



**Maynooth
University**
National University
of Ireland Maynooth

Computer Science Summer Camp 2017

Finch Robot Challenges

Controlling the LED

Control colours with the keyboard

There are other event blocks besides the “When clicked” block. Under “Events”, find the block which says “When [space] key pressed”, and drag that block into your script. If you click on the down arrow next to the word “space”, you can select any of the space key, or any of the letter, number, or arrow keys on your keyboard. Set the key to “r”. Then drag a “Finch LED” block and attach it to the bottom of the “When [r] key pressed” block. To allow Scratch to listen to your key presses, click on any blank space in your script window. Now press “r”. Your Finch should light up red.

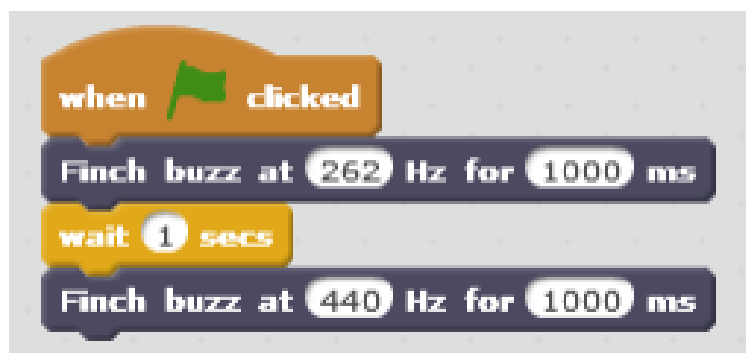


- Challenge: Can you write a Scratch program that will make your Finch light up red when you press the “r” key, green when you press the “g” key, and blue when you press the “b” key? Can you also make the Finch turn off its LED when you press the “space” key?

Controlling the Buzzer

Playing a melody

Now let's play a simple two-note melody. You might think you can do this by just dragging another "Finch buzz" block and connecting it to the bottom of the other "Finch buzz" block. However, the "Finch buzz" block does not wait while it plays the note. Instead, it just starts the note and goes on to the next block. This means that if you connect two "Finch buzz" blocks without a "Wait" in between, you will only be able to hear the Finch play the second note. You can try this to see for yourself! To allow the Finch to play one note after another, we must use a "Wait" block which can be found under the "Control" category. Drag a "Wait" block into your script and attach it to the bottom of the "Finch buzz" block. Set the duration of the "Finch Buzz" block to 1000 ms, and then set the "Wait" block to wait for 1 second (remember, 1000 ms = 1 second). Then drag another "Finch buzz" block and attach it to the bottom of the "Wait" block. Set the frequency of the two blocks to different values. Then click the green flag to run your program. You should hear two separate notes.



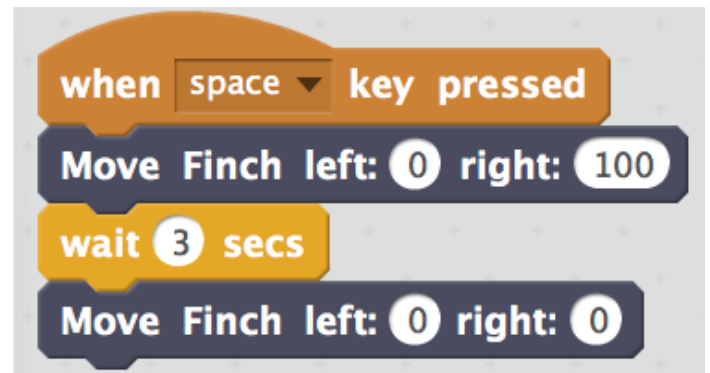
➤ Challenge: Can you write a Scratch program that will make your Finch play the C major scale? The notes of the C major scale are listed below:

- C (262 Hz)
- D (294 Hz)
- E (330 Hz)
- F (349 Hz)
- G (392 Hz)
- A (440 Hz)
- B (494 Hz)
- C (523 Hz)

Turning the Finch

When the speeds of the left and right motors are equal, the robot moves in a straight line. When the speeds are not equal, the Finch will turn.

Try the two programs shown below. How are these two turns different? How can you make the robot turn in the other direction?



- Challenge: Write a program that makes the robot turn a full circle to the left and then a half circle to the right.

Obstacle Avider

Drag a "When key pressed" block from the "Events" category to the middle of your screen. In this program, the Finch will continuously scan for obstacles and drive around them. Because this check will be occurring repeatedly, we will need to use a repeat loop. Connect a repeat forever loop from the "Control" category to the end of the "When key pressed" block.

Tell the Finch to move forward by placing a "Move Finch" block from the "More Blocks" category inside the forever loop. We don't want the Finch to move too fast, or it might miss an obstacle. Set the motor power of both wheels to 50.

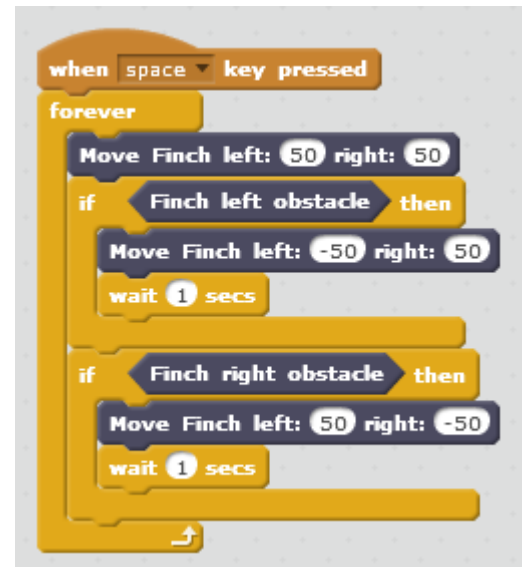
When the Finch detects an obstacle, it should perform a series of actions to avoid that obstacle. This code should only be run if an obstacle sensor sees something in its way. To make a piece of code that is only run when a certain condition is true, we can use an if statement. Attach an if statement from the "Control" category below the move block.

Now we need to supply a condition that will determine if the code should be run. Move a "Finch left obstacle" block from the "More Blocks" category into the slot on the if block. If an obstacle is detected on the Finch's left, the Finch should turn and drive around it. Add a move block inside the "if" block and make it turn the left wheel backward (-50) and the right wheel forward (50).

To give the Finch time to turn away from the object, add a "wait 1 secs" block (from the "Control" category) after the move block. The Finch will now avoid obstacles on its left. Now let's do the same for obstacles on the Finch's right. Duplicate the if statement by right-clicking it and selecting "duplicate".

Connect the new if statement below the first if. Replace the "Finch left obstacle" block with a "Finch right obstacle" block. Switch the direction of the motors.

Run the program and the Finch should avoid obstacles placed in front of it. Note that the obstacle sensors on the Finch are best able to detect large, white, or lightly-coloured obstacles like paper or cardboard boxes. To stop the program, click the red stop button.



- Challenge: Can you write a Scratch program that will make your Finch manoeuvre through a series of obstacles?

Finch Spirals

When the Finch's two motors move at the same speed, it moves in a straight line. When they move at different speeds, it moves in a circle.

Loops can be used to create a lot of interesting shapes. Start by trying out the program below, then modify it to create your own design!

- Challenge: Write a program that makes the Finch draw a shape. You may want to attach a marker to the indentation in the Finch's tail.

