Area calculation by using adxl335 and ultrasonic distance sensor.

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Abstract – *There are many applications that requires the dimensions of a particular area on the surface of buildings, which is at a particular height from ground level. Practically it is difficult to measure the dimensions directly beyond a certain height. One of the major application which make use of such dimensions are advertisement industries. Therefore we intent to design an instrument which measures the dimensions, without direct measurement. The hardware part includes arduino uno, ADXL335, HCSR04, LCD display, keypad and lasers. The dimensions are calculated by using the trigonometrically identities included in the program. The instrument is of lowcost and portable.*
Key Words: **arduino uno, ADXL335, HCSR04**.

1. INTRODUCTION

For taller buildings it is difficult to measure the dimensions of a particular area on the surface of the building which is at a height from the ground. One of the purpose of measuring this dimension is for placing the advertisement boards at a particular height above ground level, where the measurements can't be taken directly. Practically it is difficult to measure the height of buildings beyond a certain height. The main limitation faced by advertisement industries are the unavailability of dimension for evaluating the size of advertisement display with respect to the wall where it is intended to be placed. Presently the dimensions are computed manually by using measuring instrument like tapes. This method results in human errors and may cause harm to human-life.

2. COMPONENT DESCRIPTION

The designed instrument consist of arduino uno, ADXL335, HCSR04, LCD display and a matrix keypad.

2.1 ARDUINO UNO

The Arduino UNO is an open-source microcontroller board. It is based on the microchip ATmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform.

2.2 ADXL335

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.
 It contains a polysilicon surface-micromachined sensor and signal conditioning circuitry to implement an open-loop acceleration measurement architecture. The output signals are analog voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt-sensing applications as well as dynamic acceleration resulting from motion, shock, or vibration.

2.3 HCSR04

Ultrasonic ranging module HCSR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: Using IO trigger for at least 10us high level signal, the Module automatically sends eight 40 kHz and detect whether there is a pulse signal back, if the signal back through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2).
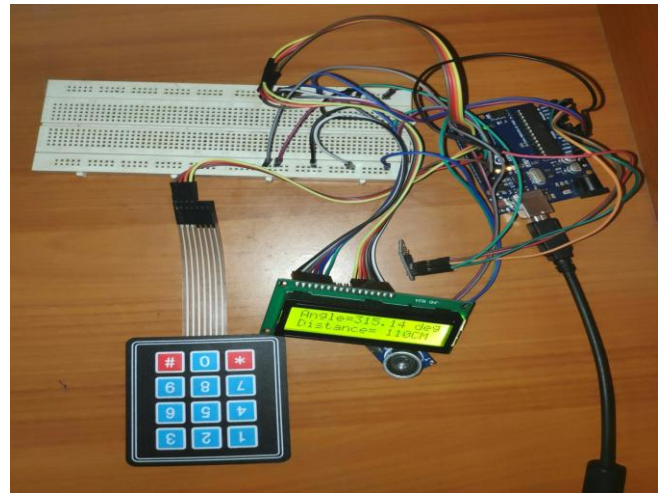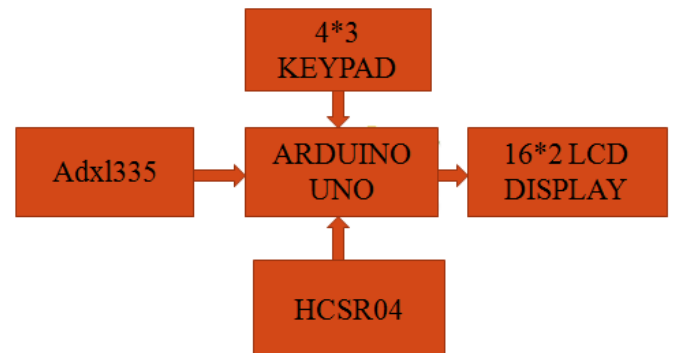

2.4 LCD DISPLAY

A 16X2 LCD has two registers, namely, command and data. The register select is used to switch from one register to other. RS=0 for command register, whereas RS=1 for data register.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. Processing for commands happens in the command register.The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. When we send data to LCD it goes to the data register and is processed there. When RS=1, data register is selected.

2.5 MATRIX KEYPAD

The 4 X 3 Matrix Keypad has 12 buttons, that are arranged in a telephone-line 3x4 grid. The keys are connected into a matrix, hence only 7 microcontroller pins (3-columns and 4-rows) are required to scan the pad. It has a size of 70mm x 77mm x 1mm and has a weight of 7.5gm.

3. BLOCK DIAGRAM

ADXL335 calculates the angle based on its position and the HCSR04 calculates the distance. By using trigonometrical identities in the program   the dimensions can be obtained. The 16*2 LCD display displays the angle and distance. At desired position the angle and distance at that point can be save by using 4*3 matrix keypad.
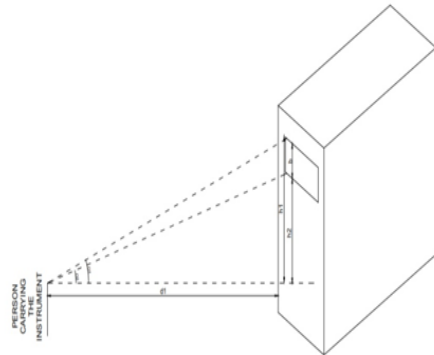
4. BASIC EQUATIONS

$$h1 = d1\tan\emptyset1$$

$$h2 = d1\tan\emptyset2$$

$$b = h1\text{-}h2$$

$$l = d2\tan\emptyset3$$

$$Area = l*b$$

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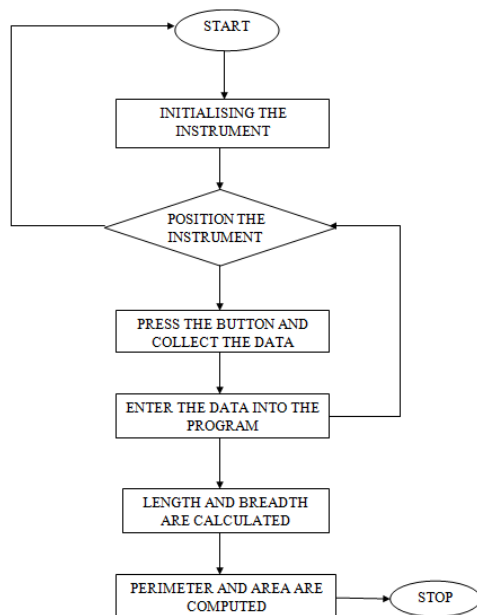
6. CONCLUSIONS

The measurements become more easier by applying the instrument which incorporates ADXL335 and distance measuring sensor. It avoids practical inconvenience in the measuring technique and also it is a cost effective way.