3D LiDAR, Robotics Club, IIT Guwahati

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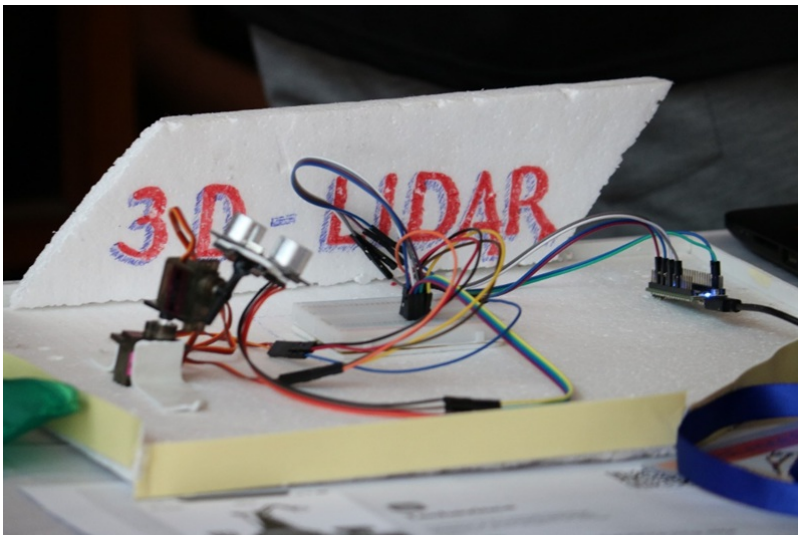
A device which scans the objects in its surroundings and makes a mapping of it on your display and guess what its small and cheap!!!



Hardware Required :

1. Servo (2 X 1)
2. Arduino
3. Ultrasonic Sensor (1 X 1)
4. Breadboard (1 X 1)

Arduino :

Some great masters have developed the **Arduino board** to help us with our quest. This board will be the heart of the project, so building the project without it would be a harsh journey. We will be using Arduino UNO for this project but any board with at least 9 digital pins is good to go.

Arduino Code :

```
#include <NewPing.h>
#include <Servo.h>

#define TRIGGER_PINL  A5  // Arduino pin tied to trigger pin on ping sensor.
#define ECHO_PINL     A2  // Arduino pin tied to echo pin on ping sensor.

#define MAX_DISTANCE 500 // Maximum distance we want to ping for (in
centimeters). Maximum sensor distance is rated at 400-500cm.
```

```
Servo myservo1;// create servo object to control a servo
Servo myservo2;// twelve servo objects can be created on most boards

int angle1 = 0;    // variable to store the servo position
int angle2 = 0;
//for UltraSonic Sensor
NewPing sonarLeft(TRIGGER_PINL, ECHO_PINL, MAX_DISTANCE); // NewPing setup of
pins and maximum distance.

unsigned int pingSpeed = 30;  // How frequently are we going to send out a ping
(in milliseconds). 50ms would be 20 times a second.
unsigned long pingTimer;     // Holds the next ping time


float oldLeftSensor, leftSensor, lSensor;
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  myservo1.attach(9);  // attaches the servo on pin 9 to the servo object
  myservo2.attach(10);
}

void loop() {
  // put your main code here, to run repeatedly:
  for (angle2 = 0; angle2 <= 90; angle2 += 10){

    myservo2.write(angle2);
    if((angle2/10)%2 == 0){
      for(angle1 = 0; angle1 <= 180; angle1 += 1){
        myservo1.write(angle1);
        ReadSensors();
          Serial.print(leftSensor);
          Serial.print("␣");
          Serial.print(angle1);
          Serial.print(",");
          Serial.print(angle2);
          Serial.println(";");

          delay(5);
    }}
    else{
      for(angle1 = 180; angle1 >= 0; angle1 -= 1){
        myservo1.write(angle1);
        ReadSensors();
          Serial.print(leftSensor);
          Serial.print("␣");
          Serial.print(angle1);
          Serial.print(",");
          Serial.print(angle2);
          Serial.println(";");

          delay(5);
    }
      }
    }
}
```

```
  //=======================================//
  //    ULTRASONIC SENSORS READING DATA    //
  //=======================================//

void ReadSensors() {


  leftSensor = sonarLeft.convert_cm(leftSensor);

  lSensor = sonarLeft.ping_cm(); //ping in cm

  leftSensor = (lSensor + oldLeftSensor) / 2;
  //average distance between old & new readings to make the change smoother

}
```

Processing Code :

```
import processing.serial.*;

// imports library for reading the data from the serial port
import java.awt.event.KeyEvent;
import java.io.IOException;
Serial myPort;
float x,y,z;
float distance,thetha, phi;
String data="";
String dist="";
String angle1="";
String angle2="";
int index1=0;
int index2=0;
void setup() {
 size(800,600,P3D);
 background(255);
 printArray(Serial.list());
 smooth();
 myPort = new Serial(this,"/dev/ttyACM0", 9600); // starts the serial
communication
 myPort.bufferUntil('\n'); //reads the data from the serial port up to the
character '.'.
}

void serialEvent  (Serial myPort) {
  data = myPort.readStringUntil(';');
  data = data.substring(0,data.length()-1);

  index1 = data.indexOf("␣");
  index2 = data.indexOf(",");
  dist = data.substring(0, index1);
  angle1 = data.substring(index1 + 1, index2);
  angle2 = data.substring(index2 + 1, data.length());
  distance = float(dist);
  thetha = int(angle2);
  phi = int(angle1);
```

```
}

void draw() {
//background(255);
stroke(0);
translate(230,230);
x = (-1) * distance * cos(thetha) * cos(phi) * 10;
y = (-1) * distance * sin(thetha) * 10;
z = (-1) * distance * cos(thetha) * sin(phi) * 10;
point(x, y, z);
print("Data␣="+data+"\t");
print("x␣="+x +"\t");
print("y␣="+y +"\t");
print("z="+z +"\n");
}
```

Output :

This is the mapping that we got of an object kept in front of LIDAR, this seems promising isn't it.