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ULTRA SONIC TARGET RANGE ESTIMATION USING SONAR TECHNOLOGY

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Abstract- This application is based upon the reflection of sound waves. Sound waves are definedas longitudinal pressure waves in the medium in which they are travelling. Subjects whosedimensions are larger than the wavelength of the impinging sound waves reflect them, thereflected waves are called the echo. If the speed of sound in the medium is known and the timetaken for the sound waves to travel the distance from the source to the subject and back to thesource is measured, the distance from the source to the subject can be computed accurately.This is the measurement principle of this application. Here the medium for the sound waves isair, and the sound waves used are ultrasonic, since it is inaudible to humans. Assuming that thespeed of sound in air is 1100 feet/second at room temperature and that the measured time takenfor the sound waves to travel the distance from the source to the subject and back to the sourceis t seconds, the distance d is computed by the formulad=1100 X 12 X t inches.
Ultrasonic sensors have definitely diversified functions including "detection" of what youcannot see, "measurement" of length, thickness and amount, and "destruction" of objects.Ultrasonic sensors are generally used for anti-collision and rangefinder purposes by measuringthe distance to an obstacle some application ideas where Ultra Sonic sensors can be used are:security systems, parking assistant systems, interactive animated exhibits and roboticnavigation.

Index Terms-Ultrasonic,,Sonar,Rangeestimation,Acoustic,Transducer.

I. INTRODUCTION

Today's the developing world shows various adventures in every field. In each field thesmall requirements are very essential to develop big calculations. By using different sourceswe can modify it as our requirements and implement in various field. In earlier days themeasurements are generally occur through measuring devices. But now a day's digitalizationas is on height. Therefore we use a proper display unit for measurement of distance. We canuse sources such as sound waves which are known as ultrasonic waves using ultrasonic sensorsand convert this sound wave for the measurement of various units such as distance, speed. Thistechnique of distance measurement using ultrasonic in air includes continuous pulse echomethod, a burst of pulse is sent for transmission medium and is reflected by an object kept atspecific distance. The time taken for the sound wave to propogate from transmitter to receiveris proportional to the distance of the object. In this distance measurement system we hadultrasonic sensor HC-SR04 interfaced with arduino UnoR3. Programming and hardware part ofultrasonic sensor interfacing with arduino UnoR3.Bats are wonderful creatures. Blind from the eyes but the vision is sharper than humans,

Ultrasonic ranging is the technique used by bats. Ultrasonic sensor provides an easy way indistance measurement. The sensor is perfect for distance measurements between moving orstationary objects. Ultrasonic Sensor measure the distance of the objects in air through noncontact technique. They measure distance without damage and are easy to use and reliable.These distance measurement sensors connect with all common types of automation andtelemetry equipment. Machinery and processes in a wide range of industries use distancemeasurement sensors where size or position feedback is required. Distance measurementsensors are used to control or indicate the position of objects and materials. Distancemeasurement sensors can determine the dimensions of objects such as height, width anddiameter, using one or more sensors.

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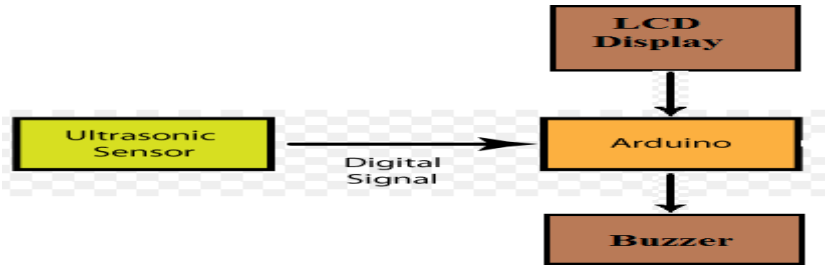


The echo time response of ultrasonic sensor detector is based on time of travel after triggerpulse to the surrounding objects is non-linear and depends on the reflectance characteristics ofthe object surface.

II. Existing Work or Literature Survey

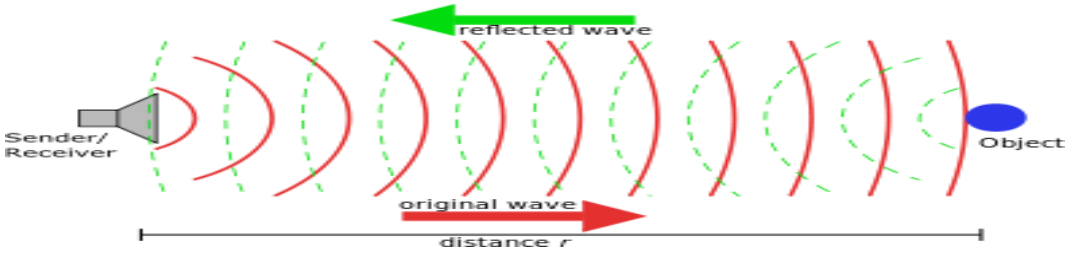
In this work, distance of the object is measured through ultrasonic distance sensor and thesensor output is connected to signal conditioning unit and after that it is processed through Arduinomicrocontroller.Themeasuredresultsaredisplayedinliquidcrystaldisplay.Theresultsaretransferred to personal computer. The sensor is attached to servo motor to find the polar distancearound the sensor upto 1800 rotations. This application is also used to find the obstacles detection andthe exact distance can also be obtained.

One useful small sonar is similar in appearance to a waterproof flashlight. The head is pointedinto the water, a button is pressed, and the device displays the distance to the target. Another variant is that shows a small display of fish. Some civilian sonars (which are notdesigned for stealth) approach active military sonars in capability, with quite exotic three-dimensionaldisplaysof theareanearthe boat.

When active sonar is used to measure the distance from the transducer to the bottom,Similar methodsmaybe used lookingupward for wavemeasurement.Activesonarisalsousedtomeasuredistancethroughwaterbetweentwosonartransducersora combination of a hydrophone (underwater acoustic microphone) and projector (underwater acousticspeaker). A transducer is a device that can transmit and receive acoustic signals ("pings"). When ahydrophone/transducer receives a specific interrogation signal it responds by transmitting a specificreply signal. To measure distance, one transducer/projector transmits an interrogation signal andmeasures the time between this transmission and the receipt of the other transducer/hydrophone reply.The time difference, scaled by the speed of sound through water and divided by two, is the distancebetweenthetwoplatforms.Thistechnique,whenusedwithmultipletransducers/hydrophones/projectors, can calculatethe relative positionsof static and moving objectsinwater. Incombatsituations,anactivepulsecanbedetectedbyanopponentandwillrevealasubmarine'sposition.A very directional, but low-efficiency, type of sonar (used by fisheries, military, and for portsecurity) makes use of a complex nonlinear feature of water known as non-linear sonar, the virtualtransducerbeingknownas aparametricarray**.**

III. Proposed Work

When you upload a sketch, you're using the Arduino bootloader, a small program that hasbeen loaded on to the microcontroller on your board. It allows you to upload code without using anyadditional hardware. The bootloader is active for a few seconds when the board resets; then it startswhichever sketch was most recently uploaded to the microcontroller. The bootloader will blink theon-board (pin 13) LED when it starts (i.e. when the board resets).To use a library in a sketch, select it from the Sketch > Import Library menu.



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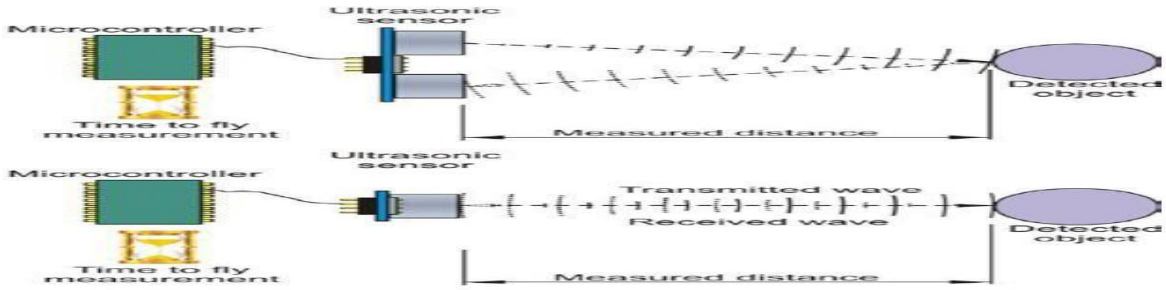
This will insertone or more #include statements at the top of the sketch and compile the library with your sketch.Because libraries are uploaded to the board with your sketch, they increase the amount of space ittakes up. If a sketch no longer needs a library, simply delete its #includestatementsfrom the top of your code.

The module works on the natural phenomenon of ECHO of sound. A pulse is sent for about10us to trigger the module. After which the module automatically sends 8 cycles of 40 KHzultrasound signal and checks its echo. The signal after striking with an obstacle returns back and iscaptured by the receiver. Thus the distance of the obstacle from the sensor is simply calculated bythe formula given asDistance= (time x speed)/2.



Here we have divided the product of speed and time by 2 because the time is the total time it took toreach the obstacle and return back. Thus the time to reach obstacle is just half the total time taken.

Iv.Results and discussion

Finally after doing the whole setup ,and we have to write the programe in aurdino software And that is to be implemented to the aurdino board .Now finally when we give the power supply it calculates the distance of the object with help of sonarand displays on lcd screen,If the distance is less than or equal to the 5cms as programmed then it gives the buzzer soundHence we can know the exact distance of target object by using sonar technology.

Speed of ultrasonic wave is 347 m/s equivalent to 0.0347cm/µsec(Temperature dependent)Timercountmultipliedwith 200nsec(0.2µsec),internalclockperiodgivesthe echotime(say,Et). As per the eqn: Speed = distance/time => echo distance (Ed) = echo speed(Ev) *echotime(Et)ie, distance(Ed) = 0.0347cmperµsec(Ev)* Et µsecThe obtained distance will be twice the actual distance since it gives the to and fro distance of theobjectas pertheto and fro timeequatedto theequation:(ie, Et stands for2Et).Thus the obtained distance divided by 2 gives actual distance of the obstacle.ie,**Actualdistance=Ed/2**.Aspertheabove illustrationyourequation is,**Ed=Ev *(Et/2)**implies **Et =2* Ed/Ev**equivalent to**Et =(2/0.0347)*Ed**Implies**Et=58*Ed**equivalentto**Ed(incm)=Et(in µsec)/58.**

Finallyafter doingthewholesetup ,and wehaveto writethe programein aurdino softwareAndthat is tobeimplemented to theaurdinounoboard Now finally when we give the power supply it calculates the distance of the object with help of sonaranddisplays on lcd screen, If the distance is less than or equal to the 5cms as programmed then it gives the buzzer soundHence wecan know theexactdistanceof target object byusingsonar technology.

V. CONCLUSION

The objective of the project was to design and implement an ultrasonic distance meter. Thedevice described here can detect the target and calculate the distance of the target. The ultrasonicdistance meter is a low cost, low a simple device for distance measurement. The device calculatesthe distance with suitable accuracy and resolution. It is a handy system for non-contactmeasurement of distance. The device has its application in many fields. It can be used in carbacking system, automation and robotics, detecting the depth of the snow, water level of the tank,production line. This device will also have its application in civil and mechanical field for preciseand small measurements.For calculating the distance using this device, the target whose distance is to be measuredshould always be perpendicular to the plane of propagation of the ultrasonic waves. Hence theorientation of the target is a limitation of this system. The ultrasonic detection range also dependson the size

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and position of the target. The bigger is the target, stronger will be the reflected signaland more accurate will be the distance calculated. Hence the ultrasonic distance meter is anextremely useful device

Distance measurement using ultrasonic sensor and arduino consist of a transmitter part ofultrasonic module units ultrasonic high frequency waves in the form of polices after collision ofthese wares with any object, these wares detected by microphone time taken by these wares fromtransmitter and receiver is used to measure distance from any object. We had used a ultrasonicsensor module of HC-SR04, because this ultrasonic module is initiated with pulse of 10us Thedistance from any object is calculated from.Distance =speed*timeThe human audible range can be converted measure the distance precisely manner.

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