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Ultrasonic Obstacle Detection & Overload Vehicle Detection

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ABSTRACT: Overloading of vehicles is common phenomenon now a days, resulting in road damages, accidents and mileage issues. The project main aim is to detect overload vehicles and help reduce road damages and accidents and improve mileage of vehicles.

Another aim of this project is to detect obstacles coming vehicle way using Ultra sonic obstacle detection; it will not only reduce vehicle accidents but also reduce damage caused due to unforeseen objects suddenly appearing while driving in late night hours.

KEYWORDS: ATMEGA328 / ARDUINO, LCD Display, Power Supply, Ultrasonic Module.

I.INTRODUCTION

The robot is powerful application in new age development. As per our final year syllabus there is a project, to implement our knowledge in studying previous years. To implement our knowledge according to our engineering field we want to develop such project, that is very helpful to multi application and interesting also. We have interested in Robotic but the controlling through switches or mobiles are old methods. We want to control the robotic application by its load limit.

As we start robot it moves forward and if obstacle is detected by ultrasonic sensor it turns right and again goes forward. Over load appear on vehicle buzzer beeps and stops vehicle.

1.1 Overload and Road Safety:

The safety issues and the cost issues are to be identified based on overloading and hence the National department of transport has incorporated a campaign against overloading in its Road Safety strategy. Overloading of commercial vehicles has a major impact on the life expectancy of road networks. The cost of premature road failure and repairs is a major burden on many governments particularly in developing countries where this problem diverts vital funding that could otherwise be spent on health and education. The overloading problems should be controlled or else the extra expenses will be borne by the people which will result in extra wages to be paid in terms of overloading penalty, extra fuel consumption charges and also the trucks carrying goods beyond the permitted load will end up paying 10 times higher the toll charges. This imposes a serious problem on both economical aspects and also upon maintenance of roads. Overloading is a safety hazard that leads to unnecessary loss of life and also the rapid deterioration of our roads, resulting in increased maintenance and transportation costs. In India the midst of building national highways under the NHDP(NATIONAL HIGHWAY DEVELOPMENT PROGRAMME) entails huge investment ,which will last for at least 10-12 years. However even a 10% overloading of goods carriage in excess of prescribe weight can reduce the life of roads and highways by 35%.

1.2 Overloading a Vehicle will pose the following risks:

Different vehicles have different maximum weights for which they are designed .Hence if this maximum weight exceeds than it is difficult to stop the vehicle and thus the vehicle becomes less stable .Effectiveness to stop the vehicle decreases due to overheating of breaks which will result in harder breaking mechanism as the vehicle is heavier. The parts of the vehicle are of great concern and overloading will incur major loss or reduction in their effective usage and will decrease the efficiency of the vehicles. As the overloading is illegal the insurance covered by it becomes invalid. Overloaded vehicles produce higher kinetic energy, resulting in greater impact forces and damages to other vehicles or to the infrastructure. The other common problems on National highways is overloading of trucks beyond the specified height and length limits. In 2014 these two causes have resulted in 36,543 deaths.

II. BLOCK DIAGRAM

This system consist of major building block like Arduino uno, Ultrasonic module,Lcd display , Power supply, Limit switch and Relay .

1. Arduino uno –

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button

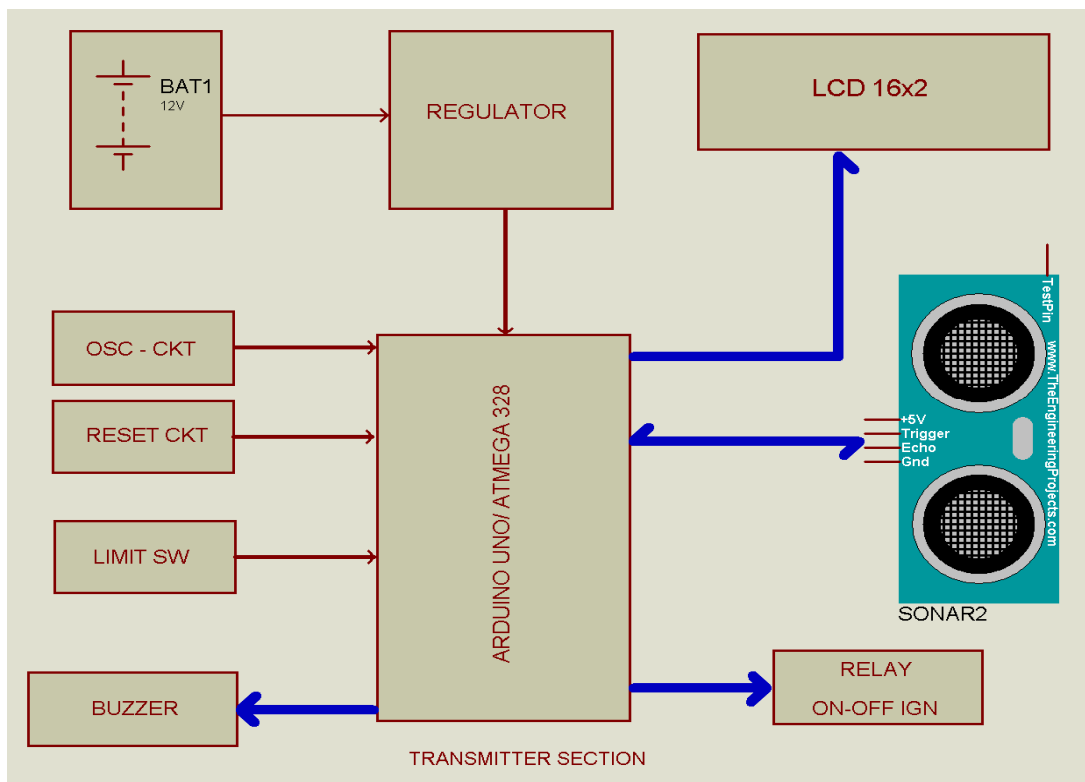


Figure 1: Block Diagram

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2. Ultrasonic Module –

Ultrasonic module has 4 pins i.e. Vcc, Gnd, Trigger, Echo. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The module includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: Using IO trigger for at least 10us high level signal. The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

3.LCD Display –

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

4.Power Supply –

Here arduino uno board, motor driver required 12V power supply connected with BATTERY, buzzer, LED indicators, sensors and control circuit operates with DC 5V. regulator is used to obtain 5V.

III. CIRCUIT DIAGRAM

12V battery is connected with directly Motor driver board and 5V obtained with regulator for microcontroller, ultrasonic sensor. 12V is converted in to 5V by LM7805 regulator IC. To cancel loading effect we used here 1000uf capacitor filter.

Arduino board pins are connected with ultrasonic Module it has 4 pins (Vcc, GND, Trigger, Echo) to 2 and 3 as echo and trigger pins and Vcc is connected with 5V and ground connected to common terminal

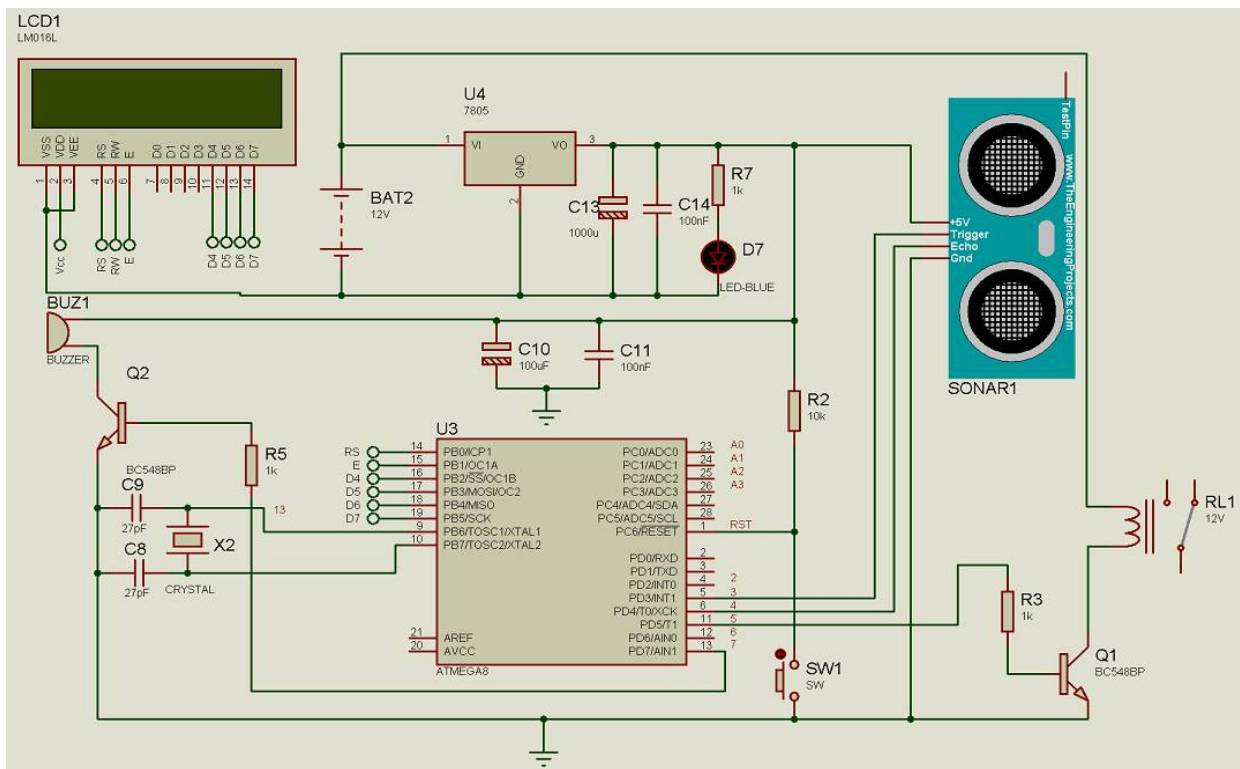


Figure 2: Circuit Diagram

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Load limit switch is connected with 6 no pin, initially that pin is high and if that pin goes low when over load given to it microcontroller output is given to buzzer to beep and stop vehicle.

Output of microcontroller pin 11 is connected with transistor amplifier via current limiting resistor of 1K and bypass of 10K. Here transistor used in common emitter mode, emitter is connected with ground and collector terminal is connected with buzzer –Ve terminal and buzzer +Ve terminal is connected to the Vcc.

According to programming conditions in arduino board, received data is processed by microcontroller and output is given to the motor driver IC L293D or motor driver board via arduino pins 23, 24, 25, 26 respectively. Now motor driver drives motor and control the robot in forward, left-turn/ right turn. We can select the motors depends upon our requirements like 100 rpm or 60 RPM.

LCD data pins (AD4 to AD7) is connected to the pin 16, pin 17, pin18, pin 19 to send the data for the LCD display. The control pins of LCD display is connected to pin 14, pin 15, respectively take action as RS, E. Variable resistor of 10K (or fixed 2.2K) is connected to the adjust contrast of 16X2 LCD display. 100nf (C4) is used to bypass the unwanted spikes produced in the circuit

IV. RESULT

It's common now a day's that vehicles are overloaded, resulting not only wear and tear of roads but also impacting mileage and speed at which traffic moves. In this project we came up with a solution that vehicles get acquainted with circuit that will not allow vehicle to not move an inch from its place when its overloaded and government can make it mandatory to reduce cost of repairs of highways, reduce accidents caused by potholes and damaged roads and improve mileage resulting in less consumption of petrol and diesel there by reducing overall reduction in carbon foot prints into atmosphere.

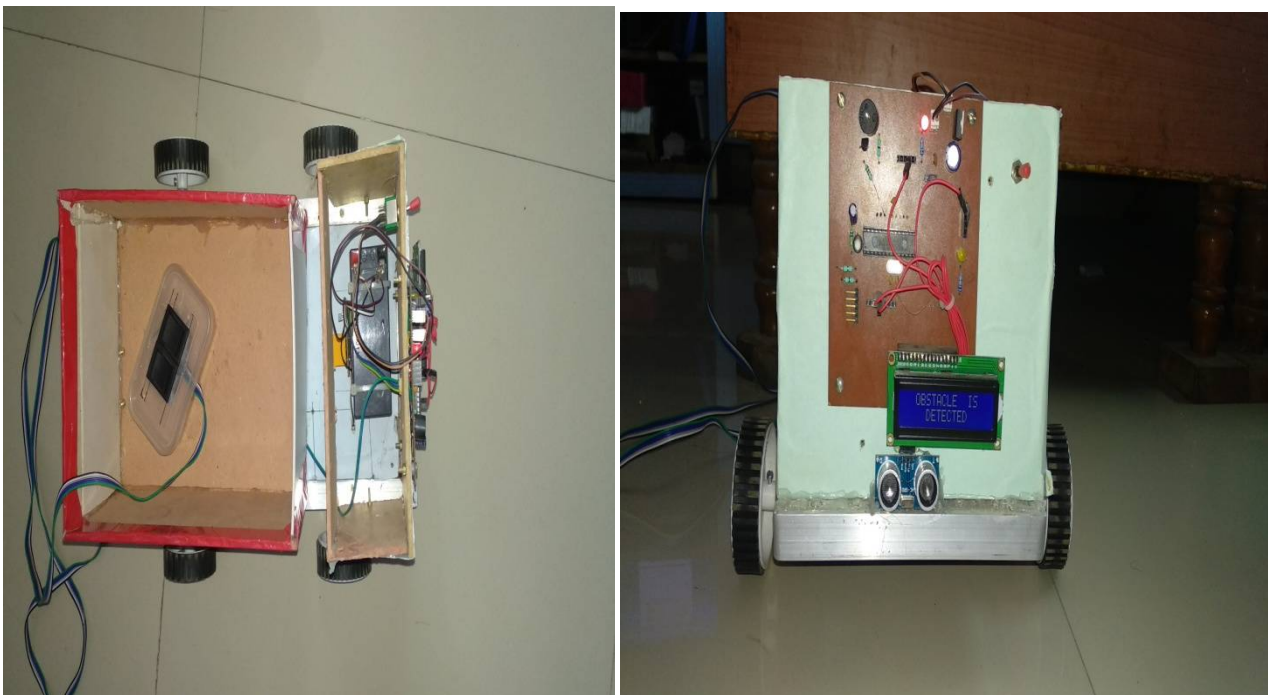


Figure 3: Implemented prototype



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An added advantage for vehicles that move during late night hours, its common in our country that people don't use zebra crossing, cattle's are found on roads moving here and there and stones and granites are loosely thrown here and there, on highways causing drivers to apply sudden breaks or take sudden turns, sometimes making it impossible to avoid accidents. We designed a circuit that will alert that there is an obstacle ahead to driver at 70ft distance and reduce vehicle speed as first step automatically and if driver is not on alert and doesn't take any action then at 10ft distance the vehicle will apply breaks as a final course of action from circuit to avoid accidents.

V. CONCLUSION

The transmission of action between engine, break and circuit for overload and obstacle detection depends on various factors with some limitations identified during this project. But if these limitations are overcome with some improvements in circuit working, the resultant will benefit not only in terms of reducing damages of roads and vehicles& accidents but also can turn out to be economical in long run.

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