ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 2, February 2017

Adaptive Electromagnetic Braking in Vehicle to Avoid Accidents

[1] A.V.Todkar, [2] S.A.Nachankar, [3] P.G.Survashi,[4] S.R.Patil [5]A.V.Kamble [6]Miss.P.M.Koli
[1]-[5]Students [6]Professor
[1]-[6]Department Of Electrical Engineering Sharad Institute of Technology College of Engineering Yadrav [Ichalkaranji], India

***Abstract*— An electromagnetic braking is a new and revolutionary concept. Electromagnetic braking system is a modern technology braking system used in commercial vehicles. It aims to minimize the brake failure to avoid the road accidents. It also reduces the maintenance of braking system. So for reliable braking the proposed scheme use the electromagnet while the function of this electromagnet is to develop a magnetic force to engage the brake .In that ultrasonic sensor measure distance between vehicle and obstacle and Proximity sensors measure the speed of vehicle. Comparing the distance and speed, the 89S52 microcontroller gives the signal to relay and electromagnet when safety distance is reduced than safety limit. Constant speed can be achieved by the using resistive touchpad screen. For that DC motor is used to pull accelerator to control the speed. The proposed scheme is simulated in Proteus and implemented in hardware (prototype).**

***Keywords* - Electromagnetic Braking system, microcontroller , Proteus , Proximity sensors ,ultrasonic sensor.**

I. INTRODUCTION

In recent year use of vehicles increases rapidly due growth in population, advance technology and also due to growth in industrialization. Proportional to that number of accident are also increasing continuously and these accident are due to collision, collision of vehicles occurs due to mistakes done by driver and bad weather conditions [1]. For that there are several advance technology and innovation are available. Even though there are number of accidents are done [2]. Hence to overcome accidents effective and efficient adaptive automatic braking system is proposed [3].

In automobile technology there are commonly conventional drum and disc type break are used and these breaks are work on hydraulic principle [4]. But some drawback this conventional braking system like oil leakage problem, wear and tear of wheel, friction also this braking involves conversion of kinetic energy into thermal energy (Heat)[5]. But the brake are required to have the ability to generating high torque and absorbing energy at high rates for short period of time. Hence electromagnetic braking system is used [6]. Electromagnetic brake operates on electric power and magnetic power .It works on electromagnetism principle.

To avoid forward collision, distance measurement between obstacle and vehicle is done by using ultrasonic sensor [7]. Proximity sensor measures the speed of vehicles which is placed near to wheel. The 89S52 microcontroller is the main controlling device to control the system. Safety limits for distance and speed is programmed in controller. When the obstacle sensed by the ultrasonic sensor and speed is less than the safety limits programmed in microcontroller, then the microcontroller gives signal for automatic electromagnetic braking [8]. In electromagnetic braking, the electromagnet get energized and applies magnetic force to engage the brake [9].

Sometime on the highway we can drive vehicle at constant speed. This advanced technique is also added in our system. To achieve constant speed for system resistive touchpad is used to select the proper speed. Then according to selected speed the controller drives the DC motor to pull the accelerator.

II. FUNCTIONAL DISCRIPTION

The functional block diagram of system is as shown in figure 1.The system consist of different modules and there function is explained in following. The proposed system is designed by a prototype model which can avoid collision with applying automatic electromagnetic brake. In this prototype the aluminum disc is considered as wheel. The system is developed by a 89S52 microcontroller which apply brake automatically. It is used in system because of microcontroller have good speed of operation.

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 2, February 2017

The ultrasonic sensor is used to measure the distance between the vehicle and preceding vehicle or obstacle. The proximity sensor is used to measure the speed of the vehicle. LCD is used for displaying status of system, such as distance, speed and touchpad output. DC motor is used to rotate the disc and another DC motor is used to pull the accelerating cable as per the selected speed by the touchpad.

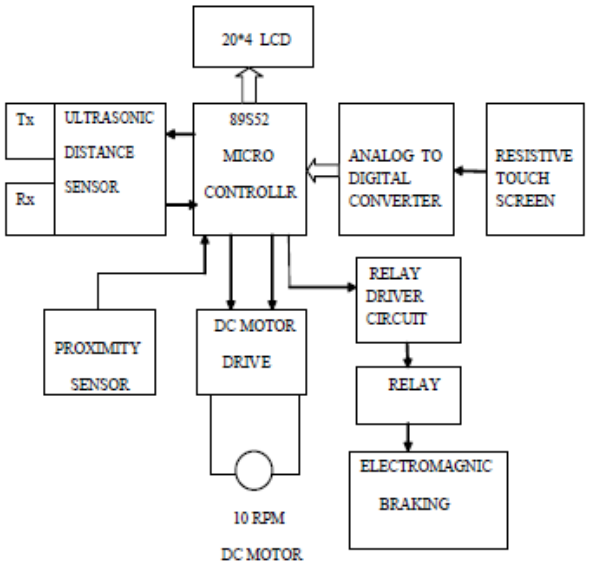


Fig : Block Diagram

A.89S52 Microcontroller

The AT89C52 is a low-power, highperformance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. It has 256 x 8-Bit Internal RAM with 32 Programmable I/O Lines. There are four ports one is output and other 3 are input ports.

B. Ultrasonic sensor

The module used ranging from minimum 10 cm and maximum 400 cm. It has accuracy of 1 cm. The sensor consist of ultrasonic transmitter, receiver and control circuit. It consist of 4 pins they are VCC, input trigger pulse, output echo pulse and ground. The parameter of ultrasonic sensor is, its working voltage 5v DC, its operating frequency is 40 kHz. Ultrasonic sensor works on the principle of piezoelectric effect. To trigger input a short 10us pulse is supplied and then the module will send an 8 cycle sonic burst of ultrasound. Once the obstacle is detected, the reflected waves (echo) are sensed by the receiver and analyzed by the microcontroller. If the distance is not in the safe limit, then the microcontroller issues a warning signal to the driver. When the received echo is faded away, the next trigger pulse is sent and this time period is called cycle period. HC-SR04 cycle period must not be below 50ms.]

C. Proximity sensor

The proximity sensor is a device which detects objects nearby without any physical contact up to nominal range. We can also say that Sensors which convert information on the movement or presence of an object into an electrical signal are called proximity sensors. There are several types of proximity sensor which are used according to the need, material detection and many other things. Here we used the inductive proximity sensor. Which generates output signal or electrical signal when metal objects are either inside or entering into its sensing area from any direction. The metal objects above includes iron, aluminum, brass, copper etc with varied sensing distances. We used iron material as an object and located on the disc. Proximity sensor is used to measure the speed of the disc.

D. Resistive touch pad

Resistive touch screen displays are composed of multiple layers that are separated by thin spaces. Pressure applied to the surface of the display by a finger or stylus causes the layers to touch, which completes electrical circuits and tells the device where the user is touching. As such, resistive type touch screens require. Resistive touch screens consist of a glass or acrylic panel that is coated with electrically conductive and resistive layers made with indium tin oxide (ITO). The thin layers are separated by invisible spacers. Resistive screens are generally the most affordable type of touch screen. Although clarity is not as good as with other touch-screen types, resistive screens are very durable. Here we used 4 wire resistive touch pad.voltage is applied across the screen and a touch presses the layers together, where a voltage can be read and this is given to the ADC for conversion. On the touch pad up, stop and down modes of speed are given. Hence according to convenience the speed is selected on touchpad.

E.0808 ADC

The ADC0808 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic. The converter features a high

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 2, February 2017

impedance chopper stabilized comparator, a 256R voltage divider with analog switch tree and a successive approximation register.

F. Electromagnet

An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. The magnetic field disappears when the current is turned off. Electromagnets usually consist of insulated wire wound into a coil. A current through the wire creates a magnetic field which is concentrated in the hole in the center of the coil. The wire turns are often wound around a magnetic core made from a ferromagnetic material such as iron; the magnetic core concentrates the magnetic flux and makes a more powerful magnet.

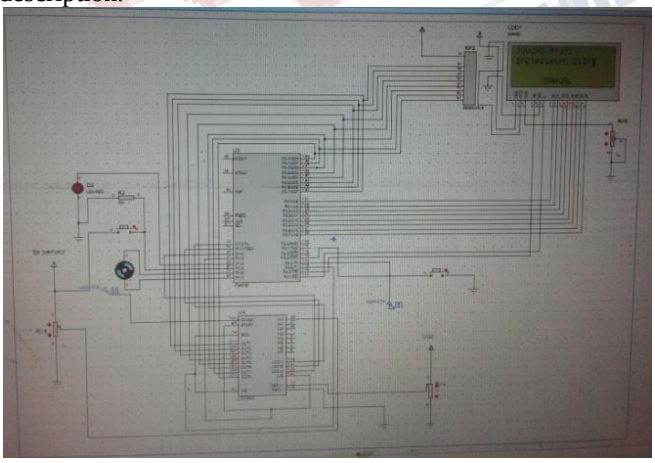
The main advantage of an electromagnet over a permanent magnet is that the magnetic field can be quickly changed by controlling the amount of electric current in the winding. However, unlike a permanent magnet that needs no power, an electromagnet requires a continuous supply of current to maintain the magnetic field.

The electromagnet used have following specifications

1. Voltage of 240v AC
2. Current required is 800mA
3. 24 gauge wire
4 .It has 800 no. of turns

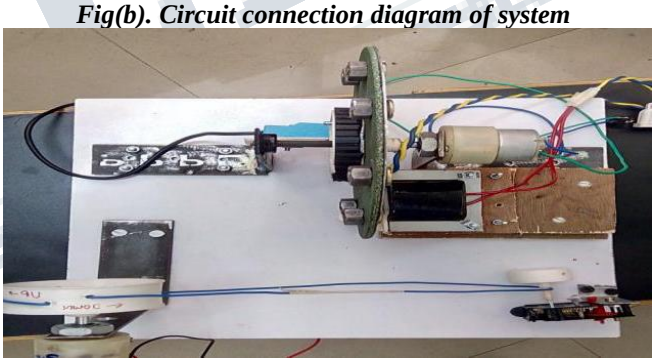
III. RESULTS

The system designed as a prototype and has been tested using all the modules mentioned in the functional description.

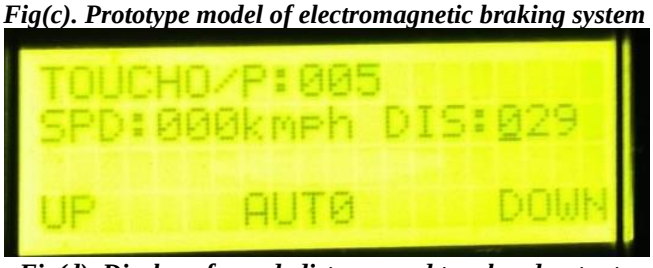


fig(a). Proteus results of simulation

Fig(b). Circuit connection diagram of system



Fig(c). Prototype model of electromagnetic braking system



Fig(d). Display of speed, distance and touchpad outputs

III. CONCLUSION

This concept is being developed for application on lighter vehicles. The concept designed by us is just a prototype and needs to be developed more because of some disadvantages. These electromagnetic brakes can be used as

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 2, February 2017

an auxiliary braking system along with the friction braking system to avoid overheating and brake failure.

Electromagnetic braking system is found to be more reliable as compared to other braking systems. In oil braking system or air braking system even a small leakage may lead to complete failure of brakes. And this system needs very little of maintenance. In addition, it is found that electromagnetic brakes make up approximately 80% of all of the power applied brake applications This enhanced braking system not only helps in effective braking but also helps in avoiding the accidents and reducing the frequency of accidents to a minimum. Furthermore the electromagnetic brakes prevent the danger that can arise from the prolonged use of brake beyond their capability to dissipate heat.

REFERENCES

[1] Uttamkumar Dravidam and Sabri Tosunoglu, "A survey on automobile collision avoidance system", Florida International

[2]Limpert Rudolf, "Brake Design and Safety, society of automotive engineers, Warrandale, Inc, Second Edition, USA, 1992, PP 11- 157,.

[3] N. S. Shayan, Vishwas. S. Patel "Collision Avoidance for Vehicle Safety" BMSCE 2011

[4]Savio Pereira, OmkarVaishampayan, Akshay Joshi., " A Review on Design of Hydraulic Disc Brakes and Calculations", PVG's COET, Pune 411009, Volume 3, Issue 2, February 2014

[5]Kumar, K.P., Kadoli, R., Kumar, M.V.A., Mechanical and magnetic analysis of magnetostrictive disc brake system, Industrial and Information Systems (ICIIS), 2010 International Conference ,July 29 2010-Aug. 1 2010.

[6]Heald, M.A., ''Magnetic braking: improved theory,'' American Journal of Physics, Vol. 56,No. 6, pp. 521–522, 1988.

[7] Mohd.Shahrizan B. Sahri, "Ultrasonic car braking systems", University of Malaysia, Pahang.

[8] Dhanya K R and Mrs R Jeyanthi, "Advanced automatic braking system with sensor fusion concept", International Journal of Emerging trends in Engineering and Development, ISSN 2249-6149, Issue 2,Volume 3 (April 2012)

[9]Kesavamurthy, N., ''Eddy-current in solid iron due to alternating magnetic flux,'' TheInstitution of Engineers Monograph, No. 339U, pp. 207–213, June, 1959