EN2532 Robot Design and Competition

Laboratory Sheet-Practical No: 4

Indexes:	210258J 210542B 210069F 210418C 210174X 210205V	Date:	10 / 7 / 2023
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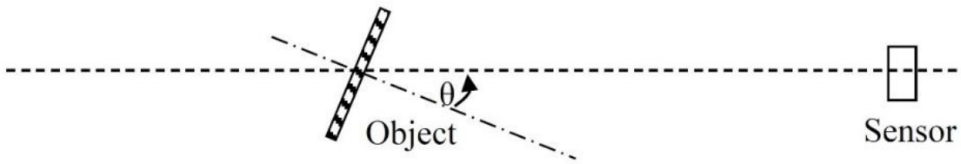
1. Comment on your observations of the sensor readings and how you can obtain the distance value according to the particular reading.

Ultrasonic sensors calculate distance by measuring the time taken for sound waves to bounce back from an object and using the formula

```
duration = pulseIn(echoPin, HIGH); //Returns the length of the pulse in microseconds
distance = (duration / sec_to_microsec) * (speed_of_sound * meter_to_cm) / 2.0;
```

The distance didn't depend on the type of material of the surface used.

2. Place objects of different size at the same distance from the sensor and identify the minimum dimensions of the object that is detected by the sensor. 1.5 cm
3. Place a cardboard sheet at a fixed distance with different ultrasound wave incident angles (θ) with the sensor and observe the measurement. Vary θ from 0^0 to 70^0 at steps of 10^0.

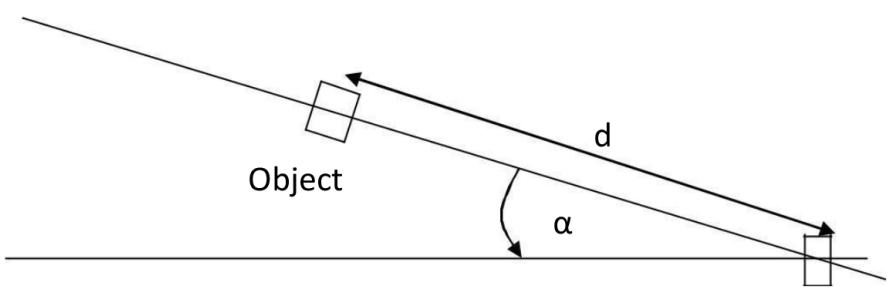


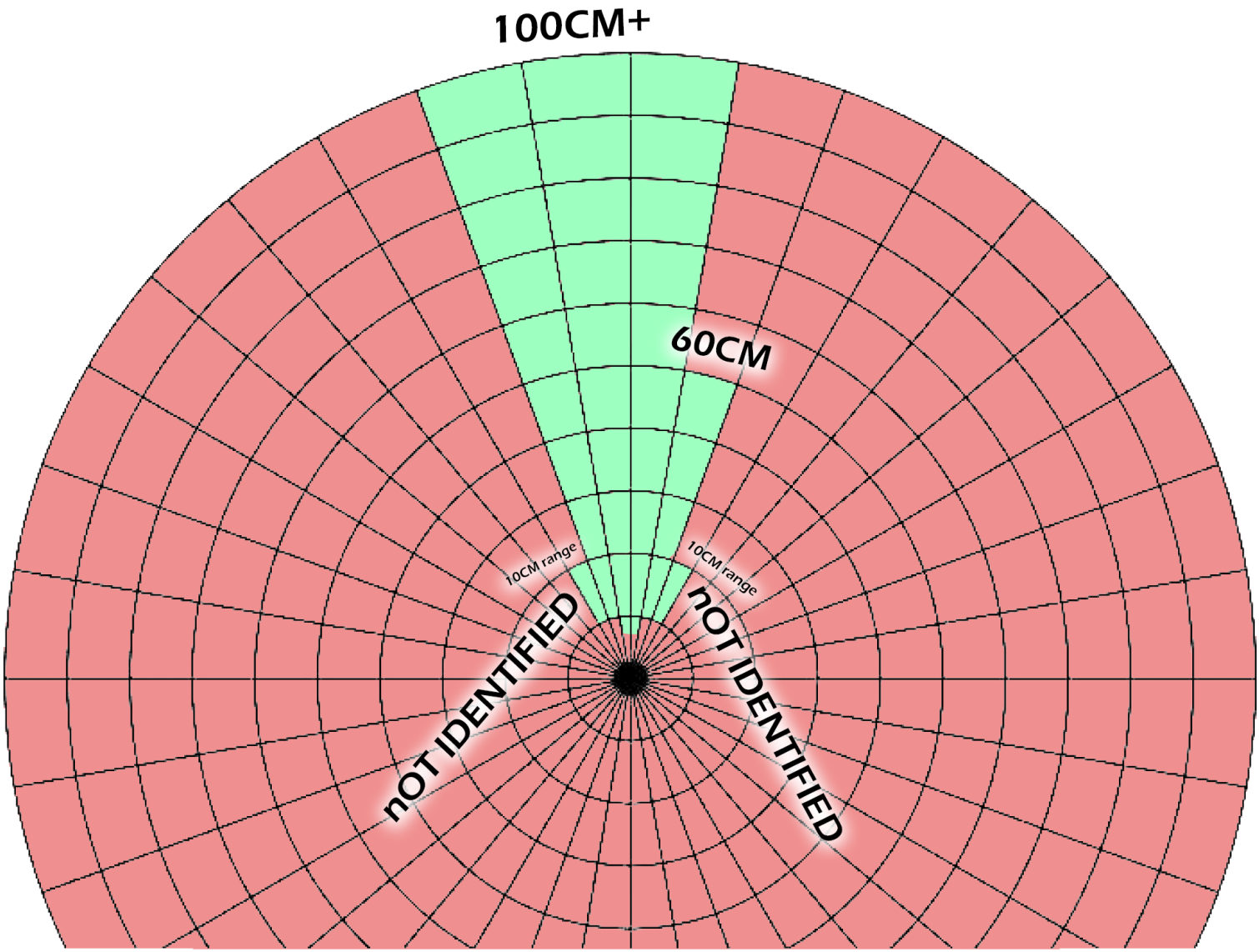
4. Comment on your observations.

0° - 30 cm	40° - 115 cm
10° - 30cm	50° - 115 cm
20° - 115 cm	60° - 115 cm
30° -115 cm	70° - 115 cm

We noticed an steep increase in measurement errors as the angle exceeded 15 degrees.

5. Place an object with minimum detectable dimensions. Then vary the angle from 60^0 to 0^0 in steps of 10^0 and obtain the maximum object detectable distance of the sensor for each angle and plot them in the given graph below,




100CM+
60CM
10CM range
10CM range
nOT IDENTIFIED
nOT IDENTIFIED