

Project: Obstacle Detection using CH32V and Ultrasonic Sensor

Objective

Design a system that uses an ultrasonic sensor to detect obstacles and LED Illumination when object is detected.

Hardware Requirements

1. CH32V microcontroller
2. Ultrasonic sensor (HC-SR04)
3. LED : two pin
4. Breadboard and jumper wires
5. Power supply (e.g., USB cable)

Software Requirements

1. VS Code for software development
2. PlatformIO multi framework professional IDE
3. Cirkuit designer IDE for virtual simulation and circuit diagram

Project Overview

The project uses an ultrasonic sensor (HC-SR04) connected to a CH32V microcontroller to detect obstacles and illuminate an LED accordingly.

Working Principle

Step 1: Trigger Pulse Generation

1. The CH32V microcontroller sends a $10\mu\text{s}$ high pulse to the TRIG pin of the ultrasonic sensor.
2. This pulse triggers the ultrasonic sensor to emit high-frequency ultrasonic waves.

Step 2: Echo Pulse Detection

1. When the ultrasonic waves bounce back from an obstacle, they are detected by the ultrasonic sensor.
2. The sensor sends a high pulse to the ECHO pin, which is connected to the CH32V microcontroller.
3. The duration of this high pulse is proportional to the distance between the sensor and the obstacle.

Step 3: Distance Calculation

1. The CH32V micro controller measures the duration of the echo pulse.

2. Using the speed of sound (approximately $0.034 \text{ cm}/\mu\text{s}$), the micro controller calculates the distance between the sensor and the obstacle.

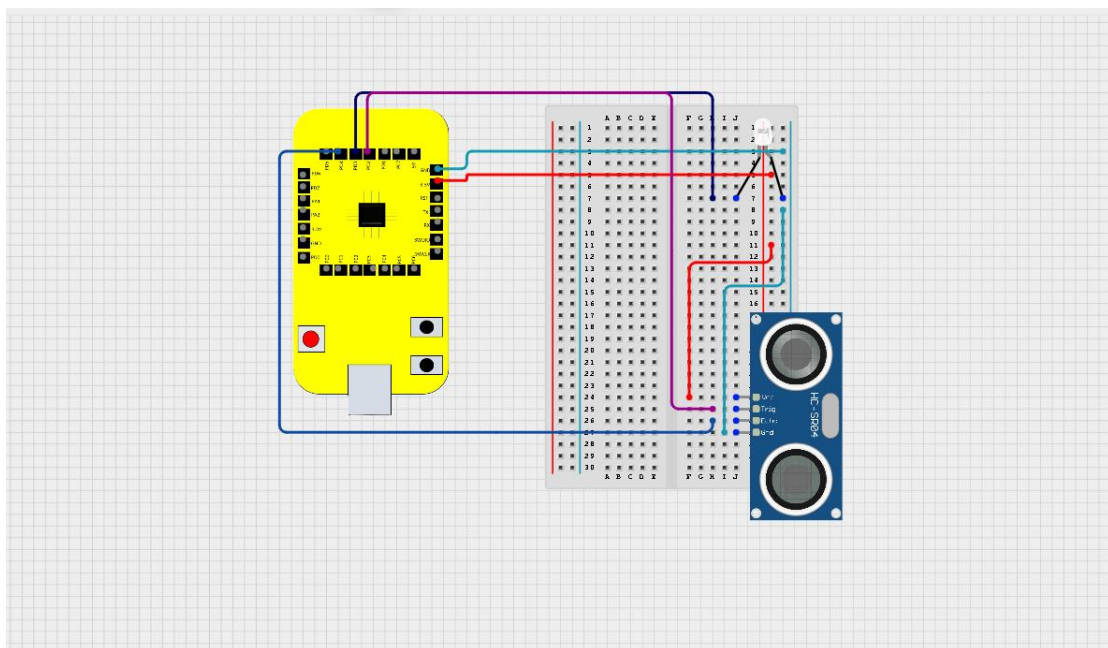
Step 4: LED Illumination

1. If the calculated distance is less than a predetermined threshold , the CH32V micro controller illuminates the LED.
2. Otherwise, the LED remains off.

Continuous Operation

The project continuously repeats the above steps, updating the LED state based on the presence or absence of obstacles within the detection range.

Circuit Diagram



Ultrasonic Sensor Connections:

1. VCC -> +5V
2. GND -> GND
3. TRIG -> PD2
4. ECHO -> PD0

LED Connections:

1. Anode -> PD3
2. Cathode -> GND