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NOVEL RECEIVER SENSOR FOR VISIBLE LIGHT COMMUNICATIONS IN AUTOMOTIVE APPLICATIONS

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ABSTRACT:Sincemoreandmorevehiclesareusingthe transportinfrastructure,thesecurityandtheeffectivenessofroadsareofabsoluteimportance.Aresolutiontoenhancethesecurityofroadtransportationisbyenablewirelesscommunicationsbetweenvehiclesandalsowiththetrafficinfrastructures(e.g.trafficlights,streetlightingortrafficsigns).Inthispaper, VLC is considered of great perspective.AbasicproblematicinvehicularVLCisthedesignofapropersensorcompetenttosupportlongdistancecommunicationsindynamictrafficsituationandinunfriendlyatmospheric conditions. Therefore, this system is focused on the design of theVisibleLight Communicationsensors deliberate for vehicular communication applications, contribution a review ofthesolutionsfoundtotemperatetheeffectofthedifficultconditions.Furthermore,thepapersummarize the solutions and proposes an environmental adaptive VisibleLight Communicationrecipientthatwouldbecapabletooptimallychangeitssettingsinordertomake the most ofthecommunication efficiency, but without disturbing the communication sturdiness tonoise.

INTRODUCTION

There are approximately 1.4 million cellular mostly radio waves base stations deployed, with over 5 billion mobile phones. Mobile phones conveyin excess of 600TB of data. Currently wireless communication use radio waves. Spectrum is the one of the most necessary requirement for wireless communication. With the advancement in technology and the number of users, the existing radio-wave spectrum fails to provide to this require. To tenacity the issues of scalability, accessibility and safekeeping, we have come up with the notion of transmitting data without wire through light via LED_s, which is called as Li-Fi is a most recent technology that makes use of LED light which help in the transmission of data much faster and flexible than data that can be transmitted through Wi-Fi. LED lights are becoming extensively used for homes and offices for their incandescent efficacy improvement.Visible light communication (VLC) is aninnovative way of wireless communication usedetectable light. Characteristic transmitters used for observable light communication are observable light LEDs and receivers are photodiodes and image sensors. We present new applications which will be prepared possible by detectable light communication technology. Location-based services are well contemplation-out to be especially suitable for detectable light communication applications. An interiordetectable data transmission method utilizing LEDs is projected. In this method, these strategies are used not only for revealing rooms, but also for an optical wireless communication system.

OVERVIEW OF LI-FI

Light Fidelity is the expansion of Li-Fi. Light Fidelity is transmission of data through light by taking the fiber exposed of fiber optics by conveyance data through a LED light bulb that varies in strength faster than the human eye can pursue. Light Fidelity is the term some have used to label the high-speed and low-priced wireless-communication system, which is the optical adaptation of Wi-Fi. Light reaches practicallyall over the place so communication can also go along with light straightforwardly. Light Fidelity is a limb of optical wireless communication which is an up-and-coming technology. By the professor of mobile communications at the University of Edinburgh, UK, first time publically displayed the evidence of Light Fidelity (Li-Fi), a technique of Visible Light communication (VLC). Light Fidelity is the transmitting of data through light by taking fiber out of fiber optics and distribution data through LED light.Light Fidelity technology provides transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. Wi-Fi is great for general wireless exposure within buildings, whereas Light Fidelity is ideal for high compactness wireless data coverage in restrained area and for relieving radio interference issues. Light Fidelity provides much better bandwidth, efficiency, availability and precautions than Wi-Fi and has previously achieved blisteringly high speed in the lab. By leveraging the low-cost nature of LEDs and lighting units there are many opportunities to make the most of this medium, from public internet access through street lamps to auto-piloted cars that communicate through their headlights. Haas envisions anopportunity where data for laptops, smart phones, and tablets will be transmitting through the light in a room.

SYSTEM ANALYSIS

EXISTING SYSTEM

The existing prototypes have been urbanized focusing on particular issues and were tested in particular conditions, exclusive ofallowing for all the impediments of the vehicular surroundings. Therefore, even if they have high probable, being able to ensure trustworthy, long-distance, and high-data rate communications the existing hardware prototypes aren't able to obey with all the necessities – further postponing the technology deployment. The complex protocols were executed to find the communication and communicate with other vehicle. Existing system communicates with other vehicles using anyone of the wireless technology. Each wireless technology has its own bandwidth and frequency. Same wireless technology is used in all vehicles.

DISADVANTAGES OF EXISTING SYSTEM:

1. Expensive to implement
2. Bandwidth problem
3. Cannot be implemented in all type of vehicles

PROPOSED SYSTEM

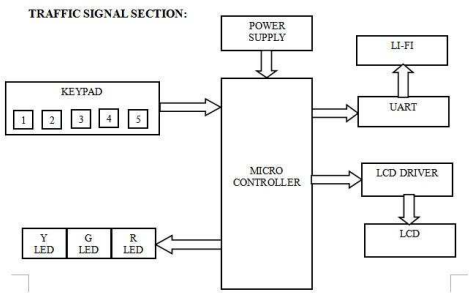
The visible light communication sensor proposed in this article addresses these issues and enables a robust communication for short to medium distances. To overcome the implementation cost of technology, Low cost Light Fidelity (Li-Fi) technology is introduced. Light is available in all vehicles, so using the light, communication is done between vehicles. There are five modes, which includes Traffic mode, Vehicle to Vehicle Mode, Drowsiness checking mode, breaking condition and Emergency vehicle mode. In Traffic mode based on the traffic signs the vehicle will be Turn On/Off. By using vehicle to vehicle communication mode we can check if any drowsiness condition or Breaking condition applied on in front of the vehicle. If any one of the condition occurs voice board gives information to our vehicle. To give way for ambulance, ambulance mode is available, so that traffic can be cleared easily.

ADVANTAGES OF PROPOSED SYSTEM:

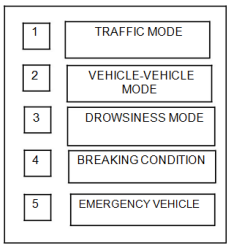
1. Low cost
2. Easy to implement
3. No complex protocols

SYSTEM IMPLEMENTATION

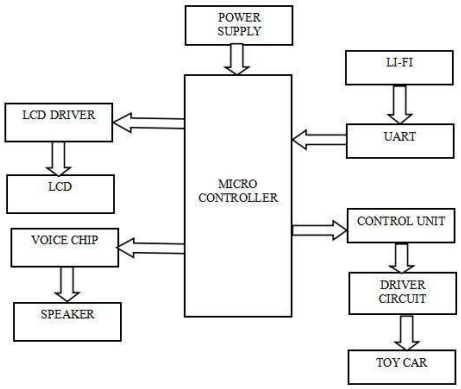
HARDWARE IMPLEMENTATION



KEYPAD OPERATION:



Micro controller used to control all operations in traffic post. Keypad is used to select mode of operation like vehicle to vehicle communication, traffic light management, Breaking condition, Emergency Mode, and etc., Light Fidelity technology used to transfer the data from vehicle to vehicle or vehicle to traffic signaling post. Power supply used to give power supply to micro controller.



Vehicle Model

Microcontroller used to operates all operations in vehicle like vehicle movement, LCD display, data transmission. Power supply used to give power supply to micro controller. LCD display used to displays the

data which is given from micro controller. Driver circuit is used to run vehicle model. Speaker used to produce sound signal.

SOFTWARE IMPLEMENTATION

TRAFFIC SIGNAL MANAGEMENT

A very significant part of the highway structure is Traffic control devices (TCDs) - traffic signs, signals and roadway markings. They give important information about the roadway to the drivers of vehicles. Traffic signs consumecolor, shape, symbols and/or words to express information. To organize traffic, signals viacolors are used in the manifestation of four dissimilar types of LED lights in roads. The light string is: green: not dangerous to cross, yellow or orange: protract to cross only if not capable to stop securely, blinking yellow or orange: cross with prudence (often used when lights are out of order or shut down) and red: do not cross.

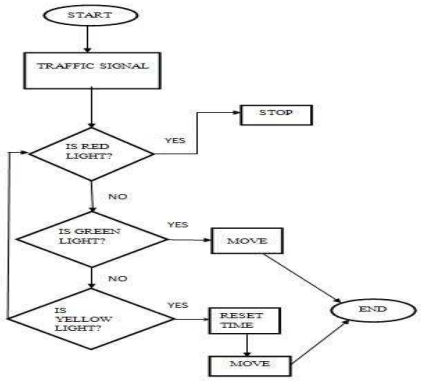


Fig 1: A flow chart defining the meaning of Traffic control signals

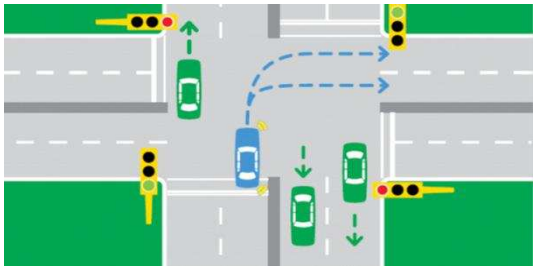


Fig 2: An image defining the meaning of Traffic control signals

All the vehicles should be blocked when present red signal. But there are some vehicles which do not like follow this rule. Light Fidelity technology used to avoidthis violent behavior of traffic signal. Allvehicles can be assigned anindividual number and information in opposition to this individual number has tostore in the main database. The red, green, yellow and orange traffic signals and the head – light and tail-lights must be Light Fidelityenable LED which can transmit and receive data. At whatever time there is a red traffic light in signal the traffic post controller of that spot transmit a signal via the red light of Li-Fi to all nearbyvehicles to send that individual code and data about the delay time they should stop on signal which is received by the head light and tail light present in the vehicle. An Arduino Atmel ATmega328 microcontroller is used to decrypt the received data which is transmitted from the red light of the traffic post. After these the vehicles must stop that specified delay time and a timer is generated. If any one vehicle starts running before the specified delay time then that is sensed by the motion sensor attached with the Arduino Atmel ATmega328 microcontroller then it transmit a signal to the traffic post controller through head-light or tail-light to red light where total information about the vehicle is then added to the database. Traffic police can formulate use of this type of data if required and can take necessary action for that specified problems in traffic signal.

VEHICLE TO VEHICLE COMMUNICATION ALGORITHM:

Sender

- Initiate
- Send the message to micro controller i.e E=mc2
- Micro controller transfer message to NPN switching circuit Ic = Ie – Ib
- NPN circuit send message to PNP circuit Ic = Ie + Ib
- PNP circuit send message to LED

Receiver

- LED transfer message to photo diode.
- Active manner |Vcc| ≥ |R L |x |I c |
- Switchmanner |Vcc| ≤ |R L |x |I c |
- Phototransistor send message to impedance matching. (Z s = Z * L)
- Impedance matching transfer message to TTL to USB convertor.
- TTL to USB change message into user understandable form E=mc 2
- Finish.

The methodneeds a transmitter and a receiver in each vehicle in both rear and front sides of the vehicle. Thus more scenarios will be applicable. For the time being, only two scenarios will be deliberate in this paper:

A. First Scenario

As shown in Fig 3 when vehicle 1 is braking, the speed meter in the vehicle will be monitoring that the present speed is lower than the previous speed. Thus, a message will be sent through the transmitter which is placed in the back lights to vehicle 2. Vehicle 2 receives the data using the phototransistor which is located at the front side of vehicle 2. A notice of (Slow DOWN) will be shown in vehicle 2 using an LCD.

Fig 3: First scenario of vehicle to vehicle communication using Li-Fi.

B. Second Scenario

As exposed in Fig 4 when vehicle 1 is in T-junction, it will continue transfer its speed-data to vehicle 2 using the LED at the headlights. The speed-data will be received by the photo transistor in vehicle 2 and compared to vehicle 2 speeds. If vehicle 2 is about to annoyed the junction while vehicle 1 is moving with a maximum speed, the driver will be alerted to check the other vehicle which is in the region of the area.

Fig 4: Second scenario of vehicle to vehicle communication using Li-Fi.

CONCLUSION

Light Fidelity technology has an enormous use in traffic organization and in establishing protected movements of vehicles on the road. But to apply it commercially each and every vehicle has to include a LED-based traffic head-light, tail-light and Arduino ATmega328 microcontroller. But the fact is Light Fidelity technology is more expensive than any other existing method. If we can somehow reduce the cost to some extent, then the there is no need of any traffic police on the road. Again we will not face any unnatural death on the road due to irresponsibility of the drivers. So it is high time we implement this wonderful technology to step forward to a digital world.

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