LESSON 42

Autonomous Car

60 minutes | Designing and Building for the Future

WHAT THIS LESSON DOES

Discover the world of ultrasonic sensors with your Move Motor car. Learn how these sensors measure distance, and apply this knowledge to create a project that enables your car to follow an object, reverse, and roam freely while avoiding obstacles. Enhance your car's capabilities by adding lights and improving its sensor range.

WHAT STUDENTS SHOULD BE ABLE TO DO

- Understand the function and operation of ultrasonic sensors.
- Develop skills in creating a new project using the kitronik-move-motor extension.
- Acquire the ability to program a sensor to measure distance.
- Learn to code a car to maintain a specific distance from an object.
- Enhance problem-solving skills by programming the car to reverse and maintain distance.

BEFORE THE LESSON

- Confirm pupils can reach https://makecode.microbit.org and add the kitronik-move-motor extension.
- Charge Move Motor cars and micro:bits, with a way to download and transfer code.
- Set out objects at varied distances and a clear floor area with obstacles for free-roam testing.

Autonomous Car

HOW THE LESSON RUNS

Introduction
Create a new project
Measure distance
Follow an object
Reverse
Free roaming
Improve and add lights

TEACHING MOVES

- 1. Introduction. Show the sensor on the front of the car. Read the sound-wave explanation together and ask how an echo could tell the car how far something is.
- 2. Create a new project. Guide everyone to a new MakeCode project and the kitronik-move-motor extension before any sensor blocks are added.
- 3. Measure distance. Help pupils create the distance variable, show the reading on the micro:bit, then test with objects at different distances in centimetres.
- 4. Follow an object. Have them change the code so the car moves to stay 10 cm away, then test by moving the object and watching the car stop at that gap.
- 5. Reverse. Prompt them to add reverse so the car backs up until it is exactly 10 cm away, then move the object back and forth to check.
- 6. Free roaming. Talk through stop, pause, reverse, turn right, then drive on. Download, set obstacles, and watch whether the car navigates the space.
- 7. Improve and add lights. Note front-only sensing and reverse crashes. Challenge pairs to try random left or right turns and lights, then retest the course.

WHAT TO WATCH FOR

- Pupils think the sensor ‘sees’ all around the car, not mainly what is straight ahead. Hold an object to the side and behind while they watch the distance reading, then link that to reverse crashes.
- Pupils expect the car to hold exactly 10 cm without a reverse branch when the object is too close. Replay the under-10 cm case and show why reverse until 10 cm is needed, not only drive-or-stop.
- Pupils always turn the same way and the car loops the same path in the obstacle area. Remind them the lesson asks for a random left or right choice after reverse so paths vary.

DIFFERENTIATION

- Emerging: Pair them with a partner for downloads and first distance tests while they watch the micro:bit reading. Stay with the measure-distance stage until the variable and on-screen number are reliable.
- Developing: Have them explain their 10 cm follow-and-reverse sequence aloud before free roam. Give extra time on one obstacle layout before changing the code again.
- Proficient: Challenge them to improve free roam with random turns and lights and retest the course. Ask them to note which changes reduce crashes and explain why.