



Ultrasonic Radar Project



Working Principle

This project works on the principle of **ultrasonic wave reflection (echo method)**.

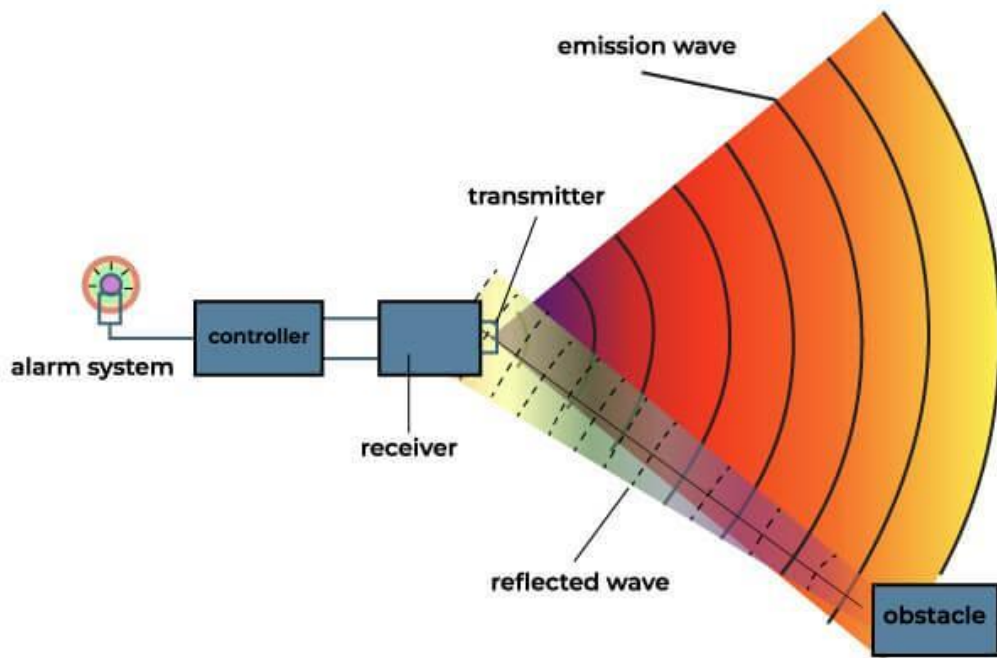
- The ultrasonic sensor (HC-SR04) emits **high-frequency sound waves**.
- These waves travel through the air and hit an object.
- The waves reflect back to the sensor as an **echo**.
- The time taken for the echo to return is measured.
- Distance is calculated using the formula:
Distance = (Time × Speed of Sound) / 2

At the same time:

- A **servo motor rotates** the sensor from 15° to 165°
- This creates a **scanning effect like radar**
- Data is sent to a computer and displayed using Processing software








Applications







This type of system is used in:

- 🚗 **Car Parking Sensors** – Detect nearby obstacles
- 🤖 **Robotics** – Obstacle avoidance robots
- 🏠 **Security Systems** – Motion/object detection
- 🏭 **Industrial Automation** – Distance measurement
- 🚁 **Drones & Automation** – Object sensing and navigation




Advantages

-  **Safe Technology** – Uses sound waves (no harmful radiation)
-  **Low Cost** – Cheap components like Arduino and HC-SR04
-  **Easy to Build** – Simple coding and wiring
-  **Real-time Detection** – Instant distance measurement
-  **Good Accuracy** for short distances

Uses (Purpose of Project)

-  **Educational Project** – Learning Arduino & sensors
-  **Object Detection System**
-  **Mini Radar Simulation**
-  **Base for Advanced Robotics Projects**

Limitations

-  **Limited range** (usually up to ~400 cm)
-  **Affected by soft surfaces** (absorbs sound)
-  **Not as powerful as real radar systems**

Short Summary

This project simulates a radar system using an ultrasonic sensor and a servo motor. The sensor detects objects by sending sound waves and measuring the echo time, while the servo provides angular scanning. The data is visualized on a computer using Processing software.

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