MINI-PROJECT REPORT

Distance measurement using ultrasonic sensor

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INTRODUCTION

Ultrasonic sensors are useful for measuring distances. Ultrasonic waves are transmitted and whenever these strike an obstacle and return back in the form of an echo. Difference of outgoing sound and returning echo gives us the distance.
However, when there are cheap methods available to find a distance like the IR sensor or even a combination of LED's and LDR would do, but the question is why we use a more expensive sensor. The reason is:-

- IR sensors are not accurate
- The result varies from object to object
- Calibration is required
- Works well only for short range.

FEATURES

This project uses an ultrasonic sensor to indicate the distance of any object from it. Here we have made a setup based on a microcontroller in which real time distance is sensed by an ultrasonic sensor and displays measured distance on an LCD display.

4W's and 1'H

Who**:**

Everyone in this world can use.

When:

Used in longer range.

Why:

It is used in many applications.

What:

Gives the accurate measurement from the object.

How:

This project is based on atmega 328P. Ultrasonic sensor provides an output signal proportional to distance based on the echo. The sensor here generates a sound vibration in ultrasonic range upon giving a trigger, after that it waits for the sound vibration to return.

SWOT ANALYSIS

Strength:

• Discrete distance of moving objects can be measured.

• High accurate within a range.

• The range of detection is very large which makes sensor useful in many applications.

• Not highly affected by dust, dirt, or high-moisture environments

• Not affected by color or transparency of objects

Weakness:

• Cannot work in a vacuum

• Not designed for underwater use

• Sensing accuracy affected by soft materials

• Have a limited detection range

• Sensing accuracy affected by changes in temperature of 5-10 degrees or more.

Opportunities:

- Ultrasonic sensors can measure the distance to a wide range of objects regardless of shape, color or surface texture.
- They are also able to measure an approaching or receding object. By using “non-contact” ultrasonic sensors, distances can be measured without damage to the object.
- They’re easy to use and, in many cases, can be used in place of other traditional sensors when the environmental conditions make traditional sensors unusable.

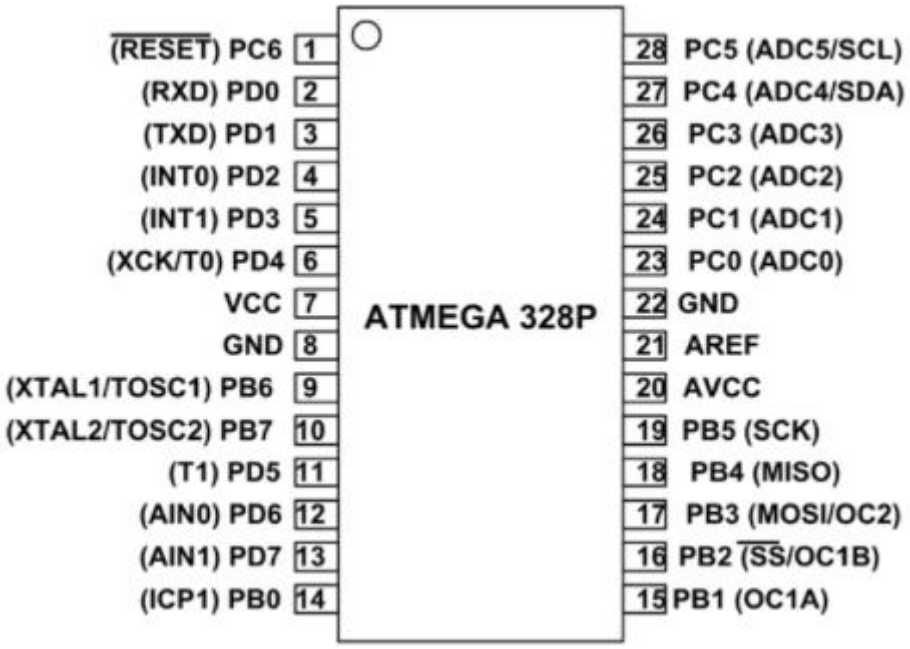
Threats:

- Wiring
    - Power supply voltage
    - Load short-circuiting
- Incorrect wiring
    - Connection without a load
    - Operating Environment

REQUIREMENTS

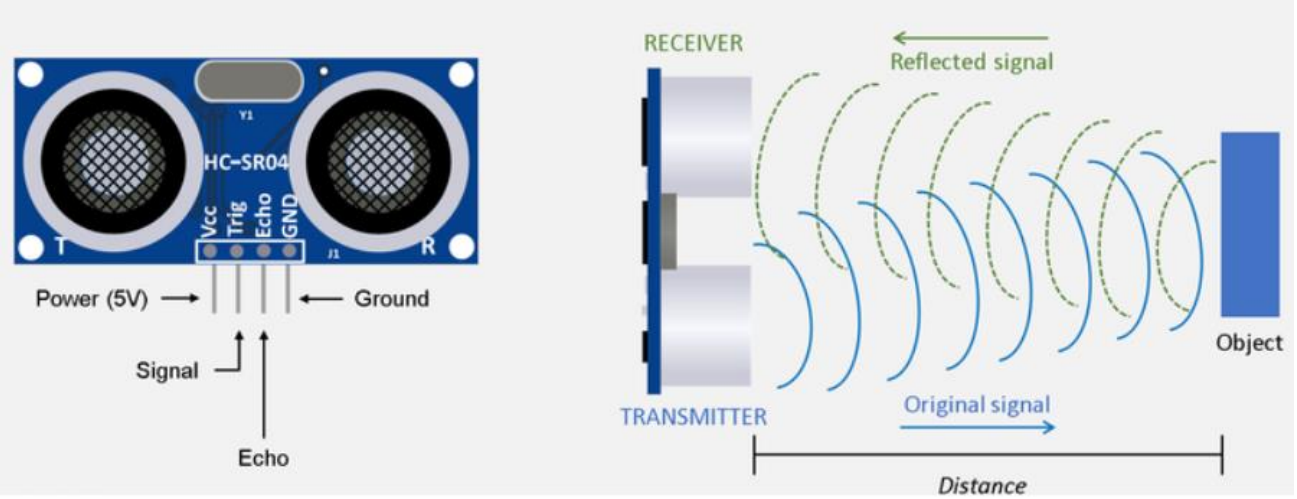
HIGH LEVEL REQUIREMENTS

In the high level requirement, we must have the knowledge of Microcontroller ATmega328



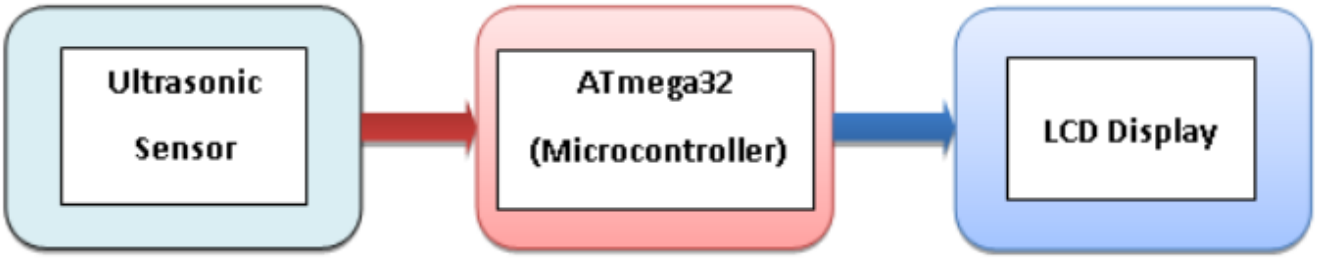
LOW LEVEL REQUIREMENTS

In the low level requirements, we must have some knowledge about ultrasonic sensor for the implementation in the project.

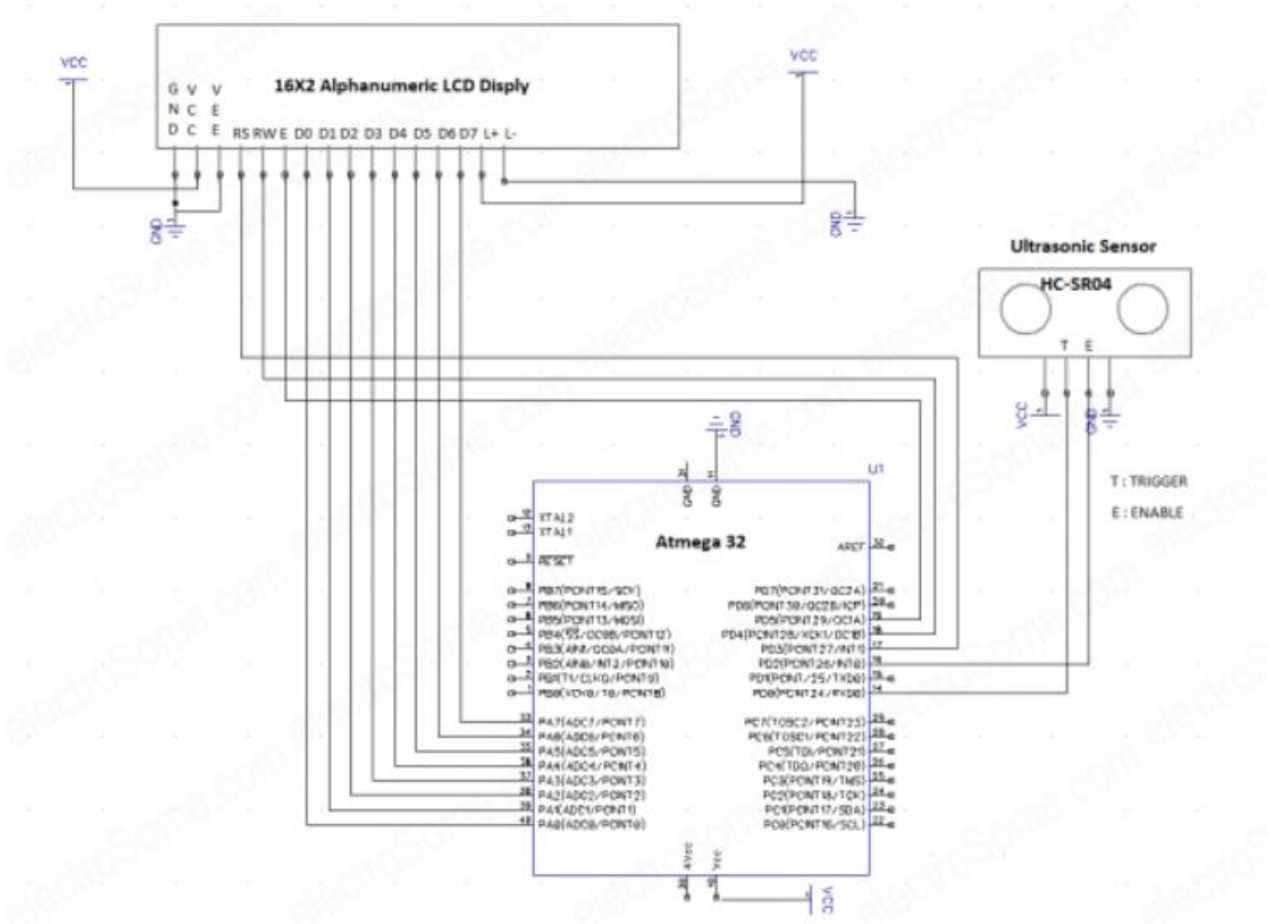


ARCHITECTURE

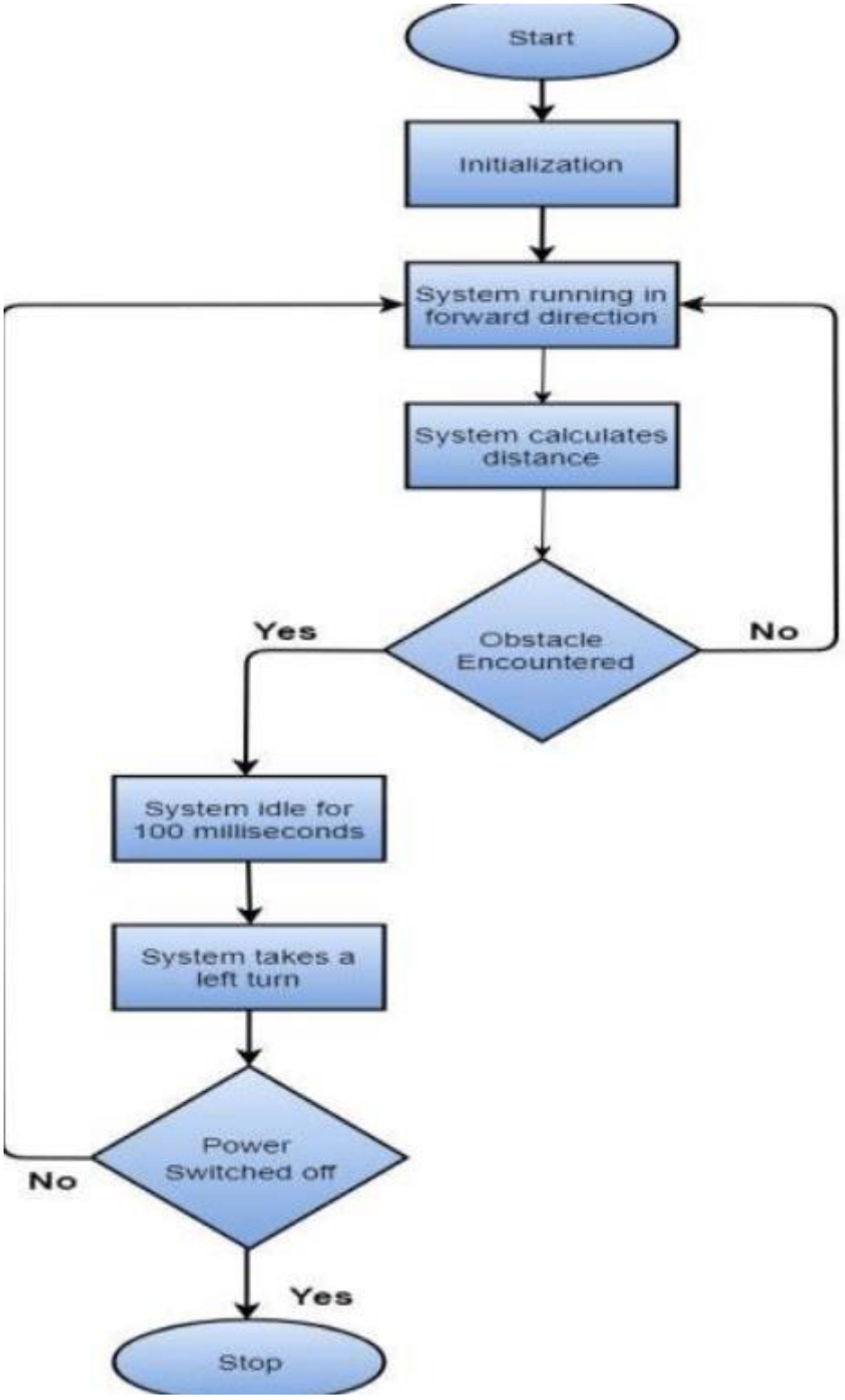
BLOCK DIAGRAM



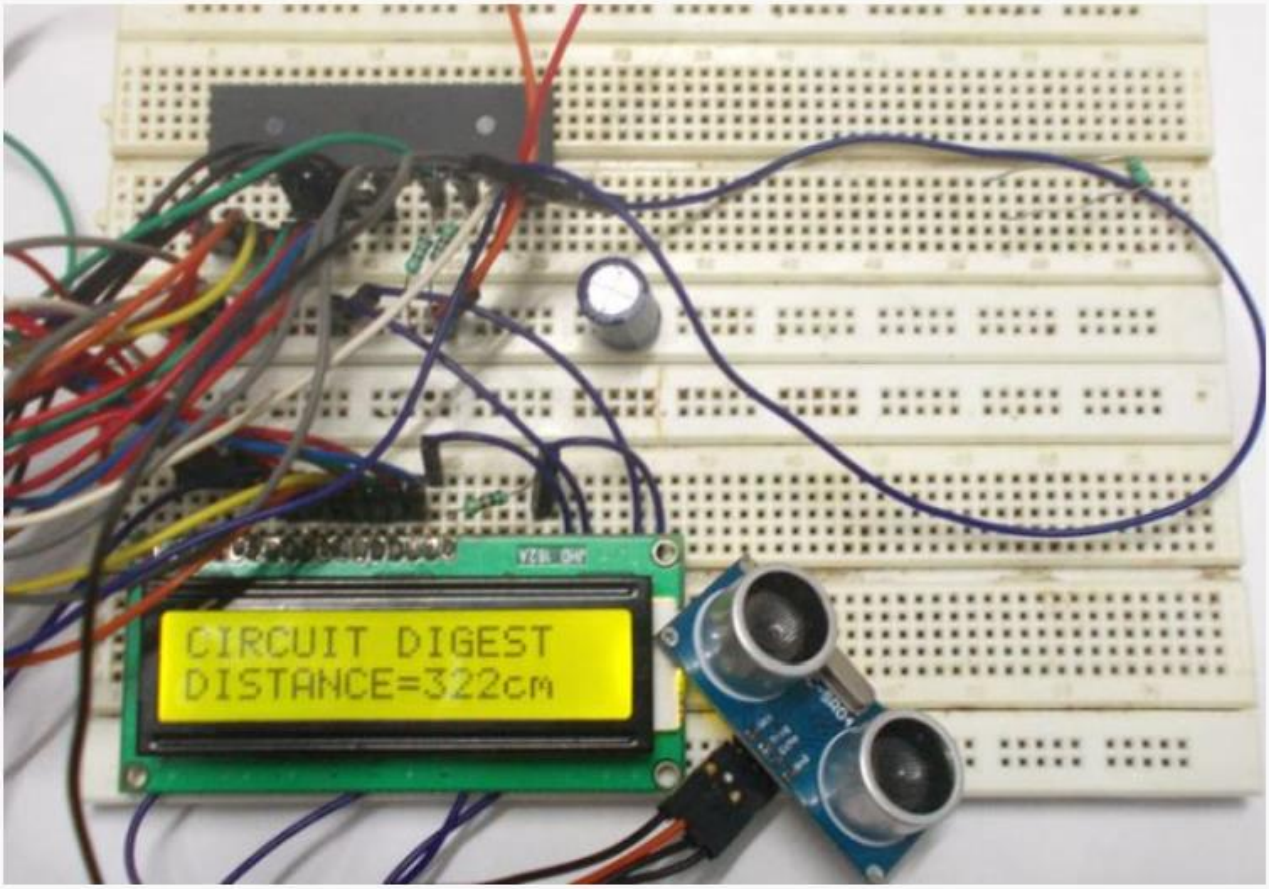
CIRCUIT DIAGRAM



BEHAVIORAL DIAGRAM



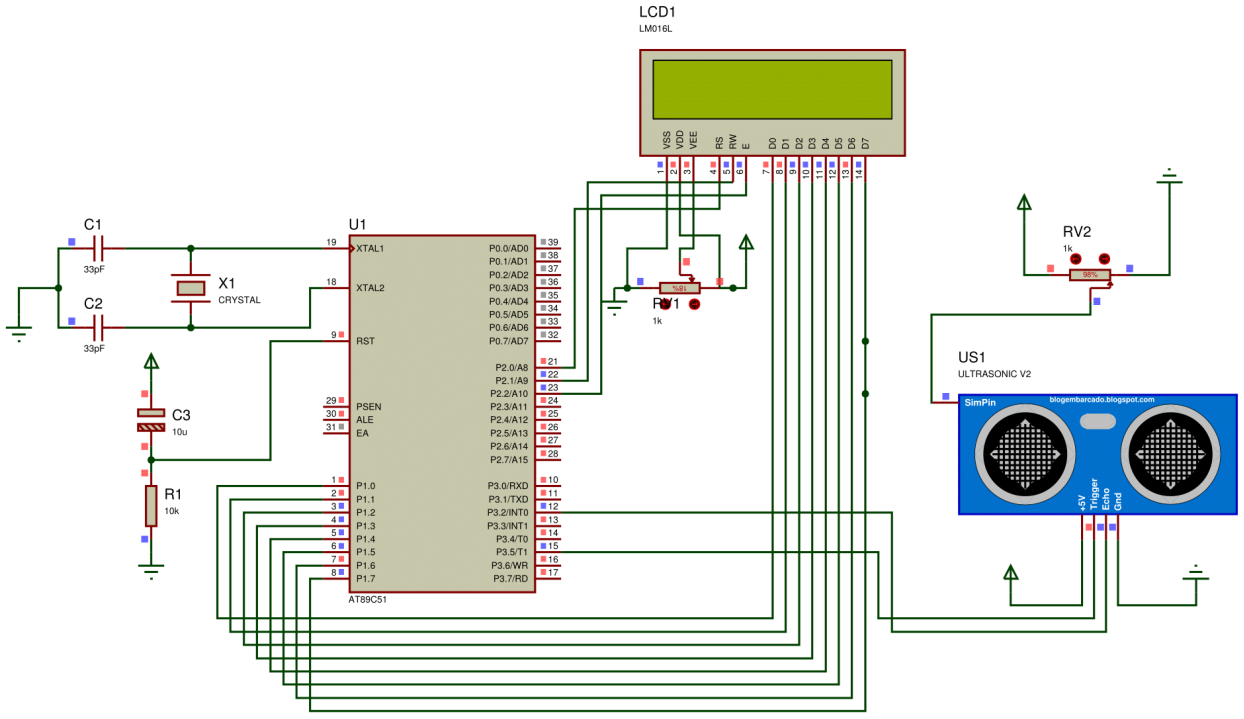
STRUCTURAL DIAGRAM



TEST PLAN

No of obs.	*Distance Measured by the Scale* D_m *(cm)*	*Distance Measured by the System* D_s *(cm)*	*Percent-age of Error* $\varepsilon(\%)$	*Average Percentage of Error* $\varepsilon_a(\%)$
1	2.00	2.02	0.500	
2	4.00	4.01	0.250	
3	6.00	6.01	0.167	
4	8.00	8.01	0.125	
5	13.00	13.02	0.154	
6	18.00	18.01	0.056	
7	25.00	25.02	0.080	
8	30.00	30.02	0.067	
9	35.00	35.01	0.029	
10	40.00	40.01	0.025	
11	50.00	50.01	0.020	0.074
12	70.00	70.02	0.029	
13	90.00	90.02	0.022	
14	120.00	120.03	0.025	
15	150.00	150.02	0.013	
16	180.00	180.03	0.017	
17	210.00	210.02	0.010	
18	250.00	250.01	0.004	
19	280.00	280.03	0.011	
20	310.00	310.02	0.006	
21	340.00	340.02	0.006	
22	390.00	390.03	0.008	

OUTPUT


LCD1
LM016L
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7
C1
33pF
C2
33pF
X1
CRYSTAL
C3
10u
R1
10k
U1
XTAL1
XTAL2
RST
PSEN
ALE
EA
P0.0/AD0
P0.1/AD1
P0.2/AD2
P0.3/AD3
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12
P2.5/A13
P2.6/A14
P2.7/A15
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
AT89C51
RV1
1k
RV2
1k
US1
ULTRASONIC V2
SimPin
blogembarcado.blogspot.com
+5V
Trigger
Echo
Gnd