SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19EET304/ IOT for Electrical Sciences

III YEAR VI SEM

UNIT 2 – SENSORS

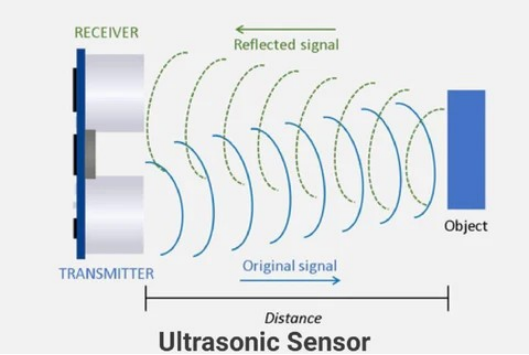
TOPIC 6 – ELECTROSTATIC TRANSDUCER & ULTRASONIC SENSORS

WHAT IS ULTRASONIC SENSOR?

Ultrasonic sensors are electronic devices that calculate the target's distance by emission of ultrasonic sound waves and convert those waves into electrical signals. The speed of emitted ultrasonic waves traveling speed is faster than the audible sound.

WORKING PRINCIPLE

Ultrasonic sensor working principle is either similar to sonar or radar which evaluates the target/object attributes by understanding the received echoes from sound/radio waves correspondingly. These sensors produce high-frequency sound waves and analyze the echo which is received from the sensor. The sensors measure the time interval between transmitted and received echoes so that the distance to the target is known.



Ultrasonic sensors

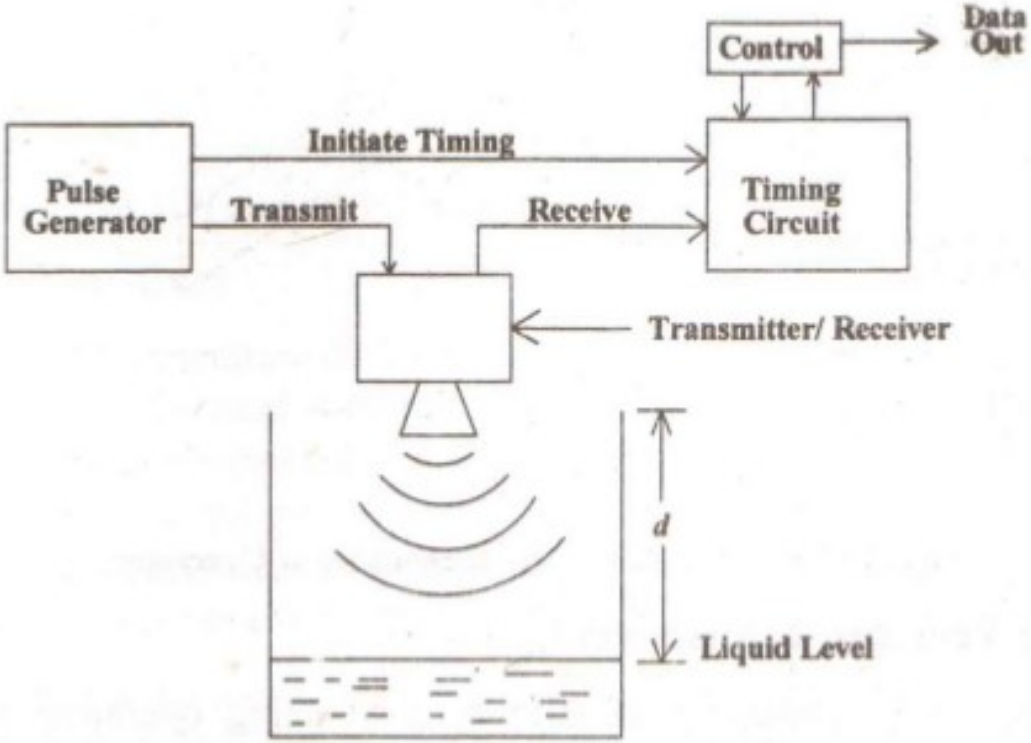


Figure 10.9 : Principle of an Ultrasonic Range Sensor

Ultrasonic sensor

- For continuous measurement of a level in a tank, floats are being replaced by ultrasonic range sensors,
- Ultrasonic sensors use pulses of sound to measure distance.
- A transmitter sends out a pulse, which is reflected against the fluid whose level is being measured.
- When the transmitter sends out the pulse, it simultaneously initiates a timer circuit that counts clock cycles.

Ultrasonic sensor

- A receiver, housed with the transmitter, receives the reflection of sound.
- The received signal terminates the timer and initiates the computation of distance.
- A microprocessor computes distance based on the speed of sound through the medium, typically air.
- The microprocessor may take several samples and compute and average to obtain a more accurate measurement.

Ultrasonic sensor

- The reflected signal will travel 2d during the period that the timer is on, del t.
- If v is the velocity of sound in the medium, the distance between transducer and liquid level is

$$d = v(2\Delta t)$$

ADVANTAGES

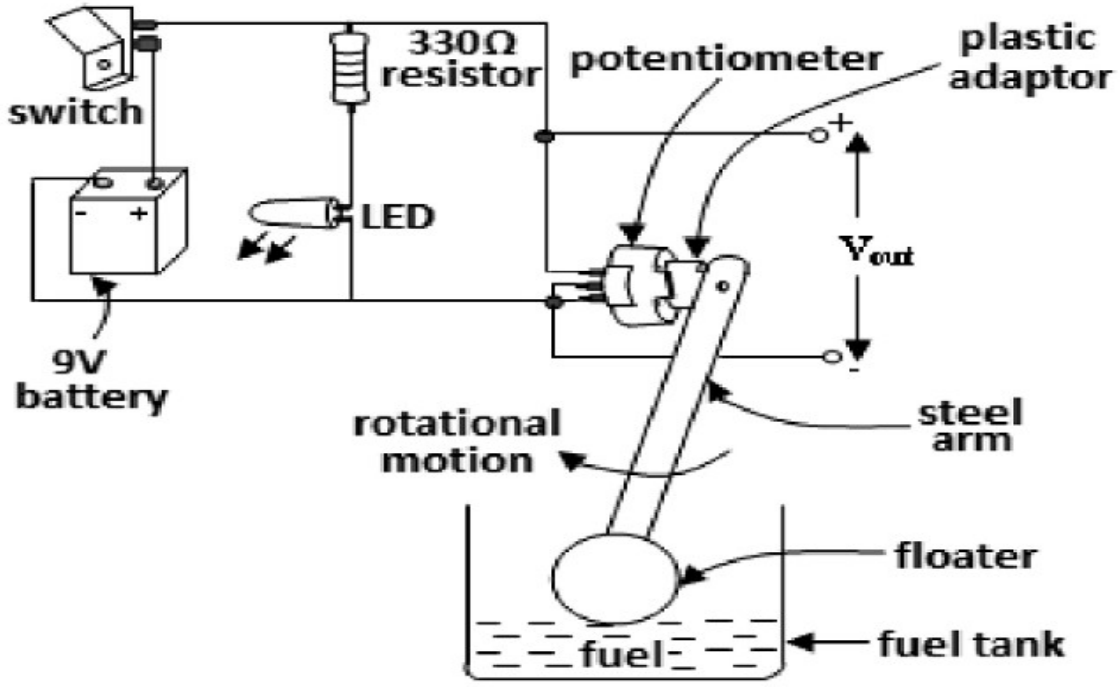
1. Capacitive sensing can sense diverse kinds of materials like metal, liquid, skin and plastic.
2. Capacitive sensing is wear-free and contactless.
3. With small sensor sizes, capacitive sensing has the capability to sense up to a large distance.
4. Capacitive sensing is a low power solution.

ASSESSMENT – 1

CAN YOU IDENTIFY THIS SENSOR?

ASSESSMENT – 2

Can you explain the circuit?



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Thank You