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Ultrasonic Radar Using 8051 Microcontroller

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ABSTRACT :
This project presents a ultrasonic radar using 8051 Microcontroller. Generally, distance can be measured using pulse echo method and phase measurement method. In this project, the distance is measured by using pulse echo technique. The ultrasonic sensor transmits a signal to the object, then after receiving echo signal from the object it produces output signal whose time period is proportional to the distance of the object. The mechanism of an ultrasonic sensor is similar to the RADAR (Radio Detection and Ranging). Based on the speed of the sound wave this system calculates the distance of the object and displays the distance on LCD display. The project aims at designing a system, which is easy to setup, user friendly eco-friendly, effective and very useful.
KEYWORDS: *RADAR, SONAR, ultrasonic transducer module, pulse echo*

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I. INTRODUCTION

Ultrasonic rangefinder can find the distance between an object from itself utilizing ultrasonic sensor. HC – SR04 Ultrasonic Module works on principle of SONAR and is intended to measure the distance of the object in small embedded projects. It offers incredible range detection with high precision and stable readings. The operation of the module is not influenced by the daylight or dark material. The ultrasonic rangefinder can measure distance up to 2.5 meters at accuracy of 1 cm.

AT89S52 microcontroller and the ultrasonic transducer module HC-SR04 structures the premise of this circuit. The ultrasonic sensor sends a signal to the object, then, at that point gets its reverberation and yields a wave structure whose time period is proportional to the distance. The microcontroller receives this signal, performs fundamental processing and shows the relating distance on the LCD display. This system utilized in automotive parking sensors and obstacle warning systems and can be utilized in terrain monitoring robots. This circuit discovers a lot of utilization in projects like automotive car parking systems, obstacle warning systems, terrian monitoring robots, industrial distance measurements and so forth. Ultrasonic sensor HCSR04 has stable execution and high ranging accuracy that makes it a famous module in electronic market. Compared to the Sharp IR running module, HC-SR04 is more economical than it. However, it has a similar ranging accuracy and longer ranging distance [2].

A. "The Idea" :

Air Force, Navy and the Army utilize this technology. The utilization of such technology has been seen as of late in the self parking car systems launched by AUDI, FORD and so on. And also the upcoming driverless cars by GOOGLE like Lexus and Prius. This a rangement can be utilized in any systems the client may want to utilize like in a vehicle, a bike or whatever else. The idea of making an RADAR came as a part of a study carried out on the mechanism and working of "Automobiles of Future". Also, in this fast moving world there is a immense requirement for the tools that can be used for the improvement of the mankind rather than devastating their lives. Thus, from the idea of self driving vehicles came the idea of self parking vehicles. The principle issue of individuals in the world is safety while driving. So, this gives a solution to that by making use of this project to frequently scan the area for traffic, population etc. and as well as protection of the vehicles at the same time to avoid accidents or minor scratches to the vehicles.

II. COMPONENTS REQUIRED

A. AT89S52 Microcontroller :

The AT89S52 comes from the popular 8051
family of ATmel microcontroller. The microcontroller is one sort of integrated circuit (IC) with 40 pins, out of which 32 pins are general purpose I/O pins, Three 16 bit timers,one full-duplex UART communication port,on-chip oscillator. It has 4 ports (P1, P2, P3 and P4). It is 8 bit CMOS microcontroller with 8K as flash memory and 256 bytes of RAM. Since it is similar to the 8051 architecture these microcontrollers are compatible with all the industry standard[1].

Figure 1.1: AT89S52 Microcontroller

B. Ultrasonic Sensor :

Ultrasonic sensors work on a principle like radar or sonar which evaluate traits of an object by interpreting the echoes from radio waves or sound waves respectively. Ultrasonic sensors produce high frequency sound waves and then evaluate echo which is received back by the ultrasonic sensor. Sensors figure the time interval between sending the signal and obtaining the echo to determine the distance to an object.

This technology can be utilized for estimating wind speed and direction (anemometer), tank or channel level, and speed through water or air. For estimating speed or direction a device uses numerous detectors and calculates the speed from the overall distances to particulates in the air or water.

To find tank or channel level, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, medical ultrasonography, sonar, burglar alarms and non-destructive testing. Systems regularly use a transducer which produces sound waves in the ultrasonic range, above 18,000 hertz, by transforming electrical energy into sound waves, then at that point after getting the echo transform the sound waves into electrical energy which can be estimated and displayed.

Figure 1.2: Ulrasonic Sensor

C. Servomotor :

A servomotor is a rotational actuator that allows for the precise control of the angular position, velocity and acceleration. It receives and processes PWM signal. Servomotor can rotate approximately 180 degrees (90 degree in each direction). Servomotors are not a different class of motor, on the basis of a fundamental operating principle, but uses servomechanism to obtain closed loop control with a generic open loop motor. Servomotors are used in industrial applications such as robotics, pharmaceutics, CNC machinery or automated manufacturing, etc.

Figure 1.3: Servo Motor

D. LCD Display :

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits and devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segment display. The main benefits of using this module are nexpensive, simply programmable and there are no limitations for displaying custom characters, special and even animations, etc.

*Figure 1.4 : 16*2 LCD Display*

III. METHODOLOGY

The technique of distance measurement using ultrasonic include continuous wave & pulse echo technique. In the pulse echo method, a burst of pulses is sent through the transmission medium & then it is reflected by an object kept at special distance. The time taken for the pulse to propagate from transmitter to receiver of ultrasonic sensor is proportional to the distance of object. For measurement of distance, the system has to rely on the target to reflect the pulse back to itself. The object needs to have a proper orientation that is it needs to be perpendicular to the direction of propagation of the pulses. The amplitude of the received signal gets significantly attenuated and is a function of nature of the medium and the distance between the transmitter and the target. The pulse echo method of range measurement is subject to high levels of signal attenuation when used in an air medium, thus limiting its distance range [3].

IV. BLOCK DIAGRAM

The major components in this project are microcontroller and ultrasonic module. The ultrasonic module transmits a signal(sound wave) to the object, then receives echo signal from the object and produces output signal whose time period is proportional to the distance of the object.

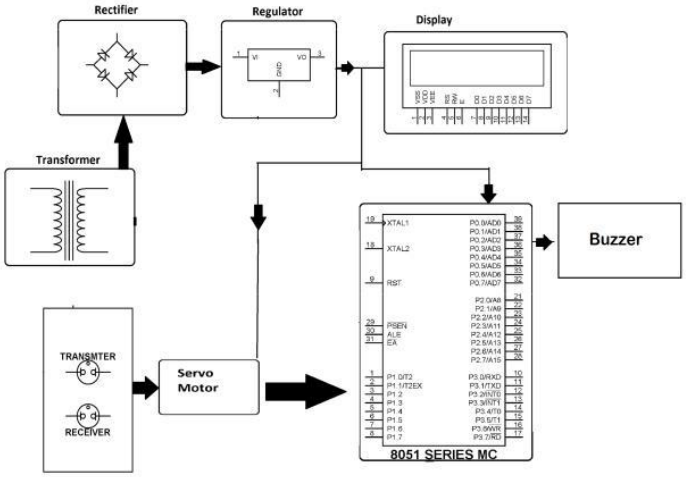

Figure 1.5: Ultrasonic Radar Using 8051 Microcontroller

What does it do?

Measure distance of object with an accuracy of a few centimeters, over a range of a few meters, at a speed of milliseconds to several seconds per sample.

How does ultrasonic distance meter work? Generally, an ultrasonic rangefinder sends a 'ping' and waits to hear an echo. Sound waves propagate from the transmitter and bounce off the objects, returning an echo to the receiver. If the speed of sound is known, the distance to an object can be calculated from time interval between the emitted and reflected sounds. When HIGH pulse of 10usec is applied to the TRIG pin, the ultrasonic module transmits 8 consecutive pulses of 40 K Hz. After transmitting 8th pulse the ECHO pin of the ultrasonic sensor becomes HIGH. When the sensor receives reflected signal from the object, the ECHO pin becomes LOW. The time taken by the signal to leave and return to the ultrasonic sensor is used to find out the range of the object [4].

V. ADVANTAGES AND APPLICATIONS

A. Advantages :

1. The ultrasonic sensor has high sensitivity, high frequency and high penetrating power therefore it can easily de tect the external or deep objects.
2. The use of ultrasonic sensor makes this system more accurate and precise than other methods.
3. This system is easy to use, not dangerous during operation for nearby objects, person, equipment or material.

B. Applications :

1. It is used in machines like Automotive parking sensor obstacle warning systems,industrial distance measurements, terrain monitoring robots.
2. RADAR speed meters are used by the traffic police for enforcing speed limit.
3. Marine RADARs used to locate the landmarks and other ships.

VI. CONCLUSION

This project can measure a distance of 2.5 meters with an accuracy of 1cm. So it can be very well used in detecting various obstacles which are at that much distance apart. The best use of this system can be made to find the distance between the car and the wall for parking purpose.

REFERENCES

[1]. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Second Edition.

[2]. A.Balleri,K.Woodbridge,K.Chetty, "Frequency -agile non-coherent ultrasound radar for collection of micro- Doppler signatures",2011 IEEE RadarCon (RADAR) Kansas City,no.201,pp.045048.

[3]. A.K.Shrivastava,A.Verma,S.P.Singh,"Distance Measurement of and Object or Obstacle by Ultrasonic Sensors",International Journal of Computer Theory and Engineering,Vol. 2,No.1,February 2010.

[4]. Girish Yadav,Ashok Kumar Jangir,Anil Kumar Sharma,Pankaj Kumar, "Microprocessor Based Ultrasonic Radar System",International Journal of Engineering and Management Research,Volume -7, Issue-2,March-April 2017.