**1)Under water data transmission**

Radio waves cannot travel through water without attenuation. What limits transmission is conduction, and sea water is very conductive, and largely, in the case of sea water, absorption. Together they severely limit high frequency (short wavelength) transmissions; however, low frequency (long wavelength) radio does travel through a little better. the conductivity of water with a relative permittivity of 81 can greatly affect its electromagnetic propagation. Radio waves get progressively weaker the deeper they penetrate into salt water, and that attenuation is a function of salinity. Submarines needs to send and receive data from underwater to the nearest camp quickly and efficiently. Ultrasonic communication is used to receive and send data to sonic communication equipment in the seabed of areas frequently travelled by their submarines and connected it by [underwater communications cables](https://en.wikipedia.org/wiki/Submarine_communications_cable) to their land stations.

**2)Short range resource sharing between devices**

A Bluetooth or Wi-Fi connection takes multiple seconds for establishing a connection. Here sound playback or recording can start in tens of milliseconds, making it more suitable for data transfer between devices when the data to be transferred is not large. An application named Google Pay now uses ultrasonic sound to transfer money. Here the phones of payer and payee are paired using ultrasonic. This feature is called audio QR code.

**3)Secure Data Transmission**

These days data security is the most important aspect of any data transfer. Bluetooth and Wi-Fi pass through the walls unlike ultrasonic sound. This feature of ultrasonic sound can be used to keep the data secure as the data does not pass through the walls and the signal of the transmitter is constrained to the same room.

**4) Electromagnetic Sensitive Area**

Electromagnetic sensitive areas (petrol pumps, hospitals etc) have a problem to transmit data. Electromagnetic radiation emitted by our mobile phones are capable of igniting the petrol vapour directly and causing explosions and it can induce currents in nearby metallic objects which can also cause explosions. Most hospitals don’t recommend using phones due to the effect of electromagnetic radiations on the patients. In such sensitive areas ultrasonic sound can be employed thereby by preventing hazardous accidents.

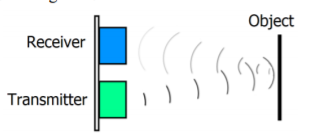
**Literature Survey**

**Jonny Biguenet, “Ultrasonic data “transmission” , 2016**

This paper gives us a insight about the problems faced during the design of transmitter and receiver circuit.

Audio hardware limitations include transmission of binary data (square wave) through normal speakers is not possible as they do not respond to such signals. This particular problem led us to explore about the possibilities of using other transducers to transmit binary data.

**V A Zhmud1, N O Kondratiev1, K A Kuznetsov1, V G Trubin1, L V Dimitrov, “Application of ultrasonic sensor for measuring distances in robotics”, 2018**



This paper gives an idea about working and internal circuitry of ultrasonic sound sensor particularly HC-SR04. The ultrasonic transducers used in this particular sensor respond to binary data (square wave). This led us to designing of a receiver and transmitter circuit using the ultrasonic transducer. This paper gives us a solution to the problems faced which was mentioned in the previous paper discussed. In our project the same transducers of HC-SR04 is used to transmit the data by varying with of square wave. Width is 2 milli-seconds if the bit is 1 and width is 4 milli-seconds if the bit is 0.

**Kerry D. Wong, “A Sensitive DIY Ultrasonic range sensor”, 2011**

This paper discusses about ultrasonic transducers. This paper also introduces us to the transmitter circuit. It uses a bridge circuit produces an output voltage roughly twice the Vcc, For longer measurements the driving voltage can be increased to 12V. The transistors 2N3904 and 2N3906 cannot be used for voltages above 6V as it heats up.

**Pascal Getreuer , Chet Gnegy, Richard F. Lyon, Life Fellow, IEEE, and Rif A. Saurous. “Ultrasonic Communication Using Consumer Hardware”, 2018**

The following points are inferred from this paper. This paper discusses about Wi-Fi and Bluetooth connection and it’s disadvantages for small data transmission as it takes longer time to pair.The 18.5 to-20 kHz is inaudible to most humans and yet realizable with commodity speakers and microphones in mobile devices. Speakers of common phone produces 74 dB SPL at 18 kHz whereas the threshold is 86 dB SPL to be audible.