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/*
  Program: Measures the water level in the tank using ultrasonic sensor
  Date: 24/11/2020
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*/

#include <LiquidCrystal.h> // includes the LiquidCrystal Library

LiquidCrystal lcd(1, 2, 4, 5, 6, 7); // Creates an LCD object. Parameters: (rs, enable, d4, d5, d6, d7)

const float trigPin = 9;
const float echoPin = 10;
long t; //duration
float maxHeight = 20.5; //maximum height of the tank in cm
float v; // volume in cubic cm
float actual_height;
float r = 10.9/2; // radius of tank in cm
float capacity; // capacity in liters
float distanceCm; // distance variable

void setup() {
  lcd.begin(16,2); // Initializes the interface to the LCD screen, and specifies the dimensions (width and
  height) of the display
  pinMode(trigPin, OUTPUT); // transmitted
  pinMode(echoPin, INPUT); // Recived
}

void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10); /* set the Trig on a High State for 10 μs
  to generate the ultrasound which sends 8 cycle sonic burst at the speed of light*/
  digitalWrite(trigPin, LOW);
  t = pulseIn(echoPin, HIGH); /*Burst will be received in the Echo pin
  which outputs the time in microseconds the sound wave traveled*/

  distanceCm = t*0.034/2; /*where 0.034 is the speed of the sound in cm/us*/
  /* The sound wave needs to travel forward and bounce backward.
  Multiply the received travel time value from the echo pin by 0.034/2 to get the distance in cm*/
  distanceCm = distanceCm - 4.5; //offset correction to place the sensor 6cm higher than the tank
  actual_height = maxHeight - distanceCm;
  v = ((3.141592654*(r*r))*(actual_height));
  capacity = v/1000; // capacity in litre

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lcd.setCursor(0,0); // Sets the location at which subsequent text written to the LCD will be displayed
lcd.print("Distance: "); // Prints string "Distance" on the LCD
lcd.print(distanceCm); // Prints the distance value from the sensor
lcd.print(" cm");
delay(10);
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lcd.setCursor(0,1);
lcd.print("Capacity: ");
lcd.print(capacity);
lcd.print(" litre");
delay(10);
}
```