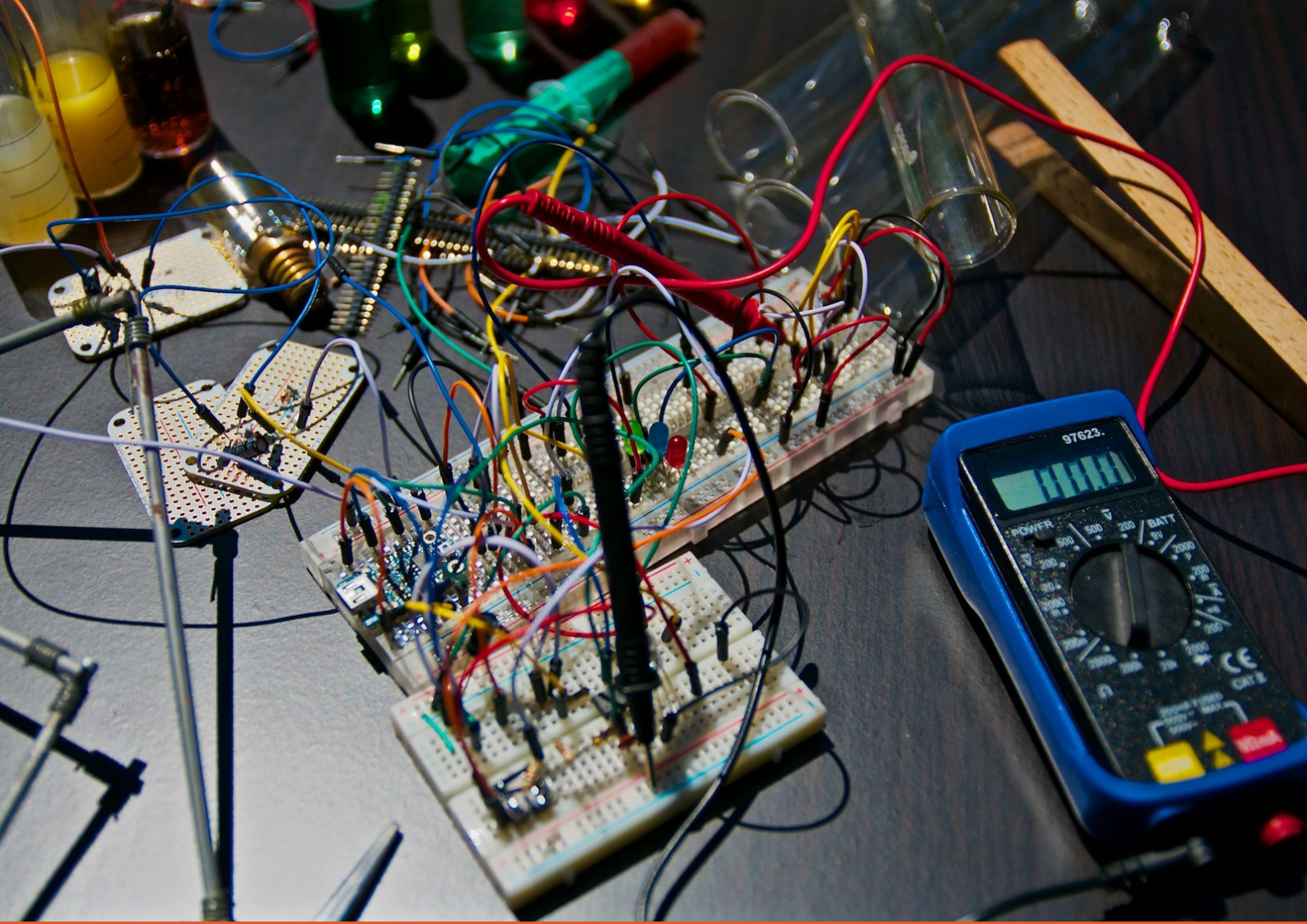




EduTrend Contents

EDUTECH · ROBOTICS RESOURCES FOR STUDENTS · HIGH SCHOOL

Virtual Parking Sensor

Build an Arduino ultrasonic parking assistant in a free simulator

Ages 15–18

Level: Advanced

75 minutes

Individual or pairs

Activity 05

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 05 · AT A GLANCE

Virtual Parking Sensor

Using a free browser simulator such as Tinkercad Circuits, students wire a virtual Arduino with an ultrasonic distance sensor, a buzzer and LEDs. They write code to measure distance, then make the beeps faster and the LEDs change as an object gets closer. They test with the simulator's distance control and document the design.

Learning outcomes

By the end of the session students can:

- wire a sensor and outputs virtually;
- calculate distance from echo time;
- map distance to feedback;
- document a design.

KEY WORDS

ultrasonic · echo · distance · map ·
buzzer · feedback

CURRICULUM LINKS

Physics: speed of sound. Maths:
linear mapping. D&T: vehicle safety
systems.

1**SENSE**

What can it detect?

2**THINK**

What should it
decide?

3**ACT**

What should it do?

4**TEST**

Run it

5**DEBUG**

Find and fix

6**IMPROVE**

Make it better

Materials (per student)

- Device with a browser
- Free simulator account
- Wiring guide
- Worksheets 1, 2 and 3

Before the session

- Set up accounts.
- Prepare a wiring guide.
- Test the starter circuit.
- Print worksheets.

SAFETY

Simulation only. If built on real hardware, check wiring before powering and keep volume low.

ACTIVITY 05 · SESSION PLAN

Step by step

The simulator lets students test sensor code with a slider before owning hardware.

Time	What happens	Say or ask
0–10 min Hook	How do parking sensors work?	<i>"What do they measure?"</i>
10–25 min Wire	Sensor, buzzer and LEDs.	<i>"Where does each pin go?"</i>
25–45 min Measure	Code distance from echo time.	<i>"Why divide by two?"</i>
45–65 min Feedback	Map distance to beeps and LEDs.	<i>"Does it feel intuitive?"</i>
65–75 min Document	Record design and tests.	<i>"What would real hardware add?"</i>

CHALLENGE CARD (print or copy onto the board)

Build a simulated parking assistant that measures distance with an ultrasonic sensor and gives faster beeps and changing LEDs as objects get closer.

ACTIVITY 05 · FACILITATOR NOTES

The learning know-how in brief

An ultrasonic sensor sends a pulse of sound and times the echo. Distance equals speed of sound multiplied by time, divided by two because the sound travels there and back. Sound travels about 343 m/s in air at 20 °C.

Mapping converts one range, such as distance, into another, such as the gap between beeps. Clear, intuitive feedback is part of good design.

Common ideas to listen for

- “The sensor measures distance directly.” It measures time.
- “No need to halve the time.” Sound goes there and back.
- “Simulation is the same as reality.” Real sensors are noisier.

Adapting the activity

Support

Provide the distance calculation code.

Stretch

Add a display showing the distance in centimetres.

WORKSHEET 1

Wiring

Name: _____

Class: _____ Date: _____

List connections.

Wiring

Component	Pin
Sensor trigger	
Sensor echo	
Buzzer	
LED 1	
LED 2	

WORKSHEET 2

Tests

Distance and feedback.

Tests

Distance (cm)	Beep gap	LEDs
100		
50		
25		
10		

WORKSHEET 3

Design record

Document your design.

How it works and what real hardware would add

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Wires correctly	Calculates distance	Designs feedback

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Virtual Parking Sensor is a sample activity from the EduTrend Contents Edutech Robotics Resources for Students programme (high school, level: advanced). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

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