

# Anti Collision and Auto Retarding System along With a Wiper Speed Control during Rains Using MSP430 Micro-controller

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**Abstract:-** In this paper we propose a system that can enhance the safety of vehicles. Our solution can assist the driver by warning the driver about impending obstacles and approaching vehicles that may lead to collision in addition to this we are also implementing an auto retarding system which helps in avoiding the accidents. In addition to this we implemented an automatic wiper speed control which controls speed of the wiper based on the intensity rain fall.

**Keywords:-** Ultrasonic sensor, Amplifier, Laser beam, IR sensor, Motor driver, LCD.

## I. INTRODUCTION

Safety is a necessary part of man's life. Due to the accident cases reported daily on the major roads in all parts of the world more attention is needed for research in the designing an efficient car driving aiding system. It is expected that if such a device is designed and incorporated into our cars as a road safety device, it will reduce the incidence of accidents, with subsequent reduction in loss of life and property. In our approach in finding solution for this we implemented three systems that enhance the safety of the driver.

First the anti collision system using a laser beam and then using an ultrasonic sensor is implemented which gives a better accuracy. The system is intended to find a way to implement a minimum spacing for cars in traffic in an affordable way. It would also achieve safety for the passengers of a moving car. The device is made up of a laser system and an even more better approach using ultrasonic sensor as laser beam is highly directive and lower proximity range. The system is also incorporated with an audio visual alarm to work in with the receiver and effectively alert the driver and/or the passengers.

Second, Auto retarding system, once the obstacle is detected and message is given to driver we also reduced the speed of the vehicle in order to enhance the safety of the driver. In this system, we have retarded the speed of the motor when there is an obstacle detected hence reducing the speed of the vehicle automatically. This system is very useful when there is a sudden obstacle detected.

Third, the wiper speed control system, which controls the operational speed of a wiper in accordance with rain conditions. The control system includes a rain sensor detecting rain conditions to produce an analog signal having an amplitude depending upon the detected rain conditions. The analog sensor signal is converted into a digital pulse signal by a converter for application to a digital circuit diagram. A control signal is produced by digitally processing the pulse signal. This signal is applied to a wiper driver circuit to adjust the operational speed or timing in accordance with the control signal. This is very useful in rain conditions as the car wind shield obstructs the vision of driver and may lead to accidents the advantage of our system is that it does the work of adjusting the speed of wiper without the need of the driver to respond.

## II. ANTI COLLISION AND AUTO RETARDING SYSTEM USING LASER

The anti collision system can be placed on the bonnet of the vehicle. The block diagram of this system is shown in figure1.

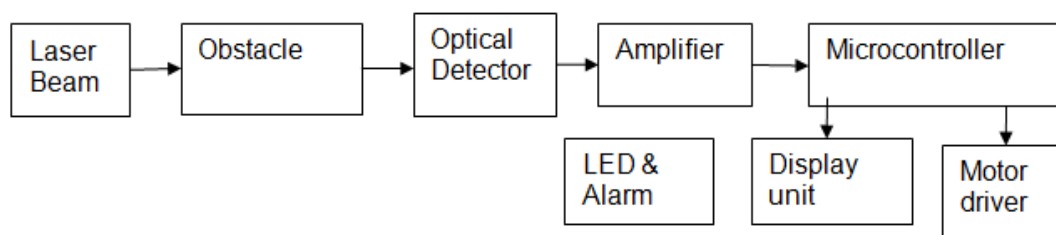


Fig. 1 Block Diagram on Anti Collision System

A continuous source laser acts as the laser beam transmitter. In our project we have used a red point laser. It is driven by giving a High low pulse from an astable Multi vibrator that is designed using an IC555 timer for a certain frequency. Upon sensing an obstacle the laser beam that is transmitted strikes it, and then it will move back after striking the obstacle's surface. These came back rays of light beam will be having certain frequency and they are to be received by a detector at the other end. For this purpose we have used an optical detector which has detector has a property to change the output voltage linearly with the amount of light incident on it. We have used a special detector in our project OPT101 it has an on-chip trans impedance amplifier The basic function of this trans impedance amplifier is to convert current to voltage. The received signal will be further amplified in two stages and this will remove the noise from the signal and better output is given to the microcontroller for better solution. The amplifier we used is a Non-inverting amplifier using IC741. We have amplified the signal in two stages. This signal is now given to the 8051 microcontroller so as to display the message on the LCD and retard the motor. The output signal at the second amplifier drives the buzzer and LED. So on detection of an obstacle the signal at the second stage amplifier goes high and the buzzer makes the sound and the message "OBSTACLE IS DETECTED" is displayed on the LCD. Along with these two warnings the motor speed is also controlled there by retarding the vehicle. The combination of these two will provide safety to the driver.

As laser beam is highly directive and also has a lower range of proximity this system may not be so effective practically for longer distances and in the case of irregular obstacles. So to overcome this problem we implemented a better approach towards the solution by replacing the laser beam with an ultrasonic sensor.

### III. ANTI COLLISION SYSTEM USING ULTRASONIC SENSOR

Anti collision system using ultrasonic sensor is a better approach as it has higher range of proximity (4m). The block diagram of this system shown in figure2.

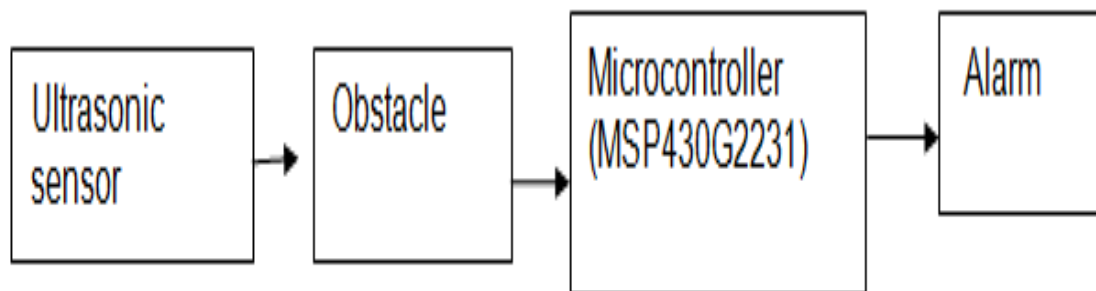


Fig. 2 Anti Collision System using Ultrasonic Sensor

It is a type of sensor that uses sound waves to detect a target. Ultrasonic sensors are the best type of sensor for detecting liquids, clear objects, or irregularly shaped objects. The sensor we used in our project gives values that are ASCII. This sensor is a high performance ultrasonic range finder. It is compact and measures an amazingly wide range from 2cm to 4m. . This ranger is a perfect for any practical application, which requires accurate ranging information. Every 500 ms, the sensor transmits an ultrasonic burst and sends out ASCII value of distance that corresponds to the time required for the burst echo to return to the sensor. In our project we have checked for two values of distance that is 10 centimeters and 1 meter. The sensor senses the obstacle at regular intervals and sends the ASCII values to the microcontroller. Here we used MSP430 microcontroller which is an ultra-low-power microcontroller consisting of several devices featuring different sets of peripherals targeted for various applications. The architecture, combined with five low-power modes, is optimized to achieve extended battery life in portable measurement applications. The device features a powerful 16-bit RISC CPU, 16-bit registers, and constant generators that contribute to maximum code efficiency. The values are sent serially to the microcontroller from the sensor. These values are stored in a register called Rx buffer. Upon detecting the obstacle, the value from the sensor and the value we are checking for matches and the buzzer connected to the output pin gets activated, there by alerting the driver about the warning. The ultrasonic sensor triggers the values for every 500ms so the system checks for it in every 500ms time period so the values are triggered very quickly. So the buzzer rings continuously with a sound that generates a warning to the driver and there by avoiding the accidents. Every 500ms triggering is ideal as the obstacle may arrive at any point of time.

### IV. WIPER SPEED CONTROL SYSTEM

In this module we detect rain using IR sensor and control the wiper according to the amount of rain. First we detect rain using IR transmitter and receiver and send this detection to the microcontroller and hence control the motor accordingly. The block diagram of this system is shown in figure3.

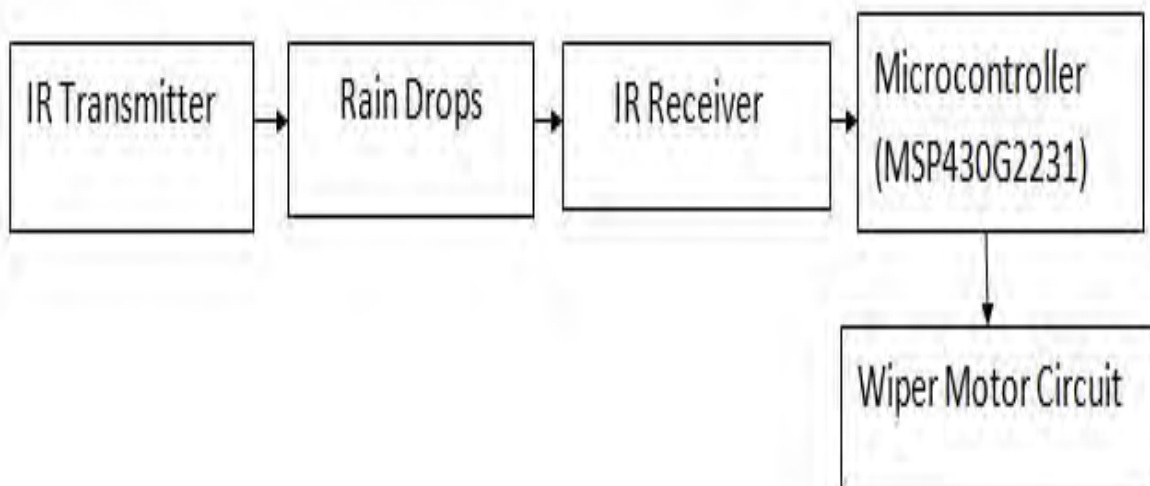


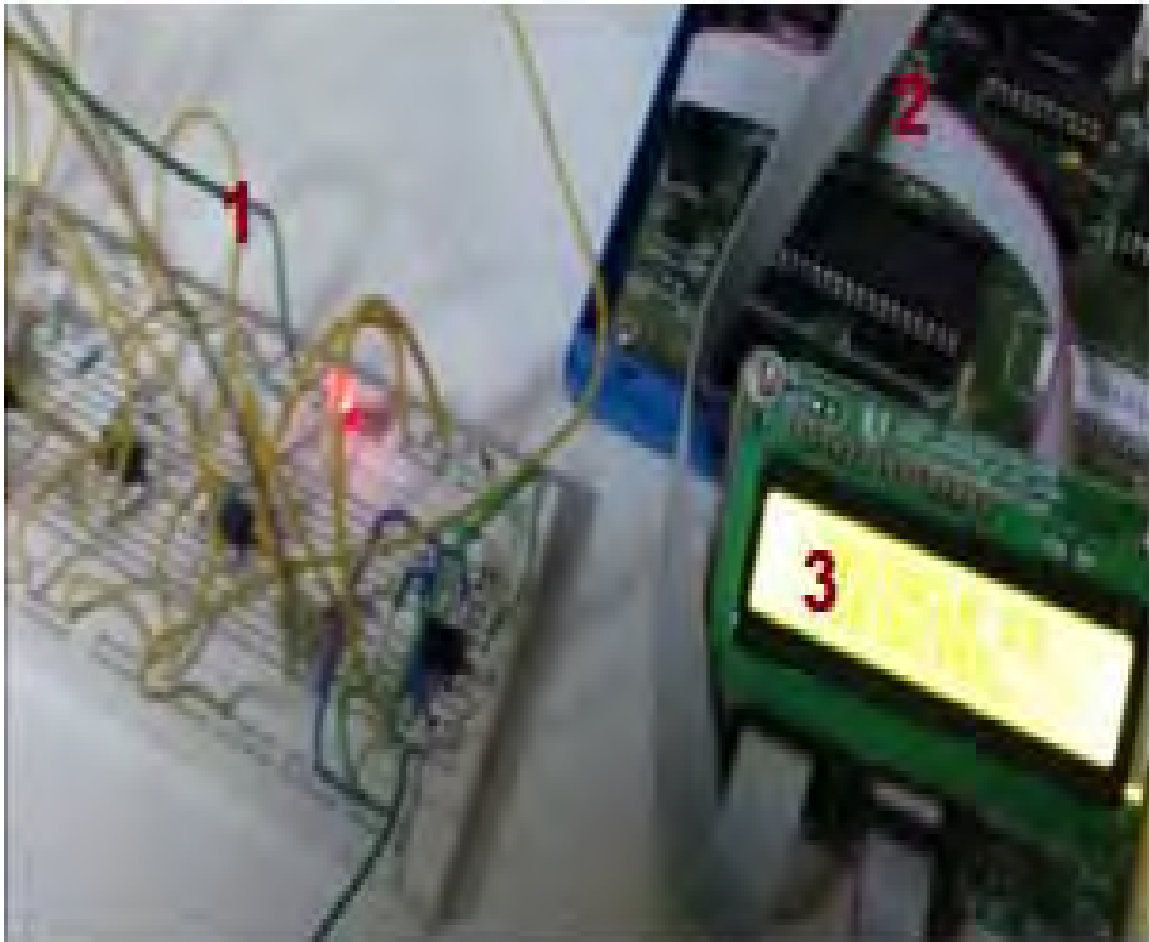
Fig. 3 Block Diagram for Wiper Speed Control

The IR Transmitter in our application senses the rain whether it is present or not. The IR transmitter and receiver are placed at right angles to the surface of rain. It is placed at right angle as the light beam reflected directly falls on the receiver as it is the critical angle, due to the total internal reflection. A glass is placed at right angle and water is sprinkled on the glass. Whenever water is sprinkled, this is detected by the receiver. At the receiver, according to the amount of rain the voltage is produced. When there is no water the voltage is high and when water is detected the voltage reduces, In higher amounts of rain the voltage still reduces. As the voltages we get from this point are low. We amplify this voltage using a amplifier circuit using IC 741. The MSP430G2231 microcontroller is used to detect when the perceived rainfall exceeds a threshold value and activate the wipers. We connect motor to the output pins of the microcontroller. The motor runs according to the amount of rain. When there is no rain the motor does not run, and when there is low rainfall the motor starts running at a speed and at higher amounts of rain the motor runs faster. We have given more delay when we want motor to run slower and vice-versa for running faster. This is applied practically to control the wiper. On introducing this system on to the vehicle the driver need not bother about the wiper speed during rains.

## V. RESULTS

The hardware circuit was connected and then it is interfaced with the microcontroller. After connecting the entire setup the code written for this application is downloaded on to the microcontroller chip. When there is no obstacle is found in the proximity of the laser beam there is no message transferred to the LCD that is there is no signal coming in. When there is an obstacle is found in the proximity of the laser beam there is a signal coming in and a message to the Display unit is sent. This is shown in figure 4.

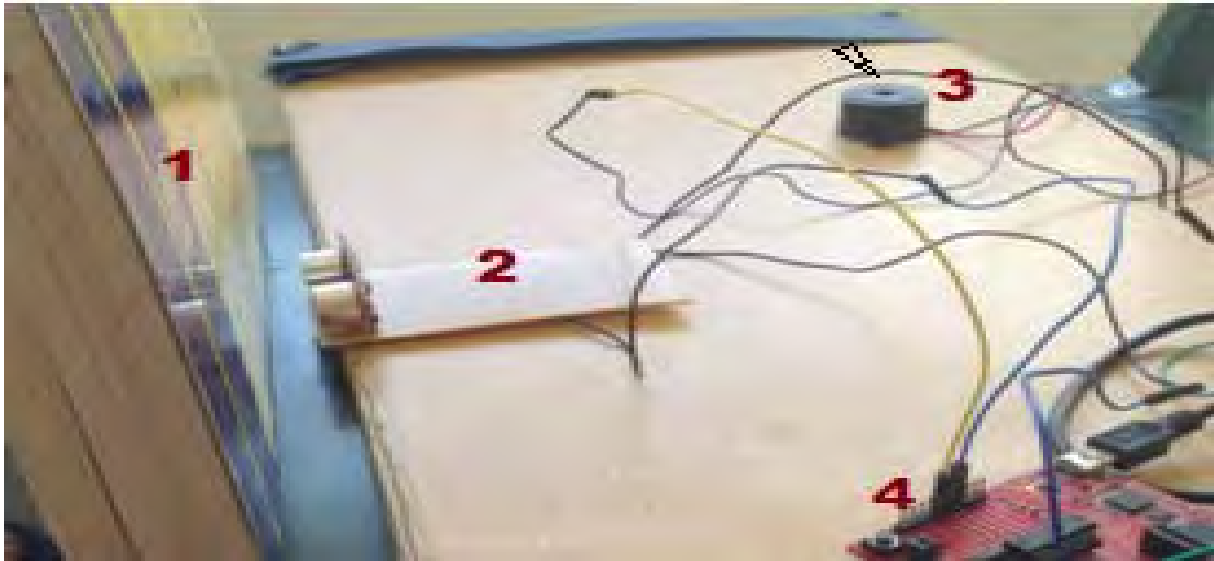
Besides displaying the message the buzzer also had made the buzzing sound, LED is turned on warning the driver about the obstacle. Simultaneously the speed of the motor is reduced there by retarding the vehicle.



1. Hardware circuit 2.8051 Kit 3. LCD showing the message "OBSTACLE IS DETECTED"  
Fig. 4 Experimental Setup for Anti collision system

We have replaced the laser beam with an ultrasonic sensor for better results as it has larger proximity range. When there is no obstacle is detected the ultrasonic sends no constant values to the microcontroller or it sends a 0 as this value is not matched with the value we are checking for the buzzer will not be activated and no sound is made.

When there is an obstacle within the range of the sensor we get the value as input to the microcontroller and this is checked with the value we are checking for and if the value matches that is if the obstacle is into the range of it. The closest range we check for is 10cm and when we placed an obstacle in this range we get a buzzing sound and when we remove the obstacle the buzzer gets disconnected and it don't make any sound. The figure 5 shows the setup.



1.Obstacle 2.Ultrasonic sensor 3. Buzzer ringing 4.MSP430 launch pad  
Fig. 5 Ultrasonic sensor Experimental Setup

In wiper speed control system When there is no rain the voltage that we get from the amplifier is high and the motor does not run and wiper is not activated, which tells that there is no rain, and when there is less amount of rain the voltage at the amplifier decreases and the motor runs at a speed that is 33% of the original speed of the motor. When there is higher amount of rain the voltage still decreases and the motor runs faster i.e., with 100% speed and the wiper moves faster. This application need not even require the driver to concentrate on to the wiper as the wiper automatically gets activated and the driver can safely drive the vehicle.

The figure 6 shows the response of the system when the amount of rain is high.



1.Hardware setup with a glass 2. Sprinkler acting as source of rain. 3.Motor rotating with high speed.  
Fig. 6 Wiper Speed Control Experimental Setup

Some of the reasons for using the MSP430 are that it is a low power device so can be made to run on batteries instead of drawing power from the car battery. Further, it is a low-cost microcontroller. We may only need to implement a few variable speeds and thus need only four to five output pins, one for each speed. Hence, the MSP430G2231 was a good choice.

## VI. FUTURE WORK

The efficiency of the dual-axis tracking system can be increased even more by placing a mirror or concave lens on top of the panel. The use of lens or mirror increases the tracker's efficiency since large amount of sunlight is concentrated on the panel and large power is generated.[6]

It can also reduce the size of the solar cell required to generate large power. It also has high optical efficiency.[6]

Alternative solar power or battery power can be provided for activating the circuit even when vehicle is in off condition for better efficiency.

## VII. CONCLUSION

We have been successful in implementing the Anti-collision System and auto retarding system along with Wiper Speed Control system using lasers, ultrasonic module and infrared diodes. Commercially such anti-collision and automatic wiper systems are available in as standard in high end cars and are available in the excess of \$100 each. That implies that to fit a car with such safety feature would cost approximately \$250. But the total cost of our raw material was less than Rs. 3000 (~\$60) i.e. less than one-fourth the commercial price. In our anti collision system laser beam is used as sensor first and then it is replaced by ultrasonic for better results. In the wiper speed control system the IR detector is very sensitive and can detect very small quantities of moisture. In case even slight rainfall the system will get activated, in higher amounts of rain the motor runs faster and this implies the wiper runs faster and will save the driver from distraction and provide convenience and safety.

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