Performance Evaluation Of Vehicle-To-Vehicle Visible Light Communications

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Abstract- *Traffic safetyapplicationsusingvehicle-to-vehicle (V2V) communication is an emerging and promisingarea within the ITS environment. Many of these applicationsrequirerealtimecommunicationwithhighreliability. Li-Fiisa wireless communication system in which light is used as acarriersignalinsteadoftraditionalradiofrequencyasinWi-Fi. Li-Fi is a technology that uses light emitting diodes totransmitdatawirelessly.LiFiisaformofVisibleLightCommunication(VLC).VLCusesrapidpulsesoflighttotransmitinformationwirelesslythatcannotbedetectedbythehumaneye.ThispaperisdeterminedtoenhancethequalityofIntelligentTransportationSystem(ITS)withthehelpofVisiblelight communication technology using a Li-Fi transmitter andreceiverkit.TheV2VcommunicationsystemconsistingoftheLi-Fi transmitters placed on a leading vehicle and the Li-Fireceiverisplacedonafollowingvehicle.Thereceiveddatacanbe used for further development in vehicle control and to avoidcollisionsbycontrollingthespeedofthe vehicle.*

*Keywords- vehicle-to-vehicle, Li-Fi , wireless , vehicle ,control, speed*

I. INTRODUCTION

HARALD HASS, who is considered to be the father ofLififromuniversityofEdinburgh,UKsaysthattheheartofthistechnologyliesintheintensityandthepotentialofthelightemitting diodes.ThemajorreasononwhichleadthemodernmanthroughthisinventionisthattheconfinementofWiFitocomparativelysmalldistance.Astherearemoreandmoredevicescomingupdaybydaythesignalsarebeingcloggedupduetoheavytraffic,therearieaneedforanerrorfreetransmission technology. And the solution to thisproblemwasthe Li-fitechnology.

Over the past few years there has been a rapid growth in the utilization of the RF region of the electromagnetic spectrum. This is because of the huge growth in the number of mobile phones subscriptions in recent times. This has been causing a rapid reduction in free spectrum for future devices. Light fidelity (Li-Fi) operates in the visible light spectrum of the electromagnetic spectrumi.e. it uses visible light as a medium of transmission rather than the traditional radio waves. Although Li-Fi can be used to off-load data from existing Wi-Fi networks, implementations may be used to provide capacity for the greater downlink demand such that existing wireless or wired network infrastructure may be used in a complementary fashion.

II. EXISTING METHOD

Li-fi basically known as "light fidelity" is an outcome of twenty first 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 place through the light emitting diodes (LED"s) the amount is comparatively small.In modern times, it is called as the optimized version of WI- FI .The advantageous thing is the wireless communication which decreases the cost enormously.LiFi is the use of the visible light portion of the electromagnetic spectrum to transmit information at very high speeds. This is in contrast to established forms of wireless communication such as Wi-Fi which use traditional radio frequency (RF) signals to transmit data.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 physics envisions that this technology would make a great difference between the assumption and the proof in this case .The demonstration took place using two Casio smart phones. The data was made to exchange between the phones using light. Even though 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 systems .The members of this consortium believes that a speed of 10 Gbps can be achieved in no time.
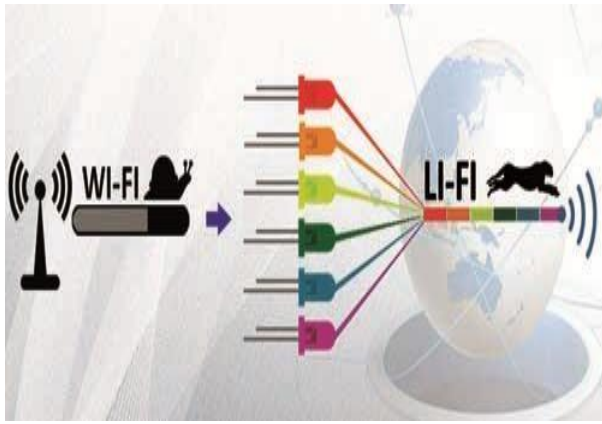
III. PROPOSED METHOD:

Li-Fi system consists of mainly two parts, the transmitter and the receiver. The transmitter part modulates the input signal with the required time period and transmits the data in the form of 1"s and 0"s using a LED bulb. These 1"s and 0"s are nothing but the flashes of the bulb. The receiver part catches these flashes using a photodiode and amplifies the signal and presents the output.

Light emitting diodes can be switched on and off very much faster than the human eye allowing the light source to appear continuously. The data transmission is done through binary codes which involve switching on LED can be done by logic 1 and switch off using logic 0.The encoding of information in light can therefore be identified by varying the rate at which the LED"s flicker on and off to give strings of 0"s and 1"s.visible light communication is this method of using rapid pulses of light to transmit information wirelessly.

Li-Fi TRANSMITTER:

LED's can be switched on and off very quick.For transmitting data this way all that we require is LED's and controller that code data into LED's.Parallel data transmission can be done by using array of LED's or by using red, green, blue LED's to alter light frequency with the frequency of different data channel. Advancements and enhancements in this field generate a speed of 10 gbps. But amazingly fast data rates and lowering band widths are not the only reasons that enhance this technology. Lifi usually is based on light and so it can be probably implemented in articrafts and hospitals that are prone to inference from radio waves.unlike Wi-Fi Li-Fi can work even under-water which makes it more advantageous for military operations. Radio waves are replaced by light waves in data transmission called Li- Fi.

A. IR DISTANCE SENSOR

In the infrared sensor, a narrow band infrared beam is transmitted from the LED. When the beam strikes an object it is reflected back towards the sensor and into a focusing lens. The focusing lens directs the reflected beam onto the PSD. The incident angle of the reflected beam is determined by the distance from the sensor to the reflecting object; the farther away the reflecting object is, the slighter the angle. As a consequence of the narrow band of propogation, there is a minimum distance away from the LED the reflecting object needs to be in order for the beam to reflect upon the focusing lens. Furthermore, as the reflecting object moves farther and farther away, the change in angle at which the reflected beam decreases; i.e. sensitivity decreases.
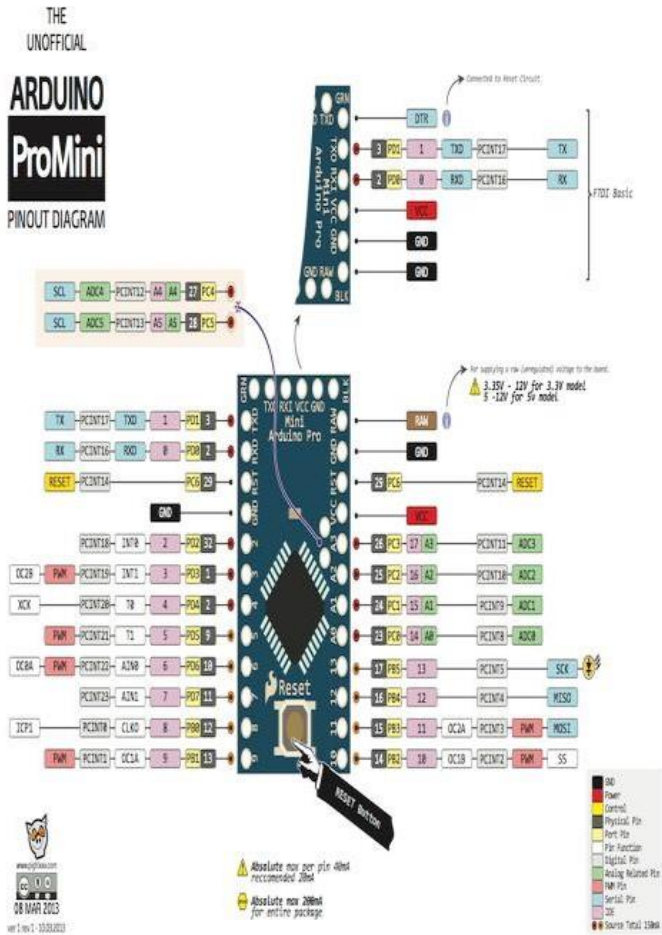
B. LCD DISPLAY:

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. This display is used to display the information about the detected object. The LCD display are built-in in the controller kit.

C. ARDUINO PROMINI

Arduinopromini is a microcontroller board based on ATMEGA 328 .It has 14 digital input and output pins.In that it has 8 analog input pins,6 PWM(Pulse width modulation) output pins. It is programmed with USB serial adapter or RS232 to TTL serial adapter. It is smaller than ArduinoUNO and more practical for building home projects.It comes with the minimum of components(no onboard USB or PIN headers).It has two versions,one operates at 5V and 16MHz and other operates at 3.3V and 8MHz.

D. INTERFACING

The arduinopromini is operating at 5V and 16MHz frequency.The pins 12, 11, 5, 4, 3, 2 are used for interfacing LCD .Either pin 6 or 9 or 10 can be used for interfacing motor (for speed control).Pin1 for interfacing Li-Fi transmitter.Pin 0 for interfacing Li-Fi receiver.

E. Li-Fi TRANSMITTER

Receives the information from the controller and it modulates the data to light signal and transmits to the receiver section. The transmitter part modulates the input signal with the required time period and transmits the data in the form of 1"s and 0"s using a LED bulb. These 1"s and 0"s are nothing but the flashes of the bulb. Power supply DC+12V and Data UART(universal asynchronous receiver transmitter). input (TTL) are the input specification for the transmitter section.

F. Li-FiRECEIVER

Receives the modulated information from the transmitter section and demodulates the signal in order to recover the original data. . The receiver part catches these flashes using a photodiode and amplifies the signal and presents the output.

IV. WORKINGPRINCIPLE

Intheinfraredsensor,anarrowbandinfraredbeamistransmittedfromtheLED.Whenthebeamstrikesanobjectit is reflected back towards the sensor. IR distance sensorsensetheinformationaboutthedetectedobjectandtransfers to the controller.Controller used here isArduinoprominiwhichisamicrocontrollerboardbasedonATMEGA328 .It has 14 digital input and output pins.In that it has 8analog input pins,6 PWM(Pulse width modulation) outputpins.LCDdisplaywhichisinterfacedtocontrollerpins(12,11,5,4,3,2)givestheinformationanditisdisplayedin LCD.Simultaneously the motor speed is reduced by thecontroller.Incaseofemergencysituationoranybreakfailurethe buzzersoundisproduced.Theseinformationsaretransmittedtothe LiFitransmitter.Receivestheinformationfromthecontrollerandit modulatesthedatatolightsignalandtransmitstothereceiversection .Thetransmitterpartmodulatestheinputsignalwiththerequiredtim eperiodandtransmitsthedataintheformof1"sand0"susingaLEDb ulb.These1"sand0"sarenothingbut the flashes of the bulb.In the receiver section ,it receivesthemodulatedinformationfromthetransmittersectionan ddemodulates the signal in order to recover the original data. .The receiver part catches these flashes using a photodiodeand amplifies the signal and transmits to the controller sothatthespeedofthefollowingvehiclecanbereducedwhichwill be indicated in the LCD display present in the receiversection.

V. CONCLUSION

WehavepresentedaVLCsystemconsistingofanLi-FitransmitterandreceiverthatistargetedatV2Vapplications,and introduced its characteristics and capabilities.In trafficsignals, Li-Fi can be used which will communicate with

theLEDlightsofthecarsandaccidentnumberscanbedecreased.Li-fiisidealforhighdensitycoverageinaconfinedregion.Itisbelievedthatthetechnologycanyieldaspeed morethan 10 Gbps .It is the fastest and cheapestwireless communication systems which is suitable for longdistancecommunication.Li-Fiwillmakealllivesmoretechnology driveninthe nearfuture.

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