

# Automatic Braking and Control for New Generation Vehicles

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**Abstract-** To develop an automatic acceleration and braking new generation vehicle, we need to modify the acceleration controller and braking system simultaneously. In the electric scooter in which we are using works on 48V battery. The same battery provide supply to other circuit elements and motor (12V) used in the scooter. The acceleration is controlled by controlling the supply to the controller whereas the brake control is done by using wiper motor (dc servo motor) which directly control the braking system. In distance control mode, a PIC logic algorithm is applied. Input to the PIC logic controller is distance from the obstacle and relative speed. According to the distance from the obstacle the rate of working of wiper motor and braking system is controlled.

**INDEX TERMS** - cruise control, ultrasonic sensor, automatic braking.

## I. Introduction

Cruise control system is developed for highway driving. Nowadays hundreds of people dies and lots of people are damaged due to accidents. This system is useful avoiding accidents especially for driving in the roads which are big, straight, and the destination is farther apart. When traffic congestion is increasing, the conventional cruise control becomes less useful. The adaptive cruise control (ACC) system is developed to cope up with this situation.[2] mentioned that conventional cruise control provides a vehicle with one mode of control, velocity control. On the other hand automatic braking and acceleration (ABAV) system provides two modes of control i.e. brake control and acceleration control. This system automatically decreases the speed when as the obstacle is coming closer. This system provides safe and effective driving especially in highways.

In this research the proposed system is done on an electric scooter in which the acceleration is done by using a BLDC controller. The power to the electric scooter is from battery which provides 48V. We are controlling the rear brakes, for automatic braking system. Normal braking as desired by driver can be done at any time required. In this system we are using PIC logic which measures distance between the obstacle and sends output command as velocity command and braking command.

## II. Hardware

To develop the (ABAV) system for the intelligent vehicle (electric scooter), hardware and sensors are designed and installed on the platform.

### A. Electric Scooter

The electric scooter used for this research works on 48V dc supply which is provided by four 12V batteries which are connected in series. For the working of other components 5V supply is required which is obtained by dc-dc converter



The scooter has a maximum speed of 35km/hr and it is provided with an inbuilt BLDC controller which makes the working of scooter more smooth, silent and efficient.

### B. Ultrasonic Sensor

The main component for ABAV is ultrasonic sensor HC - SR04. This sensor has a max range of 4m and a min range of 2m. Both the transmitter and receiver sections are included in the same unit. The transmitter sends pulses of about 40 KHz and after reflecting from the target it gets reflected back as echo which is then captured by the receiver part. By measuring the time difference between the transmitted and received pulses the distance of the obstacle can be measured using the formula:

You only need to supply a short 10µs pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion.

### C. Wiper Motor

The wiper motor is provided in order to have automatic braking system. The wiper motor used in this research works on 12V supply which can be taken from a single battery of electric scooter. We can replace the wiper motor by using shunt motor.

### D. Connecting Rod Arrangement

To change the rotational motion into linear motion connecting rod mechanism is used. The wiper will have a rotational motion and to change to linear motion we connect one end of connecting rod at the end of the wiper motor leads and the other end of the brake cable which is attached to braking system of rear wheel. In fig 2 shows a circle which depicts the wheel and using connecting rod it converted into linear motion.

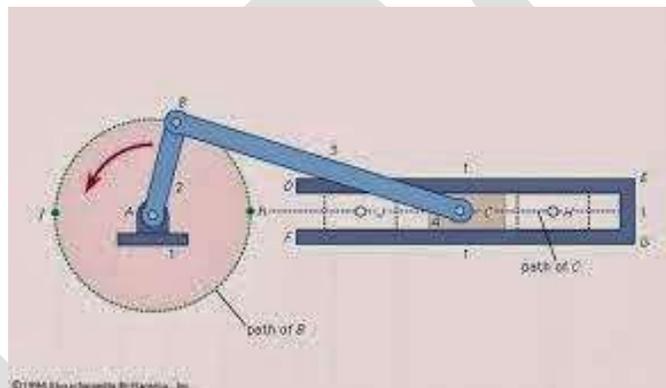


Fig.2 Connecting Rod Mechanism

### III. Block Diagram Representation

The block diagram consist of accelerator which is connected to the battery. As the accelerator cable contracts the speed of the vehicle can be controlled. When the ultrasonic sensor detects the obstacle the signal is sent to the electronic circuit and the output of electronic circuit unit (PIC) is sent to the relays which automatically closes and opens with the range of obstacle. With the working of relays working of motor and supply from battery can be cut off as required.

The circuit diagram shown in fig 4 shows the power circuit which converts the ac supply into 12V dc supply using rectifier circuit and regulator. PIC is the main component in the circuit. All the components like ultrasonic sensor are interfaced to PIC using different ICs. ULN2003 is used to interface relay with PIC, RS232 is interfaced to PIC. The circuit consists of a crystal oscillator and two capacitor which control the oscillation and life of PIC. The LCD unit is used to display the distance which is interfaced to PIC.

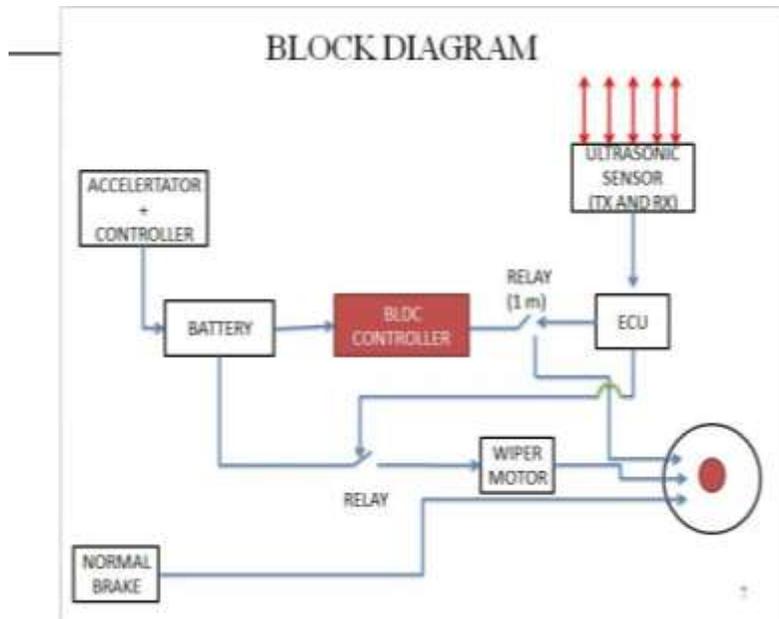


Fig 3. Block Diagram of proposed system

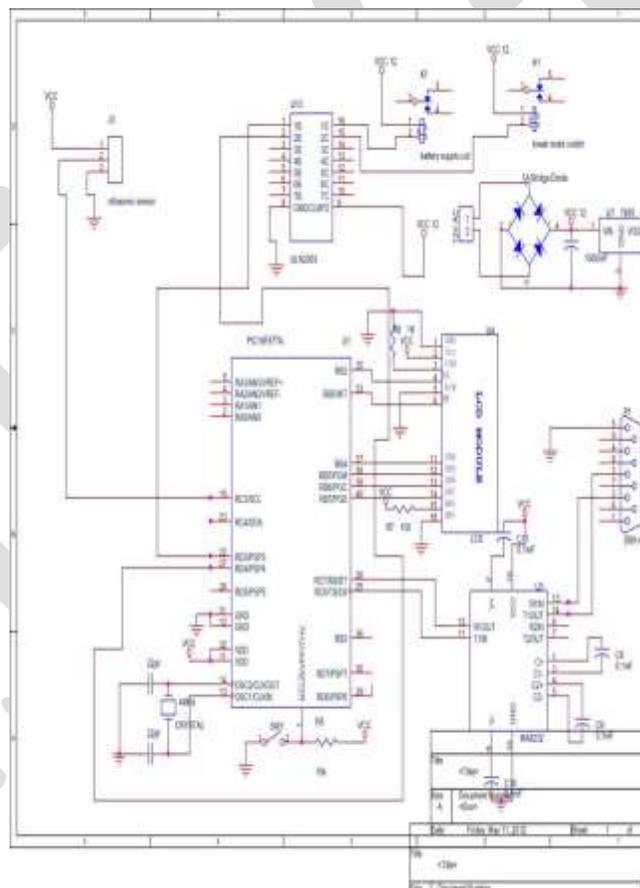


Fig 4. Circuit Diagram

#### IV. Software

The program for this system is done on embedded C. The program is made to determine the distance of the obstacle in front and to activate the automatic braking system i.e. the wiper motor. Using the if loop provided in the program the distance from

the obstacle can be divided into two i.e. between 100-200cm and between 0-50cm. during the first range only brake is applied whereas during the second range the brake is applied and battery supply to the scooter is also cut off.

For the circuit demo the circuit is provided with two LEDs, green and red as shown in fig 5. The green LED glows when the obstacle is in the range of 100-200cm whereas the red LED glows when the obstacle is in the range of 0-100cm. the green light indicates that only the brake is applied whereas the red light indicates both the brake is applied and the power supply to the scooter is also cut off and the vehicle completely stops during this range.



Fig.5 Circuit with LED demo

With the further modification in the circuit and program the velocity of vehicle moving in front can be determined. In this system we able to use the cruise control technology i.e. our proposed vehicle can be set to run at a particular speed as determined by the driver. By introducing these two system the driver becomes more free and relaxed during **driving, so that driver's hands** becomes free from accelerator and brake pedals.

## VI. Proposed System in Fuel Vehicles

### A. Throttle Valve Control System

[1] The original throttle valve control system is changed to a drive-by-wire system so as to be able to control by the motor. A 12v dc servo motor is installed to control the throttle valve position. A potentiometer is installed at the accelerator pedal to measure the pedal position. The drive-by-wire controller is developed on a microcontroller which reads the required throttle position from output voltage from the potentiometer.

### B. Automatic Braking Control System

As in the case proposed system the same wiper motor with connecting rod arrangement can be made for automatic braking system. The power supply for the wiper motor is provided from the battery used in the vehicles. The rotational motion can also be converted by using a pulley and a steel cable. If the motor rotates, the brake pedal will be pull down by the cable.

## VI. Conclusion

In this research, the ABA vehicle is designed and developed. The wiper motor is used for automatic braking which is done using connecting rod arrangement. The acceleration can be cut off by cutting the supply from the batteries which can be achieved by using electromagnetic relays. When the obstacle is away from the range which is determined in the program the vehicle starts moving as determined by the driver

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