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Fabrication and Analysis of a Prototype for a Smart Braking System

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ABSTRACT
IC motors are so advanced that their speed is turning into a great catastrophe. The advanced smart braking system improves braking techniques in vehicles. It changes the complete braking systems in a car and takes care of the Intelligent Braking System concept giving the solution. This project is designed with ultrasonic transmitter, ultrasonic receiver, Arduino UNO R3 board with PIC microcontroller, DC gear motor, servo motor and mechanical braking system. The ultrasonic sensor generates a frequency signal (0.020-20) KHZ. It is transmitted via an ultrasonic transmitter. The ultrasonic receiver is used to receive the reflected wave present in front of the vehicle, then the reflected waves are sent to the ultrasonic wave generating unit where the incoming wave is amplified and compared with the reference signals to maintain a ratio constant e This signal is given to the microcontroller and through which the direct current gearmotor and the servomotor can operate, with consequent application of the brakes.

Keywords:Arudino UNO, Ultrasonic Sensor, Rack and Pinion, Blue tooth device, Dc Motor, Servo Motor, Solar Panel, 12v Battery.

I. INTRODUCTION

Automobiles are a fundamental and fundamental element of human life in today's world.Driving is a common activity for most people. Today, technology has big changes that increase the speed. Speed plays a vital role in keeping time over long distances. But this speed is also becoming a big problem due to the causes of road accidents. Common braking is not enough to prevent accidents when the driver is not active. Further improvements need to be made to the braking system to brake a vehicle when the driver is unable to brake, i.e. an intelligent braking system may be required. This intelligent braking system allows the vehicle to brake without driver support. The main purpose of the ultrasonic braking system is for vehicles to brake automatically when sensors detect the obstacle. This is a technology for cars to detect an impending head-on collision with another vehicle or obstacle and to brake the vehicle accordingly, which is done by the braking circuit. This system includes two ultrasonic sensors, viz. Ultrasonic wave emitter and ultrasonic wave receiver. The ultrasonic wave emitter provided in the front of a vehicle with an intelligent braking system. To reduce the emission levels, more work is being done to modify the working functions of the engine and everything in between. There are various types of braking mechanism systems that can only be mechanically applicable, to move the ideology deeper and briefly the intelligent braking system will be more sufficient and satisfying besides the mechanical braking system.

Various vehicles are appearing in the current generation with new technology for implementing human comfort and other accessories. An intelligent braking system would satisfy the technological ways of stock extension to propagate the shorter philosophy and proceed differently. This entire system is installed on a stainless-steel chassis and is utilized to automatically operate the braking system.

In the current generation, various vehicles are emerging with new technologies for the implementation of human comfort and other accessories. To spread the shorter ideology and proceed differently, an intelligent braking system would satisfy the technical methods of extending stocks.

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II. LITERATURE REVIEW

While reading the paper intelligent braking system, we came across author Gajanan kolipaper "Intelligence Braking System" using IR sensor, in which they developed a system called intelligent braking system in which they used an IR sensor to detect an obstacle and apply the brake to avoid a collision between the prototype and the obstacle.Sensors are used in everyday objects such as touch sensitive elevator buttons (touch sensor) and lamps that dim or light up when the base is touched, as well as countless applications that most people are never aware of. knowledge. With advances in easy-to-use micro-machines and microcontroller platforms, the uses of sensors have extended beyond the more traditional fields of temperature, pressure or flow measurement, for example in MARG (Magnetic, Angular Rate and Gravity). Furthermore, analog sensors such as potentiometers and force sensing resistors are still widely used. Applications include manufacturing and machinery, aircraft and aerospace, automotive, medicine and robotics. It is also included in our daily life. The ultrasonic transducer produces ultrasonic signals. These signals propagate through a sensing medium and the same transducer can be used to detect the return signals. Ultrasonic sensors typically have a ceramic piezoelectric transducer that converts an electrical excitation signal into bursts of ultrasonic energy. Bursts of energy travel from the ultrasonic sensor, bounce off objects and return to the sensor as echoes. Transducers are devices that convert electrical energy into mechanical energy or vice versa. The transducer converts the received echoes into analog electrical signals that are emitted by the transducer.

III. SCOPE OF THE PROJECT

The aim of this project is to develop an ultrasonic sensor to detect the obstacle and process the ultrasonic sensor output to drive the servo motor as an actuator. Vehicles can automatically brake due to obstacles when the sensor detects obstacles. The goal of this project is to design an automatic braking system that helps us control a vehicle's braking system. The automatic braking system must also work with an ultrasonic sensor, which produces a sound pulse by means of a buzzer. The ultrasonic wave is generated by a transmitter and sent to a receiver.

IV. METHODOLOGY

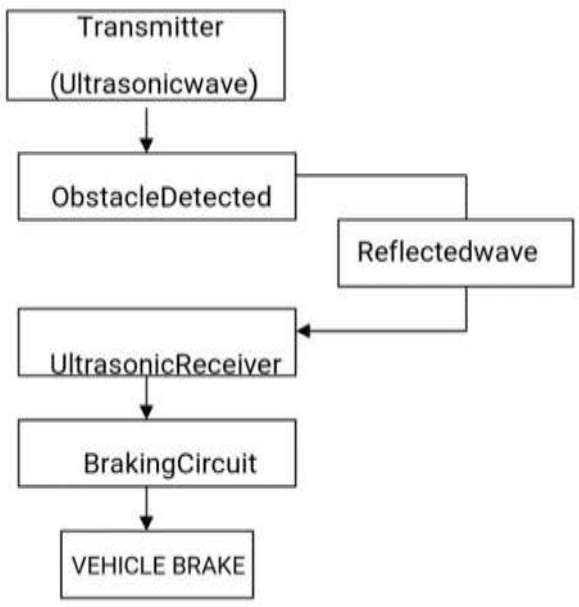

Fig 1. Block Diagram of Smart breaking system

Ultrasonic Transmitter: - Before transmitting the ultrasonic wave, there is a part which is an ultrasonic wave generator which works to generate ultrasonic waves. In that part, there is a timing instruction means for generating an instruction signal for providing ultrasonic waves intermittently. This signal will be sent to an ultrasonic wave generator to generate ultrasonic waves based on the instruction signal from said timing instruction means (transforming electrical energy into sound wave).

After the ultrasonic wave is produced, the

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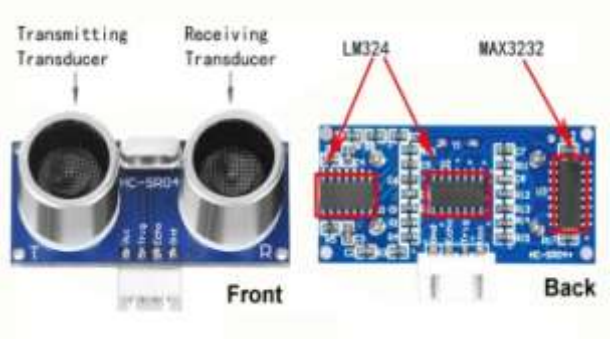
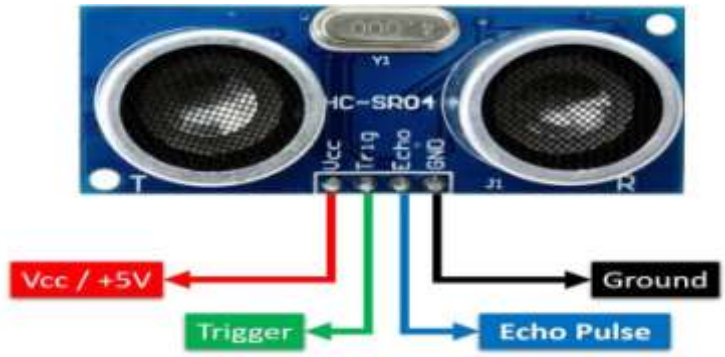
ultrasonic transmitter transmits the ultrasonic waves to the road surface to find the obstacle. The range detected by the obstacle depends on the range of the ultrasonic sensors used.



Ultrasonic Receiver:- If the ultrasonic wave detects the obstacle, it will produce a reflected wave. An ultrasonic receiver is used to receive ultrasonic waves reflected from the road surface to generate a reception signal. There is an ultrasonic transducer that will transform the sound wave into electrical energy. This signal is amplified by an amplifier. The amplified signal is compared with the reference signal to detect components in the amplified signal due to obstacles on the road surface. The amplitude of the reference signal or the amplification factor of the amplifier is controlled to maintain a constant relationship between the average of the reference signal and the average of the amplified signal.



OPERATIONAL AMPLIFIER AND ADC:- An op amp, generally referred to as an op amp, is a high gain voltage amplifier with differential inputs and a single output. The differential inputs of the amplifier consist of an inverting input and a non-inverting input. The op-amp only amplifies the voltage difference between the two inputs called the "differential input voltage". The output voltage of the operational amplifier is controlled by sending a fraction of the output signal to the inverting input. This is known as negative feedback. Due to the high gain of the amplifier, the output voltage for any given input is controlled only by negative feedback.

The amplified signal is a square pulse that is sent to the ADC. ADC (Analog to Digital Converter) converts the analog input signal into the corresponding digital signal. The digital signal is sent to the microcontroller.

BREAKING CIRCUIT: - The processed, i.e. amplified, digital signal is sent to the braking circuit. PIC (Peripheral Interface Controller (or) Programmable Interface Controller): the

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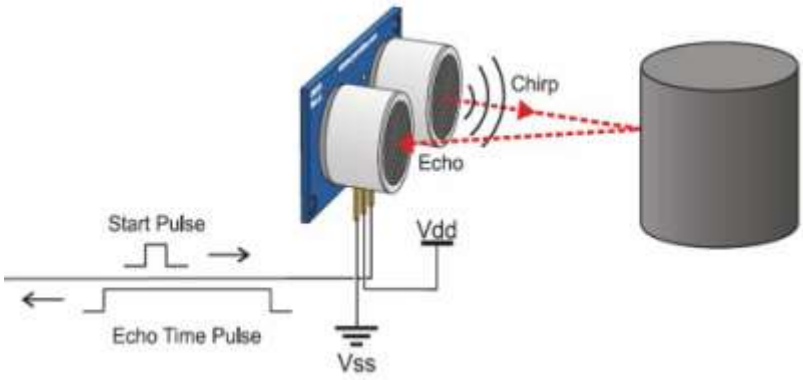
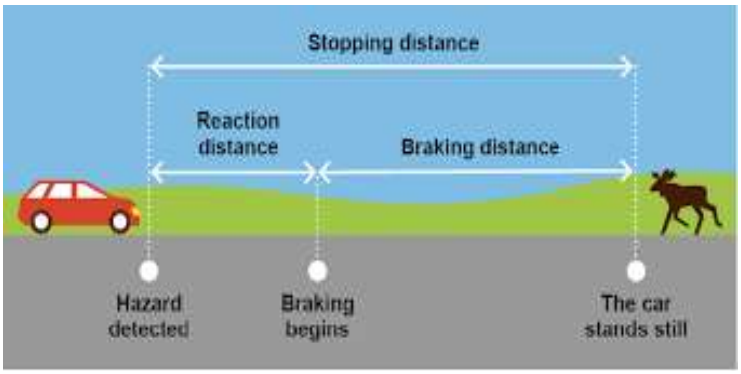
microcontroller used is the PIC 16F84, which is an 8-bit microcontroller. PIC microcontrollers are made using microchip technology. PICs are used in this system due to their low cost and wide availability. The number of instructions to perform a series of operations varies from 35 instructions on low-end PIC to about 70 instructions on high-end PIC.

Ultrasonic transducers work to radiate ultrasonic waves through a medium such as air. Transducers generally create ultrasonic vibrations through the use of piezoelectric materials such as some forms of glass or ceramic polymers.





V. SENSING CONTROLLING UNIT

The detection and control unit is the part of this system that detects the object or obstacle in front of the car, measures the distance and approach speed and then sends the necessary signals to the servomotor and then to the braking unit automatic.The Arduino is coded by software called Arduino 1.6, a language promoted by the company.

The structure of Arduino is also its drawback. When building a project, it is necessary to reduce its size as much as possible. But with the great Arduino builds. we have to stick with large printed circuit boards. If you are working on a small microcontroller like ATmega8, you can make your PCB as small as possible.

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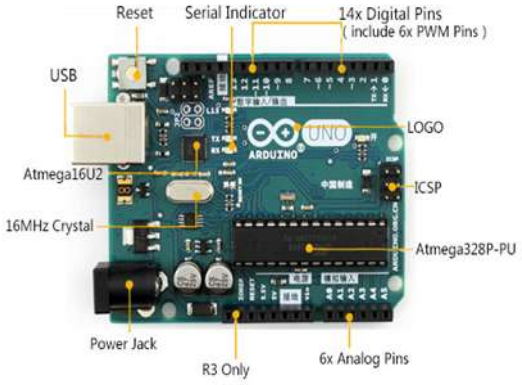

Fig 2. ARUDINO UNO R3 LAYOUT

VI. WORKING MECHANISM (PROTOTYPE MODEL)

Fig: Pictorial view of prototype model

VII. RESULTS

As a result of this smart braking system, the function of each part is working well and the whole system is successfully realized. The safety distance is determined and then the vehicle system brakes when the obstacle is detected. The range accuracy of the ultrasonic sensor in this prototype is about 2cm to 1m and works effectively within the prescribed limit.

VIII. CONCLUSION

We have successfully completed the prototype production of the smart braking system model and this project involves the implementation of a smart braking system to avoid frontal collisions, designed for use in vehicles where drivers cannot brake manually, but vehicle speed can be reduced. automatically due to obstacle

detection. It reduces the levels of accidents and tends to save the lives of many people. By doing this project in a practical way, we have gained knowledge about the operation of the smart braking system and with this future study and research, we hope to develop the system into an even more advanced cruise control system for car safety, while we realize that this certainly requires tons of work. and learning, such as the programming and operation of microcontrollers and the structure of the car. Therefore, we believe that integrating all components into the intelligent braking system will maximize safety and also give the intelligent braking system a larger market space and a competitive edge in the market.

ACKNOWLEDGEMENT

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