#include <Arduino.h>

#include <LiquidCrystal.h>

// Pin Definitions

#define BAUD\_RATE 9600

#define ECHO 12

#define TRIGGER 14

#define LED\_PIN 2

// Ultrasonic sensor variables

double duration, cm, inches;

// Function prototypes

void initSerialOutput();

void initSensor();

void readSensor();

void setup() {

    Serial.begin(BAUD\_RATE);

    Serial.println("Ultrasonic Sensor LED Control");

    pinMode(LED\_PIN, OUTPUT);

    digitalWrite(LED\_PIN, LOW);

    initSerialOutput();

    initSensor();

}

void loop() {

    readSensor();

    if (inches <= 12.0) {

        digitalWrite(LED\_PIN, HIGH);

        Serial.println("LED ON: Object within 12 inches");

    } else {

        digitalWrite(LED\_PIN, LOW);

        Serial.println("LED OFF: Object farther than 12 inches");

    }

    delay(250);

}

void initSerialOutput() {

    Serial.begin(BAUD\_RATE);

}

void initSensor() {

    pinMode(TRIGGER, OUTPUT);

    pinMode(ECHO, INPUT);

}

void readSensor() {

    digitalWrite(TRIGGER, LOW);

    delayMicroseconds(5);

    digitalWrite(TRIGGER, HIGH);

    delayMicroseconds(10);

    digitalWrite(TRIGGER, LOW);

    duration = pulseIn(ECHO, HIGH, 30000); // 30ms timeout

    if (duration == 0) {

        Serial.println("No echo received or object out of range");

        inches = 999;

        return;

    }

    cm = (duration / 2) / 29.1;

    inches = (duration / 2) / 74;

    char str[100];

    sprintf(str, "Distance: %.3f in. %.3f cm\n", inches, cm);

    Serial.print(str);

}