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Integrated Micro Circuitry Deceleration System Enhanced with Visible Light Communication

M. Preethi Pauline Mary, V. Geetha, R. Meenadevi

Abstract*: *Visible Light Communication (VLC) is the one of the advanced visible spectrum technology where we can communicate in the better way with a transmitter, a channel and a receiver. A new technology for next generation is evolved. Vehicles are connected anywhere and anytime by optical signal and light signal in VLC. Here the major instructions like braking system are communicated; therefore the risk and danger can be reduced. Thus an Integrated micro circuitry deceleration system is always required for the safety of innumerable valued lives. Collision avoidance and warning systems is equipped in vehicles for predicting the physical collision with an external body, such as another vehicle or a pedestrian to make the system smarter. In this system we have designed the microcontroller based automatic disc brake system, which will apply the instant brake to avoid the collision.

Index Terms*: *LIFI module, L293D Motor Driver, Pressure sensor, Stepper motor, Ultrasonic sensor

I. INTRODUCTION

A. Preamble

Visible light communication which consumes low power is the technology in which visible light spectrum is modulated for the transmission of data. It is found that the main victims in these accidents are Pedestrians. VLC with LEDs attracted several applications, such as lighting control,light interaction[1]. In this paper, a system is proposing an advanced electronic braking system which can be implemented to avoid collision and road accidents[17].So By the use of visible light communication which consumes low power, the data is transferred to the drive circuit in the motor so that speed of the motor is automatically reduced[2]. By the use of LIFI module the data transmission and detection takes place in the system. For data processing we need controller. A monitoring system is developed for the road safety using the scripting languages and different tools resulting in good road safety [3]-[6].sensors and obstacle detecting system is developed to find the location and control of accidents is tracked [7]. A simulation analysis to compare antenna performance within the frame of Vehicle-to-Vehicle (V2V) communication systems. LIFI concept is reviewed in [8].LIFI works with different scenario in the communication and a prototype is developed for the proper utilization [9]. WIFI is used for indoor communication where more number of users can utilizing the resource and higher data is transmitted in this [10],[11]. Next is the ECO friendly communication where it does not affect the human feature the signal is elaborated and transmitted without disturbing the originality of the input data [12]. VLC system design and OLED with dimming support was completed and tested [13].

B. *Elucidation*

Actually we are doing for the vehicles, whenever an obstacle is detected the ultra sonic sensor detects and given to the micro controller. it controls and process the signals and brake is applied by man in the car1 physically so that the pressure on the wheels are calculated and given to the micro controller[13]. so the input from the ultrasonic sensor and pressure sensors both the value are calculated and given to the microcontroller now it controls and give data control to the LIFI transmission module[14].

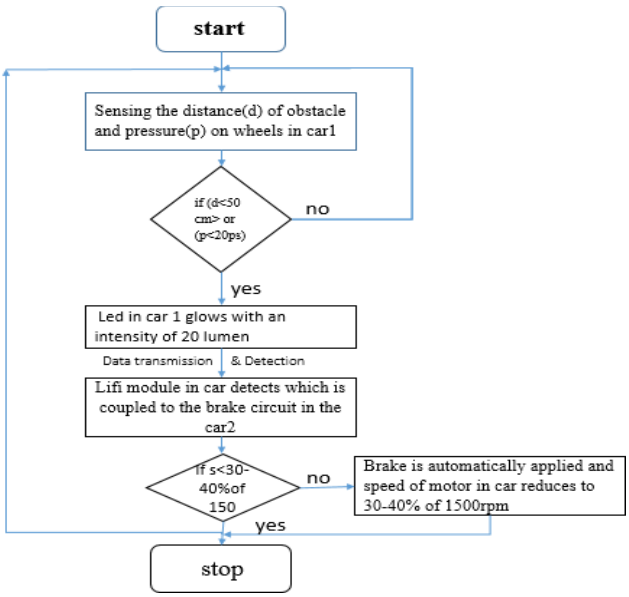

Fig.1. Flowchart of Electronic braking system

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***** Correspondence Author
M.Preethi pauline mary*, Electrical and Electronics Engineering, Sathyabama institute of science and technology, Chennai, India.
V.Geetha, Electrical and Electronics Engineering, Sathyabama institute of science and technology, Chennai, India.
R.Meenadevi, Electrical and Electronics Engineering, Sathyabama institute of science and technology, Chennai, India.

The LIFI detector in the other car detects and gives the data to control to the micro controller it transfers the data and given to motor of drive circuit in the other car so that the speed of the motor in car reduces automatically. From the fig.1 whenever the ultrasonic sensor detects the obstacle less than 300cm and the atmospheric pressure is increases to 50% and pressure is blown in to the pipe through our mouth so that pressure sensor detects the pressure[15], if it is more than 50% then led glows, and communication takes place by LIFI transmission circuit and detection in the receiver section detects and given to the micro controller here in the micro controller the output modulation technique is done by the Manchester encoding and finally given to the motor to reduce the speed[16].

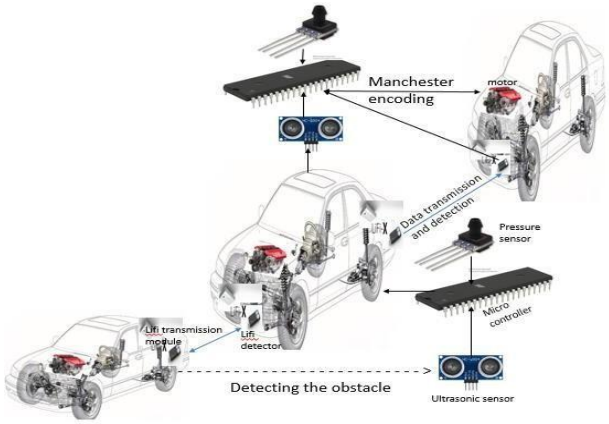

Fig.2. Proposed design of braking system

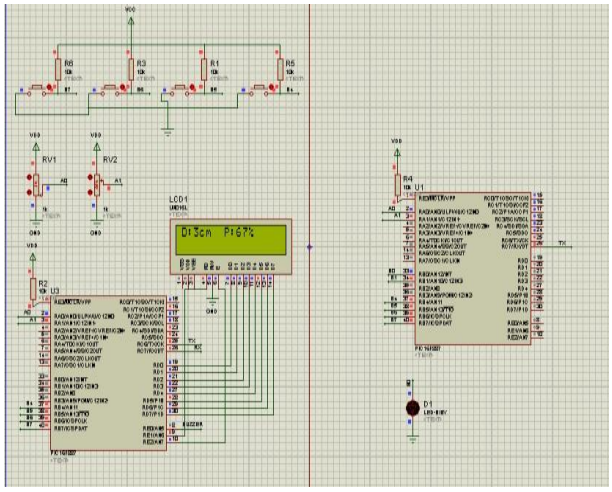

Fig.3. Simulation output.

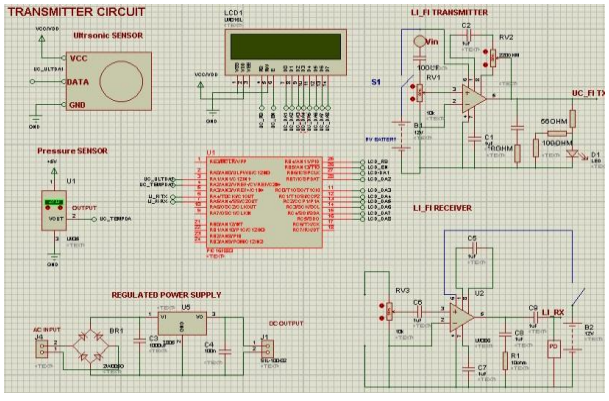

Fig.4. Hardware circuit diagram

Whenever the sensors detects and vary the led glows and data transmission takes place to the motor so that speed reduces as this is the simulation can not possible to show the motor speed. But led glowing can be seen in the simulation which is shown in fig.3. Speed reduction is shown in the hardware circuit. From fig.2 the front car is the obstacle to the next two cars so the ultrasonic sensor detects the obstacle and transmits the data accordingly given in the flowchart which is from fig.1 in the previous lines.

C. *Hardware*

A. *Specifications*

i. Intensity of light - 20lumens
ii. Pressure sensor - <20pascals
iii. PIC16F887 - 5V
iv. Stepper motor - 5V, 0.67A/Phase, 150rpm
v. Ultrasonic sensor - < 50cms

To implement prototype stepper motor is used because it has high torque at startup and low speeds, high reliability. A stepper motor is a special kind of motor in which mechanical movement can be obtained from electrical pulses. Unlike all conventional motors a stepper motor advances in steps. These steps of the motor are measured in degrees and can vary as per its application. It takes one step at the time and the size of each step is equal to the other. There are three excitation modes of a stepper, wave drive, full drive and half drive. In wave drive mode, only one winding is energized at a given time , where as in full drive mode, two phases are energized at a given time, where as in drive mode, two phases are energized at the same time. The number of steps , however, are same in both wave and full drive modes. Half drive mode combines both wave drive and full drive i.e. it energizes one two phase alternatively. To drive a stepper motor using PIC microcontroller the easiest way of interfacing a stepper motor with a micro controller is via ULN2003 are connected to the lower significant bits of PORTD of the microcontroller and the output pins(1c, 2c, 3c, 4c) are connected to the live‟ pins of the stepper motor. The common, pins of the stepper motor, together with ‘COM’ pin of ULN2003 are hooked up to a 12V battery supply. The speed of the stepper motor can be increased or decreased via proteus as well. For this purpose, right click on the stepper motor and select ,Edit properties. The window on the right will appear on the screen. For a 150 step motor, a complete rotations (360 degree) is divide into 150 steps. This gives the size of a single step which is equal to 1.8 degree. You can vary the number of steps as well as the step angle using proteus, the effect of which will be visible during simulation. An Ultrasonic sensor is a device used to measure the distance between the two objects by using ultrasonic waves. It also calculates the distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. So by measuring the distance, time can be calculated through sound wave. Ultrasonic sensors have an acoustic transducer which is vibrating at ultrasonic frequencies.

The pulses are emitted in a cone-shaped beam and aimed at a target object. Pulses reflected by the obstacle to the sensor are detected as echoes. This device measures the time elapsed between each emitted and echo pulse to accurately determine the sensor-to-target distance.

Speed of sound = 340m/s

= 0.034cm/micro sec

Time (t) = distance(s)/speed(v)

= 10/0.034

t = 294 micro sec.

Fig. 5 represents the regulated output voltage of 5 V obtained from the voltage regulator IC7805.

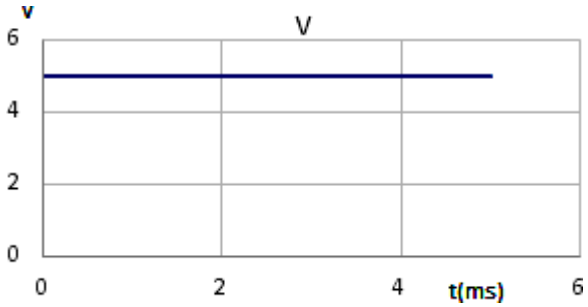

Fig.5. Regulated output DC voltage from IC7805

Transmitter section consists of a power supply and a LI-FI transmitter and micro controller which is placed in car1.12v output from the power supply is given to the controller unit which operates at 5v. so an IC7805 is used which converts 12v to 5v and given to the microcontroller and also LIFI transmitter is connected to controller to transmit the data. Pressure sensor and ultra sonic sensor are also connected to the controller to sense the distance and pressure. The output of LIFI transmitter is connected to the LED bulb which has the 20 lumens of intensity which can transmit the data from LED bulb to the LIFI detector.

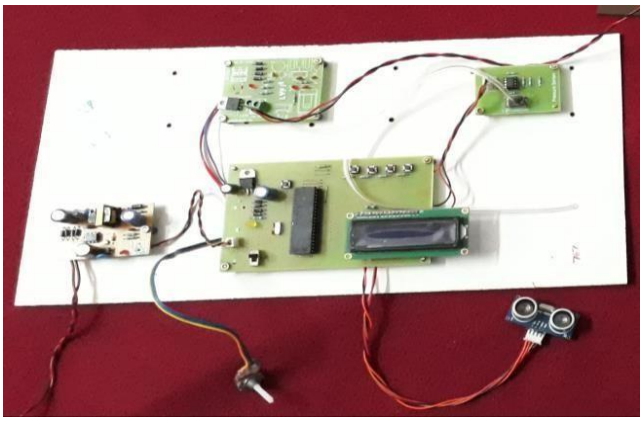

Fig 6. Overall Design of Transmitter section

Receiver section consists of a LI-FI Receiver (Detector), , Filter circuit, pic micro controller, Motor driver circuit and a Buzzer which is placed in car2. Here the transmitted signal from a LI-FI transmitter light in the form of LASER beam is incident on the LIFI detector (which is shown in fig.7) and receives the data and this data collected and send to the another microcontroller unit which process the data. here the output of power supply is connected to the filter circuit to remove noise and losses and which is directly connected to the microcontroller circuit and output of this circuit is connected to the driver circuit which also operates at 12v and the output from driver circuit is connected to the stepper motor which reduces and increases whenever the pressure sensor detects the pressure < 20pascals or ultrasonic sensor detects distance< 50cms.

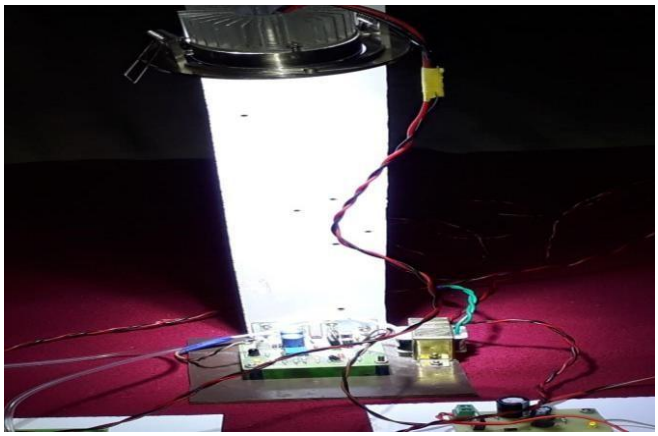

Fig.7.Transmission of Data through LED light and Detected by LIFI Detector

Depends on the distance and pressure, motor speed varies. Output of microcontroller is also connected to the Buzzer whenever the pressure or distance is detected the buzzer produces sound it acts as indication. And finally speed of the motor is reduced whenever an obstacle to the car or pressure on the wheels is detected. Constant streams of photons are emitted when a current source of constant value is supplied to an LED lamp in the form of visible light. When there is a variation of current, the intensity of the LED lamp also varies. LED lamp dims when the current is reduced and it gives high intensity when the current is increased. The current and optical output of the LED lamp can be modulated at extremely high speeds that can be detected by a photo-detector device and converted back to electrical current since LED lamps are said to be a semiconductor device.

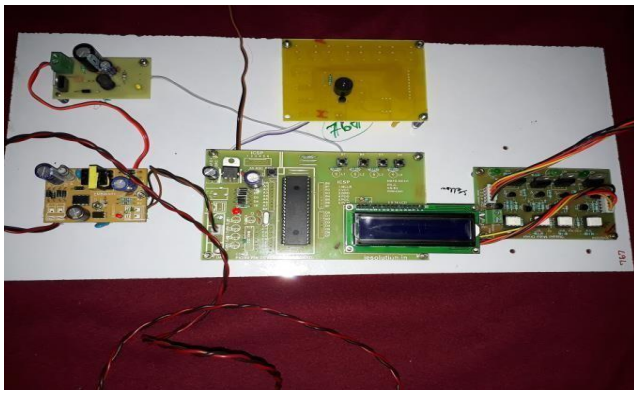

Fig.8. Overall Design of Receiver section

The intensity modulation is too fast to be sensed with the human eye and hence the communication seems to be just like Radio Frequency.

So, this method of implementation can help in transmitting high-speed data from an LED light bulb. Compared to RF communication that needs radio circuits, antennas, and complex receivers this method of transmitting information through visible light is much simpler.

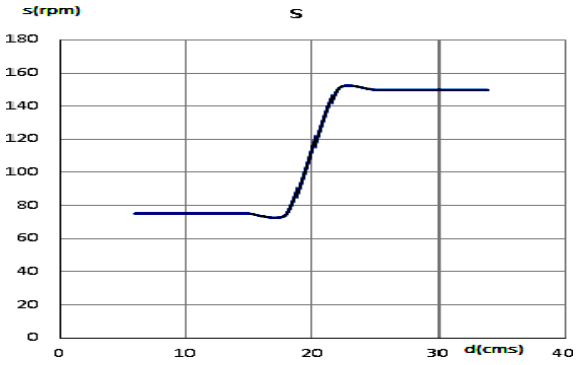

Fig.9. Graph between Distance (d) on X-axis and Speed of Motor(s) on Y-axis

Table 1 Values Obtained When Obstacle is Detected by The Ultrasonic Sensor

DISTANCE OF OBSTACLE(CMS)	SPEED OF MOTOR(RPM)
6	75
13	75
22	75
35	75
40	75
46	75
55	150
70	150
120	150
160	150
220	150

So from fig.9 whenever the distance is less than 50cms, ultrasonic sensor detects and speed of motor reduces to 50% of 150 i.e.,75rpm is reduced and rotates with a speed of 75 rpm which is half of the motor speed. And also From fig.10 whenever the pressure on the tyres of wheels is less than 20pascals, pressure sensor detects and reduces the speed of motor to 50%of 150rpm i.e.,75rpm and rotates with a speed of speed of 75rpm which half of the motor speed.

Table 2 Values Obtained When Pressure Of Tyres Of Wheels Are Detected By Pressure Sensor

PRESSURE ONTYRES OF WHEELS(PASCALS)	SPEED OF MOTOR(RPM)
6	75
9	75
12	75
15	75
18	75
22	150
25	150
30	150
31	150
32	150
33	150
34	150

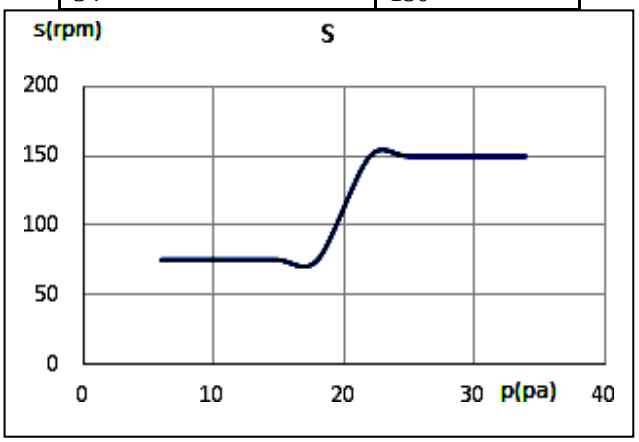

Fig. 10. Graph between Pressure on Wheels (p) on X-axis and Speed of Motor(s) on Y-axis.

II. CONCLUSION

Communicating via light, it is an advanced and easy way. The use of advanced electronic braking system(EBS) has been implanted to avoid collision and to prevent accident. It also consumes less power and by using this technique in our daily life communication no health hazard takes place to the people travelling on roads.

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AUTHORS PROFILE

M. Preethi Pauline Mary M.Preethi Pauline Mary received has received her Bachelor of Engineering degree in Electrical and Electronics engineering in 2005 and Master of Engineering in Power electronics in 2007 from St.Joseph’s College of Engineering, Anna University, and Chennai. She is pursuing Ph.D. in Sathyabama Institute of Science and Technology. She has published many papers in conferences and many reputed journals indexed in SCOPUS and WOS. She has more than 10 years of teaching experience. She is a life member in the Indian Society for Technical Education (ISTE) and International association of Engineer Society of Electrical Engineering. Her research interests include modeling, synthesis and computer-aided design of power converters, dc-dc converter for drive application, electronic ballast, controls, power-factor-correction circuits, soft switching techniques and renewable electrical energy systems.

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V.Geetha has received her B.E degree in Electrical and Electronics Engineering from Anna University, Tamilnadu, India in 2005 and M.E degree in Power electronics and industrial drives from Sathyabama institute of science and technology, Tamilnadu, India in 2008. She is pursuing her Ph. D under the faculty of Electrical and Electronics Engineering at Sathyabama Institute of Science and Technology from 2015. Her research interest includes Fuzzy logic controller, Artificial Neural network and Power Electronic Converters for induction heating application.

R.Meena Devi has received her B.E degree in Electrical and Electronics Engineering from Anna University, Tamilnadu, India in 2003 and M.E degree in Power electronics and industrial drives from Sathyabama institute of science and technology, Tamilnadu, India in 2009. She is pursuing her Ph. D under the faculty of Electrical and Electronics Engineering at Sathyabama Institute of Science and Technology from 2013. Her research interest includes Fuzzy logic controller, Artificial Neural network and Power Electronic Converters.