

THE FINCH AND SCRATCH 2.0 EXPLAINED

SOFTWARE, BLOCKS AND EXAMPLES

- Documented in Scratch 2.0 by Janet Dee
- Explanations of commands and picture of Finch sourced from www.finchrobot.com/software/scratch
- Outline picture of Finch created by Sam Bacon, RMHS student

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FIRST STEPS

Instructions for installation of software and robot server necessary to connect a Finch Robot with Scratch are available on the Finch website:

<http://www.finchrobot.com/software/scratch>

As noted on the website, the Finch currently only works with the Scratch 2.0 offline editor. The Scratch Team expects to have experimental extensions available with the web version in early 2014.

FINCH BLOCK DESCRIPTIONS

Descriptions were prepared in the same manner as the Tips for Blocks in Scratch. The block is defined and then a sample script is provided. Additional clarifications and images are included as needed.

MOTOR COMMANDS

Move Finch left: 0 right: 0

Sets the power to the left and right wheels.

when space key pressed

Move Finch left: 30 right: 30

The range is -100 to 100; for example Move Finch Left: 100 Right: 100 is full forward, Left: -100 Right: -100 is full backwards. To have Finch turn increase the power to one of the wheels.

LED COMMANDS

Finch LED color R: 0 G: 0 B: 0

Sets the color of the Finch's beak.

when flag clicked

Finch LED color R: 25 G: 30 B: 75

The R, G, and B values control the intensity of the red, green, and blue elements in the Finch's beak. Range is 0 to 100 for each color.

SOUND COMMAND



Finch buzz at 440 Hz for 500 ms

Plays the Finch's buzzer with a sound.

when b key pressed

Finch buzz at 1000 Hz for 250 ms

The sound is played at the frequency specified for the time specified. Range is 20 to 20,000 for frequency.

The image shows a Scratch 'Sound' block with a dropdown menu set to 'Finch' and a 'buzz' sound. The frequency is set to 440 Hz and the duration to 500 ms. Below the block is a yellow tooltip explaining its function. A second 'Sound' block is shown below, triggered by a 'when key pressed' event with the key set to 'b'. This block is set to play a 'buzz' sound at 1000 Hz for 250 ms. A second tooltip explains that the frequency range is 20 to 20,000 Hz.

SPEAK COMMAND

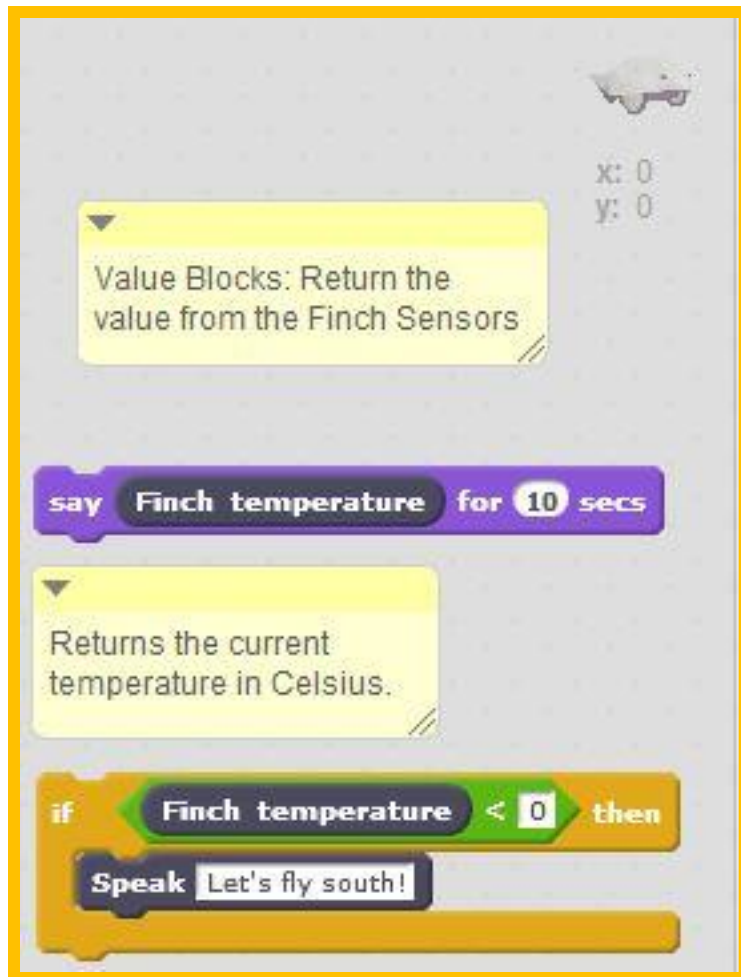


Speak Let's Race!

The "Speak" block will cause the computer to say whatever text is placed in the box.

The image shows a Scratch 'Speak' block with the text 'Let's Race!' entered in the input field. Below the block is a yellow tooltip explaining that the block causes the computer to say the text entered in the box.

SENSING COMMAND -TEMPERATURE-



The image shows a Scratch script for temperature sensing. It features a yellow 'Value Blocks' block at the top, a purple 'say' block with 'Finch temperature' and a '10' second timer, and an 'if' block with a 'Finch temperature' sensor block set to '< 0' and a 'Speak' block with the text 'Let's fly south!'. A small Finch icon is in the top right corner, with 'x: 0' and 'y: 0' coordinates below it.

Value Blocks: Return the value from the Finch Sensors

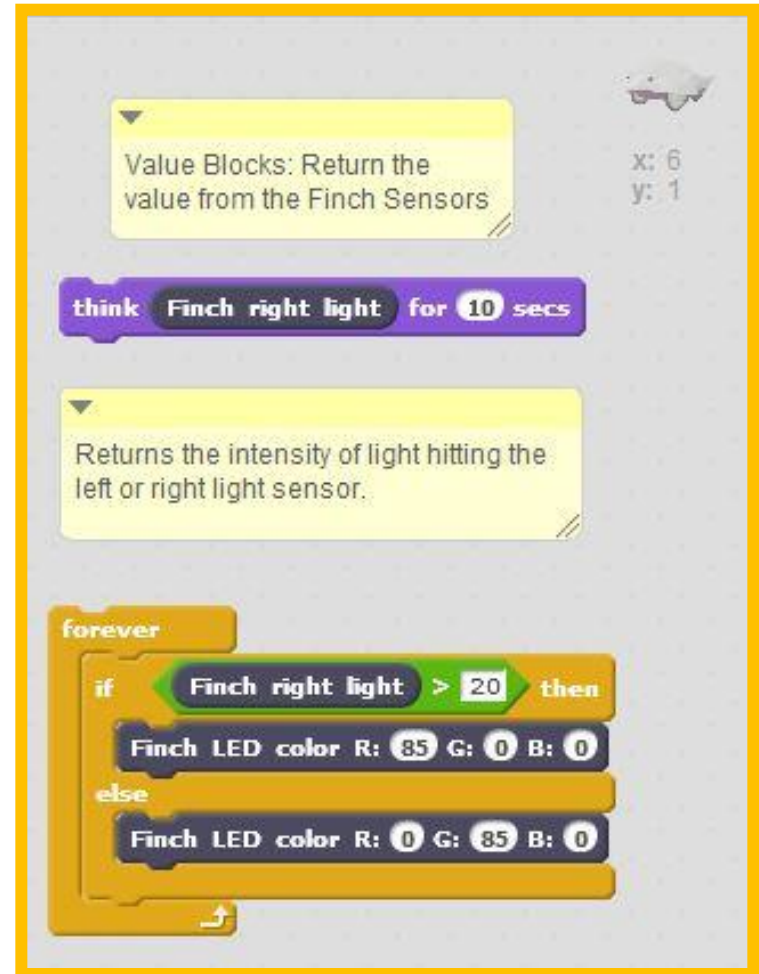
say **Finch temperature** for **10** secs

Returns the current temperature in Celsius.

if **Finch temperature** < **0** then
Speak **Let's fly south!**

x: 0
y: 0

SENSING COMMAND -LIGHT-



The image shows a Scratch script for light sensing. It features a yellow 'Value Blocks' block at the top, a purple 'think' block with 'Finch right light' and a '10' second timer, a yellow 'Returns the intensity of light...' block, and a 'forever' loop containing an 'if' block with a 'Finch right light' sensor block set to '> 20', a 'Finch LED color' block with R: 85, G: 0, B: 0, and an 'else' block with R: 0, G: 85, B: 0. A small Finch icon is in the top right corner, with 'x: 6' and 'y: 1' coordinates below it.

Value Blocks: Return the value from the Finch Sensors

think **Finch right light** for **10** secs

Returns the intensity of light hitting the left or right light sensor.

forever
if **Finch right light** > **20** then
Finch LED color R: **85** G: **0** B: **0**
else
Finch LED color R: **0** G: **85** B: **0**

x: 6
y: 1

SENSING COMMAND – OBSTACLE

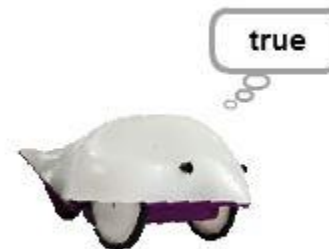
Value Blocks: Return the value from the Finch Sensors

x: 53
y: -71

think Finch left obstacle for 10 secs

These are boolean or predicate blocks, returning true if an object is 1-4" from the sensor and false otherwise.

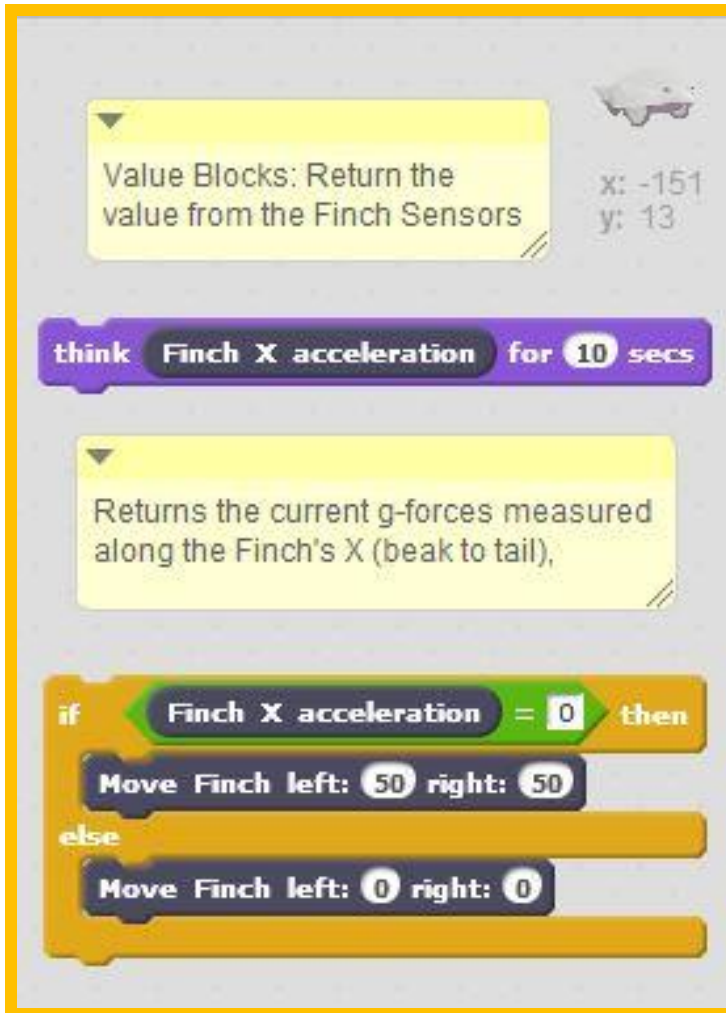
```
forever
  if Finch right obstacle then
    wait 1 secs
    Move Finch left: -40 right: -100
  if Finch left obstacle then
    Move Finch left: -100 right: -40
```



or



SENSING COMMAND – X ACCELERATION



The image shows a Scratch script for a Finch robot. It starts with a yellow 'Value Blocks' block that says 'Return the value from the Finch Sensors'. To its right, a small Finch icon is shown with 'x: -151' and 'y: 13' next to it. Below this is a purple 'think' block: 'think Finch X acceleration for 10 secs'. This is followed by another yellow 'Value Blocks' block: 'Returns the current g-forces measured along the Finch's X (beak to tail)'. At the bottom is an 'if-then-else' block. The 'if' condition is 'Finch X acceleration = 0'. The 'then' block contains 'Move Finch left: 50 right: 50'. The 'else' block contains 'Move Finch left: 0 right: 0'.



X is
Beak
to Tail

Built in accelerometer returns values from -1.5 to 1.5. In this case the X acceleration is approaching it's maximum negative value.

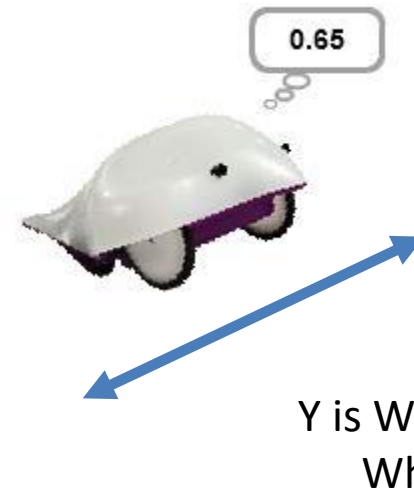
SENSING COMMAND – Y ACCELERATION



The image shows a Scratch script for a Finch robot. It consists of the following blocks:

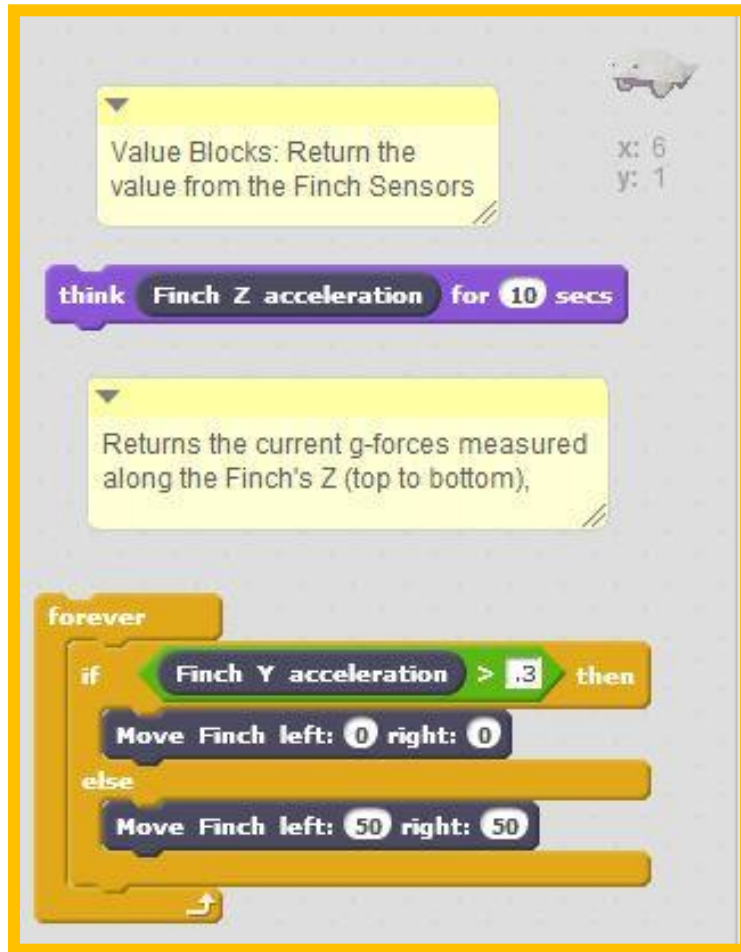
- A yellow 'Value Blocks' block: "Return the value from the Finch Sensors".
- A purple 'think' block: "Finch Y acceleration for 10 secs".
- Another yellow 'Value Blocks' block: "Returns the current g-forces measured along the Finch's Y (wheel to wheel)".
- A 'forever' loop containing:
 - An 'if' block: "Finch Y acceleration > .3 then".
 - A 'Move Finch left: right: 0' block.
 - An 'else' block: "Move Finch left: 50 right: 50".

A blue oval highlights the 'if' block and its associated 'Move Finch' blocks.



Built in accelerometer returns values from -1.5 to 1.5. In this case the Y acceleration has a positive value.

SENSING COMMAND – Z ACCELERATION



The image shows a Scratch script for a Finch robot. It starts with a yellow 'Value Blocks' block that says 'Return the value from the Finch Sensors'. Below it is a purple 'think' block: 'think Finch Z acceleration for 10 secs'. This is followed by another yellow 'Value Blocks' block: 'Returns the current g-forces measured along the Finch's Z (top to bottom)'. At the bottom is a 'forever' loop containing an 'if' block: 'if Finch Y acceleration > .3 then' followed by 'Move Finch left: 0 right: 0', and an 'else' block: 'Move Finch left: 50 right: 50'. In the top right corner, there is a small Finch icon and the coordinates 'x: 6' and 'y: 1'.

Z is Top
to
Bottom



Built in accelerometer returns values from -1.5 to 1.5. In this case the Z acceleration returns a value of 1.

SENSING COMMANDS – ORIENTATION



The image shows a Scratch script for sensing the orientation of a Finch robot. It includes a yellow 'Value Blocks' section with a small Finch icon and coordinates (x: -95, y: -51). Below this is a purple 'think' block for 'Finch Orientation' for 10 seconds. A second yellow section explains that the 'Finch Orientation' block returns the current orientation, with possible responses: level, upside down, beak up, beak down, left wing down, right wing down, and in between. The script concludes with a 'forever' loop containing an 'if' block that checks if the orientation is 'left_wing_down', followed by a 'wait 1 secs' block and a 'turn 15 degrees' block.

Value Blocks: Return the value from the Finch Sensors

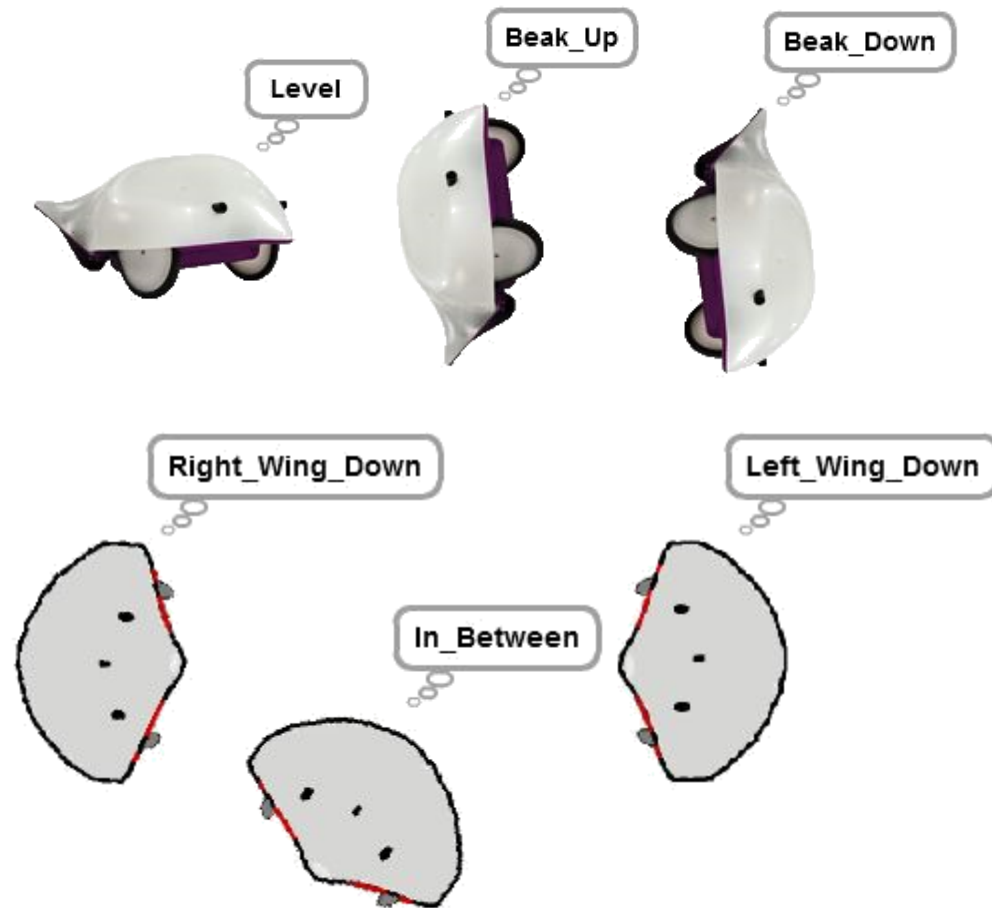
x: -95
y: -51

think Finch Orientation for 10 secs

Returns the current orientation of the Finch, possible responses are: level, upside down, beak up, beak down, left wing down, right wing down, and in between.

```
forever
  if Finch Orientation = left_wing_down then
    wait 1 secs
    turn 15 degrees
```

6 Possible Values to Use



EXAMPLE PROGRAMS

Starter Programs from the Finch Robot website:

GraphAccelerometers - This program graphs the values of all the accelerometers over time.

GraphLightTemperatureObstacles - This program graphs the light sensor values and temperature over time, as well as displaying an X if the left or right obstacle sensors are triggered.

ObstacleAvoider - Finch will go straight unless it sees an obstacle, in which case it turns and backs up.

Ideas from the RMHS Students presentation at MassCUE:

-Ruff Turf: This program causes the Finch to retreat, turn and bark when an object gets too close.

-Which Way's Up: This program uses the Finch Orientation feature to control a sprite's movement on the Scratch stage.

"To Alaska in One Minute: Create a program that allows the Finch to sense when it is too cold and time to fly south for the winter.