

Automotive Ultrasonic Sensor Target Simulator



Introduction and Functional Overview

The Ultrasonic Sensor Target Simulator (USTS) is a standalone testing system designed to simulate targets and evaluate the performance of parking assistance systems.

Applications

- Conduct validation tests for ultrasonic sensors effectively, particularly those integrated into ADAS/AD systems for parking assistance.
- Ensure reliable and consistent sensor and ADAS/AD functionality testing through scenario-based simulations using Direct Echoes, in full compliance with specifications and use cases.

Features

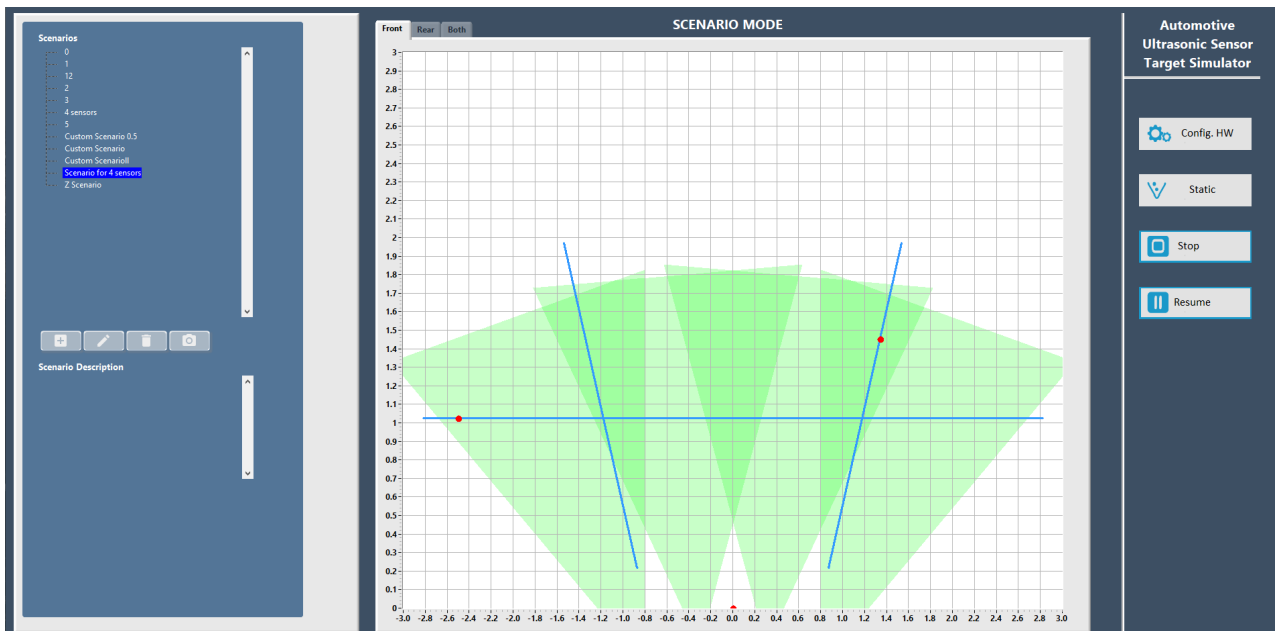


- Simulate Over the Air (OTA) ultrasonic targets
- Configurable for testing up to 16 ultrasonic sensors
- Supports ultrasonic sensors with frequencies up to 100kHz
- Equipped with a UDP interface for integration with ADAS Hardware-in-the-Loop (HIL) systems

Software

- The USTS software enables users to create, save, modify, and delete custom scenarios for static or dynamic targets on a 2D diagram. Scenarios can be previewed and simulated with adjustable parameters, including: Range (m),
- Velocity (km/h),
- Angle of Arrival (deg.)

Additionally, the software allows for the customization of static target distances, which can be adjusted during simulations.



- The system configuration allows users to define ultrasonic parameters and sensor positions on the vehicle. The configurable parameters include: Ultrasonic working max distance (m)
- Beam angle (°)
- Number of sensors,
- Vertical and horizontal positions (m)
- Positioning angle (°)

Ultrasonic Parameters

Distance (m)
2

Angle (o)
40

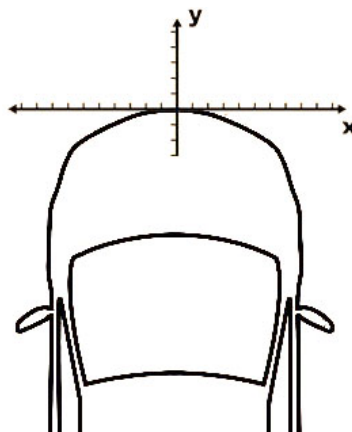
Number of sensors
4

Ultrasonic positions (m)

Front			Rear		
<input checked="" type="checkbox"/> X	Y	Angle	<input type="checkbox"/> X	Y	Angle
-0.8	-0.3	-20	0	0	0
-0.3	-0.2	-5	0	0	0
0.3	-0.2	5	0	0	0
0.8	-0.3	20	0	0	0

Open
Save
OK
Close

The zero coordinates for the front-view sensors are set at the center of the vehicle's front bumper, while the zero coordinates for the rear-view sensors are positioned at the center of the rear bumper.



UDP

The UDP protocol transmits data packets in string format. Each packet contains the following information: the first value is the ID, the second indicates the total number of packets, the third specifies the number of sensors, and the subsequent values represent the distance to the nearest target in meters as detected by each sensor. If the distance is 0, it indicates that the sensor does not detect any target.



	Example	Data Type	Units	Info
ID	1111	I32	–	The ID is the flag indicating the start of the packet
NoP	1 .. N	I32	–	Number of packet
NoS	4	I32	–	Number of sensors
DoO [1]	1.2	DBL	m	The distance of the target from the first sensor
DoO [2]	0.0			The distance of the target from the second sensor
DoO [3]	1.3			The distance of the target from the third sensor
...				
DoO [N]	0.6			The distance of the target from the N-th sensor

Specification

Parameter	
Frequency Range	1 to 100 kHz
Channels	Configurable (4, 8, 12, 16 sensor)
Sensors input	±10V, 1MS/s/ch, 16 bit simultaneous input
Sensor output	±10 V, 1 MS/s
Minimum Simulated Distance	10cm
Distance Resolution	1.5µs time delay, 0.025cm
Communication Protocols	UDP
Simulated target types	Static and Dynamic
Number of targets simulated per sensor	1