

# Distance Measurement and Accident Prevention

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*Abstract:* The report details the implementation of distance measurement system using the ultrasonic waves. The aim of the project is the contact less measurement of distance from a target. There are several ways to measure distance without contact. This project gives improvement on reading techniques compared by measuring the distance manually. Basically this project is divided into three parts, the first is to find and design the hardware that is required and related to the project. The second part is to construct and develop the hardware together with testing and troubleshooting. Then the third part is designing and develop the software and combine together with the entire hardware component developed.

*Keywords:* Ultrasonic, Sensors, DC motor, PIC, GSM, GPS, Robotic Vehicle.

## I.INTRODUCTION:

Distance information is the basis of many robotic and automotive applications such as position tracking, object identification, obstacle avoidance, automation control, human-machine interface utilities, and so on. Ultrasonic sensors provide a potential solution for reliable and low cost distance measurement applications in air.

As the human ear's audible perception is 20Hz to 20kHz, it is insensitive to ultrasonic waves, and hence the ultrasound waves can be used for applications in industries/vehicles without hindering human activity. The measurement unit uses a continuous signal in the transmission frequency range of ultrasonic transducers. The signal is transmitted by an ultrasonic transducer, reflected by an obstacle and received by another transducer where the signal is detected. Ultrasonic sensors (also known as transceivers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. The Ultrasonic Distance Meter is an efficient way to measure the distance of unreachable obstacles. Ultrasonic sensors provide cheap and convenient mean for determining the distances to objects. It is based on sending sound waves through a specific medium and observing the returning echoes to measure the distance from the device to the obstacle. The device is divided into three parts, transmitter, receiver and the microcontroller. The transmitter consists of an electronic circuitry which generates electrical signal. In

addition, an electromechanical transducer to convert electrical signal to physical form to drive through the medium, which is air. The receiver also consists of an electronic circuitry which detects the echoes bounced back from the obstacles. The microcontroller is programmed for selectivity sequence and to calculate the time of flight of the signal to find the distance and display it. The system architecture of the Ultrasonic Distance Meter was built to be cheaper, requires less power and delivers better performance. It can be reconfigured to adapt to a variety of pulsed Ultrasonic systems.

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. 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 behaviour of ultrasound through journals, books, and internet.

II. SYSTEM ARCHITECTURE:

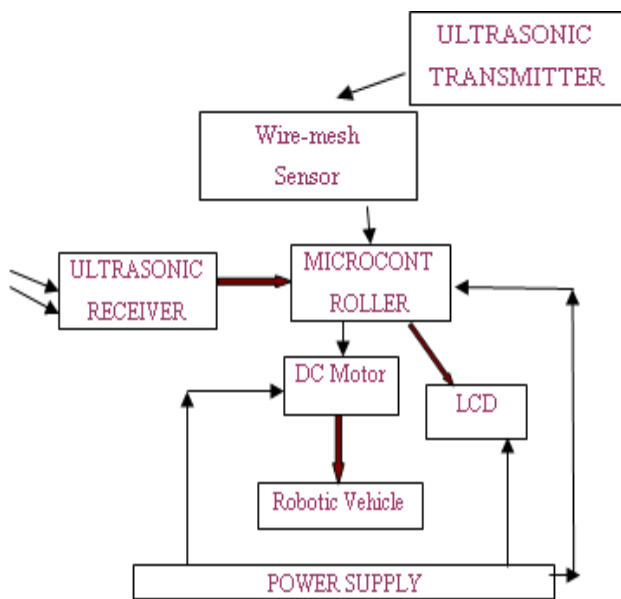


Fig.1 Main Block Diagram

A power supply of 5V is applied to the microcontroller PIC16F877A. The ultrasonic transmitter senses the obstacle and measures the distance which is then displayed on LCD. A wiremesh sensor is used for accident detection. A global positioning system(GPS) is used for location tracking and provides the location tracked in the form of longitudes and latitudes. A global system for mobiles(GSM) sends the user a message indicating accident occurred along with the location. Two D.C motors are used which drives the robotic vehicle.

A. ULTRASONIC DISTANCE SENSOR:

Ultrasonic sensors provide cheap and convenient means for determining the distance to objects. Its compact size, higher range and easy usability make it a handy sensor for distance measurement and mapping. When an accident occurs, a wiremesh sensor senses it and a message is sent to the user through GSM.

B. D.C MOTOR:

The direct current (dc) motor is one of the first machines devised to convert electrical power into mechanical power. Permanent magnet (PM) motors are probably the most commonly used DC motors, but there are also some other type of DC motors(types which use coils to make the permanent magnetic field also). DC motors operate from a direct current power source because it just needs one voltage (+5V) and generates the necessary.

C. LCD:

The electronics industry has used liquid crystal display (LCD) technology for years, in many products ranging from calculators to laptop screens. Now, LCD monitors or flat-panel displays, are quickly replacing traditional cathode ray tube (CRT) computer monitors. LCDs use less space than traditional monitors. LCD creates images on a flat surface by shining light through a combination of

liquid crystals and polarized glass. The technology differs from CRT because a CRT uses a beam of electrons projected through a large glass tube to create images.

D. MICROCONTROLLER:

PIC 16F877A:

PIC is a family of modified Harvard architecture microcontrollers made by Microchip Technology.

PIC16F877A is one of the most commonly used microcontroller especially in automotive, industrial, appliances and consumer applications. The microcontroller PIC 16F877A is used as interfacing to the output display.

E. GSM:

GSM is a TDMA based wireless network technology developed in Europe that is used throughout most of the world. GSM phones make use of a SIM card to identify the user's account. GSM uses digital technology and is a second-generation (2G) cell phone system.

F. GPS:

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth. GPS is a satellite navigation system used to determine ground position and velocity (location, speed, and direction). GPS is used to track the location and the information is sent to the user in form of latitudes and longitudes.

ADVANTAGES:

- It avoids accidents.
- It works on different modes such as automatic.
- Can detect any object.
- Can avoid obstacles.
- Due to use of ultrasonic modules higher range can be obtained.
- Line of sight communication.
- Major outcome is that this device can replace many costly equipments.
- Inexpensive components are used so that reduces the cost per unit.
- Project is also eco friendly as it does not harm earth's environment.
- Less hardware are used so smaller in size.

DISADVANTAGES:

- Sensors are costly.

FUTURE SCOPE:

- Android based intimation can be done.
- Use as ultrasonic cleaners for jewellery and lenses.
- Medical therapy, Physical therapy, etc

CONCLUSION:

The paper presents a low-cost, low power and simple system for distance measurement. It is certainly a reliable and efficient method for instantaneous measurement of distance. Since the system remained unaffected with the human activity. This system will have high application in civil and mechanical field of engineering where it has been a bigger challenge for precise measurement of small and physically unreachable distances. The scope of the project

in future can be heightened by using high-frequency transducers to make it fit for medical applications like ultrasound machine. It will surely have influence on small and large technicians who find measurements challenging in different severe environments.

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