

“ULTRASONIC DISTANCE METER”

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Abstract:

In this article we are listing all the projects and circuits we have developed using the 8051 micro controller. We have tested all of these projects in our lab and verified the working . All these projects are made to solve a real world requirement or problem. Engineering students & other diploma students will find these projects useful for their mini project and main project requirements.

All the 8051 projects listed below are made using the 8051 compliant microcontroller from Atmel – AT89S51. We have given the correct circuit diagram, working and software code (in assembly language) for each and every project. You can use all of them freely for your project & learning requirements. In case you are using a controller other than AT89S51 – please be sure to check the hardware of your controller and compare it with that of AT89S51.

This is necessary because we have developed all the software in assembly language. If you are not that good at assembly language, you can convert the software into C language & use it with any compliant 8051 controller.

Key Words: AT89S51, Ultra sonic sensor

Introduction:

Distance detector is any device capable of measuring the distance between two points. The origins of distance measurement by means of graduated lengths of material such as chain, tape measure or piece of knotted rope are lost to antiquity. Optical distance measurement also has a long history, and is usually taken to stem from the work of James Watt in 1771. Electro-magnetic measurements make up a third method, where the time of travel of radio or light waves is converted into a distance. Since James Watt, hundreds of different types of instrument have been produced to make indirect distance measurement using light. All kinds of devices or equipment nowadays, begin with the basic design, basic theory and then all the weakness followed by improvement step by step. So this project will also do right the same reason which the improvement will be applied to bring the advantages to the user when measuring the distance depending on several problems that had been identified.

Literature Review:

Distance measurement is the activity of obtaining and comparing in our real world. It is one of the important functions in science, engineering and astronomy to business activities. There are many types of distance measurement systems we use in our environment from normal rulers to Interferometer. In applications, basic concept of electronic distance measure system is adopted in many areas like aviation, navigation and many more. In aviation, direct feedback system is required for linear positioning and motion control application. One of the good examples for distance measurement in navigation is GPS system using satellites. So there is no doubt about the

usefulness of distance measurement technology in our environment. Reviews of available literature of this project have been performed to ensure more understanding to construct ultrasonic distance meter. The areas that were focused are on behavior of ultrasound through journals, books, and internet. Although many different type of ranging systems available in market, there are only three major type of ranging systems used in technology which are Ultrasonic Ranging System.

Methodology:

The technique of distance measurement using ultrasonic in air include continuous wave & pulse echo technique. In the pulse echo method, a burst of pulses is sent through the transmission medium & is reflected by an object kept at special distance. The time taken for the pulse to propagate from transmitter to receiver is proportional to the distance of object. For contact less measurement of distance, the device has to rely on the target to reflect the pulse back to itself. The target 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 target. The pulse echo or time-of-flight method of range measurement is subject to high levels of signal attenuation when used in an air medium, thus limiting its distance range.

Circuit Diagram:

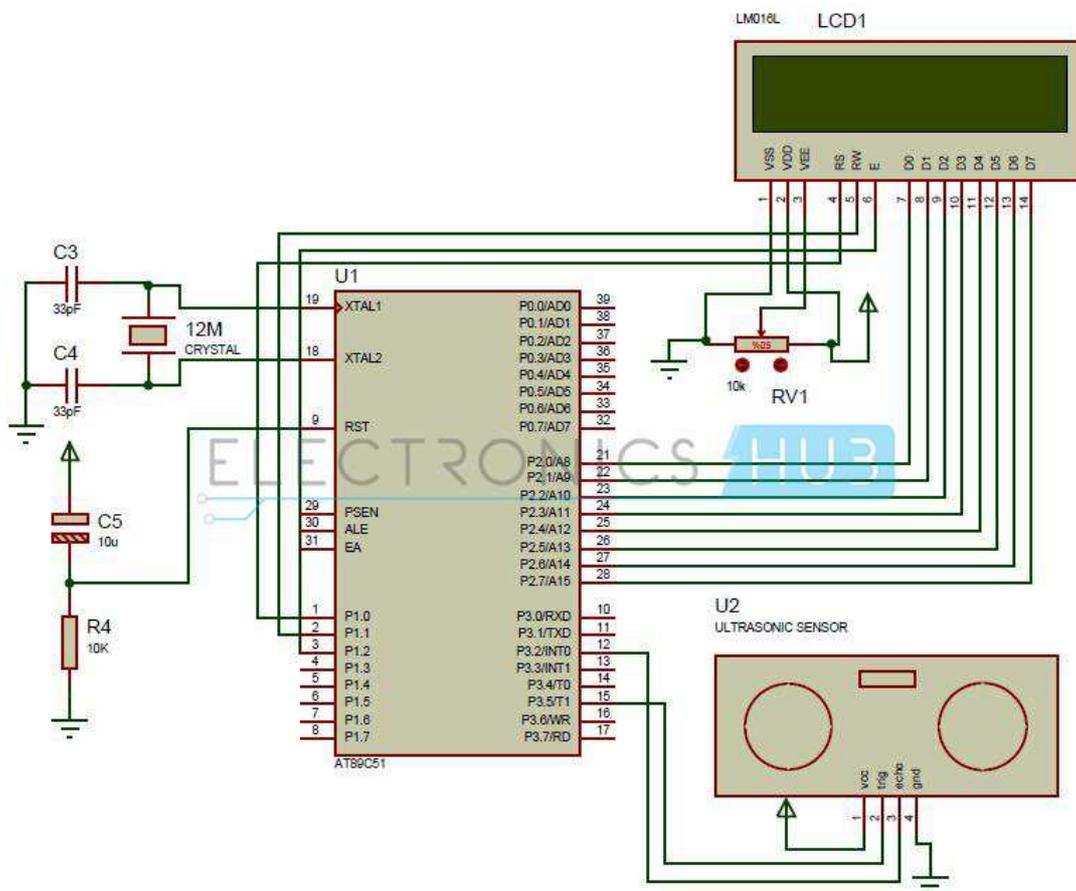


Fig: Circuit diagram of range finder ultrasonic distance meter.

Experimentation:

Ultrasonic Distance Meter Project Circuit Design using 8051:

The major components in this project are at89c51 microcontroller and ultrasonic module. The ultrasonic sensor TRIGGER and ECHO pins are connected to the P3.5 and P3.2 respectively. LCD data pins are connected to the PORT2 of the controller and controller pins RS, RW, En are connected to the P1.0, P1.1 and P1.2 respectively. Here LCD (liquid crystal display) is used to display distance of the object. Pot RV1 is used to vary the contrast of the LCD. Power supply pins of controller and ultrasonic sensor are connected to the 5V DC

What does it do?

Measure distance 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?

Typically, an ultrasonic rangefinder sends a 'ping' and waits to hear an echo. Sound waves propagate from the transmitter and bounce off objects, returning an echo to the receiver (below left). If the speed of sound is known, the distance to an object can be calculated from time delay between the emitted and reflected sounds.

When HIGH pulse of 10us is applied to the TRIG pin, the ultrasonic module transmits 8 consecutive pulses of 40 KHz. after transmitting 8th pulse the ECHO pin of the sensor becomes HIGH. When the module receives reflected signal from the object, the ECHO pin becomes LOW. The time taken by the signal to leave and return to the sensor is used to find out the range of the object

Ultrasonic Distance Meter Project using 8051 Circuit Principle:

Generally, the distance can be measured using pulse echo and phase measurement method. Here, the distance can be measured using pulse echo method. The ultrasonic module transmits a signal 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. The mechanism of the ultrasonic sensor is similar to the RADAR (Radio detection and ranging).

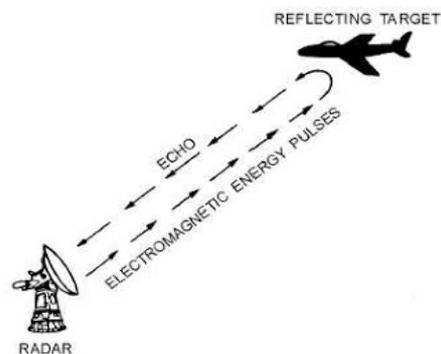


Fig: Radar Principle

Radar Concept:

This circuit calculates the distance of the object based on the speed of the sound wave at normal temperature and displays the distance on LCD.

Conclusion:

The objective of this project was to design & implement an Ultrasonic Obstruction Detection & Distance Measurement device. As described in this report a system is developed that can detect objects & calculate the distance of the tracked object. With respect to the requirements for an ultrasonic range finder the followings can be concluded.

The system is able to detect objects within the sensing range. • The system can calculate the distance of the obstruction with sufficient accuracy. • This device has the capability to interact with other peripheral if used as a secondary device.

. This can also communicate with PC through its serial port. • This offers a low cost and efficient solution for non-contact type distance measurements The Range finder has numerous applications. It can be used for automatic guided vehicles, positioning of robots as well as measuring generic distances, liquid levels in tanks, and the depth of snow banks. The device can serve as a motion detector in production lines.