

Working with ultrasonic distance sensors

- How do humans sense distance?
- How do bats sense distance?

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 - Humans estimate distance using their eyes, which is usually not a very accurate method
- How do bats sense distance?
 - Bats sense distance using sound. They emit sound waves and receive back reflected waves. The time it takes to receive the waves back provides them with a very good estimate of the distance. This is exactly how ultrasonic sensors estimate distance

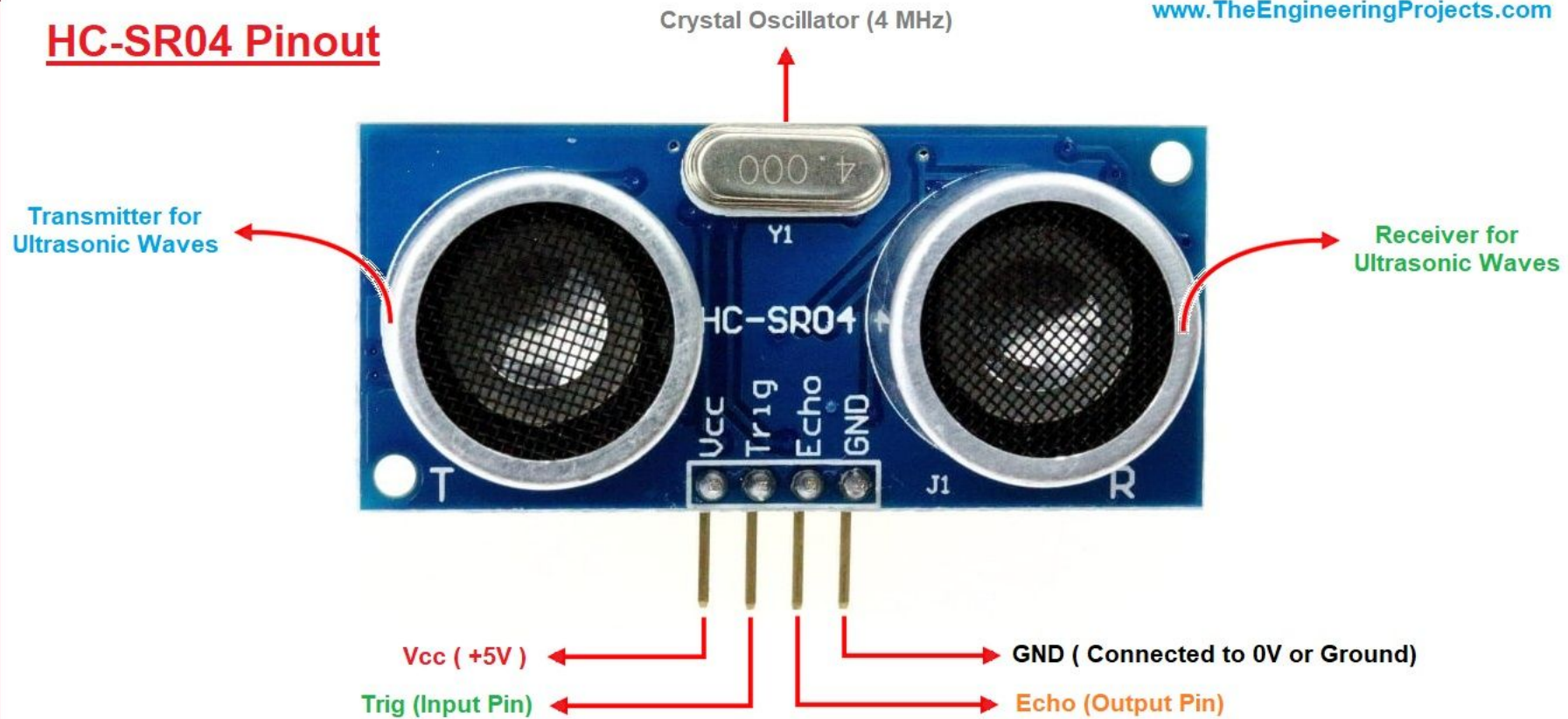
Ultrasonic Sensor

- An ultrasonic sensor has two parts:
 - A transmitter that sends out a signal that humans cannot hear
 - A receiver that receives the signal after it has bounced off nearby objects
- The sensor sends out its signal and determines how long the signal takes to come back.
 - If the object is very close to the sensor, the signal comes back quickly
 - If the object is far away from the sensor, the signal takes longer to come back
 - If objects are too far away from the sensor, the signal takes so long to come back (or is very weak when it comes back) that the receiver cannot detect it
 - The sensor sends a message back to the computer brick telling it the time taken for the signal to return. Then the brick uses this info to compute how far away the object is.

- The Ultrasonic Sensor is a Transceiver Module (Transmitter + Receiver).
- It transmits High Frequency Ultrasonic Waves of frequency greater than 20 KHz.
- Intercepts the waves reflected by an obstacle.
- Electrical Signals \leftrightarrow Ultrasonic Signals \leftrightarrow Electrical Signals

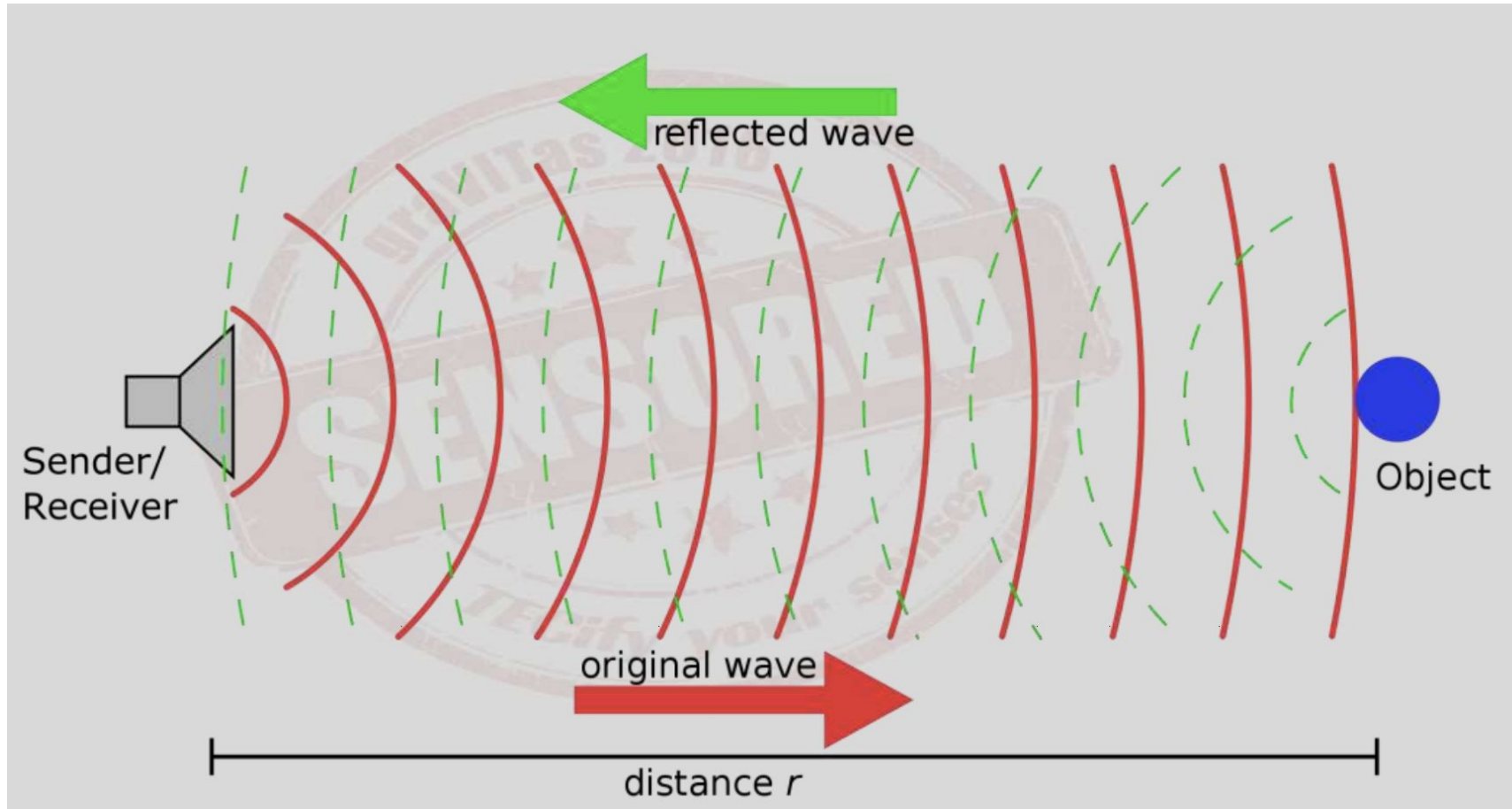
HC-SR04 Pinout

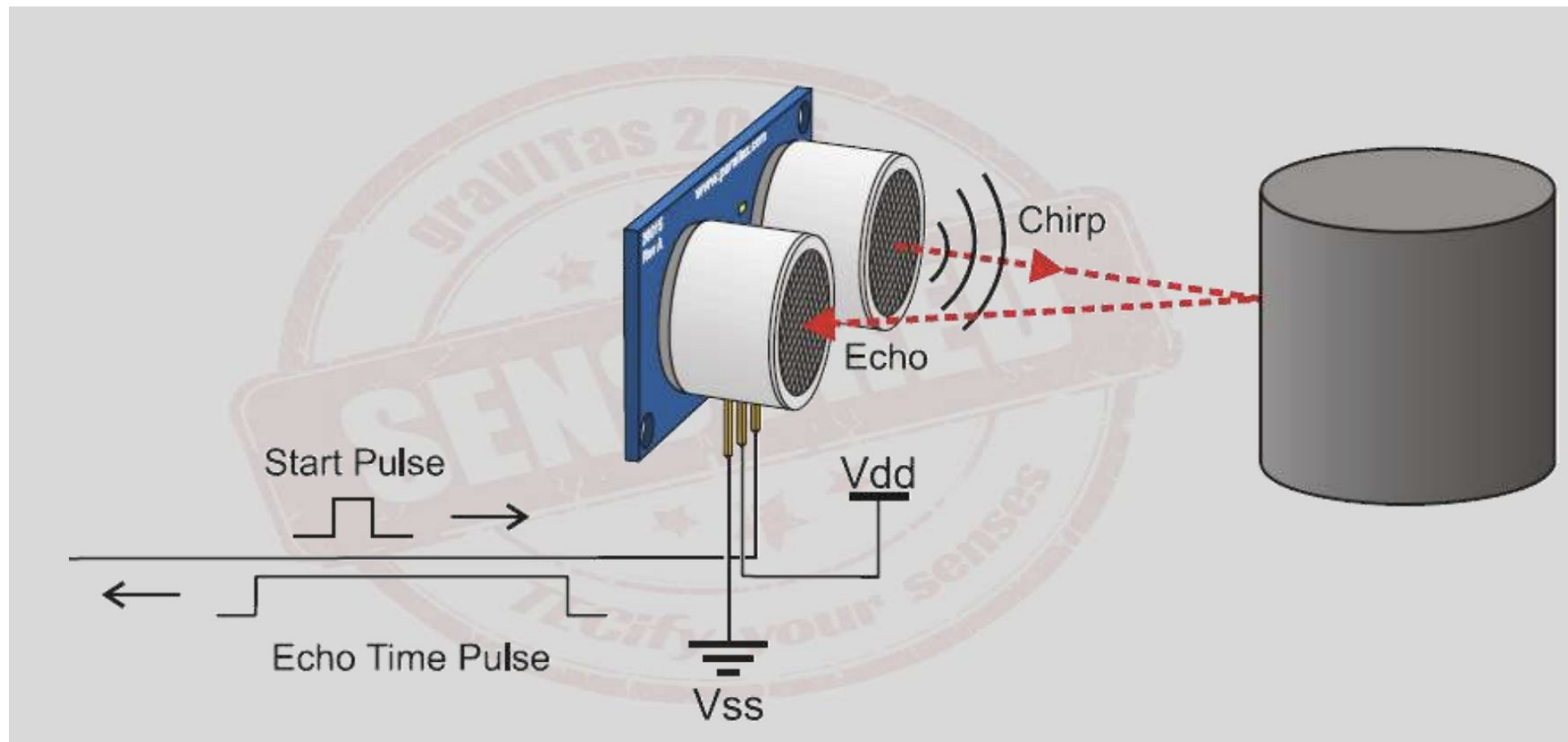
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- It provides 2 - 400 cm non-contact measurement function.
- Operating Voltage : 5V
- Working Frequency : 40 KHz
- Trigger Input Signal : 10 μ s TTL pulse

Working Principle





Applications

- Ultrasonic sensors can measure the following parameters, without even getting in contact with the medium which is to be measured :
 - Distance
 - Level
 - Presence
 - Diameter
 - Position