

A REPORT PREPARED FOR TRANSDUCER AND MEASUREMENT SYSTEMS COURSE

ON THE TOPIC OF

Obstacle detection using radar system

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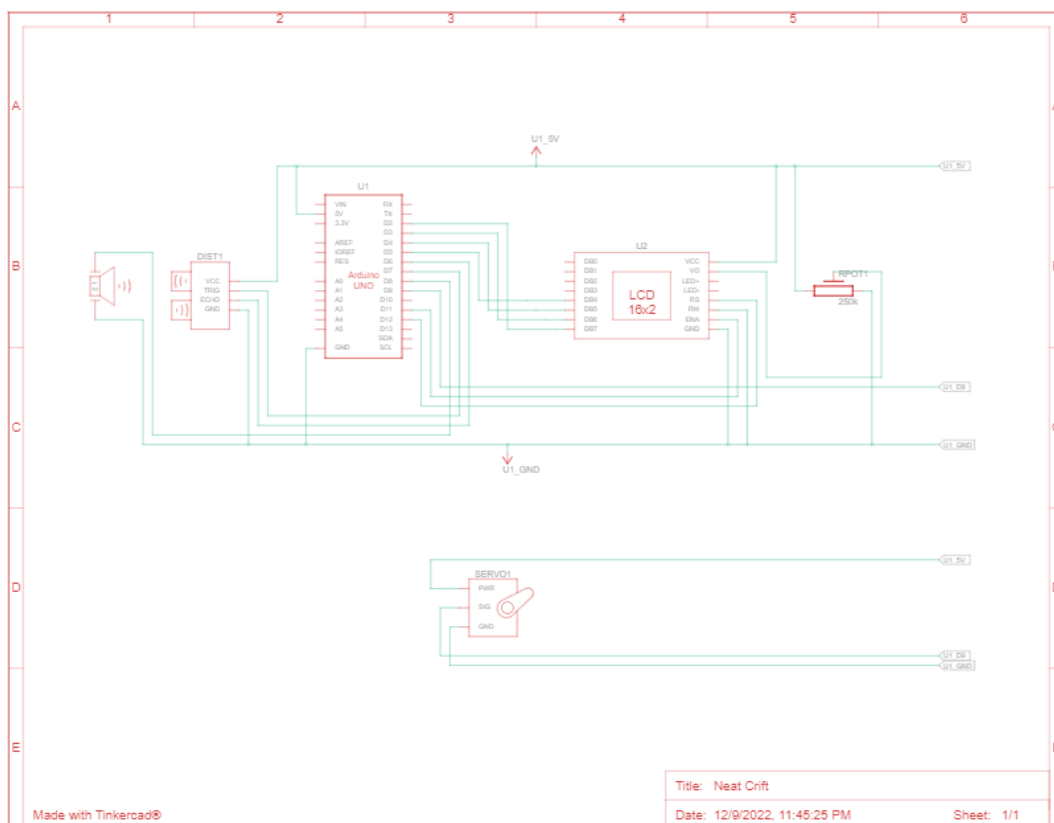
AIM OF THE PROJECT

To create a compact and power efficient object detection system based on radar principle.

COMPONENTS USED

NAME	COMPONENT	QUANTITY
U1	Arduino Uno R3	1
U2	LCD 16 x 2	1
DIST 1	Ultrasonic distance sensor	1
Rpot 1	Potentiometer (250k ohm)	1
SERVO1	Servomotor	1

CIRCUIT SCHEMATIC



PURPOSE OF THE COMPONENTS USED

1. Ultrasonic sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

2. Arduino Uno

Arduino Uno is a low cost and programmable open-source microcontroller board that can be integrated into various electronic projects. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

3. LCD Screen

We are using the screen to display the distance and angle of the object sensed by the sensor.

4. Servomotor

Servo motors are used to control the position of objects, rotate objects, move sensors etc. with high precision. Here we have used it to rotate our ultrasonic sensor with high precision from 0 degree to 180 degree.

WORKING

The Arduino Uno microcontroller board is used as our base for all the connections. We create Vcc and GND rails on the breadboard as they are utilised multiple times. The Ultrasonic sensor is mounted atop the Servomotor where it rotates along with the motor in a wide arc of 180 degrees. Here, the sensor detects objects that are less than 1200 cm away and displays them on the LCD screen.

The Buzzer module is utilised whenever an object comes less than 50 cm in front of the sensor. Then it sounds an alarm and stops moving until the object is removed. We print the distance in centimetres and the angle in degrees. We can

change the distance of alarm by changing a variable in the Arduino code.

CALIBRATION

To check the accuracy of this sensor we placed a target in front of it and measured the distance by using the ultrasound sensor and also by ruler scale. We will place the ruler on a horizontal surface with our sensor placed at 0 reading of the ruler, and mark the readings to place the object. We will place the object at different distances and record the distance and the period of each pulse.

Distance (in cm)	Distance measured (in cm)	Time duration (in microseconds)	Non linearity
5	5.0000	251	0.0000
10	9.9907	572	0.0093
15	14.9990	902	0.0010
20	19.729	1164	0.0271
25	24.9969	1457	0.0031
30	29.9871	1890	0.0129
35	34.9986	2332	0.0014
40	39.9990	2676	0.0010
45	44.9979	2917	0.0021
50	50.0000	3200	0.0000

After this we plotted a best fit line and obtained $m = 0.016$ and $b = 0.00110$

PRACTICAL/REAL WORLD APPLICATIONS OF THE PROJECT

This project / idea can be used for detection of objects/obstacles in

1. Light weight vehicles for prevention of accidents –It would be useful at night time if the driver wants the sensor to detect some object in its path which is not very visible to the naked eyes, thereby preventing accidents or collisions

In case the driver of the vehicle falls asleep at any point of time and a vehicle or a sufficiently big object comes in its path then the sensor would sense it and the buzzer would start buzzing and thereby can prevent accidents.

2. Can be used in standard mobility cane used by blind people – This would create a buzz noise if any object comes close to their cane thereby indicating them to be aware or change direction
3. Intrusion detector – Can be used outside homes in order to detect if a thief is outside and has come very close to the property. Possibly used at night time and/or when the house is empty.

