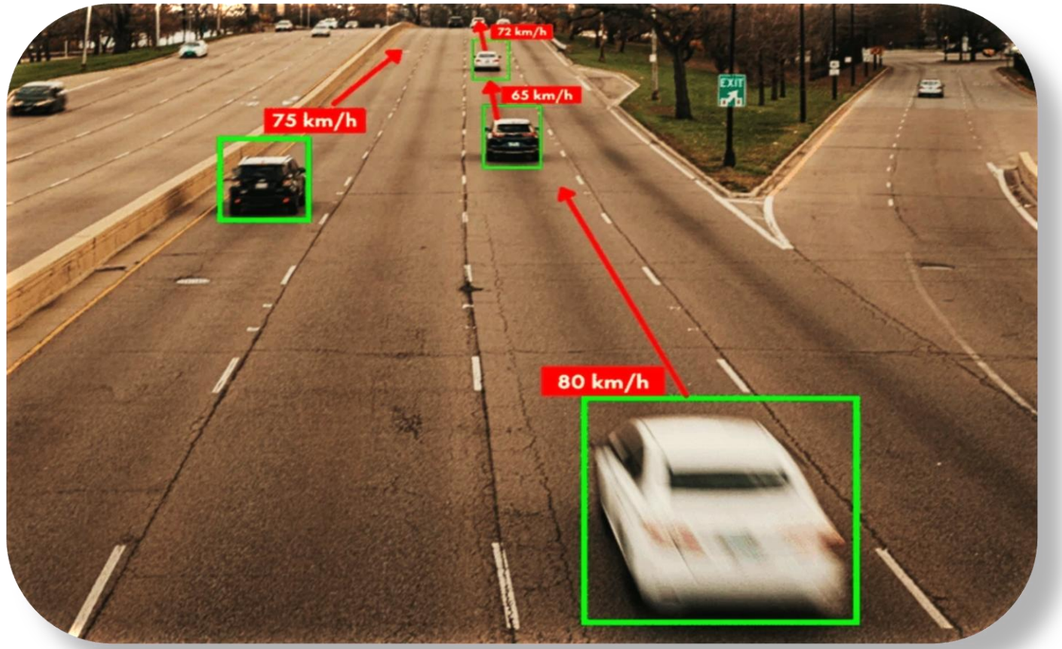

Distance Measurement & Object Detection

Exploring **ultrasonic sensor technology** with Raspberry Pi Pico for precise distance measurement and reliable object detection applications.

Done By

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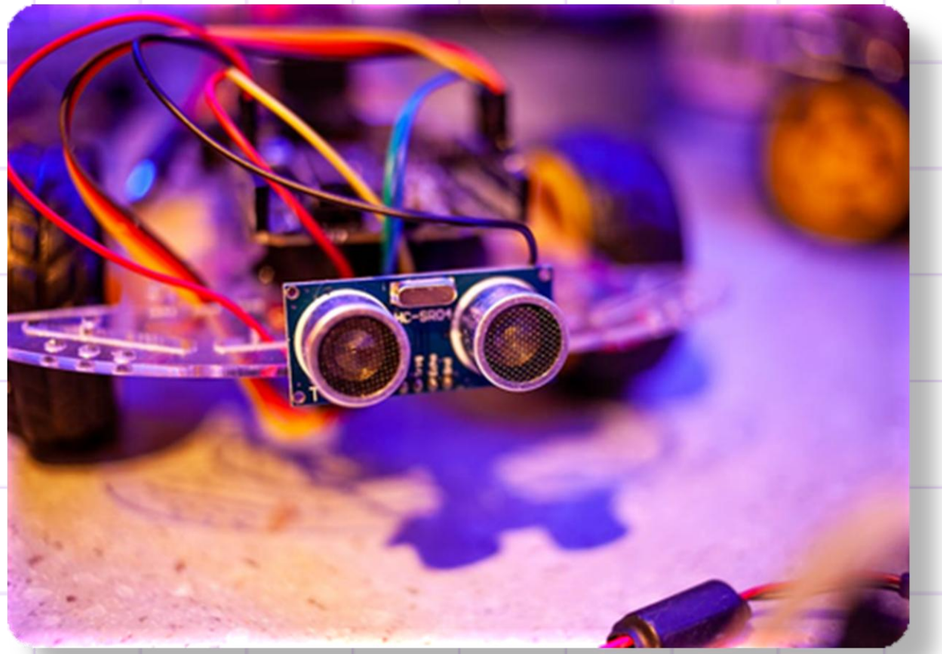
Ultrasonic Sensors with Raspberry Pi Pico

Explore the integration of ultrasonic sensors with Raspberry Pi Pico for accurate distance measurement and reliable object detection applications.



Wide Application Range

Ultrasonic sensors provide **accurate distance measurement** and **reliable object detection** across various projects.

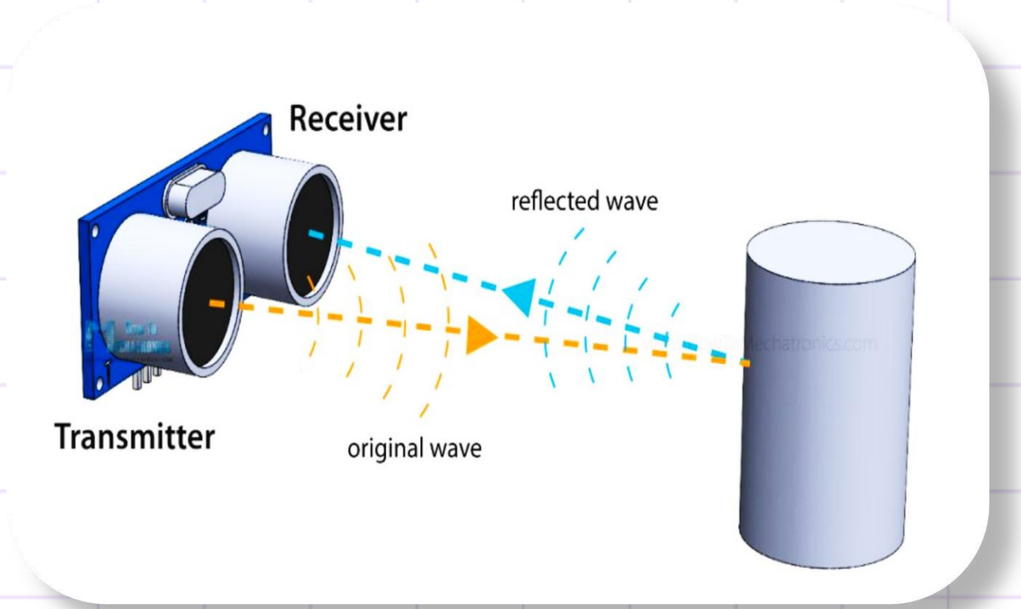
Cost-Effective Solution

Raspberry Pi Pico offers an **affordable microcontroller** platform perfectly suited for sensor interfacing.

Complete Integration Guide

Learn **working principles**, **setup procedures**, and **practical applications** for sensor integration.

Working Principle of Ultrasonic Sensors



Ultrasonic sensors emit **high-frequency sound waves** (typically 40 kHz) beyond human hearing range and measure distance by calculating the time between pulse transmission and echo reception.

Distance Calculation Formula

Distance = (Time × Speed of Sound) / 2 - measures time interval between pulse and echo

Measurement Range & Precision

Typically measures distances from **2 cm to 400 cm** with high accuracy and reliability

Key Advantages

Non-contact measurement capability combined with cost-effective and versatile design

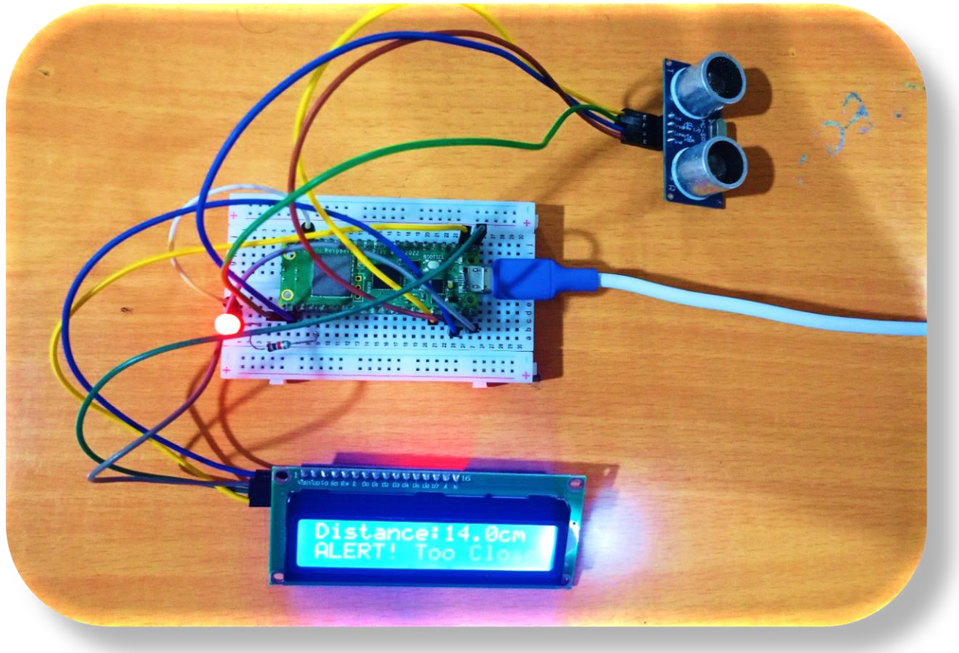
Interfacing Ultrasonic Sensors with Pico

01 Hardware Setup & Connection

Connect **VCC, TRIG, ECHO, and GND** pins of HC-SR04 sensor to Pico's GPIO pins using the dual-core ARM Cortex-M0+ processor capabilities.

02 Programming & Code Implementation

Write **MicroPython code** using **Thonny** to trigger the sensor and measure pulse duration for accurate distance calculations and measurements.



03 Real-time Data Processing

Calculate and display distance on output devices like **LCD, PC, or buzzer** with real-time acquisition using Pico's high processing speed.

Applications and Future Scope

Current Applications

Robotics obstacle avoidance
Smart parking systems
Industrial automation
Home security implementations

Future Development Scope

IoT integration for remote monitoring
ML-enhanced object recognition
Multi-sensor arrays for 3D mapping accuracy

THANK YOU