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Expt - 5

Q. 1) Explain any one application based on this experiment. (Related to your core branch)

Ans The ultrasonic distance meter works by transmitting a short pulse of sound at a frequency inaudible to the ear.

→ Ultrasonic sensor is preffered for human following robot due to its wide detection area, less light dependancy, the ability to detect glass and shinning wall, smaller in size, light weight, uses a very low memory and less power consumption.
However, being a spectacular type of sensor and narrowly focused, this can cause wrong estimation and recognition of human. Therefore necessary accompanying algorithims should be developed to encounter this issue.

→ Ultrasonic sensors and ultra sonic distance meters can be used in high level security systems that are setup by complicated computer programming. These security systems helps in guarding a sensitive space efficiently. This can be used to detect the body language and presence of an intruder. The ultrasonic sensors can be programmed to send an "alert" to the headquaters or the guards.

→ Ultrasonic distance meters can also be used in automobile industry in the development of automated vehicles and fire safety equipments.

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Q. 2> Explain any one technique or experiment other than the one performed which will achieve the result and fulfil aim of the experiment.

Ans **Ultrasonic Doppler effect for distance Measurement.**

Consider the wave transmitted when the source lies at x_0. The time is given by $\frac{x_0}{C+V_2} + \frac{x}{C-V_1}$ where V_1 = velocity of source, V_2 = velocity of medium.

Now, if the sound pressure is given by $P_0 = P\cos\omega t$, the equation of the delayed received will be

$$P_0 = P\cos\omega\left(t - \frac{x_0}{C+V_2} - \frac{x}{C-V_1}\right)$$

Now, an addition frequency term has been introduced during the time interval from transmission to reception the source will have travelled.

$$x_0 - x = v\left(\frac{x_0}{C+V_2} + \frac{x}{C-V_1}\right)$$

On solving further we get,

$$x_0 = \frac{(C+V_1)(C-V_2+V_1)\,x}{(C-V_1)(C+V_2-V_1)}$$

$$\therefore \boxed{\frac{x_0}{C+V_2} + \frac{x}{C-V_1} = \frac{2x_0}{(C+V_2-V_1)(C-V_2)}}$$

Hence, our aim of calculating the distance is fulfilled.