Project Title

Reverse Car Parking Assistance System (Embedded C)

Project Description

- A system that helps drivers while reversing by detecting obstacles using sensors, coded in **Embedded C**.
- It controls output devices like buzzers, LEDs, or displays based on sensor readings.

Example:

"This project implements a reverse car parking assistance system using Embedded C programming. It uses ultrasonic sensors to detect obstacles and provides real-time alerts via buzzer and LEDs."

Features

- Ultrasonic distance measurement.
- Multi-level warning based on distance (LEDs/Buzzer).
- Real-time distance calculation using sensor feedback.
- Highly optimized Embedded C code.
- (Optional) Displaying distance on an LCD.
- (Optional) Power-saving sleep modes for efficiency.

Tech Stack

- **Programming Language**: Embedded C
- **Hardware**:
  - Microcontroller (e.g., ATmega328, STM32, PIC)
  - Ultrasonic Sensor (HC-SR04)
  - Buzzer
  - LEDs / LCD Display
- **Tools**:
  - Microcontroller IDEs (like Atmel Studio, MPLAB X, STM32CubeIDE, etc.)
  - Programmer (USBasp, ST-Link, etc.)

How It Works

- The ultrasonic sensor sends out sound waves and receives the echo.
- Embedded C code calculates the distance based on time delay.
- Alerts (buzzer, LED) trigger based on how close an obstacle is.
- (Optional) Distance shown on an LCD display.

Future Improvements (optional section)

- Multiple sensors for side and rear obstacle detection.
- Wireless mobile app integration.
- Voice announcements.
- Integration with rear camera vision systems.

Project Overview

The **Reverse Car Parking Assistance System** is designed to help drivers safely reverse their vehicles by detecting obstacles behind them.
 Using an **ultrasonic sensor** and a **microcontroller programmed in Embedded C**, the system measures the distance between the car and nearby objects.
 When an object is detected within a set range, the system provides **audio (buzzer)** and/or **visual (LED)** alerts to the driver.
 This real-time feedback reduces the risk of collisions while parking and makes the process safer and easier.
 The system is **low-cost**, **efficient**, and can be easily installed in most vehicles.