LIFI BASED ROUTE NAVIGATION SYSTEM

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ABSTRACT:

This project presents a smart highway navigation system by using Li-Fi technology. The light fidelity technology refers to visible light communication that uses light as a medium to deliver high-speed data in a manner which is much greater than that of Wi-Fi. Over here the proposed prototype is simulated on PROTEUS 8 professional software to explore the possibilities of using LiFi in highway routing. The transmitter and receiver sections contain atmega328 which is programmed by using Arduino IDE. High intensity LEDs are used in the transmitter section for delivering high-speed data to moving vehicles. Further, in the receiver section LDR module is used to detect the signal generated by the LEDs. According to the received signal the information of present location and further diversions is displayed on the LCD installed at the receiver. Thus, this technology is more useful for automatic navigation on highways and broad-lanes.

Keywords: LIFI, Solar panel, keypad, LIFI TX, LIFI RX.

INTRODUCTION

LiFi technology uses led‟s for transmitting data. It is derivative of optical wireless communication technology using light from Led to deliver high speed communication. Visible light communication works by switching the Led off and on at very high speed, it can‟t noticed by the human eye. The intensity of the LiFi LED emitter is kept low enough so that it cannot be seen by the human eye but high enough to carry out the communication easily. It is also very secure from hacking as the light cannot penetrate the walls. However, this also limits the range. This is advantageous in electromagnetic sensitive areas where electromagnetic interference is especially

avoided like hospitals, nuclear power plants and aircrafts. Although WiFi and LiFi both employ electromagnetic spectrum to transmit information, WiFi uses radio waves and LiFi uses visible light. Li-Fi has almost no limitations on capacity. Visible light spectrum is 10,000 times larger than the entire radio frequency spectrum. The light signals are transmitted via wireless channels to the receiver. The detector in the receiver converts the optical signals to recover the message. Since light cannot travel through the walls, hence LiFi signals can be secured in physical space.

In today world, communication between the devices are much common. Radio wave spectrum is very small part of spectrum available for communication. Wi-Fi and Bluetooth are currently the two prominent short range wireless technologies But with increase in advanced technology and number of user the network becomes overloaded which results in failure to provide high data rate. Visible light acts as rival to the present wireless radio frequency communication by achieving larger bandwidth and high data rate. Because with larger frequency spectrum it is possible to provide a larger portion of the bandwidth to each user to transfer information. A switching LED can be improbably causing annoyance, but data can therefore be encoded in the light by varying the rate at the LEDs switch on and off to provide various strings of 1's and 0's. The use of fast pulses of light to transfer data without physical connection such method is called as Visible light communication (VLC).The LEDs can be switched ON and OFF very fast which is not noticeable by human eye thus the light source appear to be constantly on.When these signals transmitted to the receiver via the wireless channel, the photo diode will convert these optical signals to electrical signals and the original information will be recovered..

As the demand for wireless data communication is increasing rapidly, new technologies are arriving which uses the different frequencies in electromagnetic spectrum as the carrier for transmitting data wirelessly. Wi-Fi is one such method which uses radio waves to communicate wirelessly within an area. As radio waves have some drawbacks, it is replaced by visible light and hence the emerged technology is called Li–Fi technology. Li–Fi technology uses visible light frequency (430THz770THz) which is comparatively higher than that of radio wave frequency (3kHz – 300GHz). LED is used as a source of VLC (380nm – 740nm) to transmit information. LED which is used as the source for text data transmission has high

brightness, low cost, small size, low power consumption, long lifetime and low heat radiation and hence it is used as a substitute for established radio waves. High flickering LED is used to transmit data, wherein the change in current intensity is detected by photo detecting resistor and is not visible to human eyes. When the LED is Off, data '0' is transmitted and similarly when it is on data '1' is transmitted. Related Work: In reference with [1] transmitter and receiver have been implemented where the flickering in LED is basically used as the signal to be transmitted. The rapid ON (transmits 1) and OFF (transmits 0) of the LED is used to encode a string of data signal. In the receiver the data is converted into digital signals with the help of modulation. The optical concentrator is using to compensate for high spatial attenuation due to the beam divergence from the LEDs to illuminate large area. In reference with [2] audio transmission using Li-Fi have been implemented. They have implemented Li-Fi transmitter module consisting of amplifiers and power LED whereas the LI-Fi receiver module consists of amplifiers and LDR. They have used a way like Wi-Fi hotspots which are used to transmit the data wirelessly. This reduces the electrical overhead and is ecofriendly and hence the environment will be more radiation free zone. In reference with [3] 2D Image transmission have been implemented using Li-Fi. They have used light as a data transmission medium to securely transmit data as it overcomes the disadvantage of data leakage and efficiently transmit multimedia data over a medium. It uses Visible light communication technology.

Increasing the number of vehicles, particularly in some metropolises such as Delhi Kolkata and Mumbai etc., makes it really difficult to solve the problems of car accidents and hazards. Accidents in these cities have reached the stage of standards and are causing risks and loss of people. In dispute this dilemma, driving safety systems have been designed according to the specifications and have been promoted for many years in many developed countries. Thousands of cars are robbed in the highways and unsecured parking spaces every year. Sometimes by opening the door or breaking windows, thieves attempt to steel the vehicle parts. Because of such incident people are scared to leave the vehicles on the road or unfamiliar parking areas. Several prototypes and technologies have been designed and implemented

within the vehicles to avoid this problem. Besides the fact that such kinds of alarm systems are restricted to some distance, the driver may not have the chance to set other related safety measures that may discourage the automobile from being stolen[1] when assaulted at the gunpoint. This demonstrates that most conventional vehicle safety systems are ineffective in the handling of advanced theft. Designing an automobile safety device[2] and sharing data the owner's mobile phone tracking will however be the effective solution for the current situation and need. An automobile monitoring system is an electronic device that is mounted in a car so that the driver or a third party can determine the location of the vehicle. There are technical details which can be used to describe the ability to judge a mobile station's location, including position, geolocation, and radiolocation. By position, we mean mobile station's coordinates which can be three dimensional or two dimensional. It also includes details such as longitude and latitude of position of the mobile station. There are some firms that have the requisite technologies in vehicle monitoring[3] but their customers have to pay for the subscription made services that make it incredibly costly to access to the majority an accurate and cost-effective vehicle monitoring and security system is needed for this reason. This paper describes a lower cost monitoring and safety program for vehicles that needs very little maintenance. This could be run by the vehicle owner and does not need to pay the third party their monthly charges. The proposed solution will relay the vehicle's location information for or at a certain pre-set period as needed. The system contains a hardware device mounted in the vehicle body and a user controlled cell phone to monitor. The system collects signal from the GPS satellites[4] and sends this data via SMS to the user's phone, using the GSM module installed in the device. The information sent to user controlled cell phone will be processed and loaded into a GIS interface.

LITERATURE SURVEY

The Li-Fi technology are being developed to improve the data rate, efficiency and low power consumption. LiFi is a bidirectional network system and provides a substantially similar experience as WiFi to the user. As we move toward the future, the connectivity demands are going to increase exponentially.[6] To cater to these demands we need higher spectral capacity network. With, LiFi we can utilize the

spectrum 100000 times greater than that of radio frequency. LiFi is now providing unprecedented data and bandwidth.

It is a category of optical wireless communications, includes infra-red and ultra-violet communication as well as visible light [3]. However, Li-Fi is unique in that the same light energy used for illumination may also be used for communication. The working of LiFi is simple but powerful. When an LED light bulb is supplied with constant current stream of photons are emitted from the bulb which is seen as illumination. LED bulbs are semiconductor devices, which means the current, and therefore the illumination can be modulated at extremely high speeds which can be detected by the photo detector. Using this technique, transmission of high-speed information can be done through a LED bulb. LiFi uses direct modulation methods that are similar to the low-cost infrared devices like remote controls.

Also, LED light bulbs can have very large data rates as the LED bulbs have very high intensities.[2] A good data density reduces the need to share the bandwidth with other users hence, improving the user experience. The achievable data density by the LiFi is 1000 times greater than the WiFi. Hence, this provides more data per square meter[4].

The LiFi communication system can work even under the sunlight as the modulated light rays can still be detected. Since the system works on the detection of rapid changing light intensity and not the slow varying levels which can be caused by disruptions due to the sunlight. As light waves in LiFi are heavily modulated, the sun just adds a constant light which can be easily filtered out by the receiver.

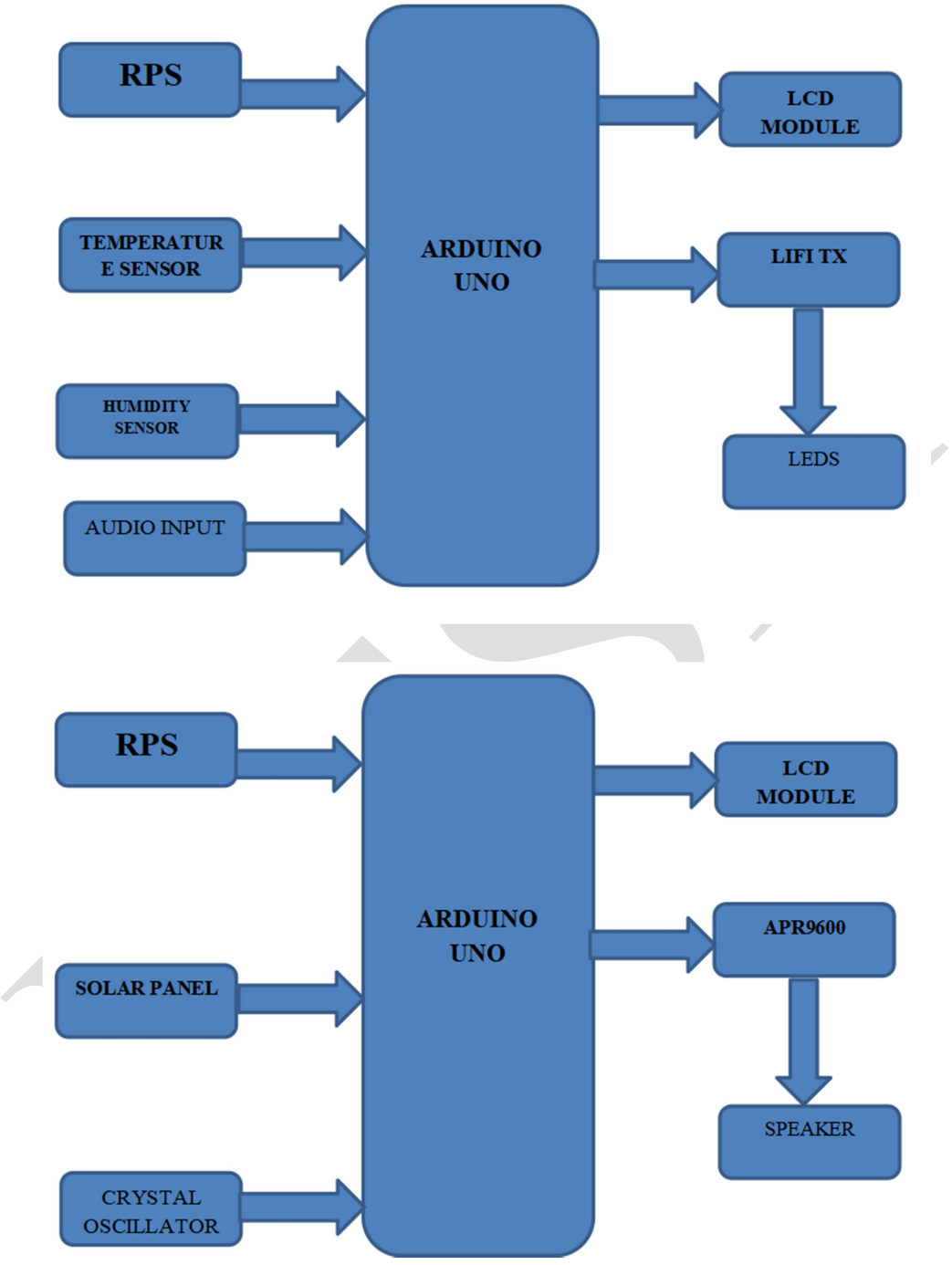
EXISTING SYSTEM

The existing Wireless communication makes use of electromagnetic waves for communication system. For instance, the deployment of Wi-Fi obviously brings several important benefits. Because it is very convenient that numbers of equipment connect to each other using wireless networks. Home-based Wi-Fi enabled device helps you to connect PC, game console or laptop. There are no boundaries if you are using Wi-Fi, you can move from one room to another or even away from home you have the liberty to access internet within the range of radial distance. Wi-Fi hotspots

concept is getting popularity among business communities and mobile workers. For this reason ISPs are consolidating Wi-Fi switches to numerous spots for the scope of wide range.

PROPOSED SYSTEM

The proposed system consists of a transmission section and a receiver section. The transmitter section consists of an APR, Li-Fi transmitting module,MIC and the receiver section consists of a Li-Fi receiving module, PIC microcontroller, an amplifier, speaker and a transformer. The Rapid growth of technology and infrastructure has made our lives easier. The advantage of technology has also increased the traffic hazards and the road accident take place frequently which causes huge loss of life and property because of the poor emergency facilities. Our project will provide an optimum solution to this draw back. An integrated Cell phone GPS-GSM system is proposed to track vehicles using Google Earth application develop in android application for mobile system. The remote module has a Bluetooth mounted on the moving vehicle with attached accident detecting sensor to identify if accidents happens. Here Bluetooth will be the medium of communication with the user mobile for activating the GPS position of the cell phone. In this case cell phone will get activated its application and track the current position of the vehicle and send it to the remote located predefined phone for tracking the real time position of the situation. After data processing, Google Earth application can be used to view the current location and status of each vehicle. (To detect the real time localization of the vehicle using Bluetooth technology with GPS locator in cell phone using android application.)

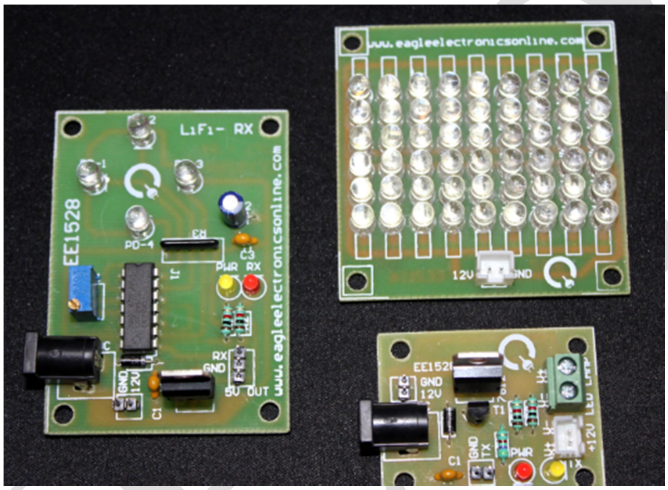


Transmitter Section

In the process of voice communication through the visible light on the transmitter side, voice is used as the input signal. This signal is converted to an electrical signal through a microphone. The transmitted data will be digitized then the digital signal drives the LED by using on-off-keying (OOK) modulation. LED,

turning led ON for ones and OFF for zeros. Hence, the transmission data rate has to be so high that it eliminates the flicker and perceive as a constant light source to human eye. LED, turning led ON for ones and OFF for zeros.

The data whose has to transmit given from the playback module to the modulator circuit.The information is modulated to bits of 1's and 0's using On-Off Keying modulation .Light is used as a carrier signal.The modulated signal is amplified by Audio Amplifier. The data's of 1's and 0's comes out from LED which on for ones and off for zeros.



Receiver Section

The receiver module consists of photo detector .When the light falls in, it detect the data that is transmitted via light. This detected data will be given to an amplifier which will amplify the detected signal and give it to microcontroller. The microcontroller will extract the data from the received signal. This digital data will be converted to analog using digital to analog converter. The analog signal (i.e. audio) will be amplified by Audio amplifier then using relay proper information (audio) comes out from the speaker.

The audio amplifier gain is internally set to 20db but can be increased to 200db by using a resistor and capacitor between pin1 and pin8 or just with a capacitor. The output signal as both AC and DC components and DC component cannot be fed to the speaker so to remove this DC component capacitor is used at pin5. Along with this capacitor, a filter circuit is used to remove high frequency oscillations or noise. Pin7 can be grounded using a capacitor or left open for stability. 3. Working The audio input signal is given through media players. These analog

signals are converted to digital switching signal using transistor, for switching ON and OFF the LED. These signals are then transmitted. The transmitted light signal is received by the photo receiver. Here we have used Solar cell as Photo receiver. These received signals are fed to amplifier. The signals are amplified using audio amplifier and these amplified signals are given to speakers.

Trans-reception of the audio and text files is successfully implemented using Visible light as the carrier. The following observations are made.

1) As the distance between the transmitter and receiver increases, the received signal quality decreases.

2) The experimental result defines that maximum distance achieved in visible light communication system is approximately 2m for data transmission and around 15ft for audio transmission.

3) The received data is affected if the angle between the receiver and LOS of the LED changes.

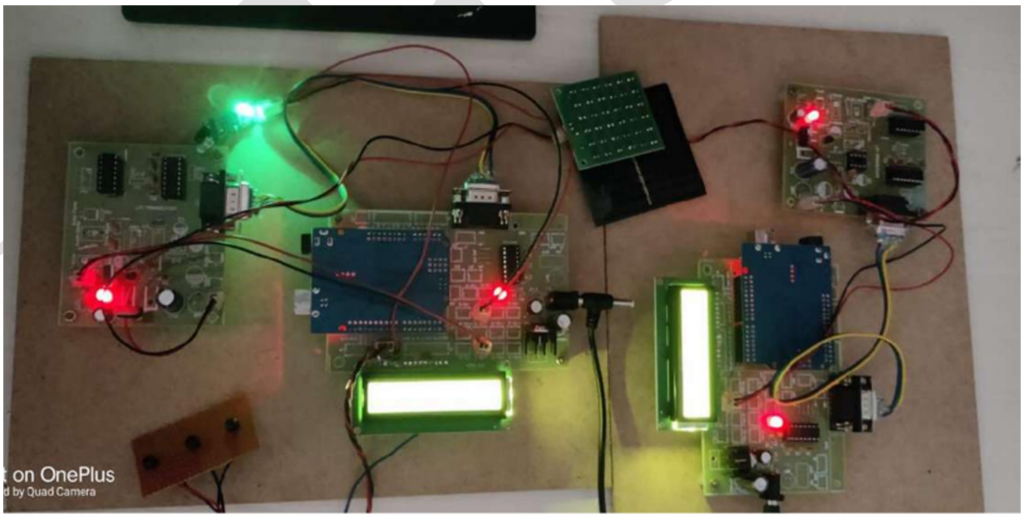


Fig.1. Hardware kit module.

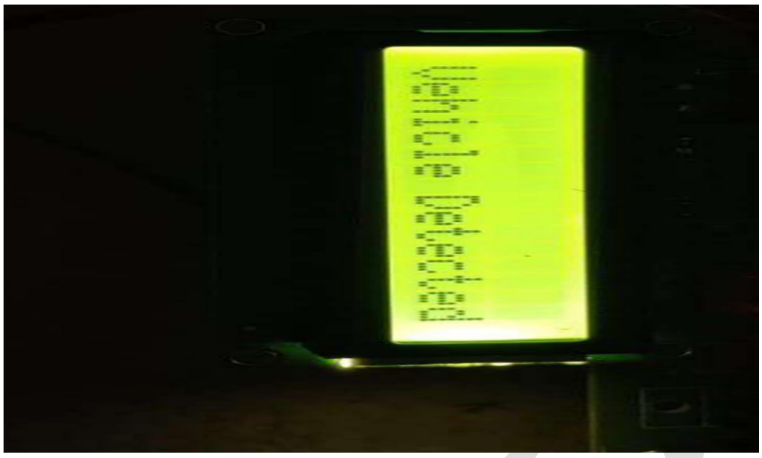


Fig.2. DATA transfer technology with serial module.

Fig.3. Data input and output side.

CONCLUSION

Vehicle tracking system is becoming increasingly important worldwide owing to the alarming rate of robbery. The paper describes a highly accurate and affordable and efficient vehicle monitoring and safety system utilizing GPS that could be used to control and secure any remote vehicle fitted with the In-Vehicle System. The system consists of a Control Phone and an In-Vehicle unit. Using GSM modem on GSM network, the location information is transmitted via SMS to the authorized user control phone. The controller cell phone also has a GSM module that gathers information about the location of the automobile over the GSM network. Once it has

been indicated that there is a robbery a Text messaging from the regulate phone cuts the remote vehicle's engine by stopping the fuel flow and thus the vehicle stops.

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