

Configuring a Sensor

(tell your NXT what is plugged into it, and where)

Suppose we have an NXT with a light sensor connected on port 3. How do we tell Enchanting this?

1. Click on the "Sensing" palette.

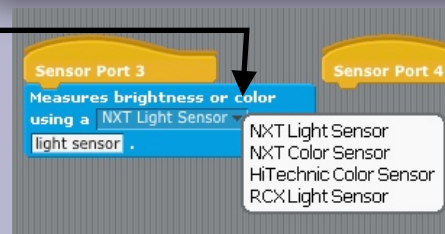
2. Click on the "Configure Sensors" button. A dialog comes up.

3. Find the light sensor configuration block on the left-hand side of the dialog. Drag it to "Sensor Port 3" and drop it there.

4. Choose what sort of light sensor you have.



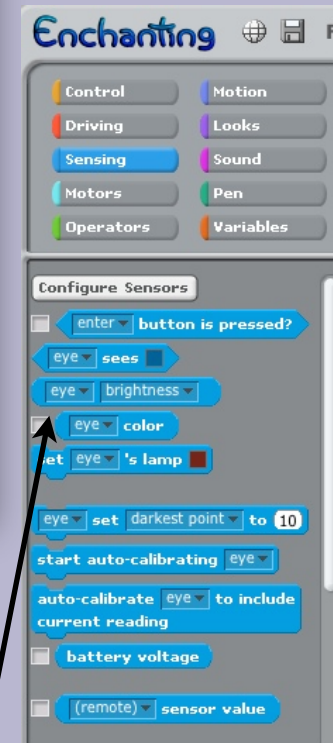
6. Press "OK".



5. Optionally, give it a descriptive name.

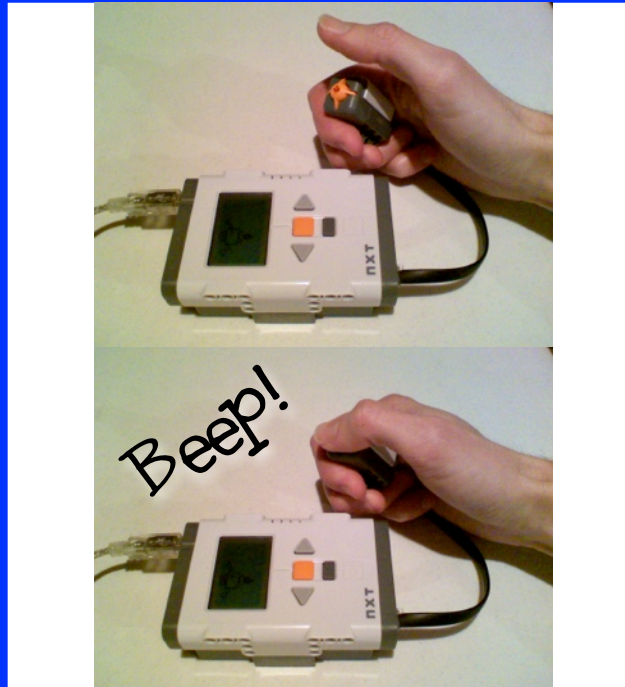


7. You now have new blocks to use!



Morse Key

Press a button to make a sound.



YOU NEED

An NXT with a touch sensor connected to port 1.

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Morse Key

Select the **Sensing** palette, and click on the **Configure Sensors** button [it is above all the light blue blocks].

Configure a touch sensor, like this: →

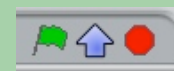
Sensor Port 1
Measures physical contact using a Touch Sensor named morse key


Make sure that your touch sensor is on port 1 on the actual robot.

↑
Name it.

GET READY

TRY THIS CODE



Click the  and wait for the program to run on the robot. Press and release the touch sensor. What happens?

DO IT!

What would happen if you changed the note or the duration?

GO FARTHER

Where could you use **pick random 50 to 90** or **set instrument to 2**?

Range Finder

See how far away something is.



YOU NEED

An NXT with an ultrasonic sensor connected to port 4.

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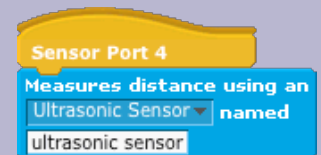
Range Finder

GET READY

From the **Sensing** palette, choose the **Configure Sensors** button.

Configure a ultrasonic sensor.


Make sure the port you configure it for matches the port the real ultrasonic sensor is plugged into!



TRY THIS CODE



DO IT!

Click the  and wait for the program to run.

Point the ultrasonic sensor at different objects.
What do you see on the screen?

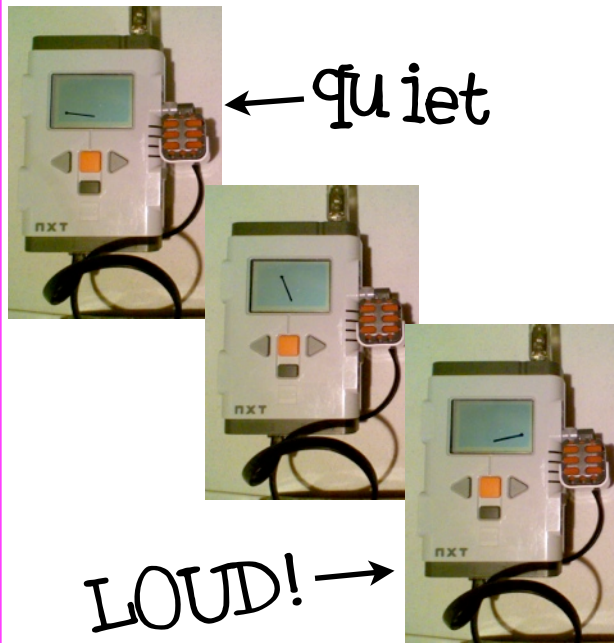


GO FARTHER

What are the largest and smallest values you see?
Are there any gaps where you get no numbers?

Sound Meter

Create a sound-level meter.



YOU NEED

An NXT with a sound sensor*
connected to port 2.

* Not included in all NXT sets.

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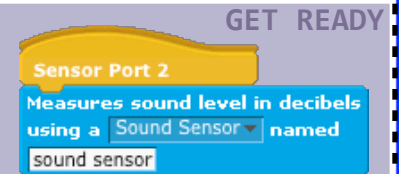
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Sound Meter

From the **Sensing** palette, choose the **Configure Sensors** button.

Configure a sound sensor.



Paint a new costume for the sprite -- make it a dot!

TRY THIS CODE



Click the and wait for the program to run.

DO IT!

Whisper, talk, sing, shout, or blow on the sound sensor.

Draw a gauge on the background.

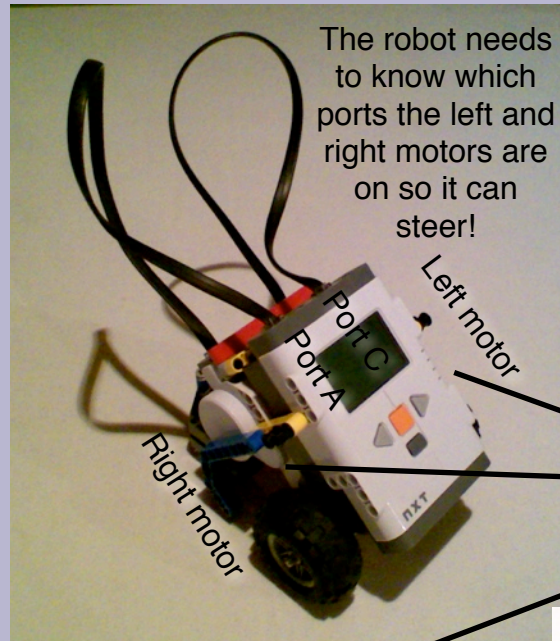
GO FARTHER

Adjust how far the meter moves back and forth.

Differential Drive

(lets your two-wheel robot drive around)

From the **Driving** palette, choose the **Configure Drive Type** button. Configure a differential drive.



The robot needs to know which ports the left and right motors are on so it can steer!

If your robot has two wheels, it is using a differential drive!

The first number embossed on a LEGO tire is the tire's diameter in millimeters. This tire is 56 mm across.

Drive Type

Differential drive

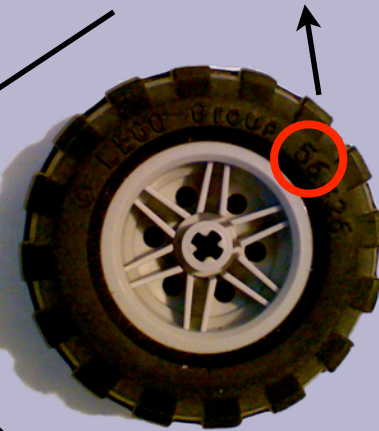
wheel diameter: 56 mm

track width: 9.4 cm

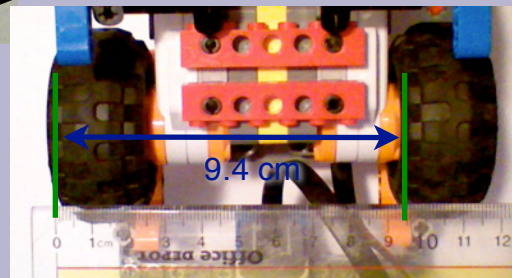
left motor: Port C

right motor: Port A

motors drive in reverse



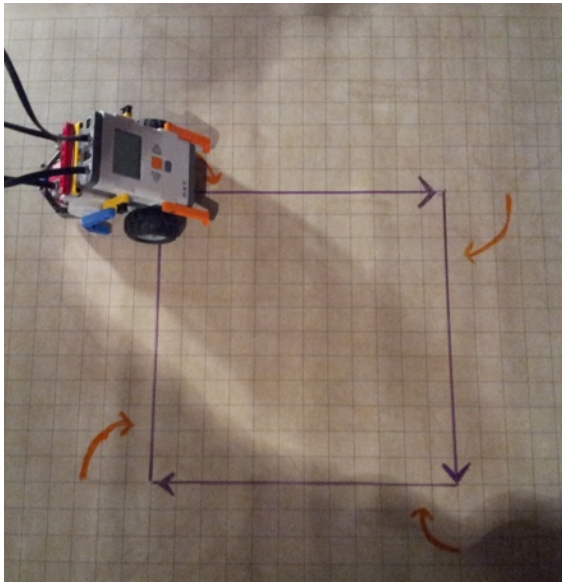
If you tell the robot to drive forwards and it goes backwards, swap the direction that you've configured the motors to drive in the drive type.



The track width is how far apart the wheels are. Measure from a place on the left wheel to that same place on the right wheel. Here, measuring from the left-most point of the left wheel to the left-most point of the right wheel, the track width is about 9.4 cm.

Square Dance

Drive in a square.



YOU NEED
An NXT with two driving wheels.

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Square Dance


GET READY

From the **Driving** palette, choose the **Configure Drive Type** button. Configure a differential drive, using the instructions on Card #4. Measure numbers to match your robot.

TRY THIS CODE



DO IT!

Click the  and wait for the program to run. Unplug the USB cable and place the robot where you want it to start. Press the orange “enter” button on the NXT.



Does the robot “dance” in a square? (Is it configured properly?) Note that you’ll never get 100% accurate motion.

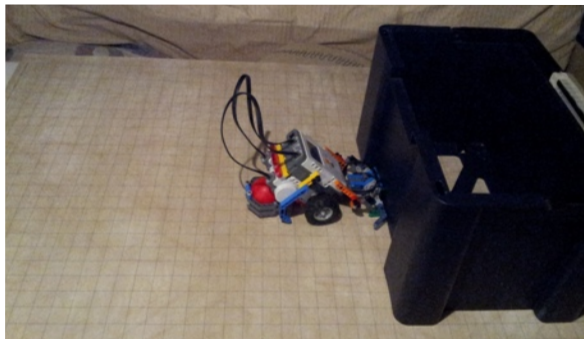
Press the orange “enter” and dark grey “exit” buttons on the NXT to quit the program before plugging it back into the computer.

GO FARTHER

What other shapes and patterns could you make the robot “dance”? Could you have one robot “dance” a square inside a square being “danced” by another robot, at different speeds?

Crash Test

Drive into a wall and then stop.



YOU NEED

An NXT with two driving wheels and a bumper (touch sensor) on port 1.

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Crash Test

Driving

Configure Drive Type

as on Card #4.

GET READY

Sensing

Configure Sensors

Configure a touch sensor for use as a bumper.


Sensor Port 1

Measures physical contact using a Touch Sensor named bumper

TRY THIS CODE



DO IT!

Click the  and wait for the program to run. Unplug the USB cable and place the robot where you want it to start. Press the orange “enter” button on the NXT.



The robot drives until it hits something. Pick it up and press the “enter” button again. It drives until it hits something.

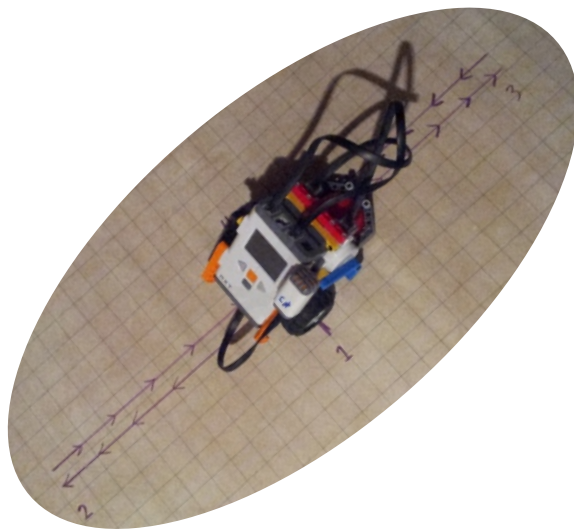
GO FARTHER

Can you make the robot say something when it hits a wall, such as, “Ouch, my nose” or “Ooof”? Could you draw eyes on it and make it wince?

How would you make the robot explore a room? Try it out!

Mexican Wave

Shout “go”, and each robot, in turn, drives forwards, backwards and forwards again.



YOU NEED

1+ NXTs, each with two driving wheels and a sound sensor* on port 2.

* Not included with all NXT sets.

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Mexican Wave

Driving → **Configure Drive Type** as on Card #4.

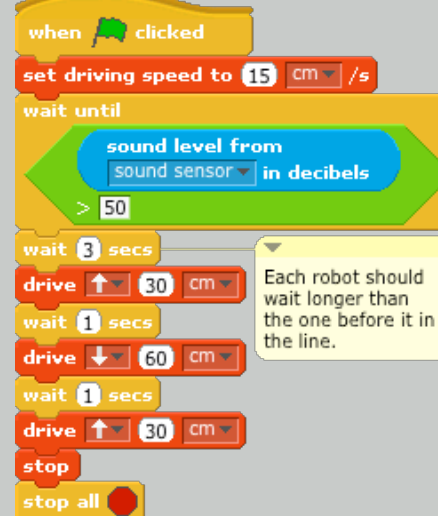
Sensing → **Configure Sensors**.

Configure a sound sensor to listen for the start command.

Sensor Port 2
Measures sound level in decibels using a **Sound Sensor** named **sound sensor**

GET READY

TRY THIS CODE



DO IT!

This works best if you have a whole line up of robots. The delay for each robot is a couple of seconds longer for the one before it in line.

On each robot, click the green flag and wait for the program to run. Unplug the USB cable and place the robot in line.

Then, on a signal, you all shout “go” together, and then, one by one, the robots do the same wave maneuver!

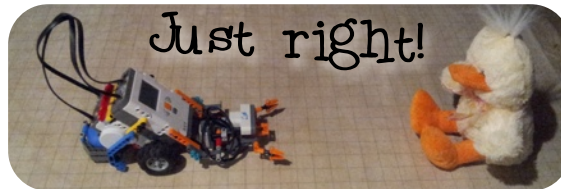
What other displays can you “choreograph”?

GO FARTHER

(“Choreography” is the art of designing of movements, and comes from Greek words meaning “dance writing”).

Shy Puppy

Robot follows you around and wants to be close, but not too close!



YOU NEED

An NXT with two driving wheels and an ultrasonic sensor pointing forwards

Shy Puppy

Driving → **Configure Drive Type** as on Card #4.

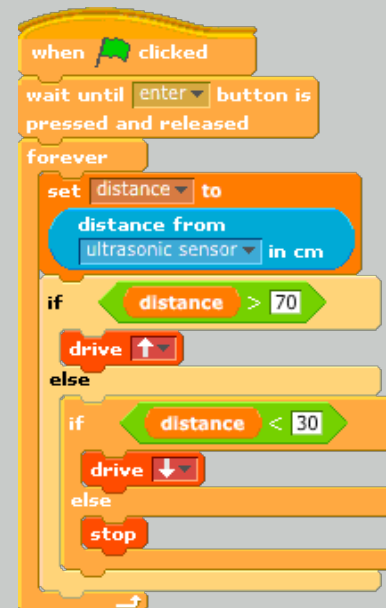
Sensing → **Configure Sensors**

Configure an ultrasonic sensor.

Sensor Port 4
Measures distance using an Ultrasonic Sensor named ultrasonic sensor

GET READY

TRY THIS CODE



DO IT!

Click the and wait for the program to run. Unplug the USB cable and press the orange "enter" button on the NXT.

Try walking away from the robot. Does it follow? Try going towards it. Does it shy away? Does it ever stand still?

GO FARTHER

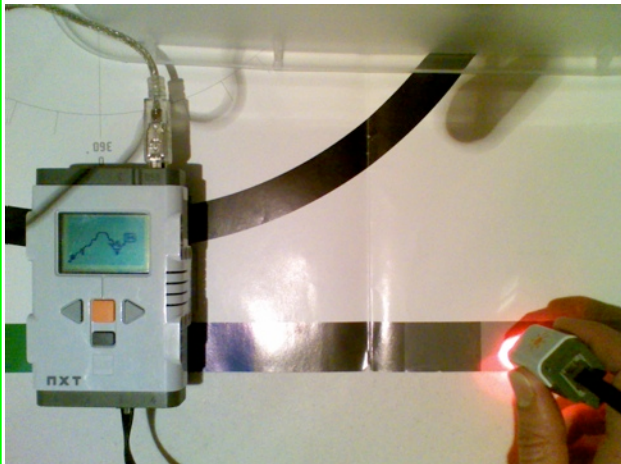
What would happen if you made the robot turn?

What do two or more robots together do?

Add a face to the robot, make it "speak", or dress it up!

Sparkline

Graph a changing value.



YOU NEED

An NXT with a light or colour sensor on port 3.

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Sparkline

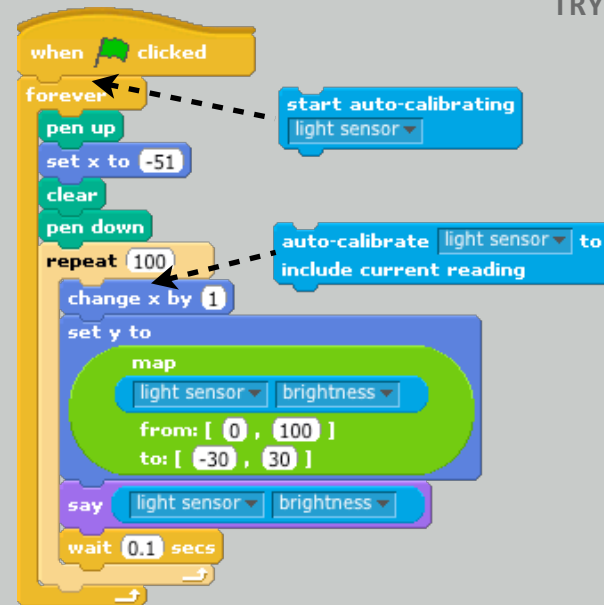
In **Sensing**, choose the **Configure Sensors** button. Configure a light or colour sensor, choosing the one you have.

NXT Light Sensor
NXT Color Sensor
HiTechnic Color Sensor
RCX Light Sensor

GET READY

Sensor Port 3
Measures brightness or color using a **NXT Light Sensor** named **light sensor**.

TRY THIS CODE



DO IT!

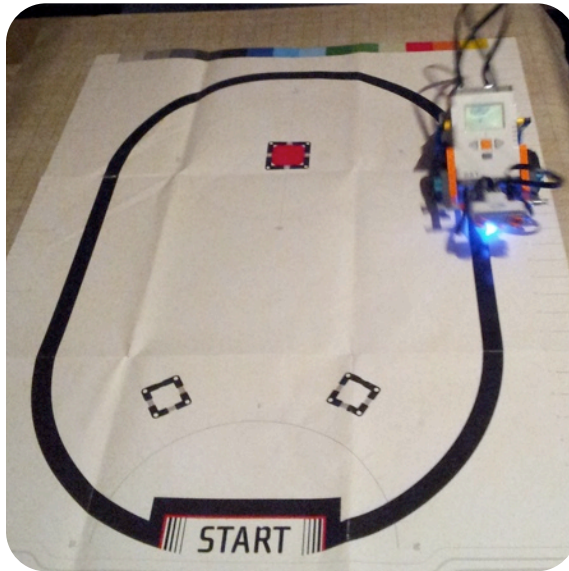
Click the to start. Move the light sensor over different colours and shades. Move it closer and farther from a surface. Point it at a light. Change the angle. What happens?

GO FARTHER

What happens if you add in the auto-calibration blocks? Try drawing a white line on a black background. Change the lamp colour.

Follow That Line!

Follow a line around.



YOU NEED

An NXT with two driving wheels and a light/colour sensor pointing downwards.

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Follow That Line!

GET READY

Driving → **Configure Drive Type** as on Card #4.

Sensing → **Configure Sensors**

NXT Light Sensor
NXT Color Sensor
HiTechnic Color Sensor
RCX Light Sensor

Configure and name a light or colour sensor, choosing the type that matches your sensor.

Sensor Port 1
Measures brightness or color using a **NXT Color Sensor** named **eye**.

TRY THIS CODE

```

when clicked
set eye's lamp
wait until enter button is pressed and released
set driving speed to 20 cm/s
forever
if eye brightness < 35
arc radius: 15 cm
else
arc radius: 15 cm

```

```

when clicked
wait until exit button is pressed and released
stop all

```

DO IT!

Click the and wait for the program to run. Unplug the USB cable, place the robot on or beside a line, and press the orange "enter" button on the NXT.

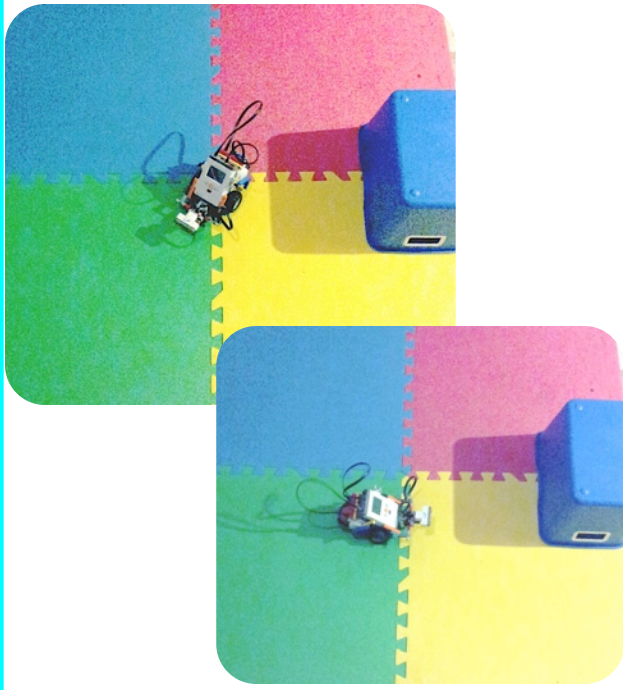
Press the dark grey "exit" button to stop the robot.

GO FARTHER

What happens if you adjust the numbers? Does the line-following course make a difference? Can you follow the edge of a table? Where is the best place to put your light sensor? What would you do with a second or third sensor? Draw eyes and make them look left and right!

Locator

Find a nearby object.



YOU NEED

An NXT with two driving wheels and an ultrasonic sensor on port 4.

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Locator

Driving

Configure Drive Type

as on Card #4.

Sensing

Configure Sensors

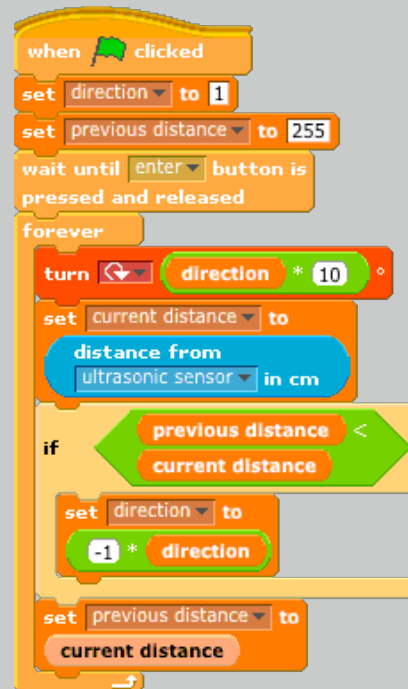
Configure an ultrasonic sensor.

Sensor Port 4

Measures distance using an Ultrasonic Sensor named ultrasonic sensor

GET READY

TRY THIS CODE



DO IT!

Click the and wait for the program to run. Unplug the USB cable and press the orange "enter" button on the NXT.

Move an object around in front of the robot. Does it turn to follow it?

GO FARTHER

How does it work? How would you do this with two sensors?

Can you make the robot ignore a wall (and anything else as far away as it)?

Try making it scan in a full circle and point at the closest item.

Sumo

(card 1 of 2)

Push your opponent out of a ring.



YOU NEED

Each competitor needs an NXT with two driving wheels, an ultrasonic sensor, and a light or colour sensor.

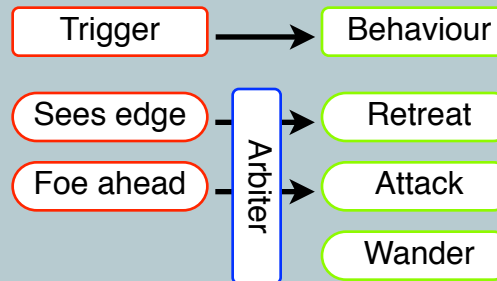
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Sumo

THE PLAN



If it has nothing better to do, the robot wanders around. If it sees a foe ahead of it, the robot attacks, trying to push the enemy out of the ring. Most importantly, if it sees the edge, the robot retreats from it, in an effort to stay in the ring.

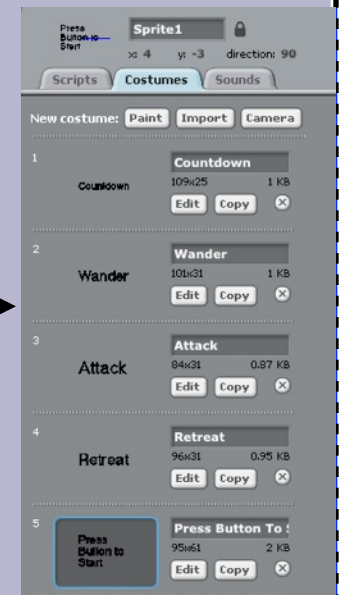
GET READY

Driving → **Configure Drive Type** as on Card #5.

Sensing → **Configure Sensors**. Configure an ultrasonic sensor and a light/colour sensor.

Create a bunch of costumes for your sprite, using the text tool to display the following words in large letters, “Countdown”, “Wander”, “Attack”, “Retreat” and “Press Button to Start”.

Variables → **Make a variable**. Create variables named “next action”, “foe ahead”, and “sees edge”.

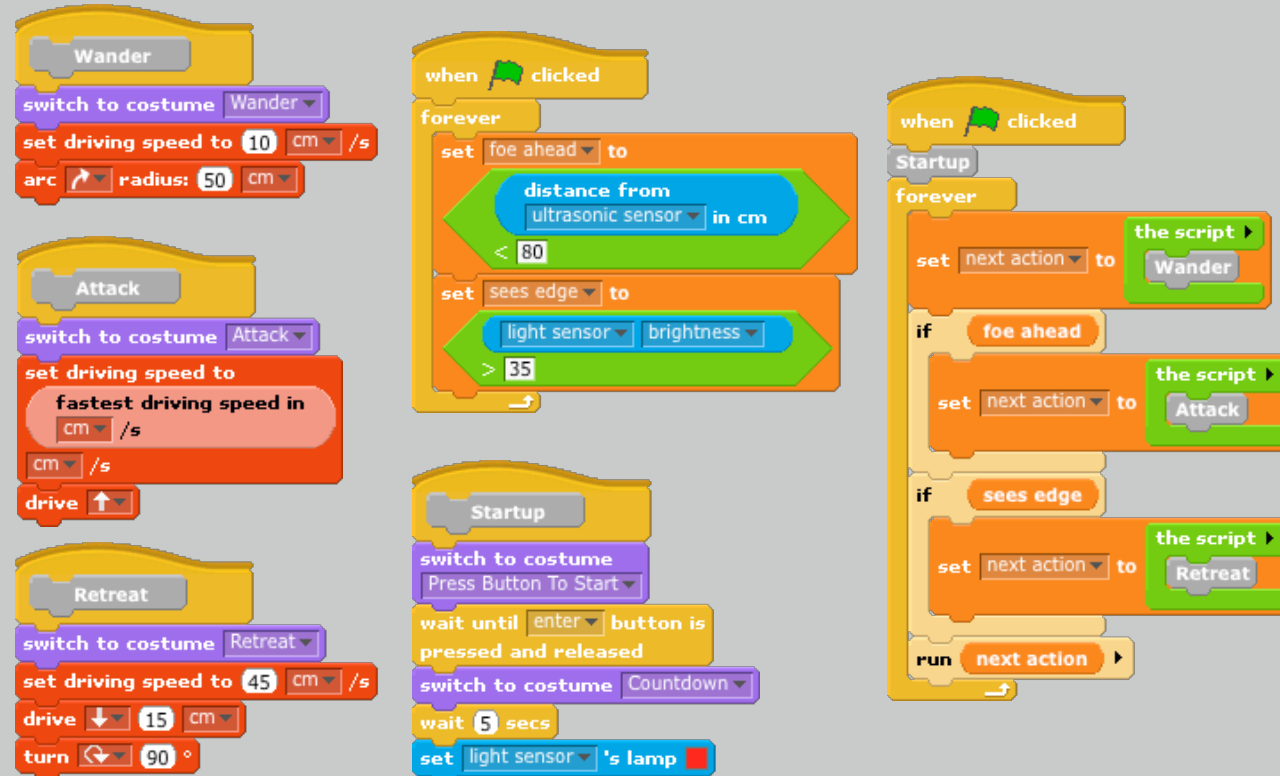


Sumo

(card 2 of 2)

Variables → **Make a block**. You'll make blocks called "Attack", "Retreat", "Wander", and "Startup".

TRY THIS CODE



DO IT!

Click the  and wait for the program to run.

Unplug the USB cable and place the robot on the sumo board. When you are told to start your robot, press the orange "enter" button on the NXT.

GO FARTHER

Can you add other behaviours to the robot, or change some of the existing ones? What could you do to make your sumo robot better?

Would this method of programming work for other robots?