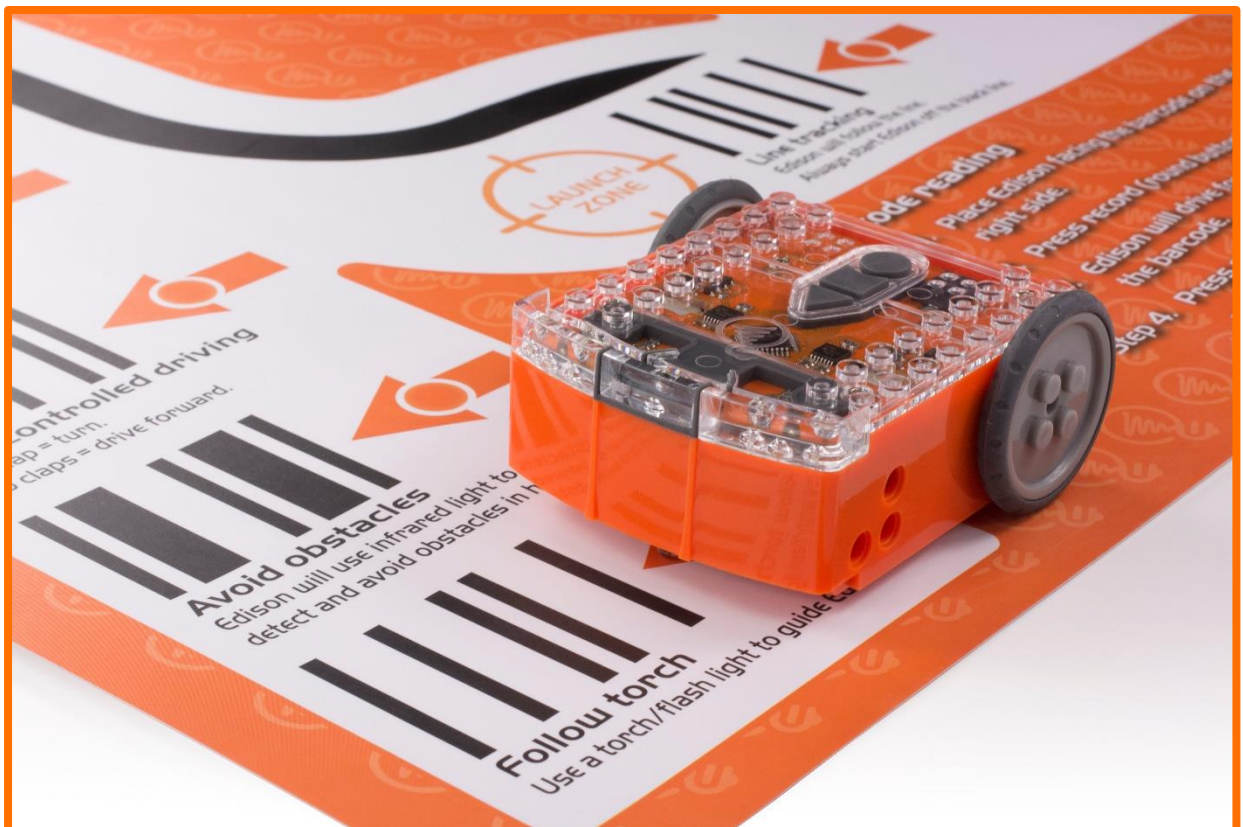




Your EdVenture into robotics

Barcodes and Edison



www.meetedison.com



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Introduction

Edison is your new robot buddy who will teach you about electronics, programming and robotics in a fun, hands-on way.

Edison is equipped with all the sensors, outputs and motors needed to introduce you to the amazing world of robotics.

That's great, but what is robotics? Well, that's not an easy question to answer. Edison's creator, Brenton O'Brien says that *"a robot is a machine that can behave autonomously."* This means that a robot can 'think' in a way. A robot can make decisions on its own and act on those decisions. Many other people have different definitions, but we like this one as it's nice, simple and applies to what you're about to learn.



This is the Edison robot

Robotics wouldn't be possible without electronics. Your Edison robot has its own electronics which you can see through the transparent top. There are resistors, capacitors, transistors, motors and more. The most important electronic part is Edison's microcontroller.



Edison's microcontroller

The microcontroller is like Edison's brain. It's where all the robot's 'thinking' happens. Edison's microcontroller is very similar to the processor chip inside a computer, only much smaller. Just like a processor chip in a computer, Edison's microcontroller contains programs. These programs are what allow Edison to 'think' and make decisions.

Edison comes with pre-loaded programs that are activated by driving the robot over special barcodes. Here is a sample barcode that activates Edison's line tracking program.



A barcode that activates Edison's line tracking program

Getting started

Let's get Edison ready to go!



Ensure the batteries are in the right way

First, open the battery compartment and remove the EdComm programming cable. Next, insert 4 'AAA' batteries. Refer to the image and be sure that the batteries are in the correct way. Clip the battery cover back on.

Turn Edison on by sliding the power switch to the 'on' position. Edison will make a chirping beep, and the robot's red LED lights will start flashing when the robot is powered on.



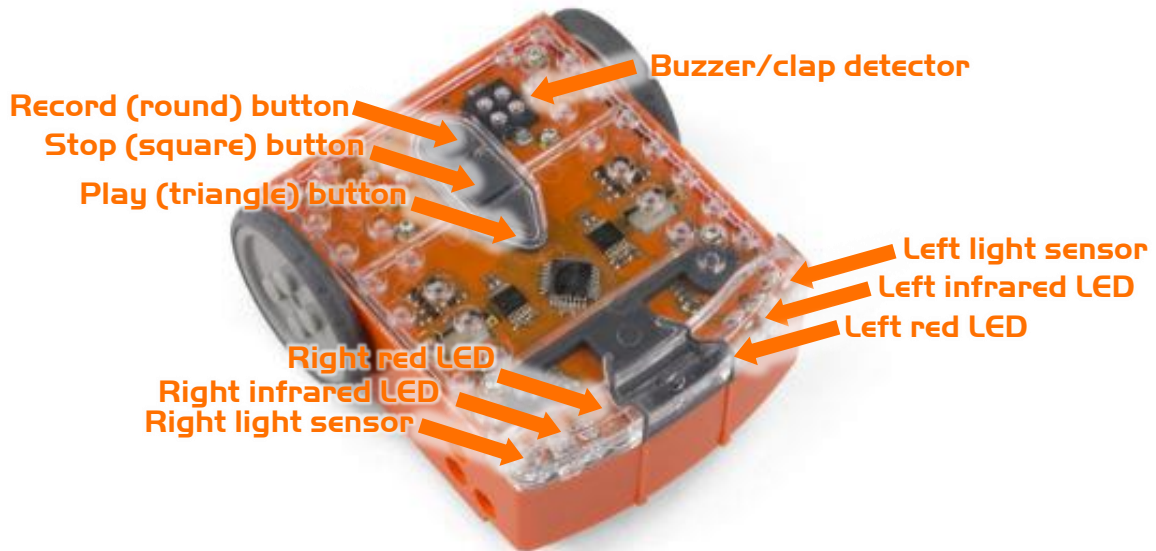
Push the switch towards the 'on' symbol

Edison is ready to go!

Get to know Edison

To use your Edison, you're going to need to know where all of the robot's sensors are and what the three buttons do. Have a look at the images below. You may need to come back and have another look as you go through the EdVentures in this book.

This is the top of the Edison robot



Play (triangle) button – Press to start a program
 Stop (square) button – Press to stop a program
 Record (round) button – 1 press = download a program from a programming app
 3 presses = read a barcode

Flip Edison over and look at the bottom of the robot. This is where Edison's power switch and line tracking sensor are located.

There is one more part that came with Edison: the EdComm cable. The EdComm cable is used to download programs to Edison. It connects into the headphone socket on your computer or tablet.



This is the bottom of the Edison robot



EdComm programming cable

You won't need the EdComm cable to use the barcodes, but keep in some place safe! You will need this programming cable when you use Edison with the programming apps.

EdVenture 1 – Clap controlled driving

Edison is equipped with a sound sensor and can detect loud sounds, like clapping.

This barcode activates Edison's '*Clap controlled driving*' program. The program 'listens' for a loud sound, like a clap. When Edison detects a loud sound, the robot responds by turning to the right. If the robot detects two claps, it will drive forward, then stop.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode



Barcode - Clap controlled driving

What to do

To run the program, place Edison down on a flat surface and press the play (triangle) button.

Now, with your hands close to Edison, clap your hands one time. The robot will turn right. Now clap your hands twice. Edison will drive forward about 30cm.

Next, try tapping Edison with your finger, first one time, then two times.



EdFact

Sound sensors just like the one in your Edison are used in modern cars to detect when the engine fires each cylinder. This information is fed to the car's computer to ensure that the firing is occurring at just the right time. If the engine is firing too late, it can cause damage to the engine. Ensuring that the firing is happening at just the right time also ensures the most economical fuel consumption.

EdVenture 2 – Avoid obstacles

Edison can ‘see’ invisible light, called infrared light, and use it to detect obstacles.

This barcode activates Edison’s ‘Avoid obstacles’ program. This program drives Edison forward. Then, when an obstacle is detected, the robot reverses and then turns on the spot away from the obstacle. Then Edison will continue to drive forward.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode

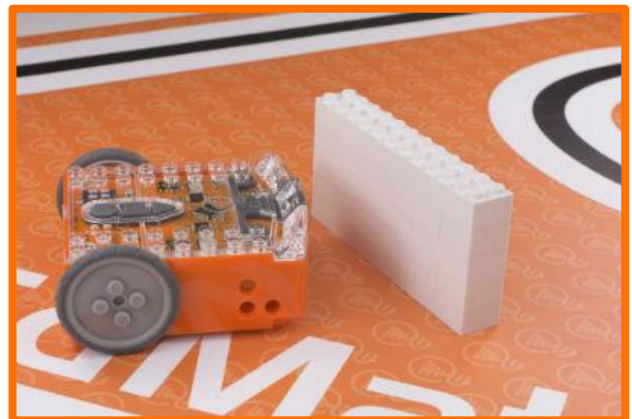


Barcode – Avoid obstacles

What to do

Assemble some objects to be obstacles for Edison to avoid. The obstacles need to be at least the same height as Edison (3.5cm/1.5in) and opaque (not see-through) but not too dark (not black).

To run the program, press the play (triangle) button. Watch Edison approach an obstacle, then turn away to avoid colliding with it.



Next, why not build a maze and see if Edison can escape from it?

EdFact

Edison’s obstacle detection system uses infrared (or ‘IR’) light, which is invisible to us because it has a longer wavelength than the human eye can see. Your remote control uses this same IR light to tell the TV to change the channel!

Edison emits IR from two light emitting diodes (LEDs), one on the left and one on the right. In between the two LEDs is an IR sensor. The sensor detects when IR is reflected from an obstacle. If the IR is reflected from the left LED, then the obstacle is on the left. If the IR is reflected from the right LED, then the obstacle is on the right.

Is Edison not behaving? Does the robot bump into obstacles or turn when the object is still really far away? Go to page 15 to see how to calibrate the obstacle detection system.

EdVenture 3 – Follow a torch

Edison loves light! When you run this program, the robot will drive towards the brightest light source ... even if that means falling off the table. *Look out, Edison!*

This barcode activates Edison's 'Follow a torch' program. (In American English, a torch is known as a flashlight.) The program uses Edison's light sensors and motors to make the robot follow the brightest source of light it can detect.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode



Barcode – Follow a torch

What to do

You will need a torch/flashlight and a flat surface away from any other really bright sources of light, such as sunlight.

To run the program, press the play (triangle) button and aim your torch at Edison. Once the robot 'sees' the bright source of light, it will drive towards it.

You can control how Edison drives by moving the torch. *Does this behaviour remind you of anything?*



EdFact

This is one of Edison's most interesting programs because it mimics the behaviour we see in some flying insect. Have you ever seen moths on a hot summer night swarming around a bright light? This type of behaviour is called 'phototropism' and is also found in plants that grow towards the sun.

This program is also very interesting because Edison is behaving autonomously. This means that Edison is 'thinking' and responding to changes in the environment without any help. *Does Edison's ability to behave autonomously mean that Edison is alive?*

EdVenture 4 – Line tracking

Line tracking is a very popular robotics activity because it's fun to watch the robot go around and around a track. How does it work? Is it magic? Is it magnetic?

This barcode activates Edison's '*Line tracking*' program. The program uses Edison's line tracking sensor and motors to follow the edge of a black line.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode



Barcode – Line tracking

What to do

The first thing you need is a line. You can print the small track on the next page, print the large A1 (84cm x 59cm) EdMat from meetiedison.com/edmat/ or make your own line using black electrical tape on a white table (the line must be 1.5cm/0.6in thick).

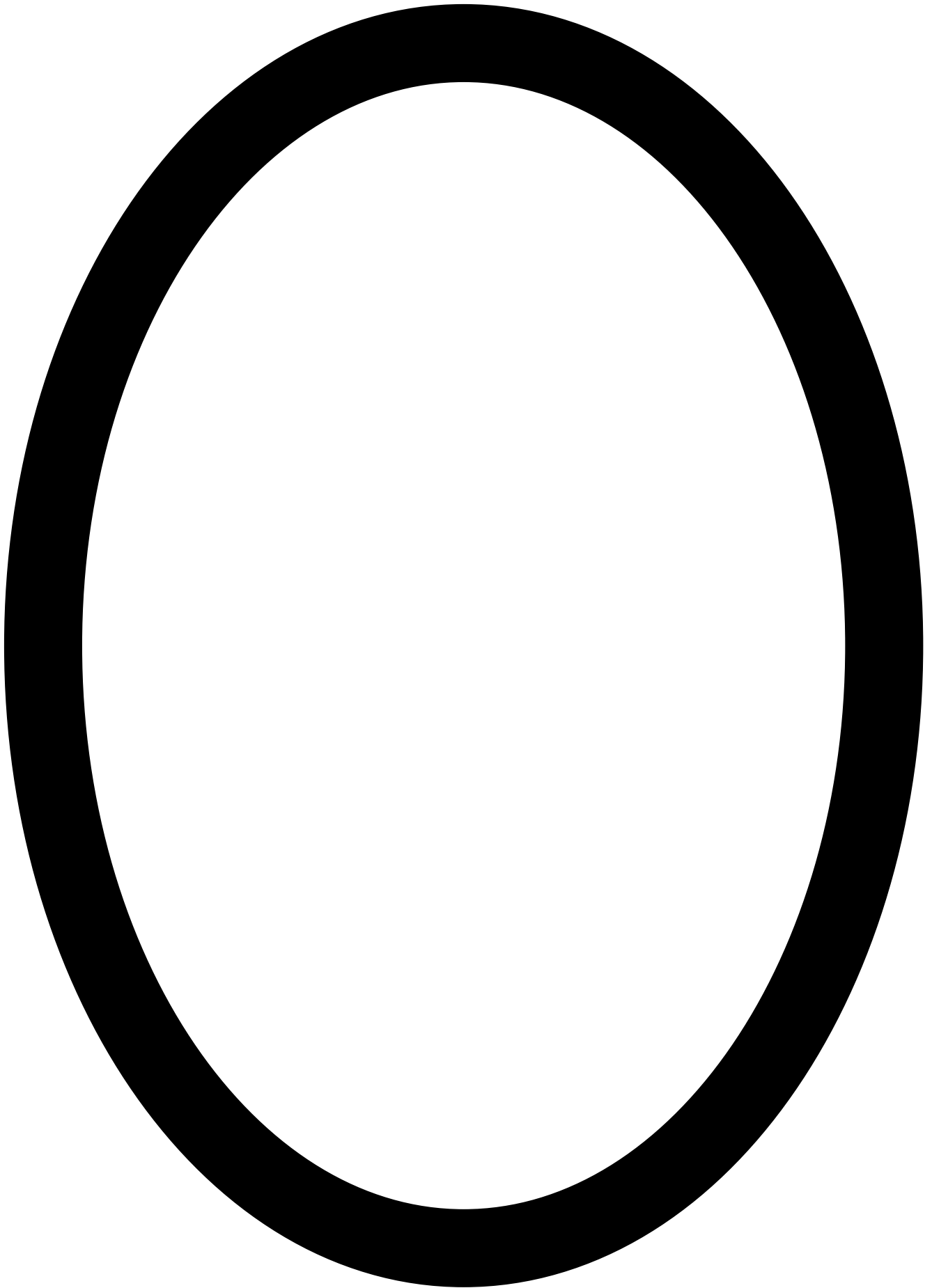
To run the program, place Edison to one side of your line. Make sure that the line tracking sensor is on **white**. Don't place the sensor directly on the line. Then, press the play (triangle) button and watch Edison find and follow the line.



EdFact

Edison's line tracking sensor is made up of two parts: a red LED light and a light sensor. The red LED shines light beneath the robot. The light sensor then measures the amount of light that is reflected back. If the surface is white, it reflects lots of light, and the light sensor gets a high light reading. If the surface is black, it does not reflect much light, and the light sensor gets a low light reading.

When Edison runs the '*Line tracking*' program, the robot is in a constant state of dissatisfaction. When Edison is off the line, it turns right to get on the line. But when Edison is on the line, it turns left to get off the line. This results in Edison 'waddling' on the edge of the line.



EdVenture 5 – Bounce in borders

Ever heard of Dromophobia? Well, it's a fear of crossing the street, and we're going to give a version of it to Edison! Cue evil laugh...*Muwahaha!!!*

This barcode activates Edison's '*Bounce in borders*' program. The program uses Edison's line tracking sensor and motors to stop the robot from crossing a black line.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode

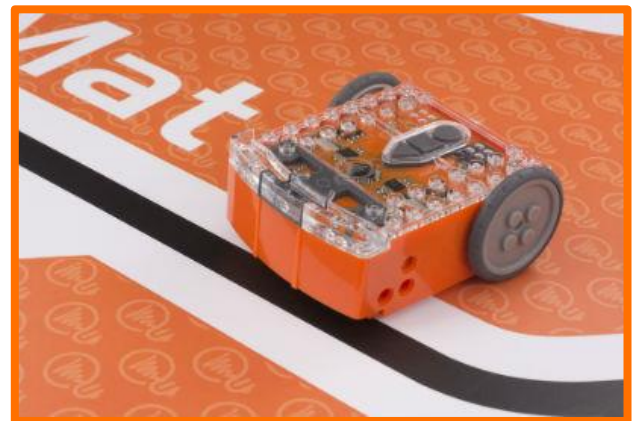


Barcode – Bounce in borders

What to do

The first thing you need is a shape with a dark border. You can print the small track on the last page, print the large A1 (84cm x 59cm) EdMat from meetedison.com/edmat/ or make your own shape using black electrical tape on a white table (the line must be 1.5cm/0.6in thick).

To run the program, place Edison inside the borders. Make sure that the line tracking sensor is on **white**. Don't place the sensor directly on the line. Then, press the play (triangle) button. Edison will drive forward until the line tracking sensor detects the line, then reverse back, turn, and continue driving.



EdFact

The '*Line tracking*' and '*Bounce in borders*' programs are fun, but there's a serious use for them too. Warehouses that use robots to move items around use lines or markers on the ground to guide the robots to their destination. These robots in Amazon's warehouse are using barcode markings on the floor to navigate.

EdVenture 6 – Sumo wrestle

Bring on the robot wars!

This barcode activates Edison's 'Sumo wrestle' program. The program brings together the 'Bounce in borders' program to keep the robot in the ring plus a version of obstacle detection to locate and attack the opponent.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode



Barcode – Sumo wrestle

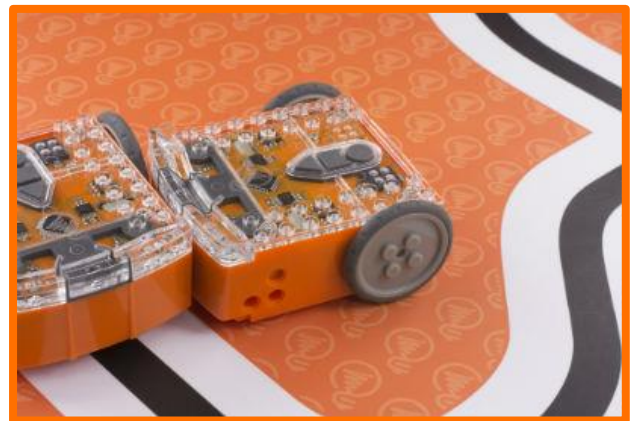
What to do

Print the large A1 (84cm x 59cm) EdMat from meetiedison.com/edmat/ or create your own sumo wrestle ring using black electrical tape on a white surface. The ring should be at least 40cm (16in) in diameter.

Place at least two Edison robots inside the ring and press play on both at the same time.

Each Edison will slowly drive forward, staying inside the ring and 'looking' for the opponent. If a robot detects an opponent, that Edison will charge forward at full speed until it detects the edge of the ring. The robot then reverses back victorious and continues to look for another opponent.

Battles don't always go to plan, however. There are so many variables, such as the angle of the opponent, the proximity of the edge of the ring and just plain bad luck! *Keep up the good fight, Edison!*



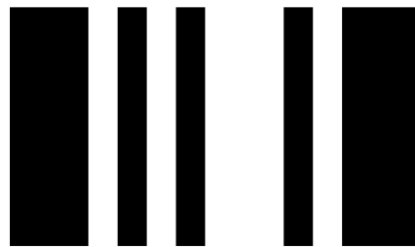
EdVenture 7 – Remote control driving

So you really want to control your Edison!?! Here's your chance to control Edison like a remote control car. And you can do it with your TV remote control!

These barcodes allow Edison to learn commands from your TV or DVD remote control.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode
4. Press a button on your TV/DVD remote that you want to match to that barcode's action



Barcode – IR learn drive forward



Barcode – IR learn drive backward



Barcode – IR learn spin right

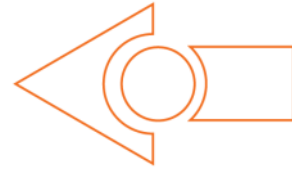


Barcode – IR learn spin left

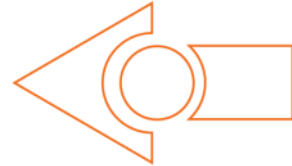




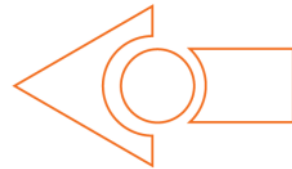
Barcode – IR learn turn right



Barcode – IR learn turn left



Barcode – IR learn play beep



Barcode – IR learn play tune



What to do

Teach Edison each barcode one by one. Use buttons on your remote control that align with the action Edison will perform. For example, use an 'up' arrow (like 'volume up') for 'drive forward'. You can make changes whenever you want by rescanning the barcode and pairing a different button, so play around with which buttons suit you the best.

Now *go driving!*

Edison is compatible with around 75% of TV and DVD remote controls. If one of your remotes doesn't happen to work, try another one. If none of your remotes work, then you can purchase an inexpensive 'universal remote' and set it to be a Sony DVD remote control, which works well with Edison.



Calibrate obstacle detection

You can regulate the sensitivity of Edison's obstacle detection system. By making the obstacle detection system more sensitive, Edison can detect obstacles further away. By making the system less sensitive, Edison will only detect very close obstacles. Follow the instructions on this sheet to adjust your Edison's obstacle detection system.

Read the barcode

1. Place Edison above the arrow on the right side, facing the barcode
2. Press the record (round) button 3 times
3. Wait while Edison drives forward and scans the barcode



Barcode – Calibrate obstacle detection

Set maximum sensitivity

After scanning the barcode, set Edison down on a table or desk and remove any obstacles in front of Edison. Then press the play (triangle) button. Edison is now in calibration mode.

The left sensitivity is calibrated first.

1. Repeatedly press the play (triangle) button, which increases sensitivity, until the red LED on the left is flickering.
2. Repeatedly press the record (round) button, which decreases the sensitivity, until the LED completely stops flickering.
3. Press the stop (square) button to switch over to calibrate the right side.
4. Repeatedly press the play (triangle) button until the right red LED is flickering.
5. Repeatedly press the record (round) button until the LED completely stops flickering.
6. Press the stop button to complete the calibration.

Custom sensitivity

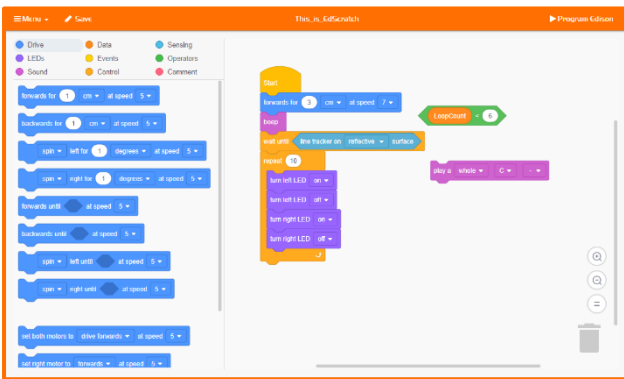
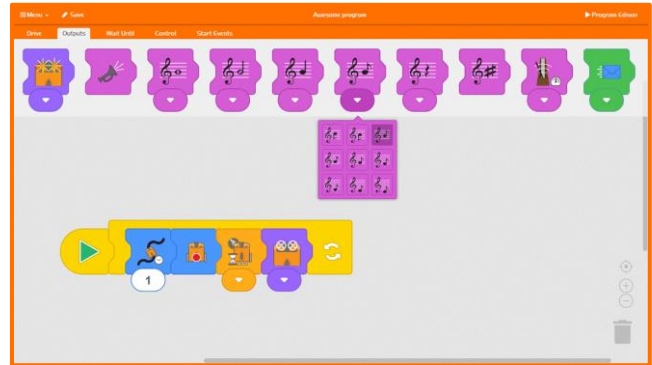
It is possible to set the distance that obstacles are detected. To do this, scan the 'calibrate obstacle detection' barcode, place an obstacle in front of Edison at the distance you want Edison to detect obstacles, press the play button and then repeat steps 1 through 6 to set the sensitivity.

What's next?

Now that you've learned all about Edison's abilities, sensors and controls, you are ready to move on to programming! Go to www.meetedison.com to see the different coding languages you can use with your Edison robot.

EdBlocks

EdBlocks is a drag-and-drop, fully graphical horizontal programming language for the Edison robot. EdBlocks is a perfect introduction to programming and a fun way to start your coding journey.

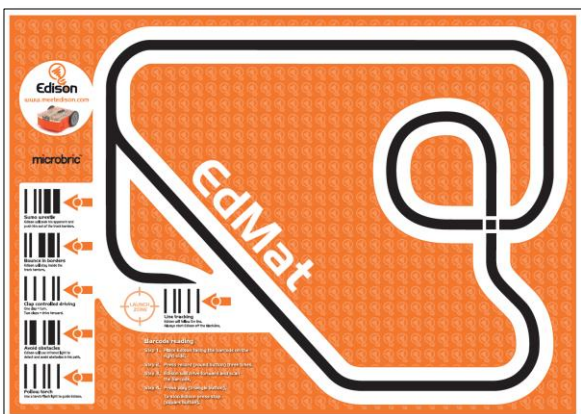
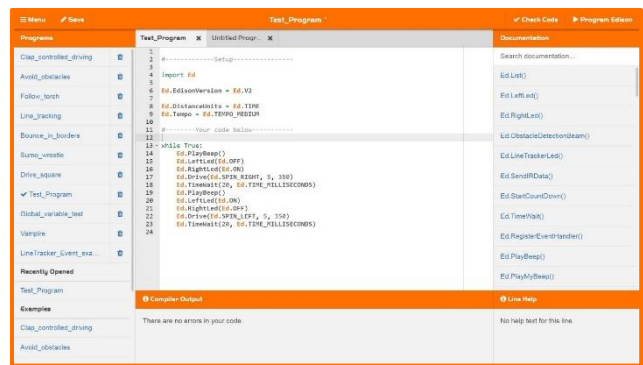


EdScratch

EdScratch is a vertical block-based programming language for the Edison robot based on Scratch. EdScratch combines the ease of drag-and-drop programming with powerful functionality and flexibility.

EdPy

EdPy is a python-like text-based programming language for the Edison robot. EdPy lets you unlock even more of Edison's abilities while learning text-based programming.



Don't forget! You can also download the free EdMat activity mat in colour or black and white. The EdMat is A1 size (59cm x 84cm) and can be printed at your local print shop for a small fee. Download from: meetedison.com/edmat/