PROJECT REPORT

Required Hardware Components

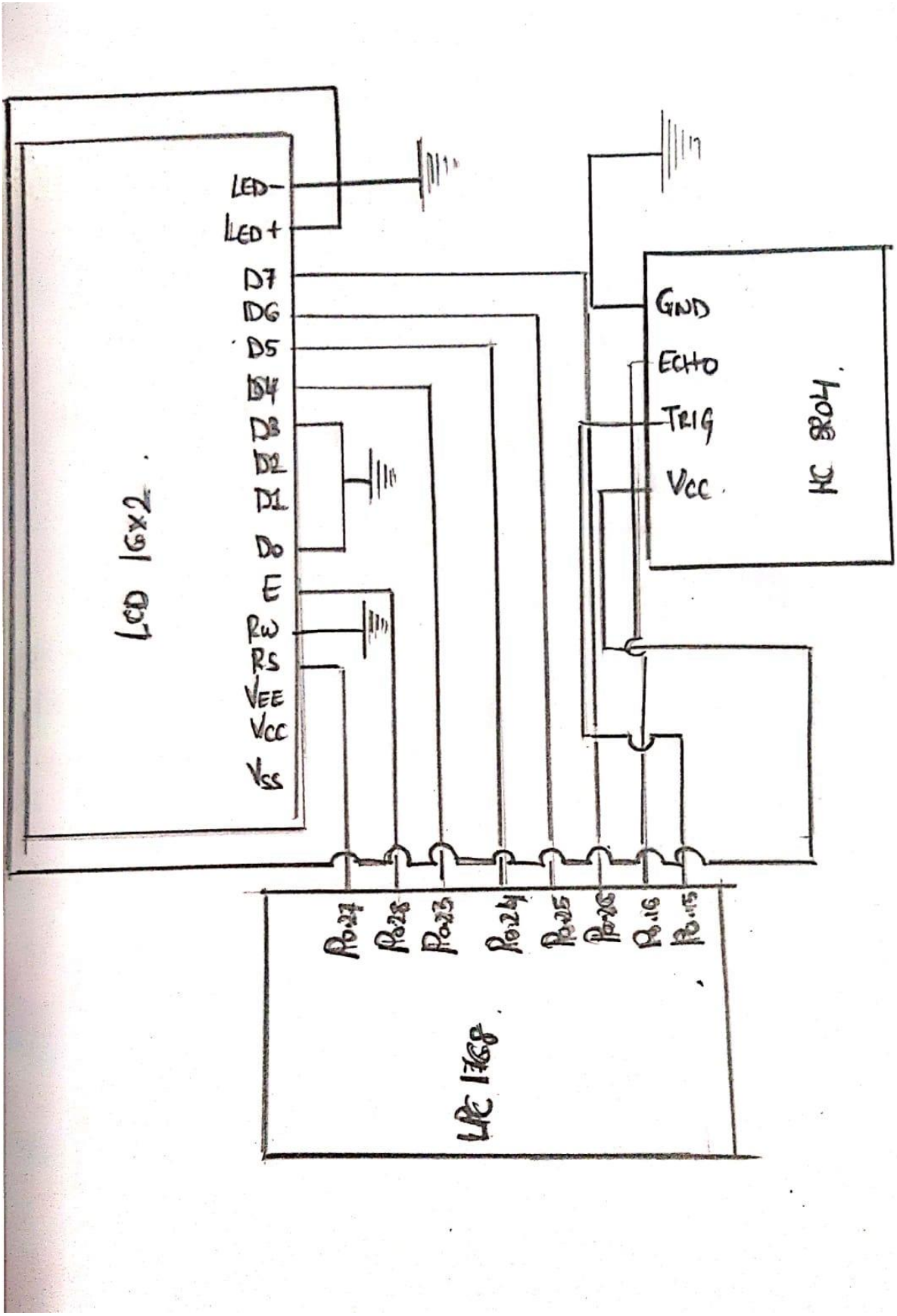
- LPC 1768 MICROCONTROLLER
- HC-SR04 ultrasonic sensor
- DC Power Supply
- Bread Board
- Jumper Cables
- FRC Cables
- LCD

Working Principle of HC-SR04 Sensor:

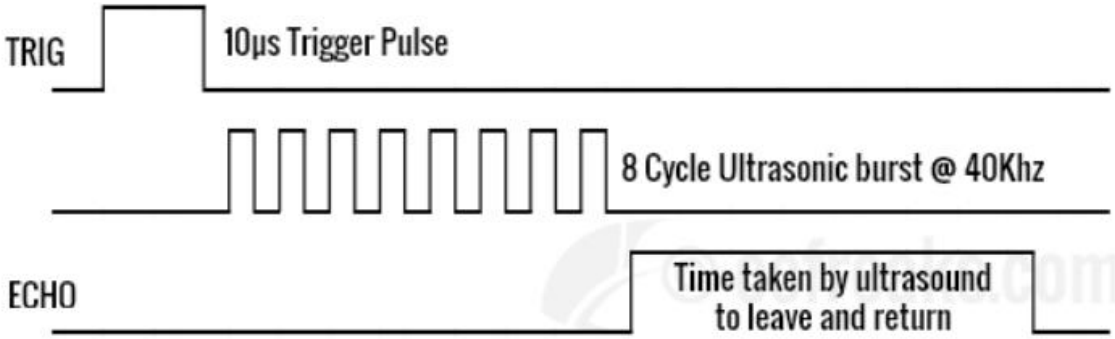
The HC-SR04 ultrasonic sensor working principle is based on the speed of sound or time taken by the sound waves to travel a certain distance. It measures the distance of an object from its surface by emitting and receiving sound waves.

It uses non-contact ultrasound sonar to measure the distance to an object and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit.

Pin Diagram:


LCD 16x2
LED-
LED+
D7
D6
D5
D4
D3
D2
D1
D0
E
RW
RS
VEE
Vcc
Vss
HC SR04
GND
ECHO
TRIG
Vcc
LPC 1768
P0.27
P0.28
P0.23
P0.24
P0.25
P0.26
P0.16
P0.15

Waveform:



Distance Calculation:

Speed of sound in air,

Vs = 343 m/s = 0.0343 cm/us

Distance Travelled = Speed x Time taken

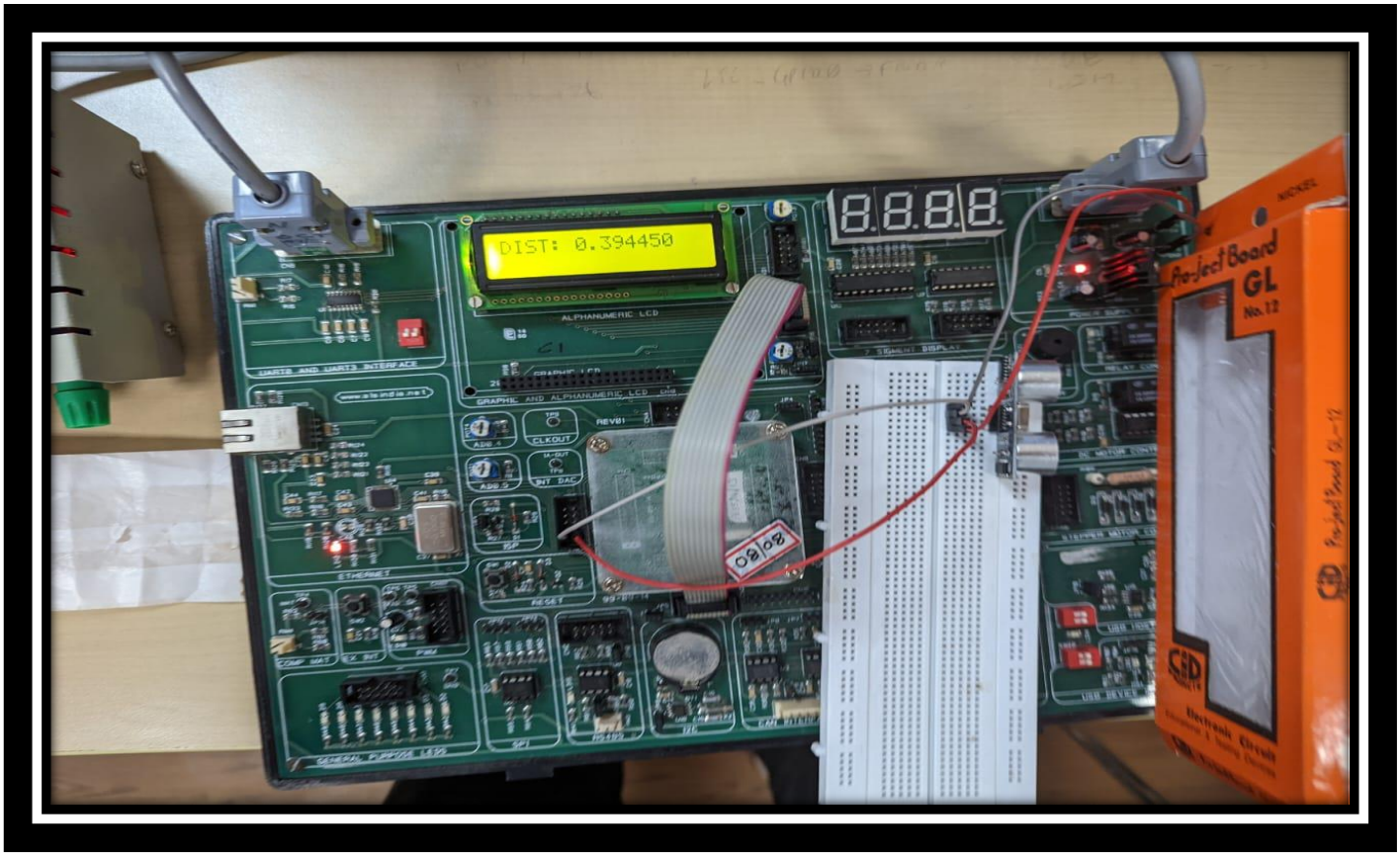
D' = 343 m/s x T s = 0.0343 cm/us x T us

The ultrasonic waves travel as an echo back and forth, the total distance travelled is ascertained as

D = D'/2 = (0.0343 x T)/2

Source Code (.c file):

Attached in the C file.



Output:

DIST: 0.394

Result:

The sensor sends an ultrasonic wave output, and starts a timer. This timer is stopped when this output is received. This time is then used to calculate the distance using the formula D=0.0343*T/2. The calculated distance is then used and displayed on the LCD.