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Creative Computing Club

LEGO MINDSTORMS NXT Introduction

Set Up

For this tutorial we used LEGO MINDSTORMS NXT software v2.0,f4 some of the images and names may vary from version to version. The hardware we tested the programs on was the NXT 2.0 “8547” set.

Install LEGO MINDSTORMS NXT as per the developers instructions from the disc.

LEGO MINDSTORMS NXT will automatically generate a “LEGO Creations” folder where your programs will be stored.

Now lets open LEGO MINDSTORMS NXT and click on File “New” and “Save”. Save the LEGO MINDSTORMS NXT .rbt as “Example1”

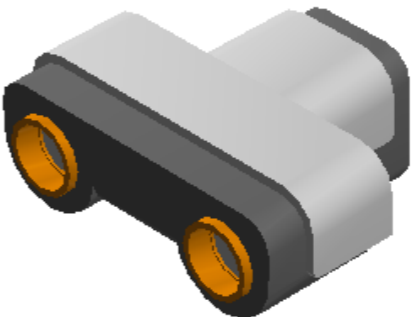
LEGO MINDSTORMS NXT is an amazing system for bringing all kinds of wonderful interactive creations to life using LEGO bricks and components.

Now lets get started.

LEGO MINDSTORMS NXT Components



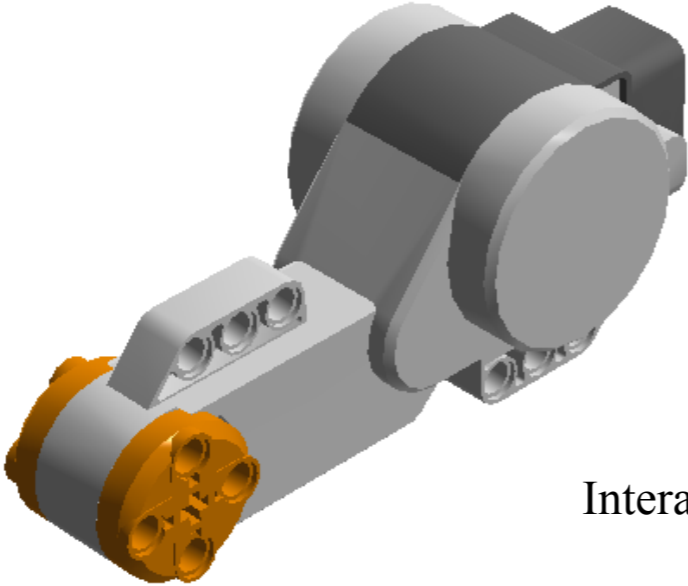
NXT micro-computer



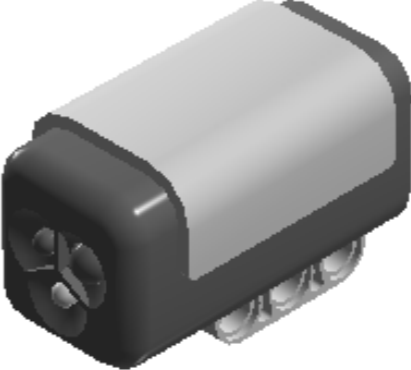
Ultrasonic Sensor



Touch Sensors



Interactive servo motors



Colour Sensor

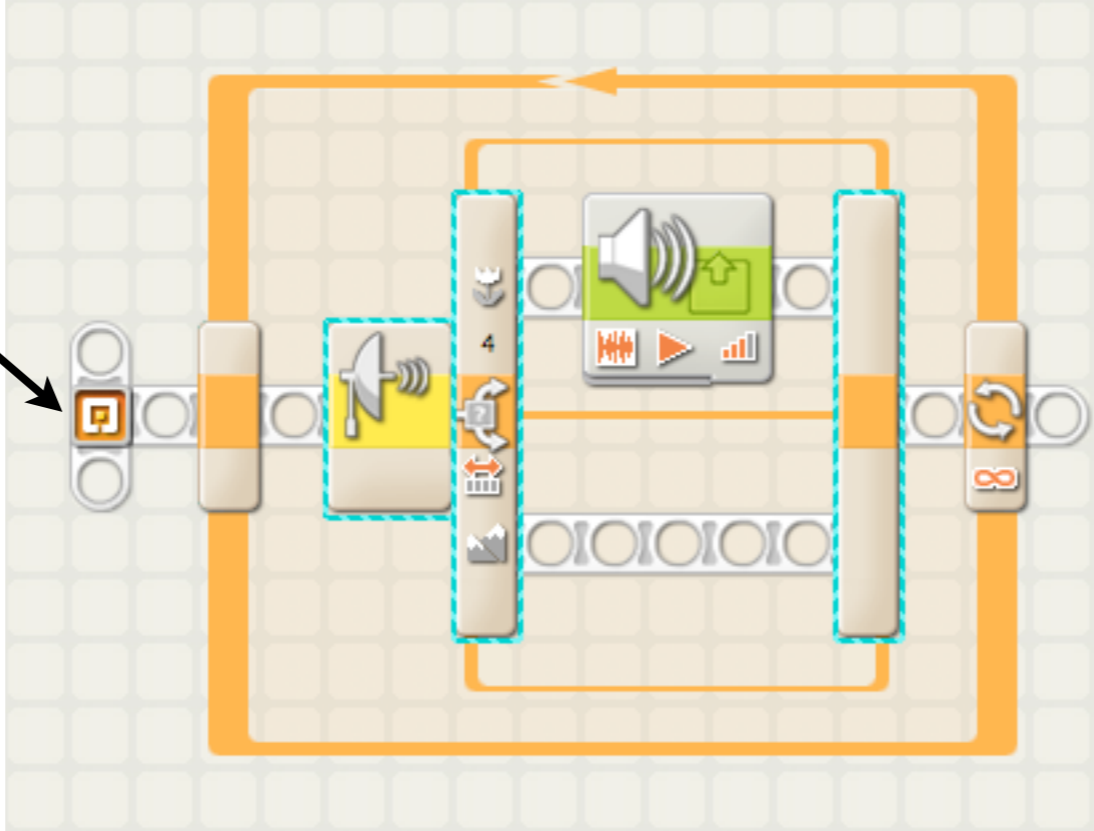
Example1

Here is a simple “Hello world” example.

By waving or hand in front of the Alpha Rex’s eyes, the robot will respond with “Hello”

This is the start of the program.

The actions run from left to right.



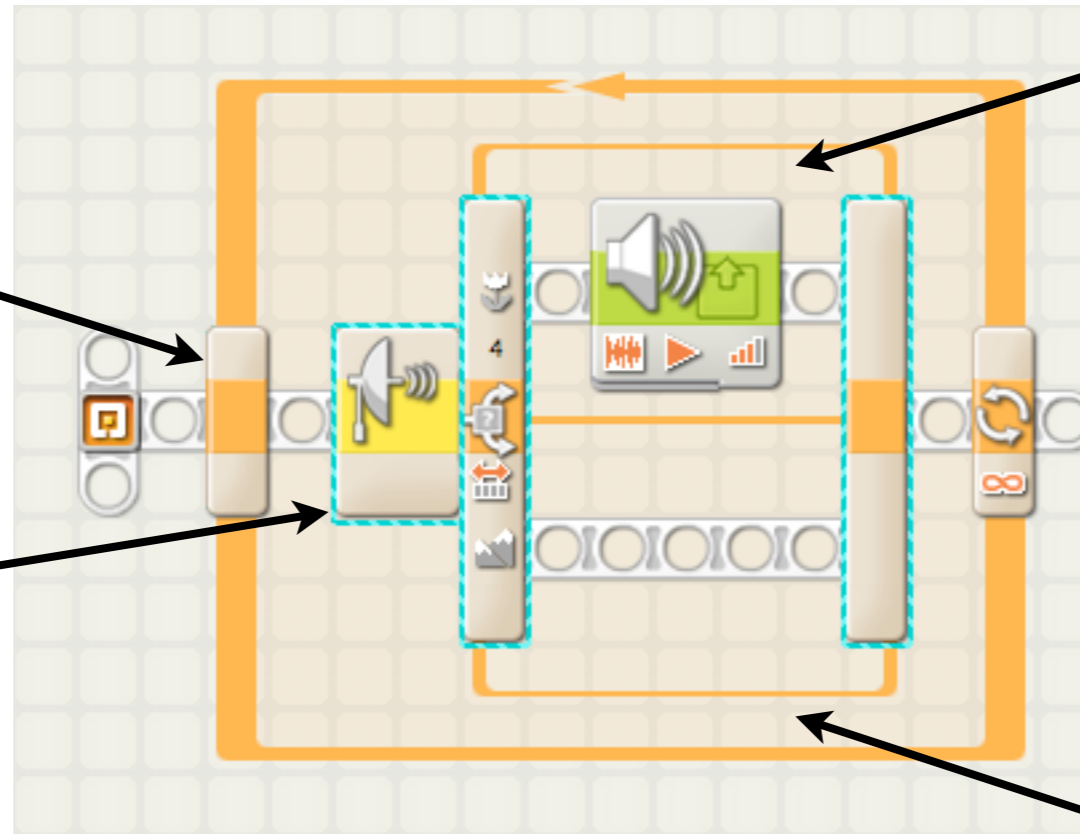
Example1

Here is a simple “Hello world” example.

By waving or hand in front of the Alpha Rex’s eyes, the robot will respond with “Hello”

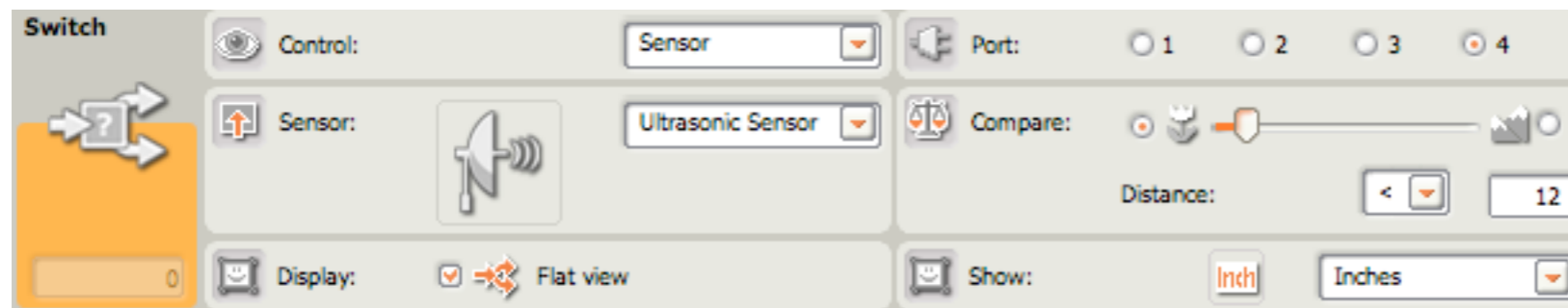
Step 1: Insert a loop.
The actions within this loop will be run again and again, from left to right, when it reaches the end it will start at the left again.

Step 2: Insert a switch choose Control type “Sensor”, Sensor type “Ultrasonic Sensor”, select Port “4” which is where the ultrasonic sensor should be attached to. The Distance should be “<<” less than “12” “Inches” or “30” “Centimeters”, as shown below.



These things will be run if something is detected less than 12 Inches / 30 Centimeters away.

These things will be run if something is detected more than 12 Inches / 30 Centimeters away.



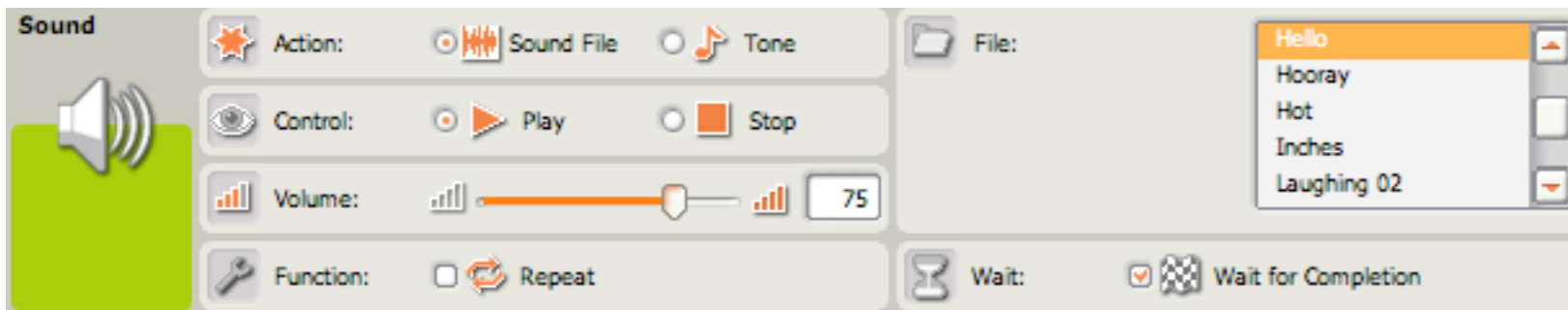
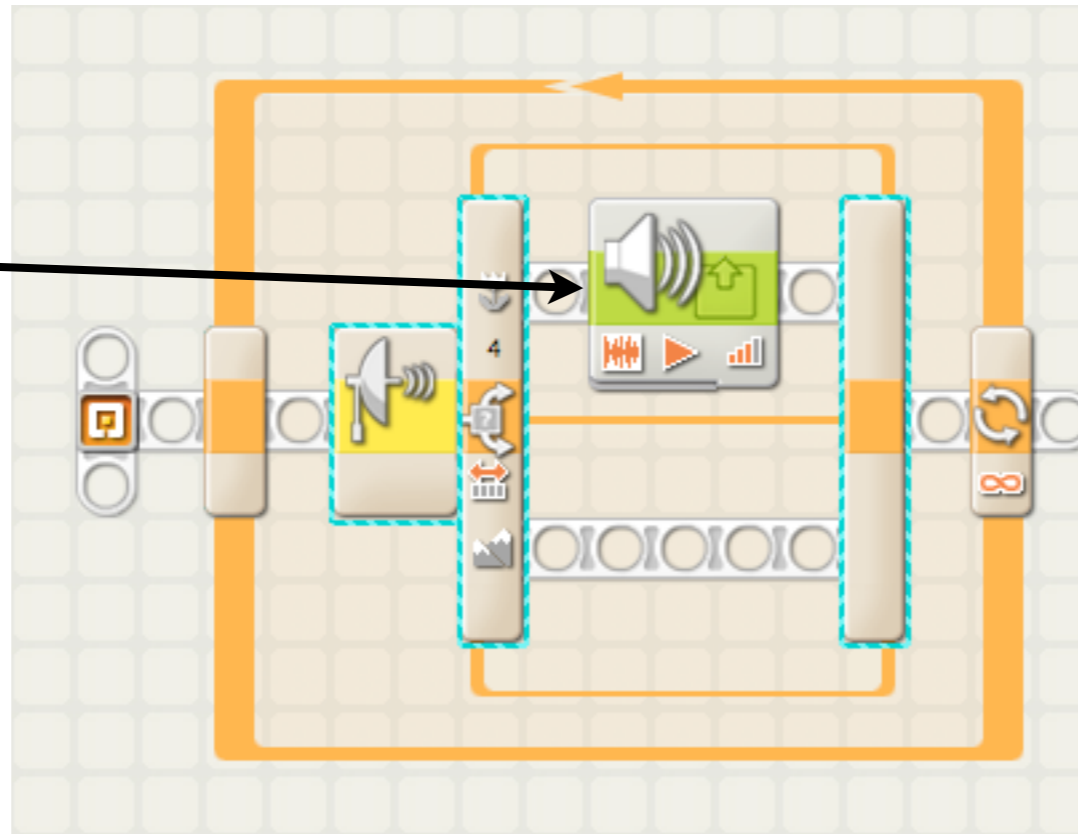
Example1

Here is a simple “Hello world” example.

By waving or hand in front of the Alpha Rex’s eyes, the robot will respond with “Hello”

Step 3: Insert a sound action choose Action “Sound File”, Control “Play”, Volume “75”, File “Hello”, Wait “Wait for completion”.

This selects a sound file is to be played instead of a simple beep, it plays the sound at 75% volume, only once, it plays the “Hello” sound file and it waits until the sound file has finished before moving on to the next action.



Example 1

Here is a simple “Hello world” example.

By waving or hand in front of the Alpha Rex’s eyes, the robot will respond with “Hello”

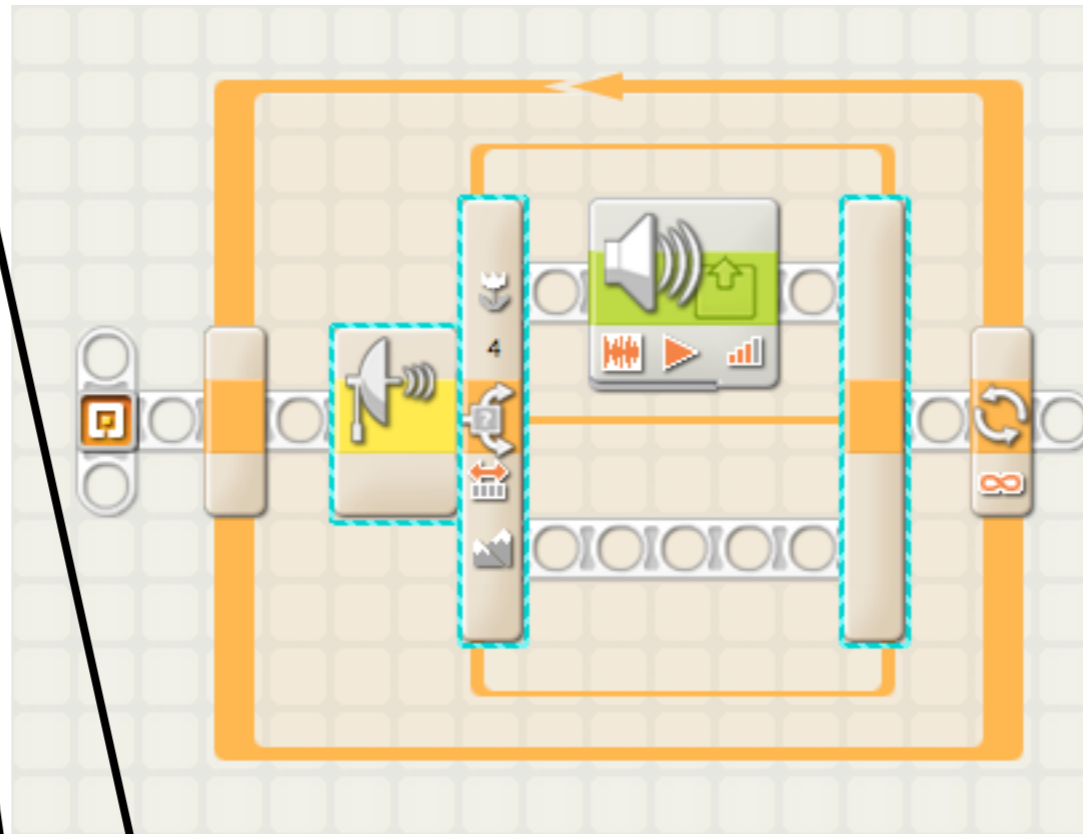
Step 4: Press Play to compile, send and run it.

Play: compiles, downloads to the NXT brick and runs the program.

Download: Simply compiles and downloads the programs and awaits the user to tell it to run.

Stop: Stops the currently running program is the USB cable is running.

This program can be run while the USB cable is attached as the robot isn’t moving around.



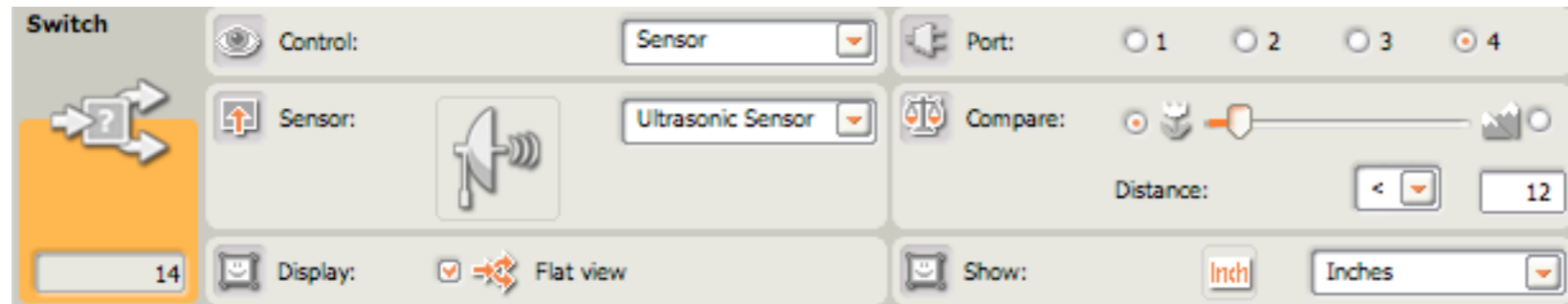
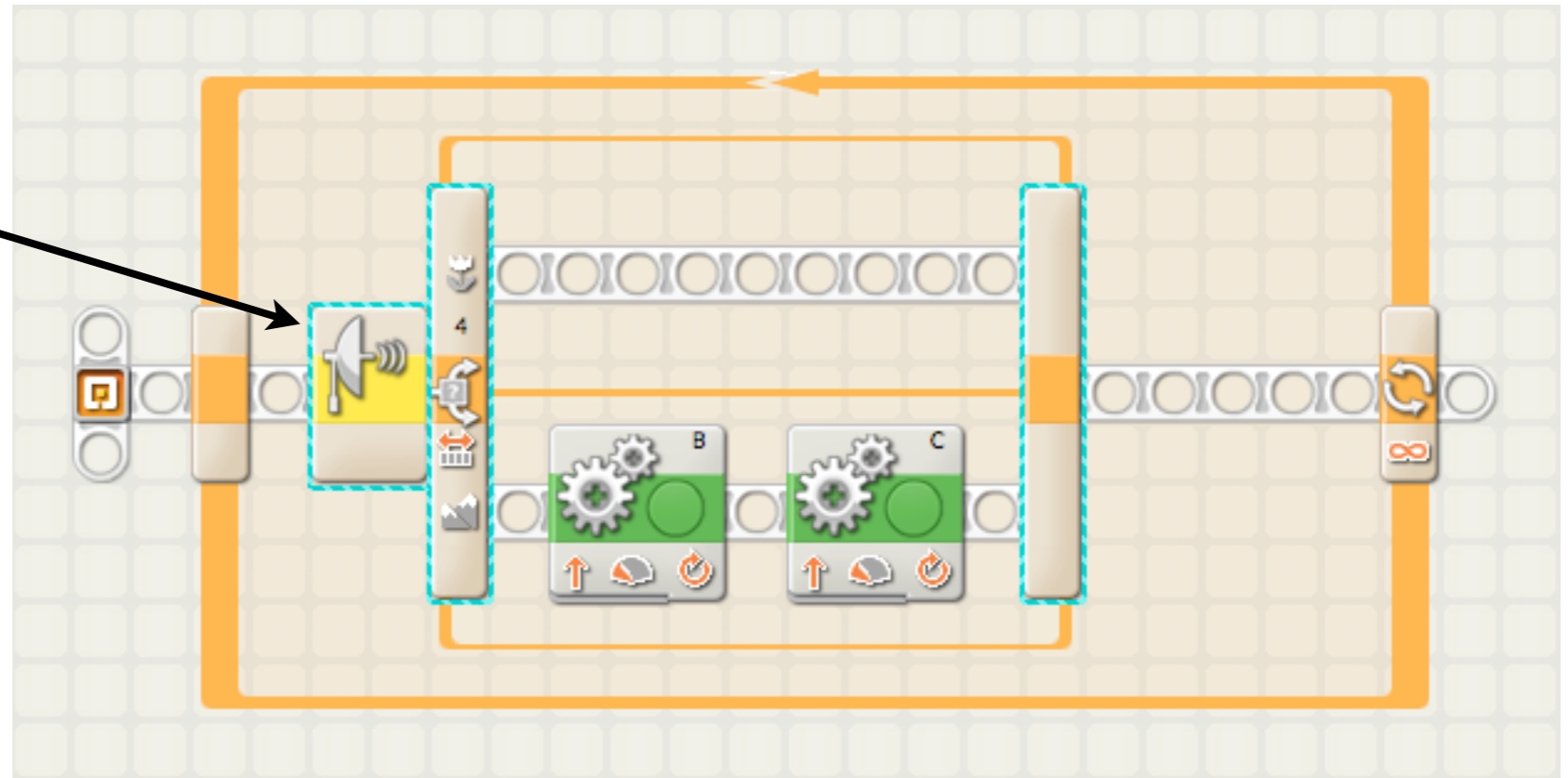
Example 2

Here is a simple example to check if the path is clear to walk.

Step 1: Insert a loop.

Step 2: Insert a switch choose Control type "Sensor", Sensor type "Ultrasonic Sensor", select Port "4" which is where the ultrasonic sensor should be attached to. The Distance should be "<<" less than "12" "Inches" or "30" "Centimeters", as shown below.

This time we are going to be putting the next actions on the bottom track instead of the top, this runs if nothing is detecting less than "12" "Inches" or "30" "Centimeters" away.



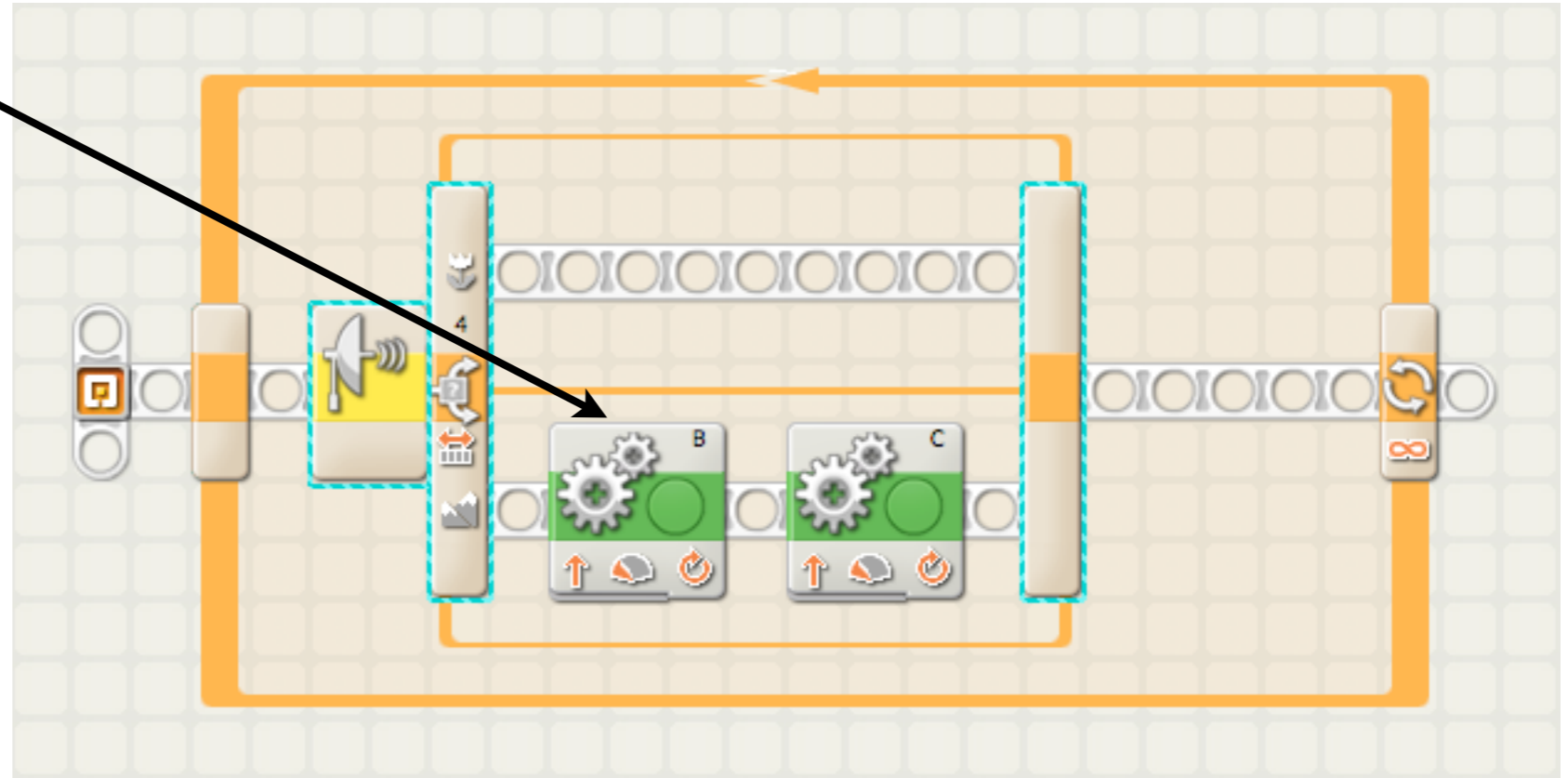
Example 2

Here is a simple example to check if the path is clear to walk.

Step 3: Move Servo Motor B

Choose Direction "Up", Power "45", Duration "0.15" "Rotations", Next Action "Coast".

This rotates the motor a little before moving on to the next action, the power is below the halfway mark so the action won't be too abrupt to topple the robot. And it performs the action smoothly by "coasting" at the end of it instead of breaking.



Example 2

Here is a simple example to check if the path is clear to walk.

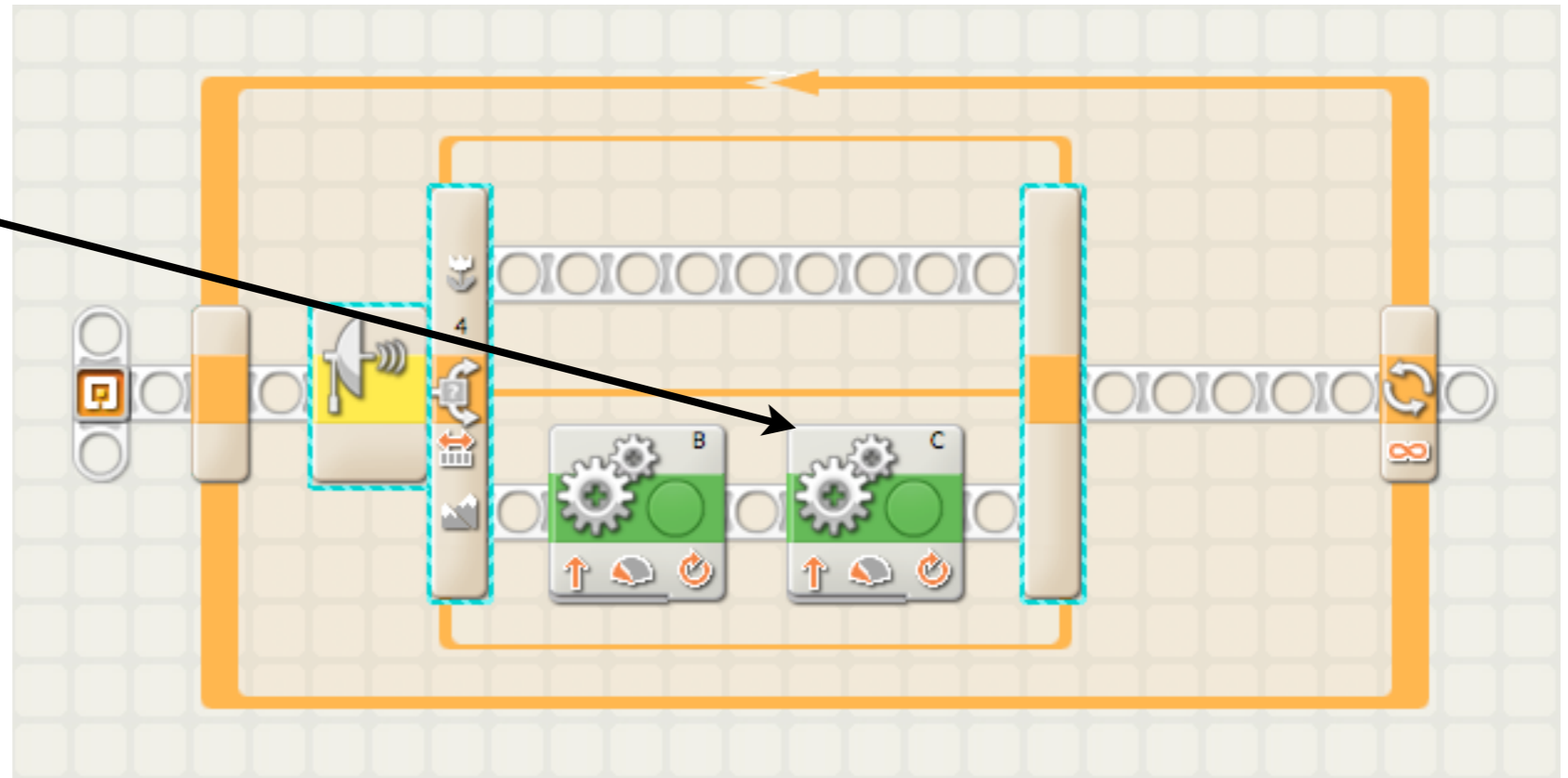
Step 4: Move Servo Motor C

Choose Direction "Up", Power "45", Duration "0.15" "Rotations", Next Action "Coast".

This rotates the motor a little before moving on to the next action, the power is below the halfway mark so the action won't be too abrupt to topple the robot. And it performs the action smoothly by "coasting" at the end of it instead of breaking.

Step 5: Press "Download" when complete disconnect USB cable.

Step 6: Run Program on NXT brick and test.



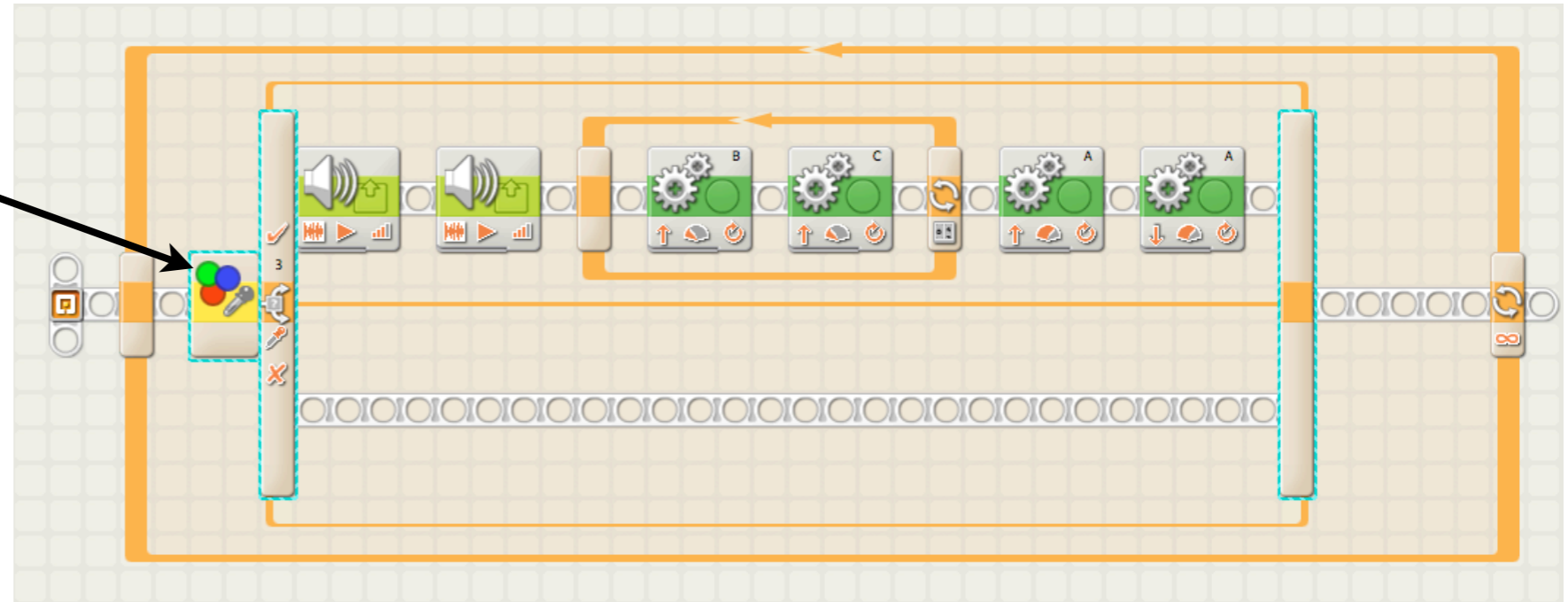
Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

Step 1: Insert a loop.

Step 2: Insert a switch choose Control type "Sensor", Sensor type "Color Sensor", select Port "3" which is where the color sensor should be attached to. The Action should be "Color Sensor" and Compare should be "Inside Range" select the Green color range.

This time we are going to be putting the next actions at the top, as we want the robot to perform the actions if a Green Ball is detected.



Switch

Control: Sensor

Port: 1 2 3 4

Sensor: Color Sensor

Action: Color Sensor

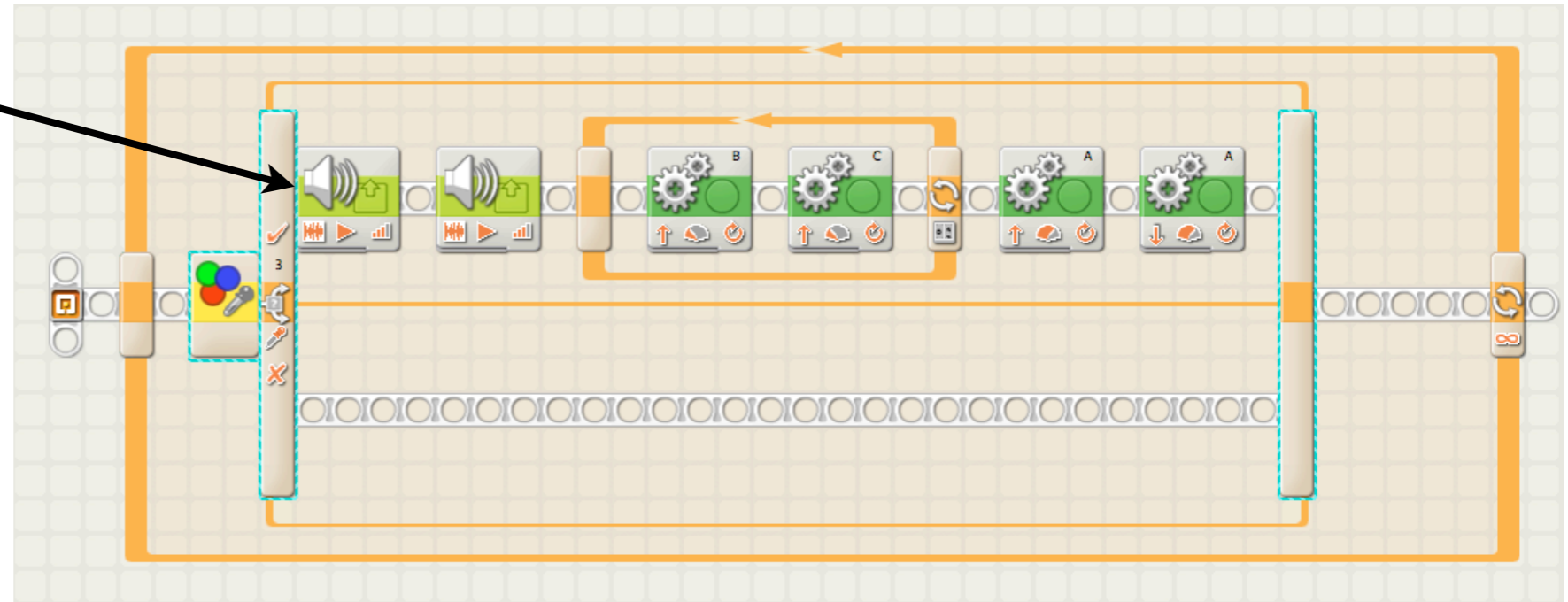
Compare: Inside Range

Display: Flat view

Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

Step 3: Insert a sound action choose Action "Sound File", Control "Play", Volume "75", File "Good", Wait "Wait for completion".



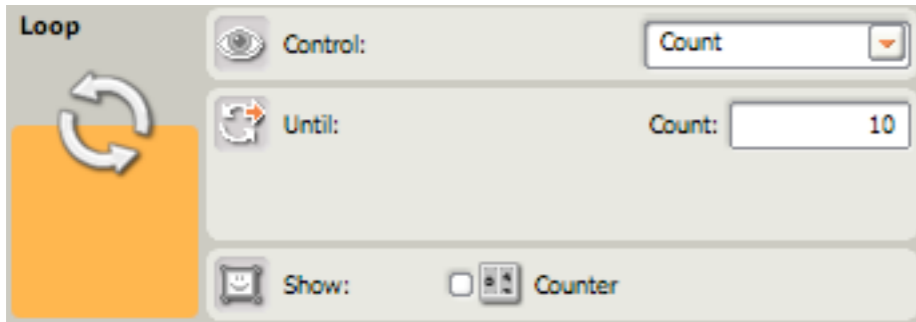
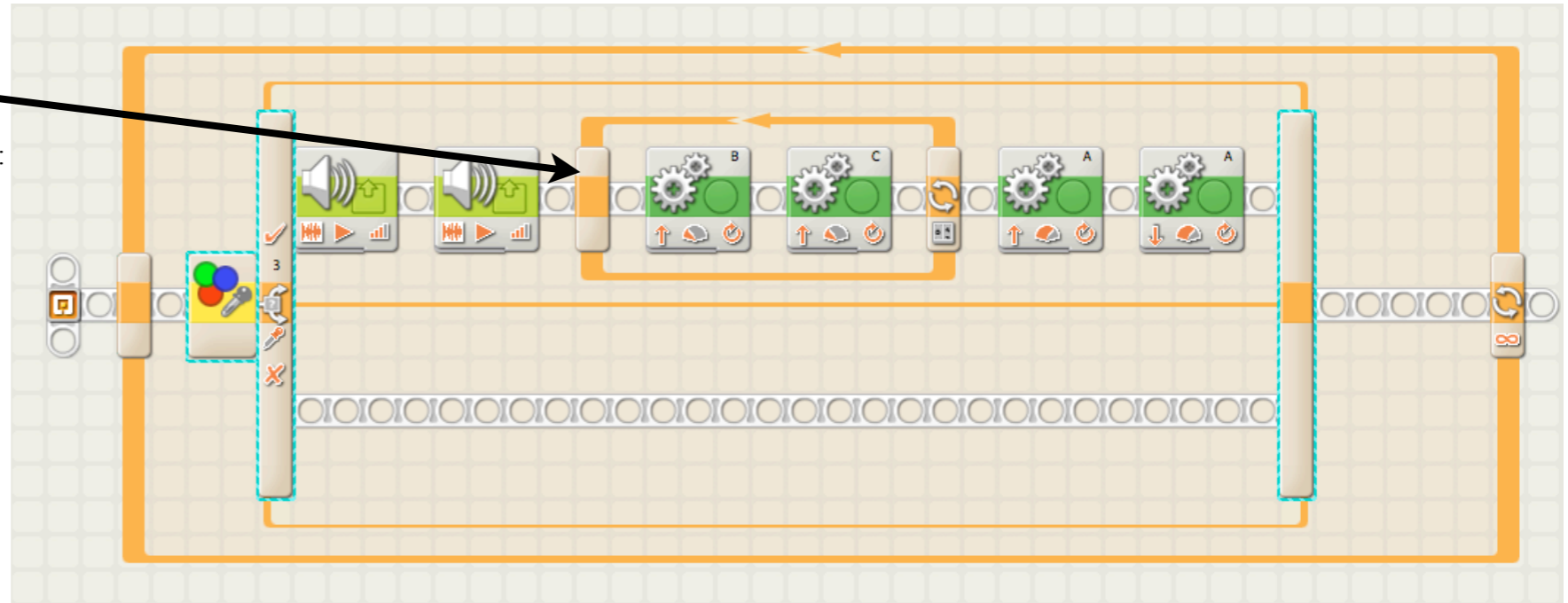
The screenshot shows the 'Sound' configuration panel in Scratch. The 'Action' is 'Sound File', 'Control' is 'Play', 'Volume' is 75, and 'Wait' is 'Wait for Completion'. The 'File' dropdown menu is open, showing 'Good' selected.

Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

Step 4: Insert a loop, this time however we only want the contents of the loop to be looped 10 times so set Control to "Count" and Until Count: to "10".

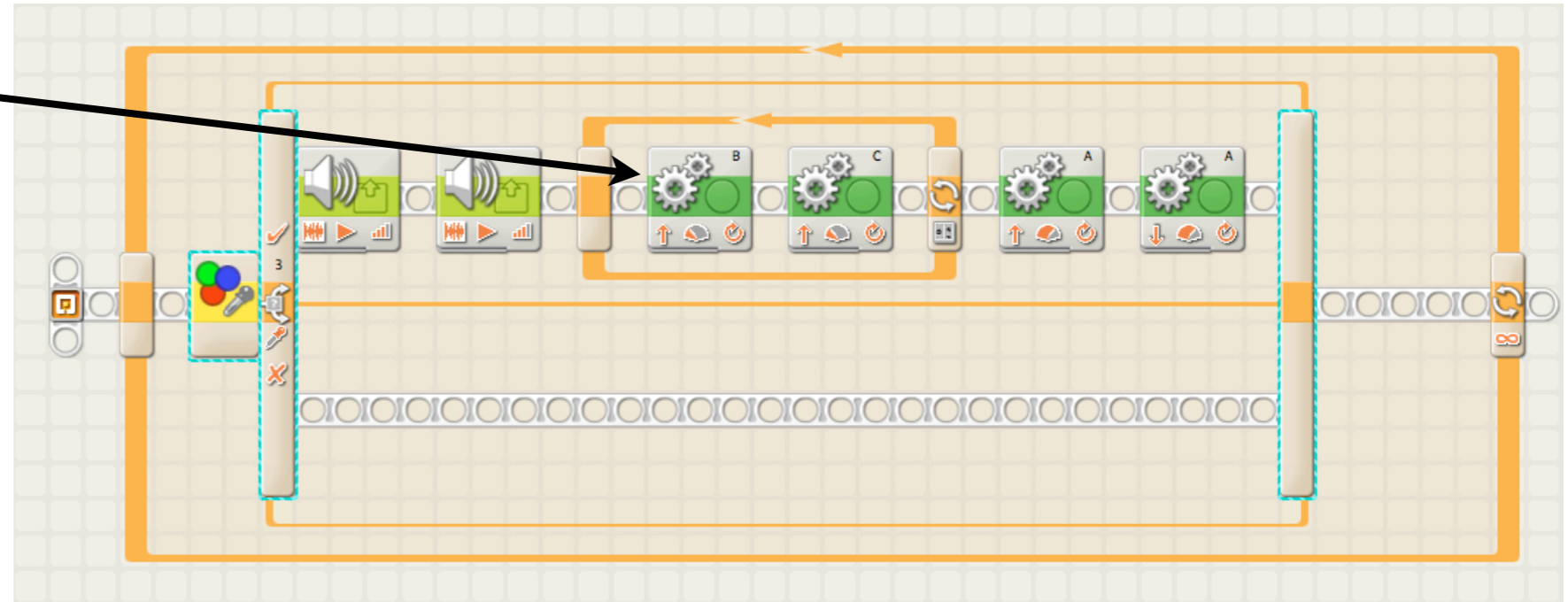
Therefore if a Green Ball is detected it will repeat this section 10 times, 20 steps.



Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

Step 5: Move Servo Motor B
Choose Direction "Up", Power "45", Duration "0.15" "Rotations", Next Action "Coast".



Move

Port: A B C

Power: 45

Direction: Up Down Stop

Duration: Rotations

Next Action: Brake Coast

Steering: B Up Down

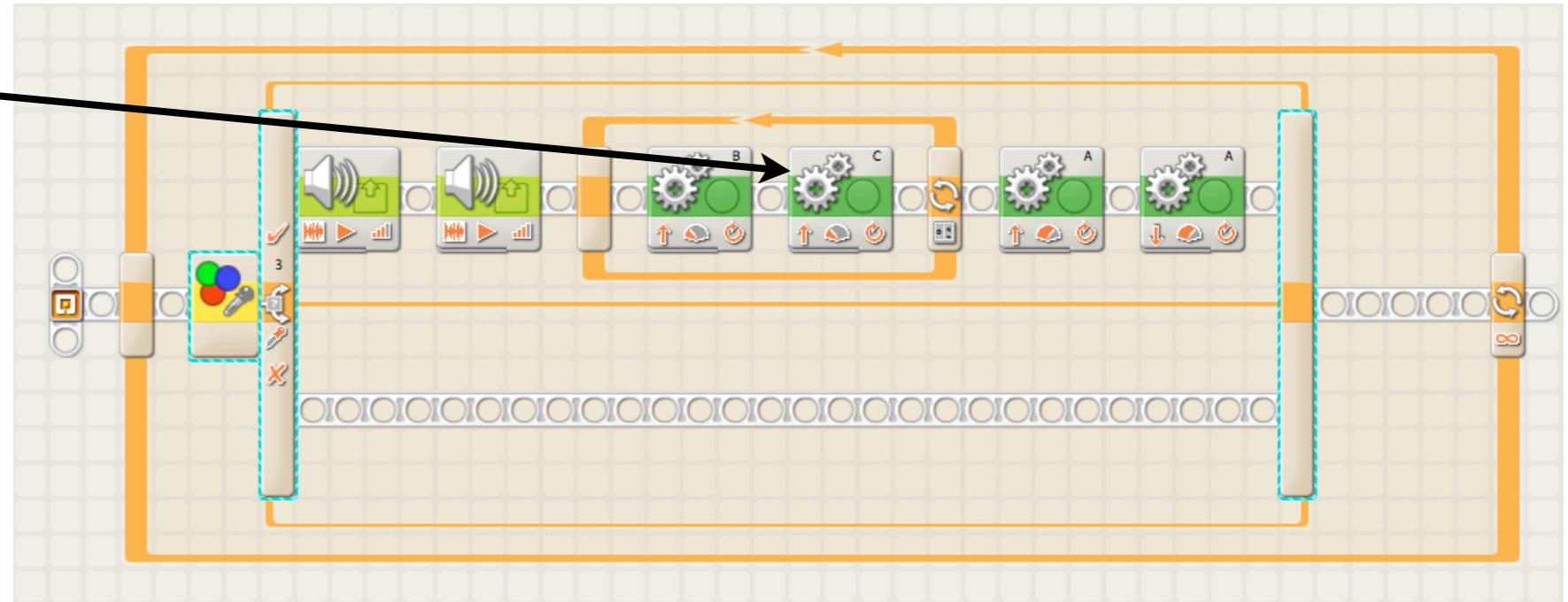
4 A
0 B
374 C

Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

Step 6: Move Servo Motor C
Choose Direction "Up", Power "45", Duration "0.15" "Rotations", Next Action "Coast".

We are now at the end of the 10 times loop, so the next actions will only be performed once every time a Green Ball is detected.



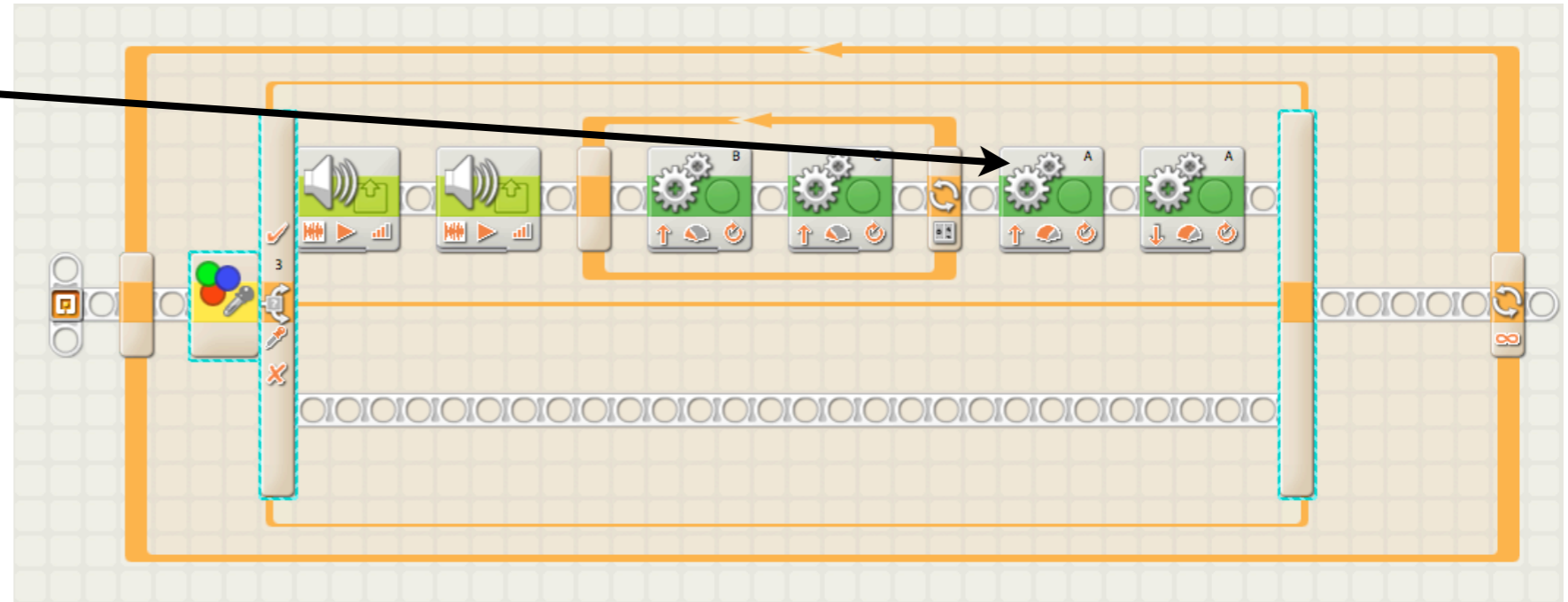
| | | | | | | | |
|------------|-------------------------------------|----------------------------|---------------------------------------|--------------|-----------------------------|--|----|
| Port: | <input type="checkbox"/> A | <input type="checkbox"/> B | <input checked="" type="checkbox"/> C | Power: | <input type="checkbox"/> 0 | <input type="checkbox"/> 100 | 45 |
| Direction: | <input checked="" type="radio"/> Up | <input type="radio"/> Down | <input type="radio"/> Stop | Duration: | 0.15 | Rotations | |
| Steering: | <input type="checkbox"/> A | <input type="checkbox"/> B | <input checked="" type="checkbox"/> C | Next Action: | <input type="radio"/> Brake | <input checked="" type="radio"/> Coast | |
| Rotations: | 4 | 554 | 0 | | | | |

Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

Step 7: Move Servo Motor A
Choose Direction "Up", Power "45", Duration "0.5" "Rotations", Next Action "Coast".

The A Motor controls the swaying of arms and opening and closing of the hands. This first action should open the hands.



Example 3

Here is a simple example to check if the robot has been given a Green ball, if so walk forward and then drop the ball and wait for the next ball.

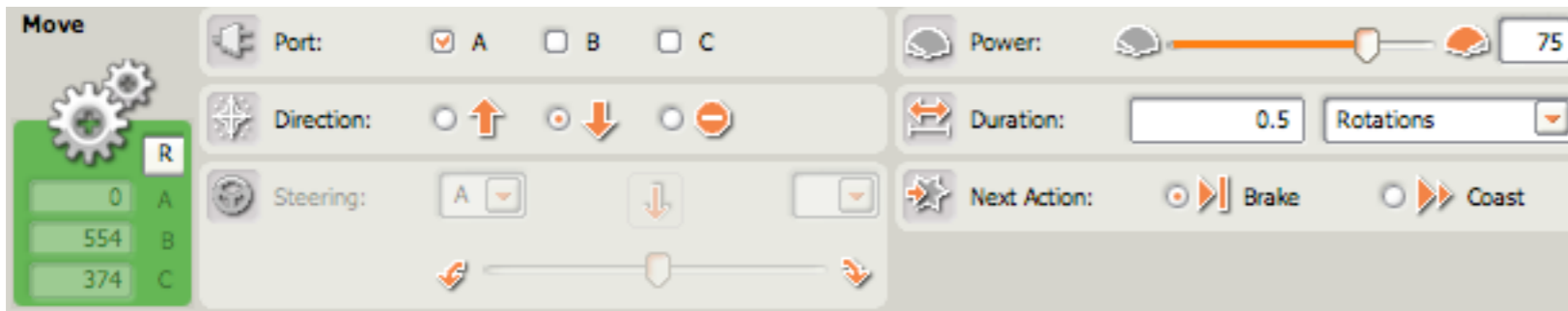
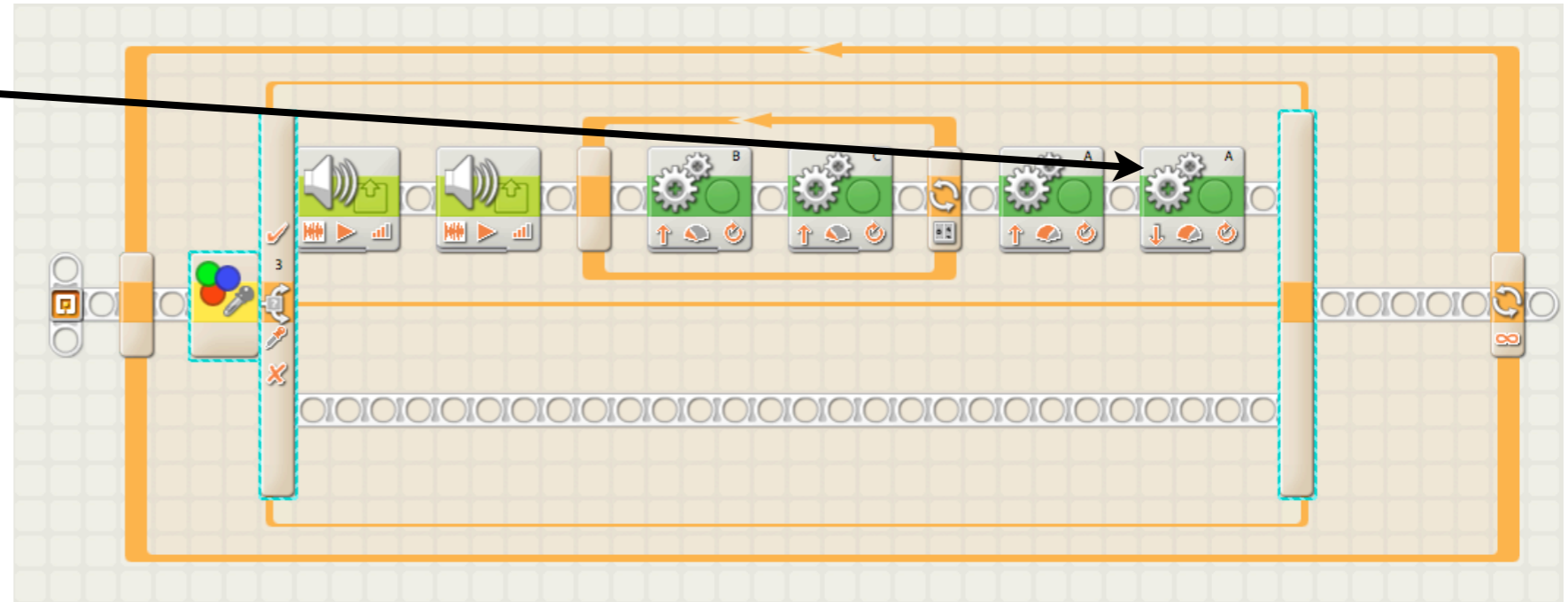
Step 8: Move Servo Motor A
Choose Direction "Down", Power "45", Duration "0.5" "Rotations", Next Action "Coast".

This second A motor action should close the hands.

Step 9: Download and disconnect the USB cable.

Step 10: Run the program.

Step 11: Place Green Ball in left hand to test program with the color sensor.





Now what?

Now that you have learned a bit about LEGO MINDSTORMS NXT and what it can do, maybe you can start to think about what you could do with it.

LEGO MINDSTORMS NXT is a very powerful and fun system with a huge community and hundreds of examples online. This was purely an introduction to the wonderful LEGO MINDSTORMS NXT which is capable of so much more, the rest however is up to you.