

FINCH ROBOT: SNAP LEVEL 4

COPYRIGHT 2017 BIRDBRAIN TECHNOLOGIES LLC

THE FINCH IS A GREAT WAY TO GET STARTED WITH PROGRAMMING. WE'LL USE **SNAP!**, A VISUAL PROGRAMMING LANGUAGE, TO CONTROL OUR FINCH.

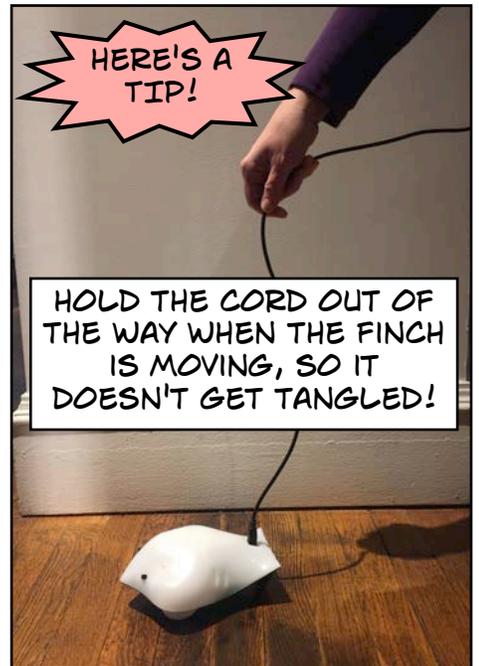


FIRST, PLUG THE FINCH INTO YOUR COMPUTER. USE THE PORT ABOVE THE TAIL.



HERE'S A TIP!

HOLD THE CORD OUT OF THE WAY WHEN THE FINCH IS MOVING, SO IT DOESN'T GET TANGLED!



ON A MAC OR PC, OPEN "BIRDBRAIN ROBOT SERVER."



BirdBrainRobotServer

ON A CHROMEBOOK, OPEN "FINCH CONNECTION APP."



Finch Connection App

A WINDOW WILL APPEAR, LETTING YOU KNOW IF YOUR FINCH IS CONNECTED.

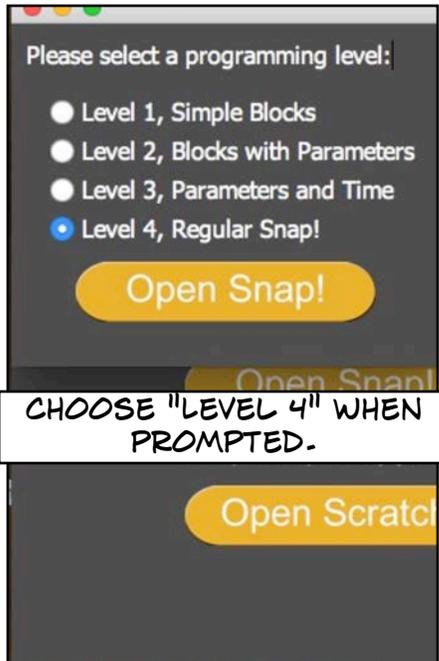
The screenshot shows the Finch Connection App interface. At the top, it says "BirdBrain" and "Finch Connected". Below this is an image of the Finch robot. There are two buttons: "Open Snap!" and "Open Scratch!". A checkbox is next to "Open Snap! locally (no cloud storage)".

Open Snap!

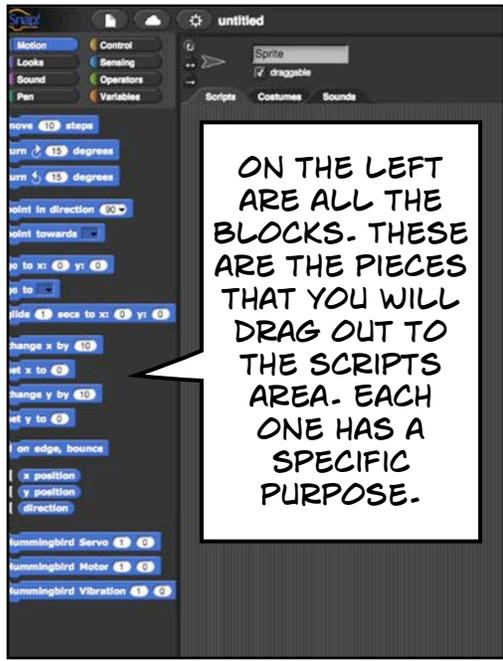
Open Snap! locally (no cloud storage)

Open Scratch

CLICK "OPEN SNAP!"



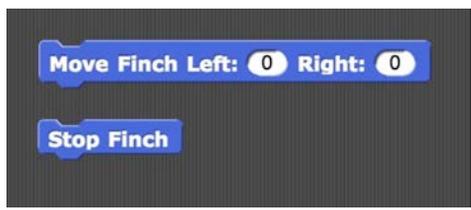
CHOOSE "LEVEL 4" WHEN PROMPTED.



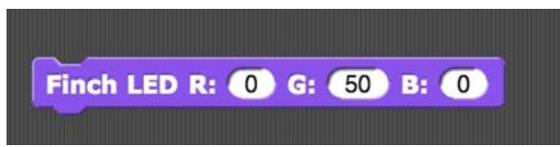
IN THE TOP LEFT, YOU CAN CHOOSE DIFFERENT BLOCK MENUS. SOME OF THE FINCH BLOCKS ARE IN THE **MOTION** MENU, SOME ARE IN THE **LOOKS** MENU, SOME ARE IN THE **SOUND** MENU, AND SOME ARE IN THE **SENSING** MENU.

THERE ARE FOUR MAIN TYPES OF FINCH-SPECIFIC BLOCKS

MOTION BLOCKS



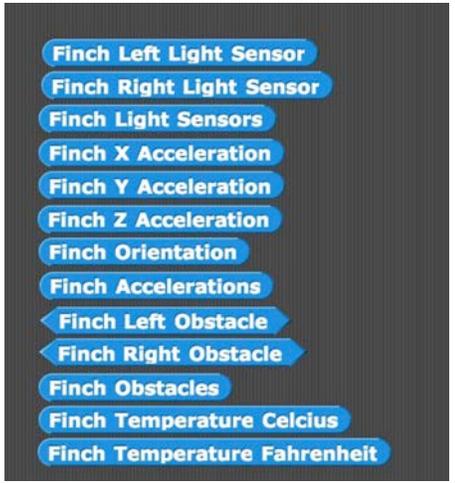
LOOKS BLOCKS



SOUND BLOCKS



SENSOR BLOCKS



FIRST, WE'LL TRY OUT THE MOTION BLOCKS AND GET THE FINCH'S WHEELS ROLLING!

TO USE THE MOTION BLOCKS, WE WANT TO WRITE **PROGRAMS** THAT SNAP! WILL UNDERSTAND. FOR EXAMPLE, LET'S TELL IT:

"MOVE FORWARD AT MEDIUM SPEED FOR ONE SECOND, THEN STOP."

BUT IN ORDER TO DO THAT, WE NEED MORE THAN JUST THE MOTION BLOCKS. WE'LL ALSO NEED THE **YELLOW CONTROL BLOCKS**.



THE **YELLOW CONTROL BLOCKS** ARE USED TO DETERMINE WHEN THINGS HAPPEN IN A PROGRAM.

when space key pressed

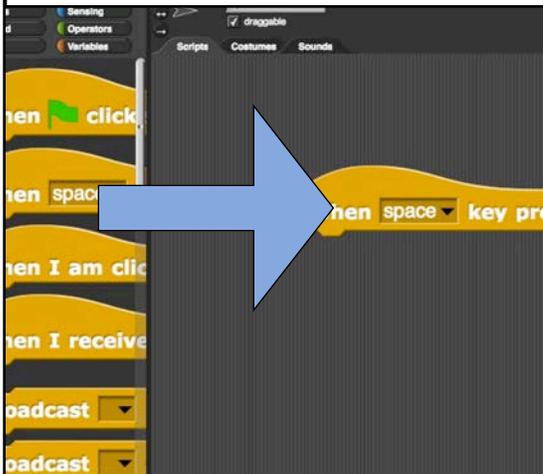
if
else

wait 1 secs

FOR THIS ACTIVITY, WE'LL ONLY NEED TWO CONTROL BLOCKS:

"WHEN SPACE KEY PRESSED" AND "WAIT"

WE'LL BEGIN BY DRAGGING THE "WHEN SPACE KEY PRESSED" BLOCK INTO THE SCRIPTS AREA. SIMPLY DRAG THE BLOCK OUT.



NEXT, GO TO THE MOTION MENU. DRAG OUT THE "MOVE FINCH BLOCK" AND SNAP IT TO THE CONTROL BLOCK LIKE SO. THE MOVE BLOCK HAS SPEEDS BETWEEN 0 AND 100. WE'LL CHANGE THE VALUES TO 50.

when space key pressed

Move Finch Left: 50 Right: 50

YOU CAN TRY IT OUT NOW - CLICK THE SPACE BUTTON AND WATCH THE FINCH'S WHEELS BEGIN TO MOVE.

YOU MIGHT NOTICE THAT IT IS WORKING, BUT THE WHEELS AREN'T STOPPING! WE NEED TO TELL THE FINCH HOW LONG IT SHOULD GO.

HOWEVER, WE NEED TO ADD THE "STOP FINCH" BLOCK TO REALLY END THE PROGRAM. THE "WAIT" BLOCK ENSURES THAT THE FINCH WILL MOVE FOR ONE SECOND BEFORE STOPPING.

when space key pressed

Move Finch Left: 50 Right: 50

wait 1 secs

when space key pressed

Move Finch Left: 50 Right: 50

wait 1 secs

Stop Finch

WE CAN DO THIS BY USING THE "WAIT" BLOCK. YOU CAN MAKE THE FINCH MOVE AS LONG AS YOU'D LIKE.

WHAT HAPPENS IF YOU INSERT NEGATIVE VALUES INTO THE "MOVE" BLOCK?

TO HAVE THE FINCH SPIN IN PLACE, ONE WHEEL NEEDS TO MOVE BACKWARDS (HAVE A NEGATIVE VALUE).

```
when space key pressed
Move Finch Left: 50 Right: -50
wait 1 secs
Stop Finch
```

MOVING FORWARD (OR BACKWARD) IS HELPFUL, BUT YOU MAY NEED TO TURN THE FINCH. TO DO THIS, THE WHEELS NEED TO MOVE AT DIFFERENT SPEEDS.

TO HAVE THE FINCH MOVE IN A CURVED LINE, ONE WHEEL NEEDS TO MOVE SLOWER THAN THE OTHER.

```
when space key pressed
Move Finch Left: 50 Right: 30
wait 1 secs
Stop Finch
```

NOW WE CAN USE OTHER FEATURES OF THE FINCH, SUCH AS BEAK COLOR AND THE BUZZER. REMOVE THE PREVIOUS PROGRAM BY DRAGGING THE MOTION BLOCKS BACK OVER TO THE MENU.

```
when space key pressed
Move Finch Left: 50 Right: 30
wait 1 secs
Stop Finch
```

THE BLOCK THAT CONTROLS BEAK COLOR IS IN THE LOOKS MENU. PULL THE "FINCH LED" BLOCK OUT AND SNAP IT TO THE CONTROL BLOCK.

```
when space key pressed
Finch LED R: 0 G: 50 B: 0
```

TRY ENTERING DIFFERENT VALUES (0-100) IN THE RED, GREEN, AND BLUE SLOTS. WHAT HAPPENS WHEN YOU MIX COLORS?

TO TURN THE BEAK OFF, YOU'LL NEED TO SET ALL THE VALUES TO ZERO.

TO MAKE THE FINCH BUZZ, HEAD TO THE SOUND MENU AND PULL OUT THE "BUZZER" BLOCK.

```
when space key pressed
Finch Buzzer 900 Hz 1000 ms
```

TRY MESSING AROUND WITH THE VALUES. THE FIRST CONTROLS PITCH, WHICH CAN BE SET FROM 50-20,000HZ. THE SECOND IS THE LENGTH OF THE SOUND IN MILLISECONDS.

```
when space key pressed
Finch Buzz+Wait 440 Hz 500 ms
Finch Buzz+Wait 100 Hz 1000 ms
Finch Buzzer 900 Hz 1000 ms
```

IF YOU WANT YOUR FINCH TO "SING," YOU'LL WANT TO USE THE "BUZZ + WAIT" BLOCK. THIS BLOCK HAS A BUILT-IN WAIT THAT ALLOWS THE FINCH TO PLAY ONE TONE AFTER ANOTHER.

NOW YOU CAN MAKE YOUR FINCH MOVE, ALTER ITS APPEARANCE, AND EVEN SING A SONG! BUT WHAT IF YOU WANT THE FINCH TO REACT TO ITS ENVIRONMENT? THE FINCH IS EQUIPPED WITH SENSORS THAT ALLOW YOU TO DO JUST THAT.

FIND THEM IN THE SENSING MENU!



THE ACCELERATION SENSOR REPORTS ON THE FINCH'S ORIENTATION-- WHERE IT IS IN SPACE.

- Finch X Acceleration
- Finch Y Acceleration
- Finch Z Acceleration

THE TEMPERATURE SENSOR DETECTS THE TEMPERATURE AROUND THE FINCH.

- Finch Temperature Celsius
- Finch Temperature Fahrenheit

THE OBSTACLE SENSORS DETECT WHETHER THERE ARE OBJECTS IN FRONT OF THE FINCH.

- Finch Left Obstacle
- Finch Right Obstacle

THE LIGHT SENSORS DETECT LIGHT, ALLOWING THE FINCH TO DETERMINE WHETHER IT IS DARK OR BRIGHT.

- Finch Left Light Sensor
- Finch Right Light Sensor

THE ORIENTATION SENSOR DETECTS THE POSITION OF THE FINCH - BEAK UP, UPSIDE DOWN, ETC.

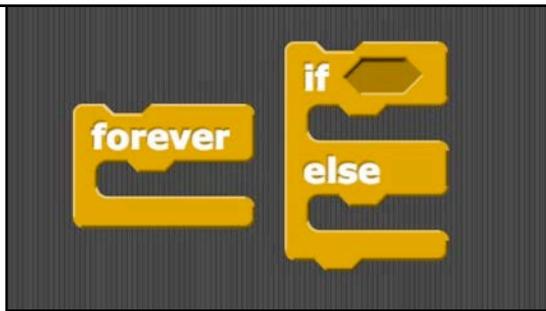
- Finch Orientation

THE OBSTACLE BLOCKS AND THE ORIENTATION BLOCKS ARE BOTH A LITTLE DIFFERENT! OBSTACLE BLOCKS GIVE RESULTS IN **BOOLEAN** (TRUE OR FALSE), AND THE ORIENTATION BLOCK DELIVERS A **STRING** (WORDS). ALL OTHER SENSORS GIVE **NUMBERS**.

LET'S BUILD A **PROGRAM** USING THE SENSORS.

IF THE ROOM IS DARK, TURN THE FINCH'S BEAK ON. IF NOT, KEEP THE BEAK OFF.

THIS PROGRAM IS A LITTLE MORE COMPLEX THAN THE LAST ONE. WE WILL NEED TO USE A FEW MORE OF THE CONTROL BLOCKS, SPECIFICALLY THE "IF, ELSE" BLOCK AND THE "FOREVER LOOP" BLOCK.



THE "IF, ELSE" BLOCK IS LIKE A LITTLE SENTENCE:

IF (SOME CONDITION IS MET),
THEN DO THIS **ACTION**, OR **ELSE**
DO THIS OTHER **ACTION**.

BUT WHAT GOES IN THE **FIRST** PART OF THE "IF, ELSE" BLOCK?

Finch Left Light Sensor

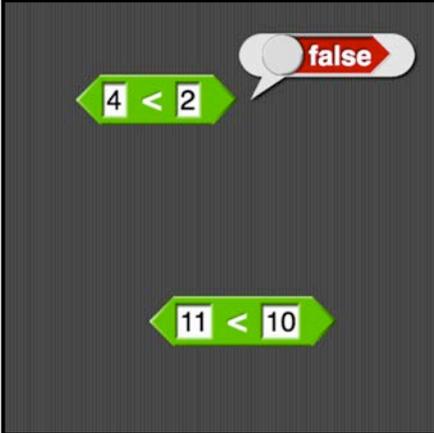


THAT'S WHERE WE'LL PUT THE SENSING BLOCKS...AS WELL AS SOME GREEN BLOCKS CALLED **OPERATORS**. THEY CAN BE FOUND IN THE OPERATORS MENU.

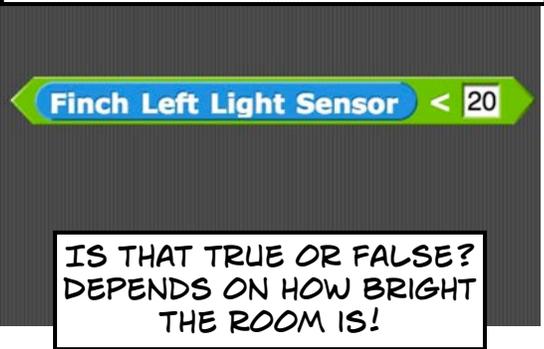
WITH THE GREEN **OPERATOR** BLOCKS, WE'RE GOING TO LOOK AT TWO SYMBOLS YOU MIGHT REMEMBER FROM MATH CLASS:

< (LESS THAN)
> (GREATER THAN)

IF YOU PUT IN SOMETHING **FALSE**...LIKE THAT 9 IS MORE THAN 10, IT WILL TELL YOU WHEN YOU CLICK ON IT!



WE CAN PUT OUR **SENSORS** IN THESE BLANKS!
FOR EXAMPLE, THIS IS SAYING "THE LIGHT HITTING OUR SENSOR IS LESS THAN 20"!



NOW, WE NEED TO SET THE FIRST ACTION FOR THE "IF, ELSE" BLOCK. DRAG THE BEAK LED BLOCK INTO THE FIRST SECTION OF THE "IF, ELSE" BLOCK.



WE CAN HAVE THE SENSOR CHECK THE LIGHT IN THE ROOM -TO DO THAT, WE'LL PUT OUR OPERATOR INSIDE THE "IF, ELSE" BLOCK DIAMOND.

DRAG THE GREEN BLOCK HERE.

TIP: SNAP ON A "WHEN SPACE KEY PRESSED" AT THE TOP TO BE AN ON SWITCH!

NOW YOU HAVE THIS PROGRAM:
IF THE LIGHT HITTING OUR SENSOR IS LESS THAN 20, TURN THE BEAK BLUE!

DOES IT WORK? IF NOTHING CHANGES, TRY TURNING OFF THE LIGHTS IN THE ROOM AND TRYING AGAIN!

BUT, WHAT IF YOU TURN THE LIGHTS BACK ON? HOW DO YOU GET THE LED TO TURN OFF WHEN IT'S NOT NEEDED?

THIS IS WHERE THE ELSE STATEMENT COMES IN.

WE WANT TO CREATE A PROGRAM THAT SAYS: IF THE LIGHT HITTING OUR SENSOR IS LESS THAN 20, TURN THE LED TO 100. OTHERWISE, TURN THE LED TO ZERO.

THE ELSE IS THE SECOND PART OF THIS STATEMENT. ELSE APPLIES WHEN THE FIRST IF CONDITION IS NOT MET.

ADDING THE ELSE ACTION IS EASY - IT'S JUST LIKE ADDING THE FIRST IF ACTION.

THIS TIME, WE'LL SET THE LED INTENSITY TO ZERO - COMPLETELY OFF.

AS IT STANDS, THAT STATEMENT WILL ONLY CHECK THE ROOM ONCE. TO HAVE IT CONSTANTLY CHECK, PUT EVERYTHING INSIDE A "FOREVER" BLOCK. THE "FOREVER" BLOCK CAN BE FOUND IN THE CONTROL MENU.

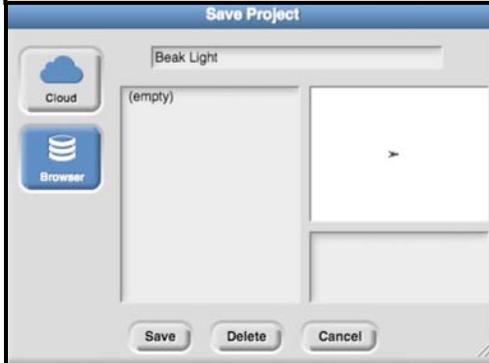
LET'S TEST IT AGAIN! TRY THE FLIPPING LIGHTS ON AND OFF.

BE SURE TO SAVE YOUR WORK!

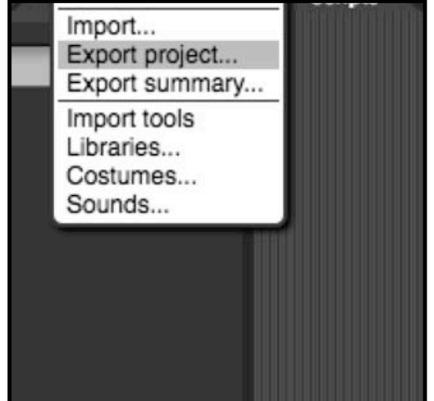


THERE ARE A FEW WAYS TO DO THAT. FIRST, YOU CAN CHOOSE "SAVE PROJECT IN THE CLOUD." YOU'LL NEED TO CLICK "SIGN UP" AND CREATE AN ACCOUNT TO DO THAT.

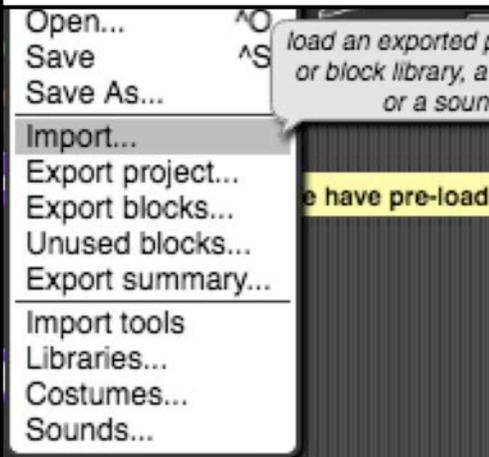
YOU CAN CHOOSE "SAVE PROJECT IN THE BROWSER". THIS ONE IS A LITTLE RISKY BECAUSE IT ONLY SAVES TO ONE COMPUTER AND CAN DISAPPEAR IF SOMEONE CLEARS THE CACHE.



FINALLY, YOU CAN EXPORT THE PROJECT AS AN XML FILE. THIS FILE CAN BE SAVED ON THE COMPUTER AND SHARED WITH OTHERS.



TO OPEN A PROJECT FROM AN XML FILE, CLICK ON IMPORT AND THEN CHOOSE THE .XML FILE YOU WANT.



THESE ARE JUST A FEW OF THE THINGS YOU CAN DO WITH THE FINCH ROBOT! CHECK WWW.BIRDBRAINTechnologies.com FOR MORE IDEAS, LESSONS, AND ACTIVITIES.

