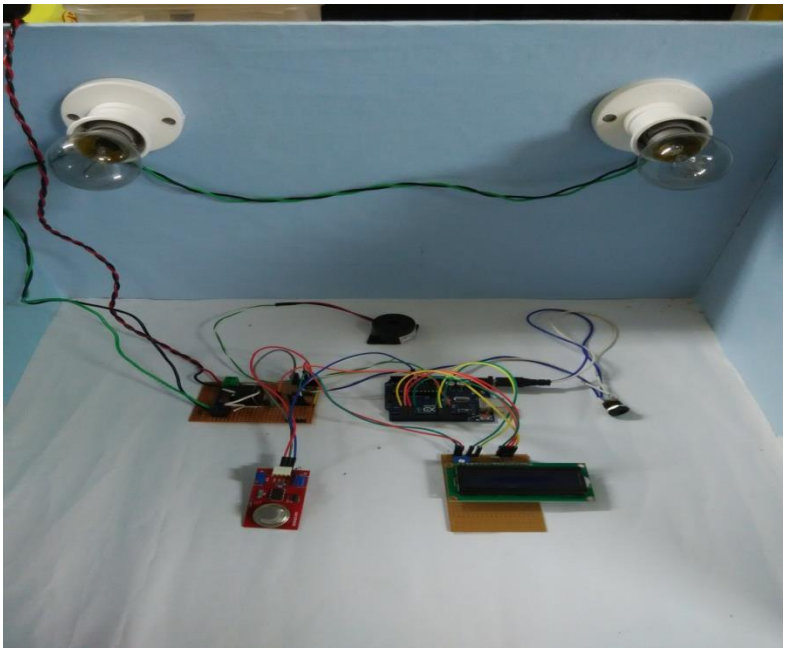
SCIENCE EXHIBITION

EUREKA 2017

UKTRASONIC DISTANCE METRE



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Ultrasonic Distance Meter:-

Introduction:-

Ultrasonic sensors are great tools to measure distance without actual contact and used at several places like water level measurement, distance measurement etc. This is an efficient way to measure small distances precisely. In this project we have used an **Ultrasonic Sensor** to determine the distance of an obstacle from the sensor. Basic principal of ultrasonic distance measurement is based on ECHO. When sound waves are transmitted in environment then waves are return back to origin as ECHO after striking on the obstacle. So we only need to calculate the travelling time of both sounds means outgoing time and returning time to origin after striking on the obstacle. As speed of the sound is known to us, after some calculation we can calculate the distance

Components required for making:-

1. Arduino Uno
2. Ultrasonic sensor module(HC-SR04)
3. LCD
4. Buzzer
5. Code(To function)
6. Scale
7. Bread board
8. Veroboard

Working principle of the device:-

Before starting with the working principle of the gas detector, let us first have a brief idea of the components used in the device.

Vero board – It is brand of strip broad. It is an insulating board made up of copper strips; which works as a pre- formed circuit board.

Breadboard -A breadboard also known as protoboard is a type of solderless electronic circuit building. You can build a electronic circuit on a breadboard without any soldering . Best of all it is reusable. It was designed by Ronald J Portugal of EI Instruments Inc. in 1971.Building or prototyping circuits on a breadboard is also known as **'breadboarding** '.

Arduino – It is a microprocessor which is used in communications and in controlling and operating multiple devices. Founded be Massimo Banzi and David Cuartilelles of Italy. The processor uses Harvard architecture where the program code and program data have separate memory locations. The code is stored in the flash memory, whereas the data is stored in the data memory. Since the microprocessor has two memory locations, one is the program memory and the other is the data memory. The Atmega 328 has 32 KB of flash memory for storing code (0.5 is used for the boot loader), 2 KB of SRAM (Static RAM) and 1 KB of EEPROM (Erasable programmable read – only memory) and operates with a clock speed of 16MHz.

A diagram or the algorithm of the microprocessor will give us a vivid view of the working of the microprocessor.

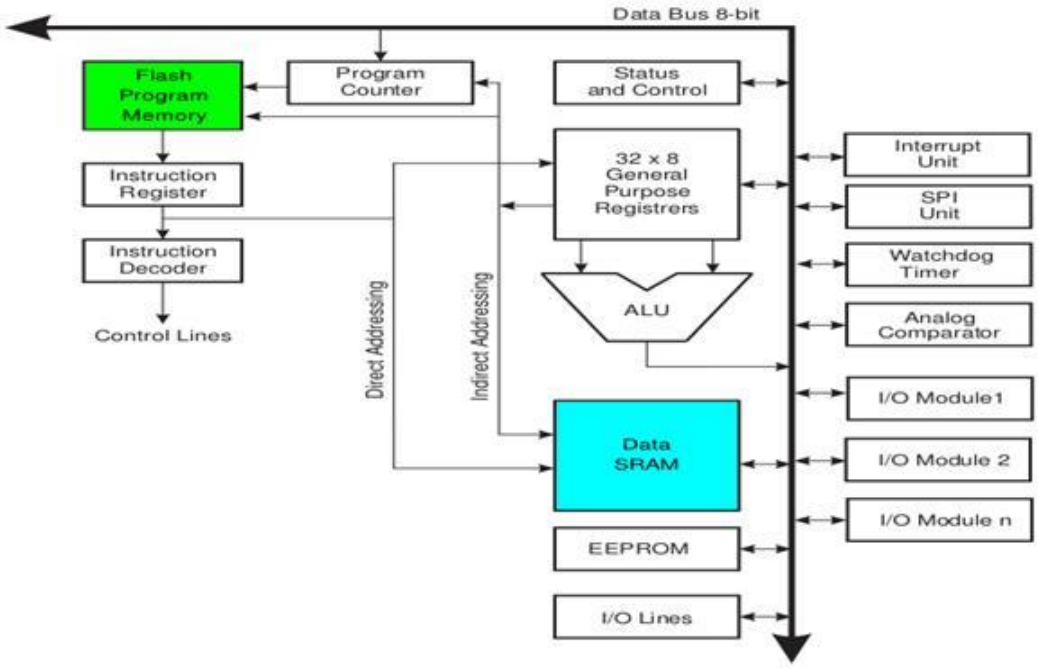


FIG:- ARCHITECTURE OF ARDUINO

DESCRIPTION:-

The module works on the natural phenomenon of ECHO of sound. A pulse is sent for about 10us to trigger the module. After which the module automatically sends 8 cycles of 40 KHz ultrasound signal and checks its echo. The signal after striking with an obstacle returns back and is captured by the receiver. Thus the distance of the obstacle from the sensor is simply calculated by the formula given as

Distance= (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 to reach the obstacle and return back. Thus the time to reach obstacle is just half the total time taken.

In circuit connections Ultrasonic sensor module's "trigger" and "echo" pins are directly connected to pin 18(A4) and 19(A5) of arduino. A 16x2 LCD is connected with arduino in 4-bit mode. Control pin RS, RW and En are directly connected to

arduino pin 2, GND and 3. And data pin D4-D7 is connected to 12, 11, 5 , 4 , 3 and 2 of arduino.

First of all we need to trigger the ultrasonic sensor module to transmit signal by using arduino and then wait for receive ECHO. Arduino reads the time between triggering and Received ECHO. We know that speed of sound is around 340m/s. so we can calculate distance by using given formula:

Distance= (travel time/2) * speed of sound

Where speed of sound around 340m per second.

A 16x2 LCD is used for displaying distance.

Circuit diagram of ultrasonic distance meter :-

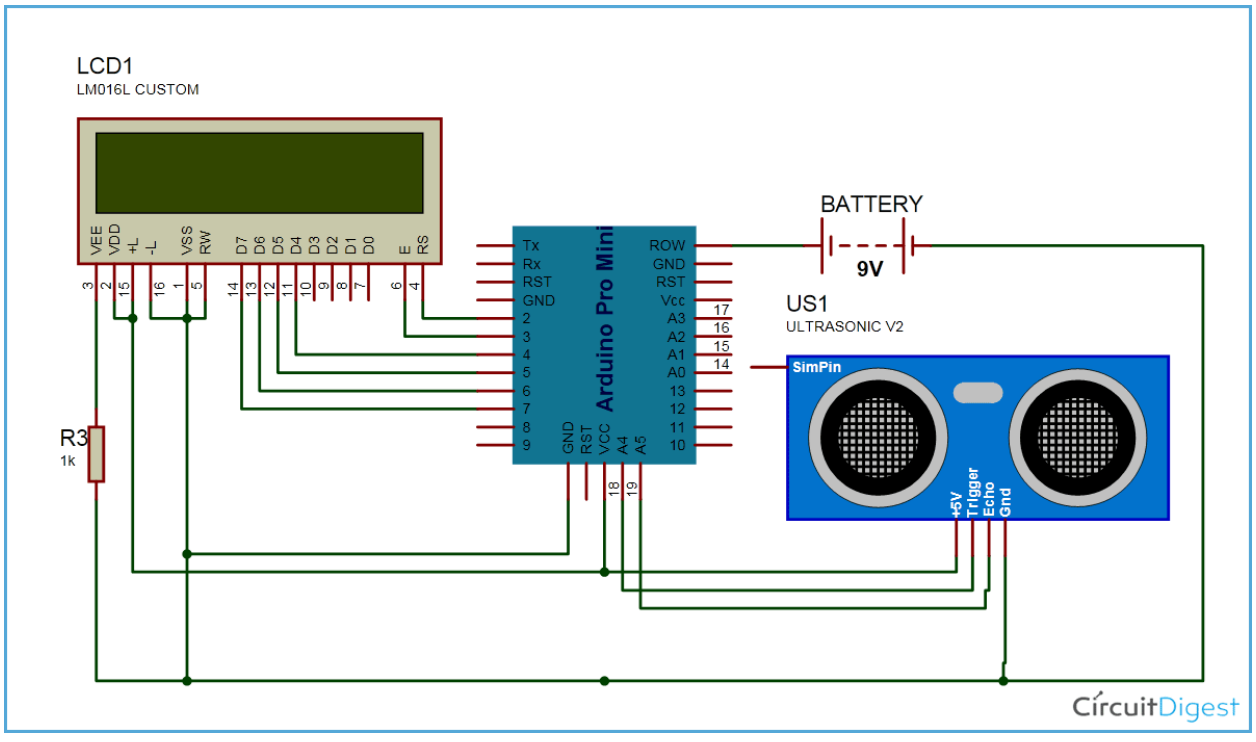


FIG :- CIRCUIT DIAGRAM OF ULTRASONIC DISTANCE METER

CODE :-

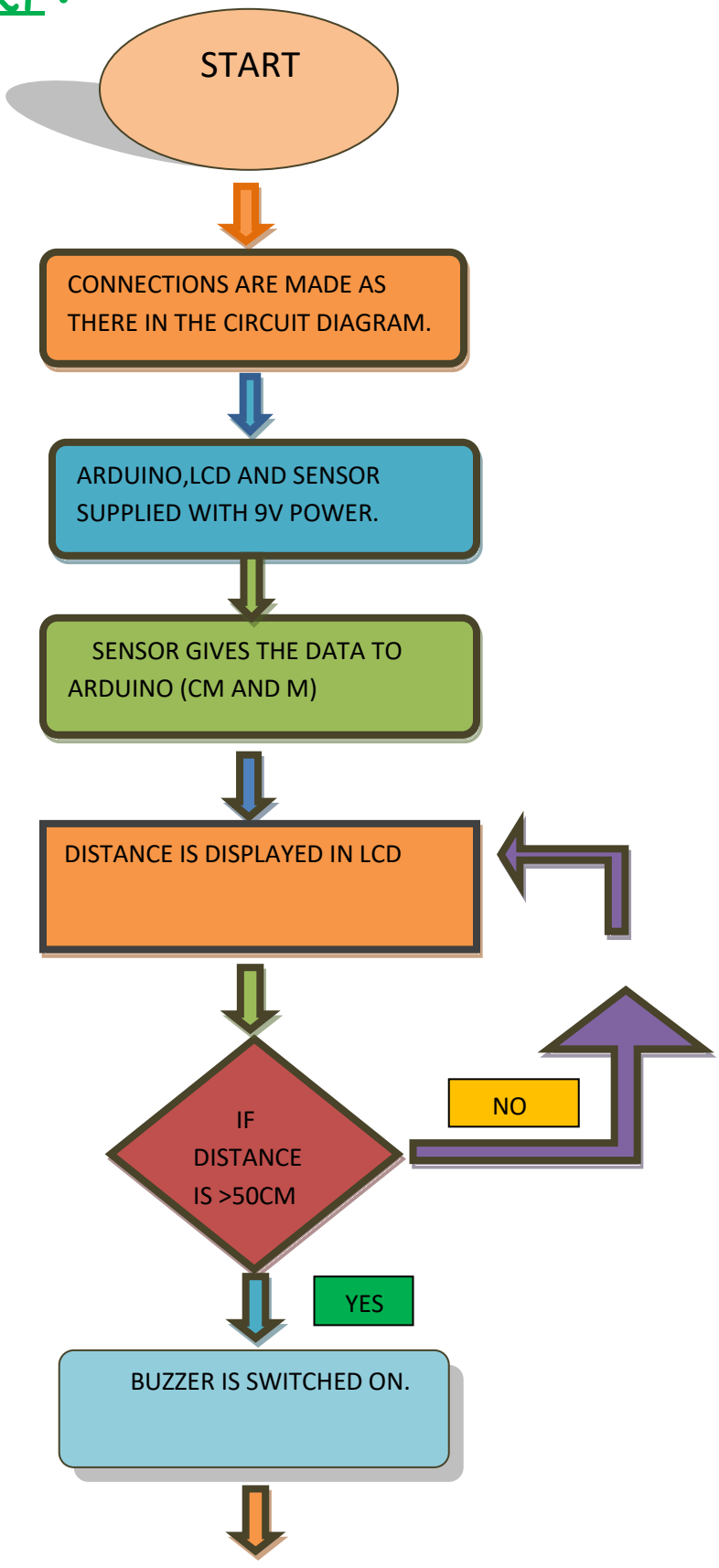
```
#include <LiquidCrystal.h>

#define trigger 18
#define echo 19
int buz=10;

LiquidCrystal lcd(12,11,5,4,3,2);

float time=0,distance=0;

void setup()
{
 lcd.begin(16,2);
 pinMode(buz,OUTPUT);
 digitalWrite(buz,LOW);
 pinMode(trigger,OUTPUT);
```

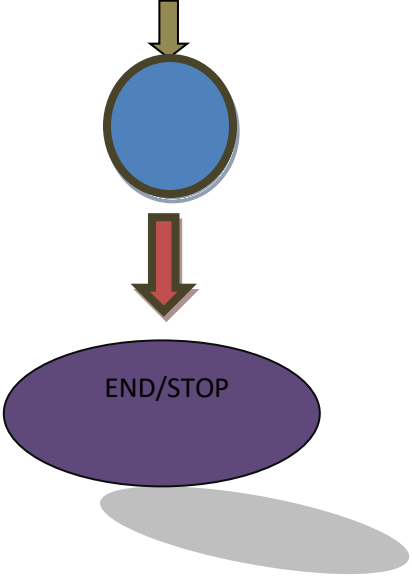
```
 pinMode(echo,INPUT);
 lcd.print("Ultra Sonic");
 lcd.setCursor(0,2);
 lcd.print("Distance Meter");
 delay(2000);
 lcd.clear();
 lcd.print("     EUREKA");
 lcd.setCursor(0,2);
 lcd.print("  AMAN & ROHIT");
 delay(2000);
}

void loop()
{
 lcd.clear();
 digitalWrite(trigger,LOW);
 delayMicroseconds(2);
 digitalWrite(trigger,HIGH);
```

```
 delayMicroseconds(10);
 digitalWrite(trigger,LOW);
 delayMicroseconds(2);
 time=pulseIn(echo,HIGH);
 distance=time*340/20000;
 lcd.clear();
/* lcd.print("Distance:");
 lcd.print(distance);
 lcd.print("cm");
 lcd.setCursor(0,1);
 lcd.print("Distance:");
 lcd.print(distance/100);
 lcd.print("m");*/
 if(distance < 10)
 {
   digitalWrite(buz,HIGH);
   lcd.print("     ALERT");
   lcd.setCursor(0,1);
```

```
   lcd.print("Distance:");
   lcd.print(distance);
   lcd.print("cm");
   delay(3000);
 }
 else
 {
   digitalWrite(buz,LOW);
   lcd.print("  SAFE ZONE");
   lcd.setCursor(0,1);
   lcd.print("Distance:");
   lcd.print(distance);
   lcd.print("cm");
 }
 delay(1000);
}
```

FLOWCHART :


START
CONNECTIONS ARE MADE AS THERE IN THE CIRCUIT DIAGRAM.
ARDUINO,LCD AND SENSOR SUPPLIED WITH 9V POWER.
SENSOR GIVES THE DATA TO ARDUINO (CM AND M)
DISTANCE IS DISPLAYED IN LCD
IF DISTANCE IS >50CM
NO
YES
BUZZER IS SWITCHED ON.



BLOCK DIAGRAM :-

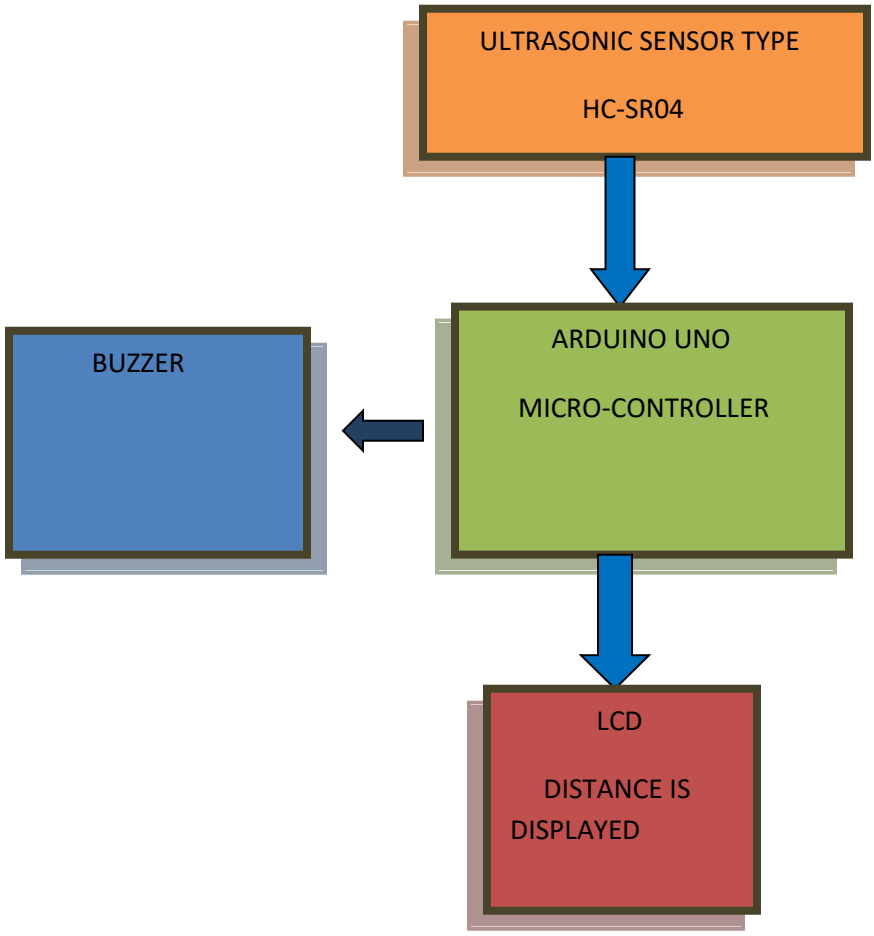


FIG:-BLOCK DIAGRAM

ALGORITHM :-

1. Connections are made from the microprocessor to different components by assigning the pin number to them.
2. 9V power supply is given to Arduino, Lcd and sensor.
3. Sensor HC-SR04 measures the distance of the object.
4. Distance is displayed on LCD in meter and centimeter.
5. If the distance is less than 50cm then the buzzer goes on.
6. Else the distance is a safe distance from the object.

FUTURE PROSPECT:-

Nowadays safety is a major issue and probably the most important issue in today's highly technical world. This is where the demand comes from. Nearly every home uses LPG gas cylinders for the house hold purpose. There are high chances of accidents taking place when people are not meticulous. This device can provide safety in such places. Not only it can provide in homes but it can provide in industries as well as in residential places. It can be used by the police department to detect alcohol, since it is also sensitive to alcohol; helping in liquor test.

By the help of socket programming, the device can be made more effective. In addition to the working, the device would send an "SMS" to the people who number has been used in the code. The Arduino will be connected with the Wi-Fi adaptor which will provide the "GPS" location of the premises where the leakage is detected; and the fire

brigade will get notified about it. This implementation broadens the security and cuts down the chances of accidents.

Advantages:-

1. An ultrasonic sensor's response is not dependent upon the surface color or optical reflectivity of the object. For example, the sensing of a clear glass plate, a brown pottery plate, a white plastic plate, and a shiny aluminum plate is the same.
2. Ultrasonic sensors with digital (ON/OFF) outputs have excellent repeat sensing accuracy. It is possible to ignore immediate background objects, even at long sensing distances because switching hysteresis is relatively low.
3. The response of analog ultrasonic sensors is linear with distance. By interfacing the sensor to an LED display, it is possible to have a visual indication of target distance. This makes ultrasonic sensors ideal for level monitoring or linear motion monitoring applications.

Disadvantages:

1. Ultrasonic sensors must view a surface (especially a hard, flat surface) squarely (perpendicularly) to receive ample sound echo. Also, reliable sensing requires a minimum target surface area, which is specified for each sensor type.
2. While ultrasonics exhibit good immunity to background noise, these sensors are still likely to falsely respond to some loud noises, like the "hissing" sound produced by air hoses and relief valves.
3. Proximity style ultrasonic sensors require time for the transducer to stop ringing after each transmission burst before they are ready to receive returned echoes. As a result, sensor response times are typically slower than other technologies at about 0.1 second. This is generally not a disadvantage in most level sensing and distance measurement applications.

Extended response times are even advantageous in some applications. Transmitted beam style ultrasonic sensors are much faster with response times on the order of 0.002 or 0.003 seconds.

4. Ultrasonic sensors have a minimum sensing distance.
5. Changes in the environment, such as temperature, pressure, humidity, air turbulence, and airborne particles affect ultrasonic response.
6. Targets of low density, like foam and cloth, tend to absorb sound energy; these materials may be difficult to sense at long range.
7. Smooth surfaces reflect sound energy more efficiently than rough surfaces; however, the sensing angle to a smooth surface is generally more critical than to a rough surface.

ABSTRACT :-

One of the problems addressed was the size of the device. To overcome the problem a Vero board was used instead of a breadboard, which provided the same features as that of a breadboard. The need of multiple VCC and ground connections was also a problem in making the device. To overcome this problem a berge connector was soldered in the Vero board and an IC 7805 was used through which multiple 5V VCC were taken and ground connections were given to different components. Brightness of LCD was also a problem, for this a resistance was used.

After meticulously making, all the intricate technicalities this device serves as a great LPG gas sensing device.

CONCLUSION:-The device can be used in real life as well. The concept can be used to make a better device which can be used in automobiles and many more.