled by the keypad.

Keypad - Four Zones

1. School zones, 2.hospital zones, 3.high-way zone, 4.both school and hospital zones.

Here the speed of the vehicle is controlled. The speed is reduced in the school by 30km/hr so that if any students crossing that zone the driver react immediately by applying the break that avoids the accident and also it will not affect the engine system of the vehicle by applying the break in 30Km/hr. Next in hospital zones the horn is limited due to two reasons of 1.for patient health and 2. Due to the noise pollution that affects the public too. In the high-way zone the light intensity is reduced and according to the light intensity around the vehicle the light is dimmed and brightened. In the both school and hospital zones the both the horn and speed is reduced but if in case of emergency the voice will be activated that “emergency please all public move away” these are the zones activities. fields, military field, industrial field and many other fields.

MATLAB DISCRIPTION

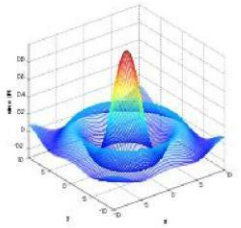
MATLAB is a "Matrix Laboratory", and as such it provides many convenient ways for creating vectors, matrices, and multi-dimensional arrays. In the MATLAB vernacular, a *vector* refers to a one dimensional ($1\times N$ or $N\times 1$) matrix, commonly referred to as an array in other programming languages. A *matrix* generally refers to a 2-dimensional array, i.e. an $m\times n$ array where m and n are greater than or equal to 1. Arrays with more than two dimensions are referred to as multidimensional arrays. MATLAB provides a simple way to define simple arrays using the syntax: *init*: *increment: terminator*. For instance: here we have used the MATLAB for the simulation purpose the output for the MATLAB simulations are,

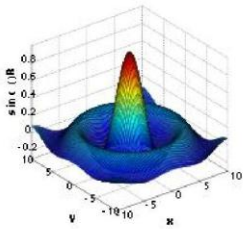
CONCLUSION

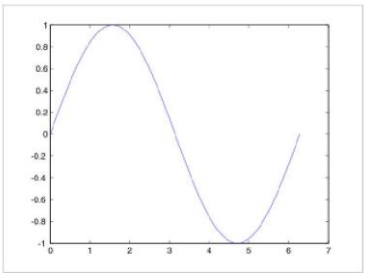
Therefore by using this Li-Fi technology the possibilities are numerous, also can be explored further and electromagnetic waves can be reduced which influences the green environment. The data passed through light is very fast than the radio frequency range so if this technology can be put into practical use, every bulb can be used something like Wi-Fi hotspots to transmit wireless data, and an another main purpose in this technology is security, that the message passing through light cannot be hacked like Wi-Fi. No specific bandwidth is allocated to light so cost wise its is cheaper than the Wi-Fi. So this Li-Fi technology is a safety and also advantageous of transferring data at faster rate and also that cannot be done through the Wi-Fi.. Since vehicle is the second major property next to mobile phone used by public now-a-days this wireless technology will be the best next to Wi-Fi.

FUTURE SCOPE

In future we can implement both transmitter and receiver in the same vehicle and control all the parameters of vehicle and also accessing to the parameters of environment around us like climate, road signs, directions traffic, ect. We can also sink this vehicle to the common important zones like in petrol bunk mobiles should no operated power plant areas Education







The first two graph represents the 3-dimentional and the third graph is the sine function.

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