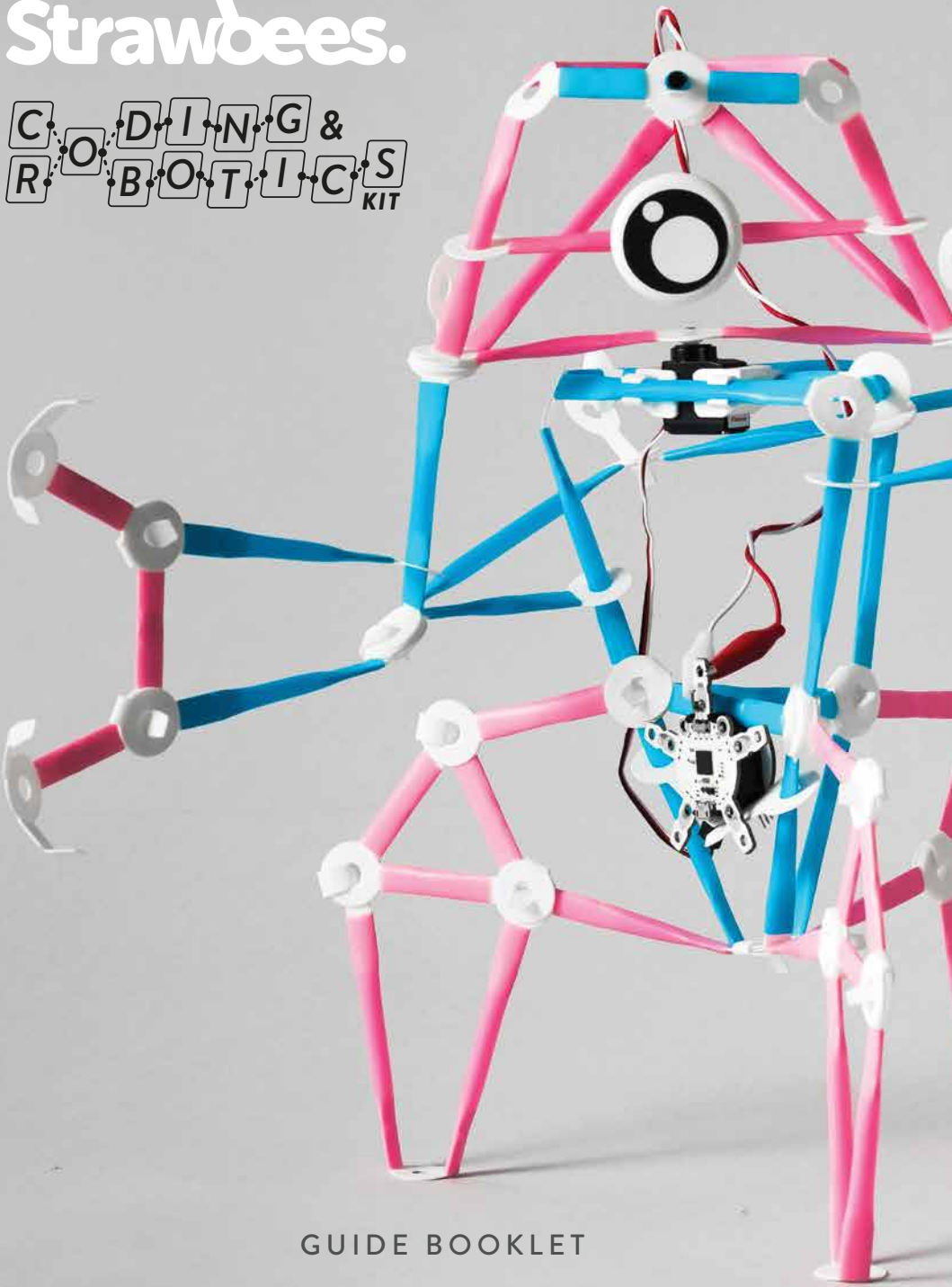
Strawbees.

CODING & ROBOTICS KIT



GUIDE BOOKLET

DEAR MAKER,

Every project you will create with this kit is a process. We believe it is important to encourage multiple attempts to create something new. Through the process of experimentation, testing ideas, prototyping then modifying your project the result that is not important, but the journey and exploration. We encourage everyone to curiously embrace our challenges with a great sense of enthusiasm and humor because we believe that problem solving with a positive attitude fosters creativity.

When you first open the box the Quirkbot is programmed, ready-to-use for the simple exploration of building a robot. Use the challenges found at the back of this booklet to expand your skills to build and program your own projects using the three Strawbees CODE modes available at **code.strawbees.com**.

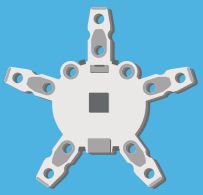
As you read through the tips and tricks you can understand how to use the Quirkbot and the components with ease. **The projects serve as inspiration to get started; we encourage you to use your imagination, and modify them for a different outcome each time.** You can find more activities and support for Strawbees construction-techniques and learning how to use Strawbees CODE at **learning.strawbees.com**.

Welcome to our community of endless ideas put together solely to support your creativity. If you have any questions, we will be happy to address them at education@strawbees.com

Happy making!

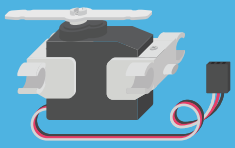
The Strawbees team

IN THE BOX



QUIRKBOT

SERVO BACKPACK



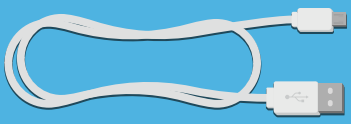
SERVO MOTOR

ELECTRIC STRAWBEE

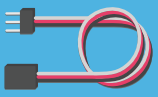
DUAL COLORED LEDS

LIGHT SENSOR

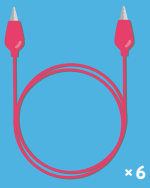
MINI SCREWDRIVER



USB CABLE



SERVO EXTENSION CABLE



ALLIGATOR CLIPS

SNAP-ON EYES WITH STICKERS

BOOTS

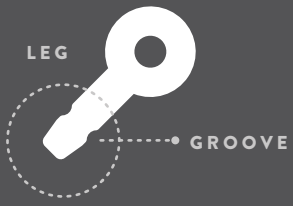
MAGNETIC DUCK FEET

CONTENTS

STRAWBEES TIPS & TRICKS

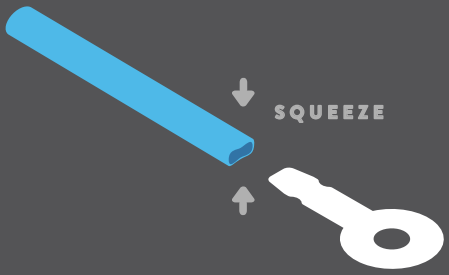
STRAWBEES CONNECTORS

Strawbees are connectors that can be used for combining straws, connectors, cardboard, and many types of materials.



CONNECTING TO STRAWS

Squeeze the opening of the straw for easy insertion.



CONNECT & LOCK

OR

Slip the head into the groove of the leg and **listen for the click**. This will secure connectors and allow rotation.

Push the leg **all the way through** the head to lock in place. The connectors are limited in rotation.

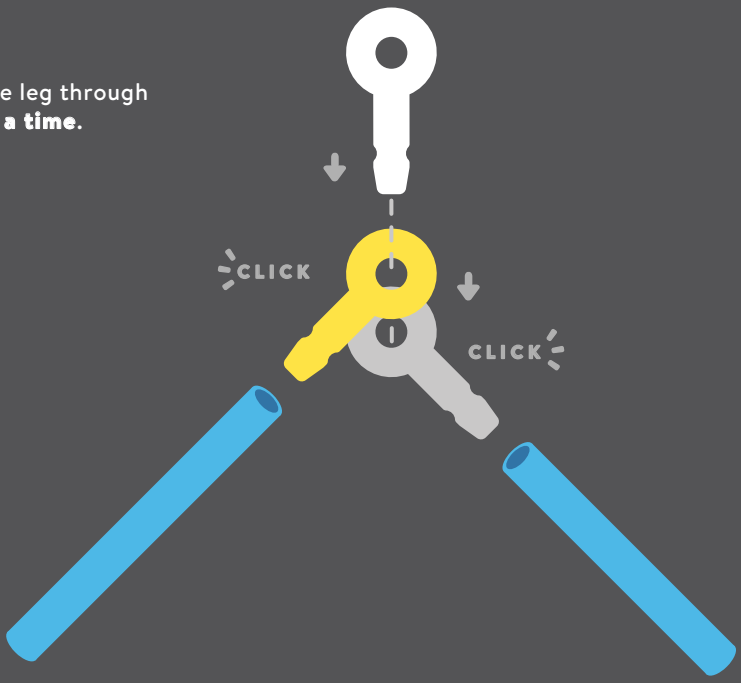
LOCKING STRAWS

You can lock the straws in place to prevent slipping.

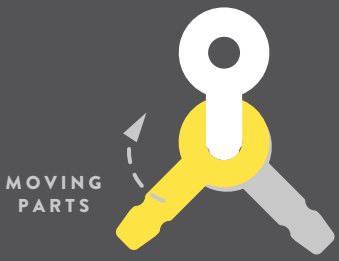
Snap onto the **groove**.

JOINT

Push the Strawbee leg through each head **one at a time**.



MOVING JOINT

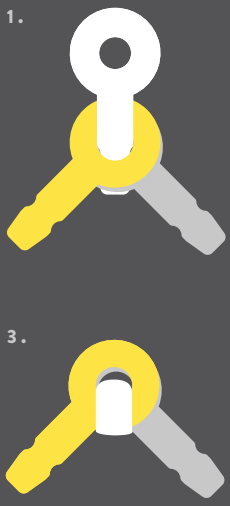


Snap the heads of connectors into the groove of another connector to create a fully rotating joint.

LOCKED JOINT

Push the leg all the way through to create a joint with limited movement.

FRICTION LOCK



FOLD THE HEAD ALL THE WAY TO THE BACK

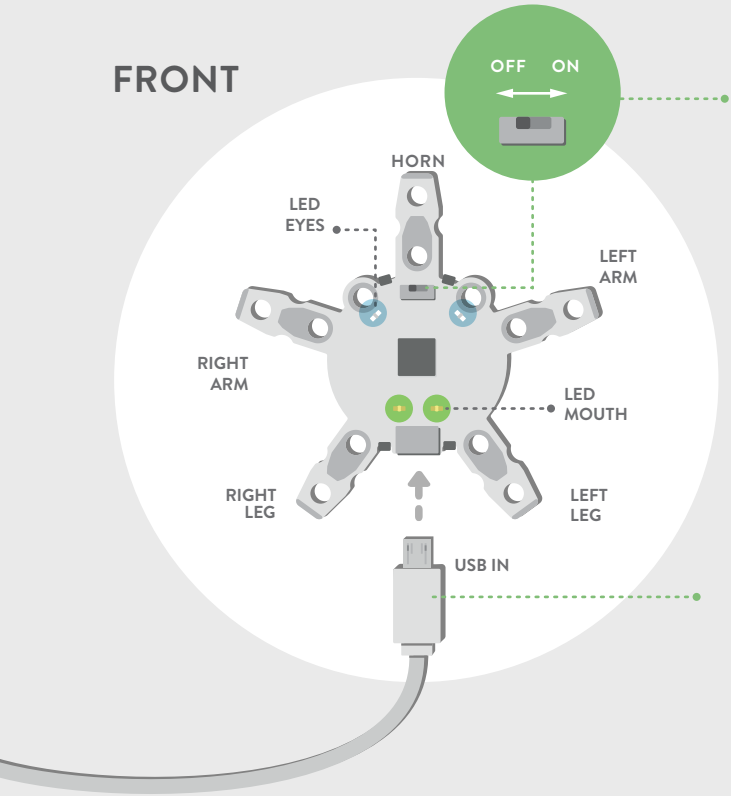
PUSH THE LEG THROUGH THE HOLE TO LOCK

With the moving joint fold the head over to the other side and snap it into the groove to create a friction lock. The legs will shift and hold in different positions.

QUIRKBOT TIPS & TRICKS

When you first pick up the Quirkbot we need to understand and become familiar with the parts that make the hardware work. The orientation is always described from the Quirkbot's perspective. The left arm is on your right - just like when you face another person.

FRONT



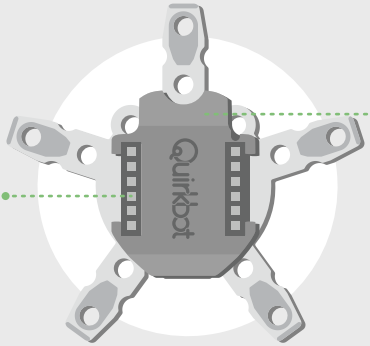
TURNING IT ON

Slide the on-off switch to the right. Every time you turn on the Quirkbot it will start blinking to say, "*Hello!*"

PROGRAMING & CHARGING

Connect to a computer to upload programs and plug to a power source to charge it. The red LED in front turns off when the battery is fully charged.

BACK



BACKPACK PORT

For plugging in different types of backpacks.

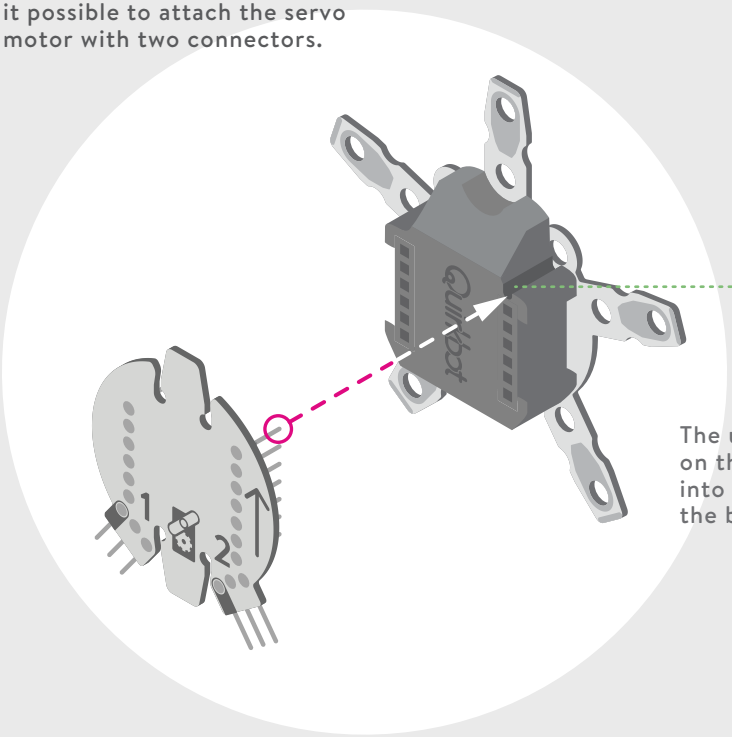
BATTERY

The rechargeable battery.

IMPORTANT!
The Quirkbot gets its power from the battery (just like a mobile phone). So if it is out of charge or has a very low charge it won't work. If you are experiencing problems please turn the Quirkbot off and charge it for 30 minutes.

SERVO BACKPACK

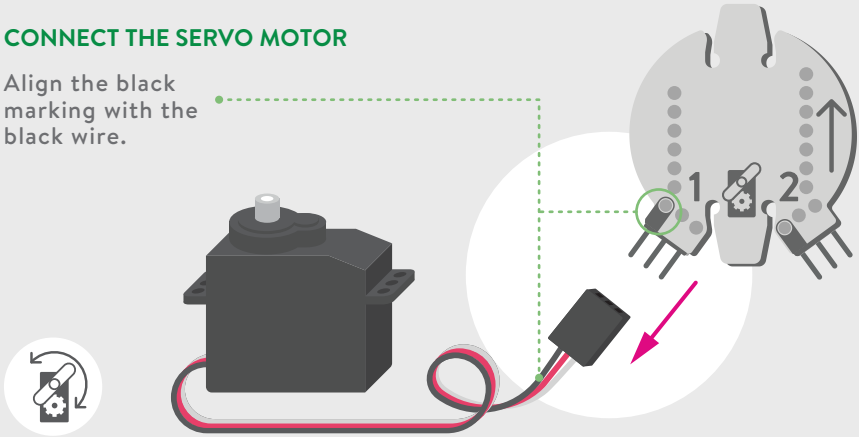
Backpacks gives the Quirkbot additional abilities. The servo backpack provided in this kit makes it possible to attach the servo motor with two connectors.



The uppermost pin on the backpack fits into the open slot on the backpack port.

CONNECT THE SERVO MOTOR

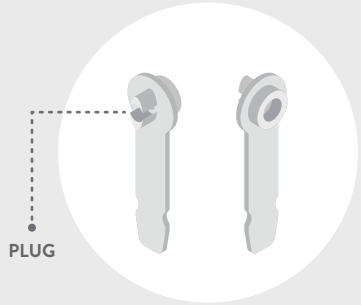
Align the black marking with the black wire.



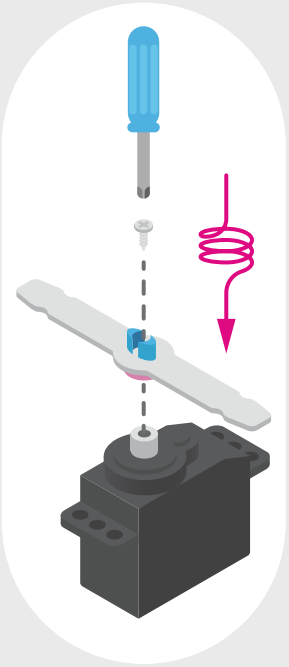
QUIRKBOT

STRAWBEE SERVO ARM

This is the servo arm to attach to the servo. Optionally fasten the arm with screws.

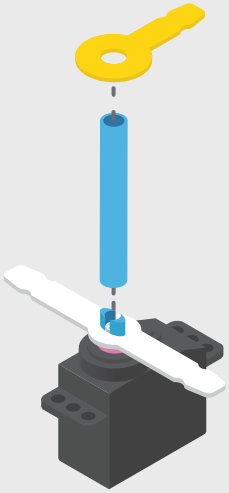


Attach the arm with the little screw to the servo motor.

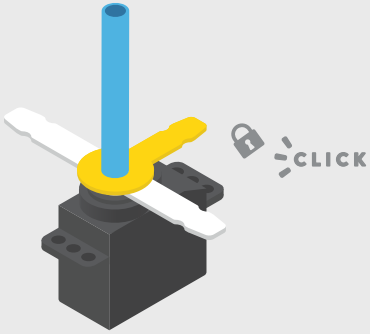


CONNECT TO PLUG

1.

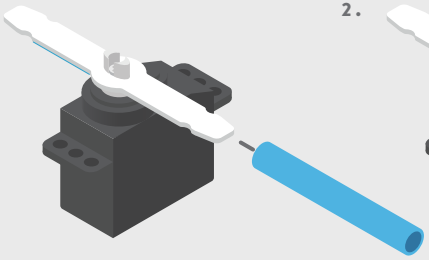


2.

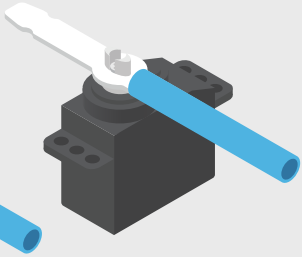


CONNECT TO ARM

1.

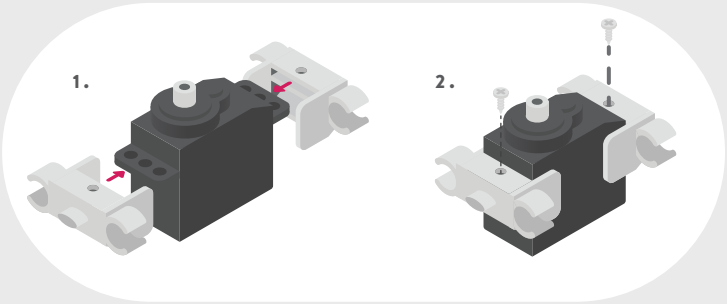


2.



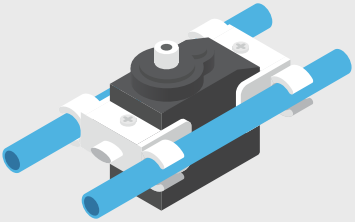
SERVO MOUNT

Attach the set of mounts onto the tabs of the motor and optionally secure with the screws.

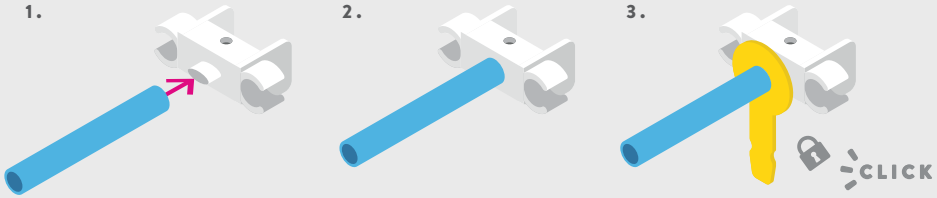


Here are three examples of how to attach the motor mounts to constructions:

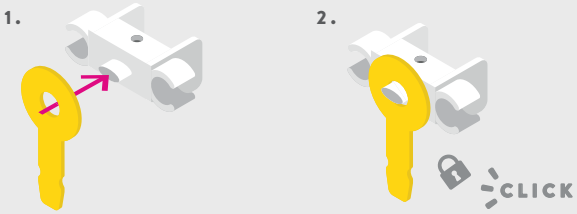
STRAWBEE SNAPS



STRAW PLUG

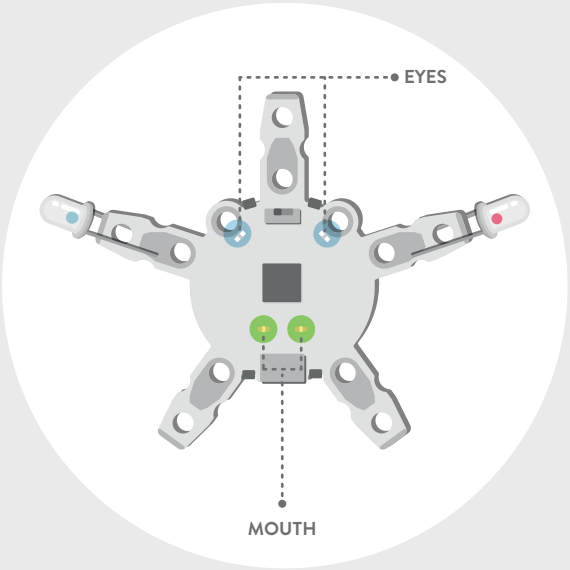


STRAWBEE PLUG



LEDS

Make projects light up with LEDs, known as light-emitting diodes, in the following ways:

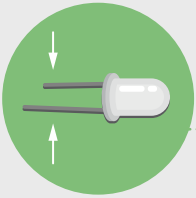


BUILT-IN EYES AND MOUTH

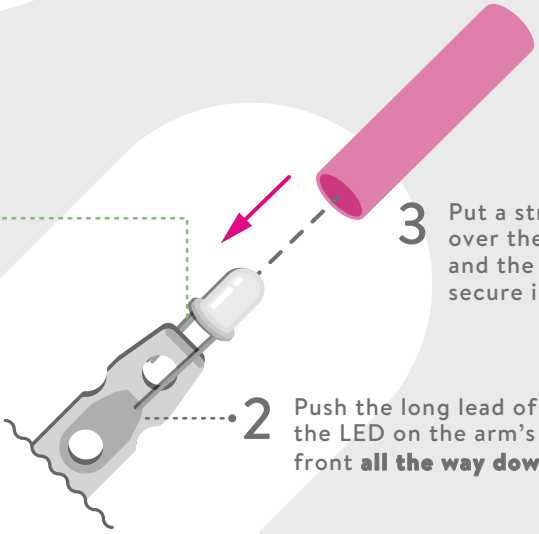
The Quirkbot has 2 blue LEDs for eyes and 2 green LEDs for the mouth. Program these with the LED node.

DUAL COLOR LEDS

From the box you can place the dual color LEDs on the arms, legs and horn of the Quirkbot. These can be programmed from blue to red using the Dual Color LED nodes.



1 Squeeze the leads gently together to make them grip the arms better.



2 Push the long lead of the LED on the arm's front **all the way down.**

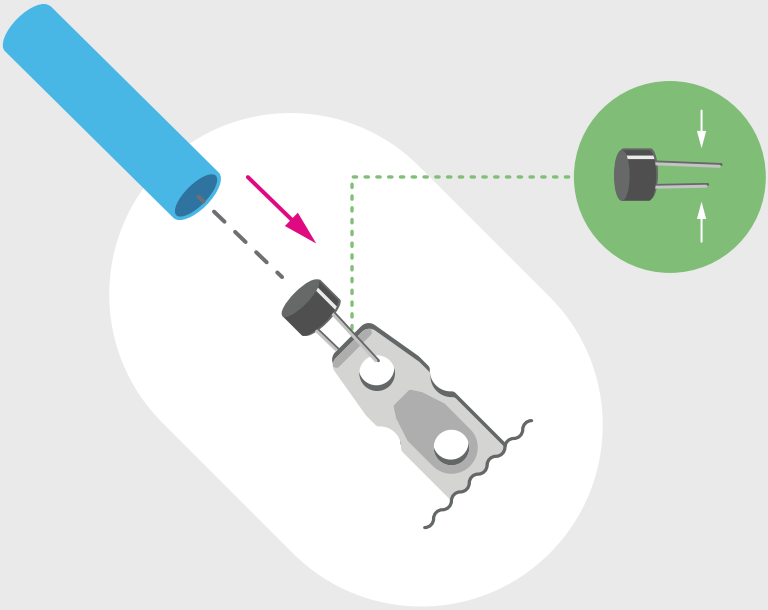
3 Put a straw over the LED and the arm to secure in place.

Try It!
When you first turn on the Quirkbot the left and right arms are already prepared to light up.

LIGHT SENSOR

This sensor measures the amount of light present and communicates how much it reads to the Quirkbot.

You can, for example, use the Light Sensor to trigger your creations when you turn on or off a ceiling lamp, shine a flashlight on it or point it toward the sun.

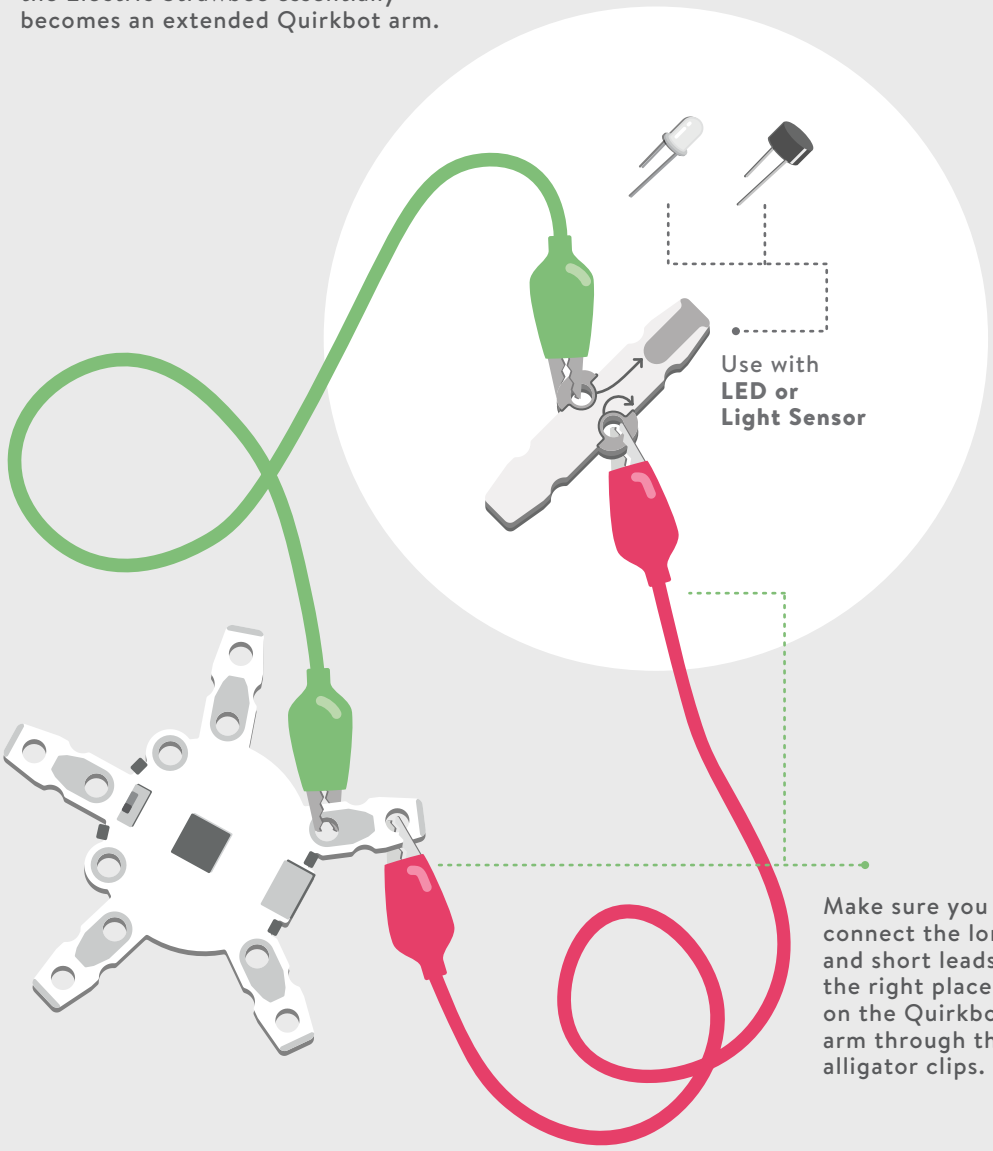


Just like the LED, you press the leads on the Light Sensor together a little bit, to make it hold on to the Quirkbot arm. Optionally slide a piece of straw over to hold it in place.

Remember: the **long lead** must be on top of the **front side** of the Quirkbot.

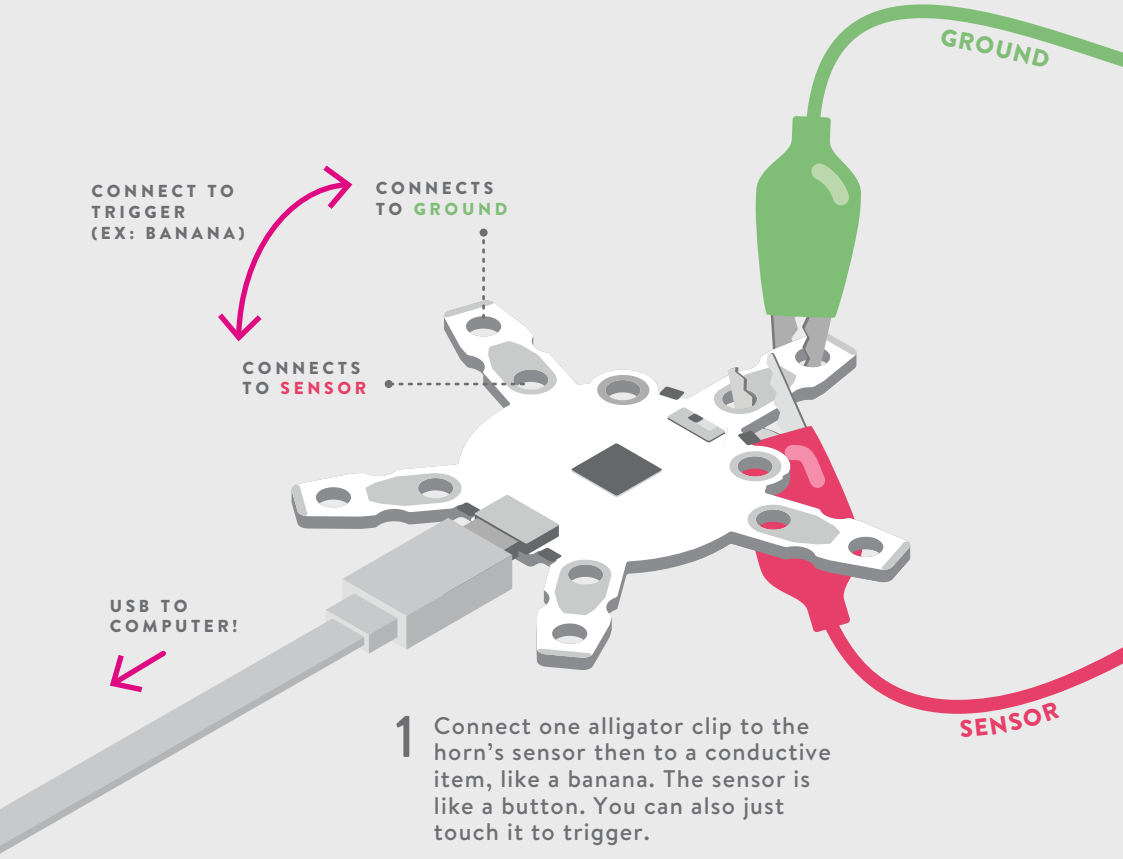
ELECTRIC STRAWBEE

This component makes it possible to put an LED or a light sensor on a different place than directly on the Quirkbot. By using the **alligator clips**, the Electric Strawbee essentially becomes an extended Quirkbot arm.

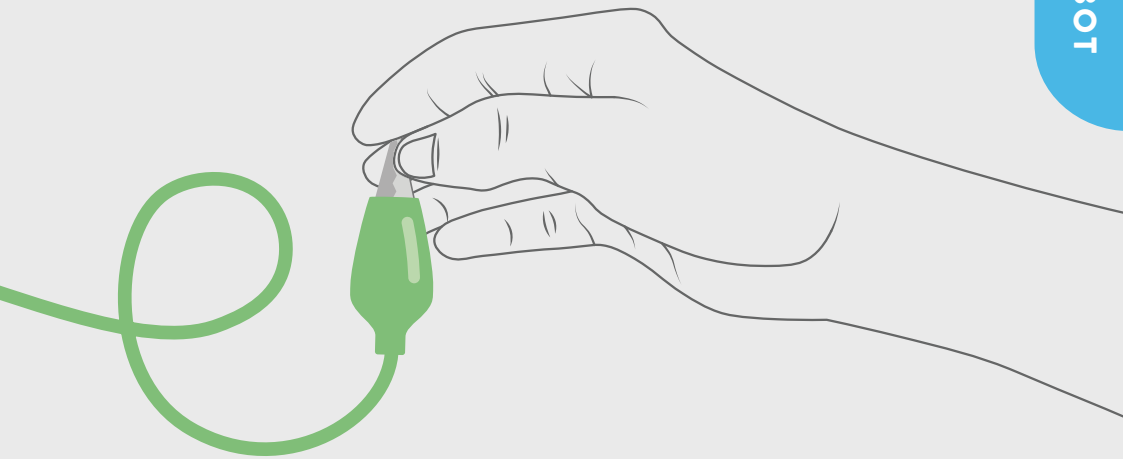


CIRCUIT TOUCH

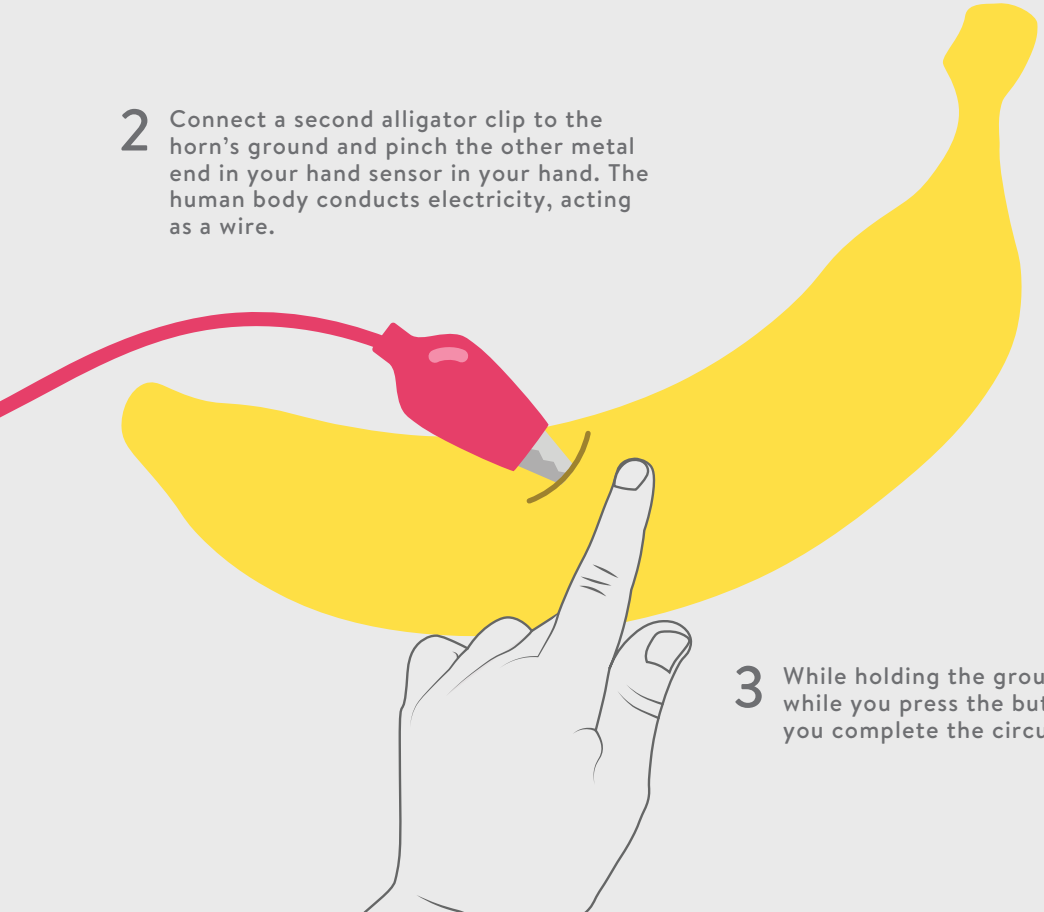
This function transforms all conductors of electricity into a touch function for a switch. Use the alligator cables to extend the touch function to conductive materials such as fruit, plants, metal objects, and fellow humans.



1 Connect one alligator clip to the horn's sensor then to a conductive item, like a banana. The sensor is like a button. You can also just touch it to trigger.



2 Connect a second alligator clip to the horn's ground and pinch the other metal end in your hand sensor in your hand. The human body conducts electricity, acting as a wire.

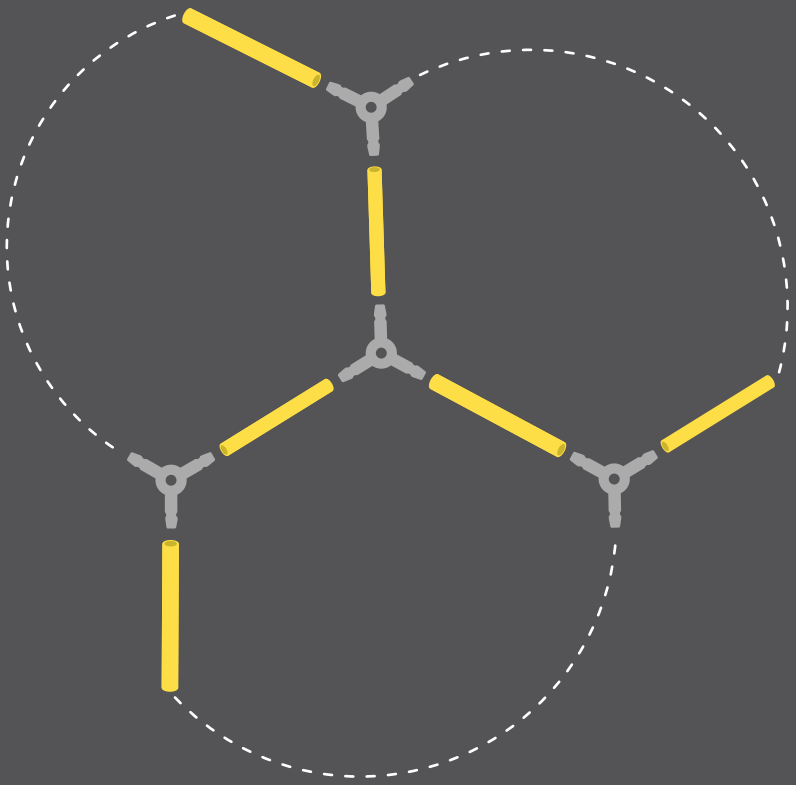


3 While holding the ground while you press the button you complete the circuit.

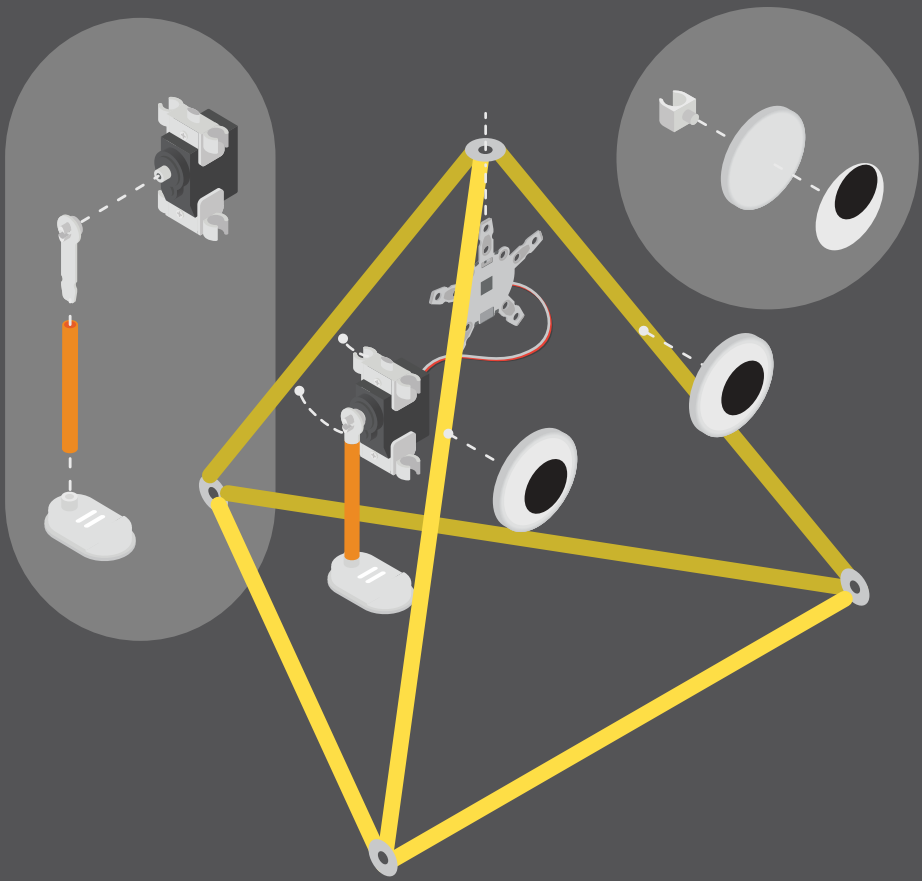
BUILD A ROBOT

Create a racing robot to travel across the room in the straightest line possible. When you first use the Quirkbot in this box you can use the preprogrammed settings to make a robot body with the servo motor and foot attached.

1 Build the body of your walker using geometric shapes.



2 Create the leg of your walker then attach.



3 When testing your robot's walking patterns, try to identify the parts of movement:

- *Leg length*
- *Starting point of foot*
- *Servo Speed*
- *The position of the Quirkbot and body's movement for proper balance*

FLOW-BASED PROGRAMMING

To create a program in **flow-based programming** you add nodes and connect them together, forming a network where data flows continuously.

NODE CATEGORIES

There are three categories of nodes: **INPUT**, **BRAINS** or **OUTPUT**. They are represented on your screen by boxes of different colors.

INPUT

Information from the physical world.

For humans this can be: hearing, seeing or touching.

For Quirkbots this is: reading different sensors like light or touch.

BRAINS

Something that manipulates or generates information.

For humans this can be: thinking about something.

For Quirkbots this is: generating data, reading values, maths or logic.

OUTPUT

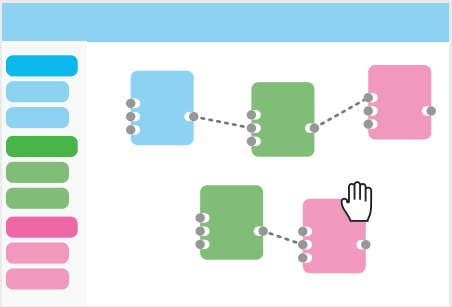
The ability to control something in the physical world.

For humans this can be: moving your arms or talking.

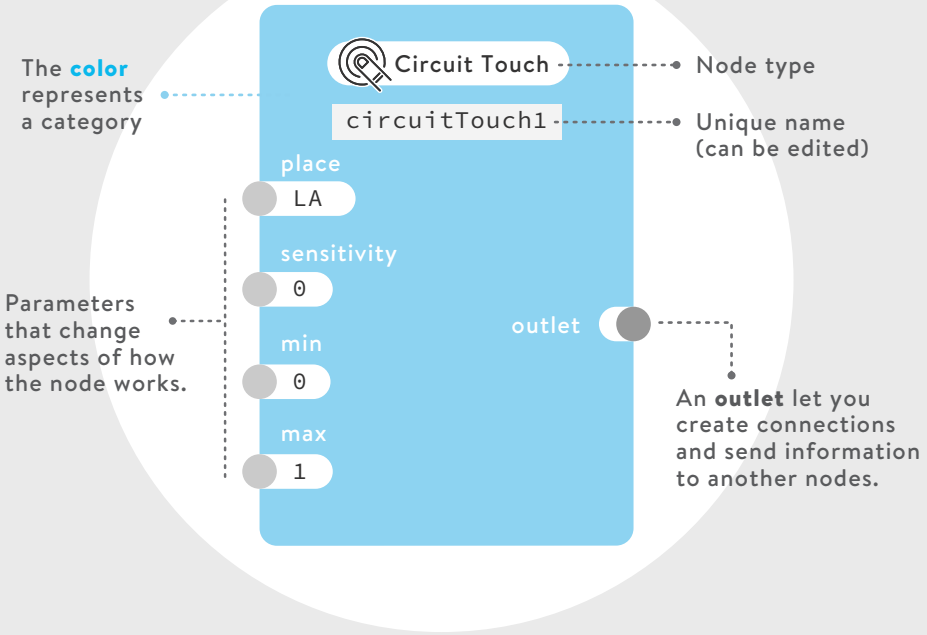
For Quirkbots this is: moving motors, blinking LED lights, or typing on the keyboard.

PROGRAMMING WORKSPACE

All the available nodes are displayed in the menu on the left. Drag and drop a node from the menu onto the **workspace** to create your program. Nodes can be moved around, modified and connected as you like.

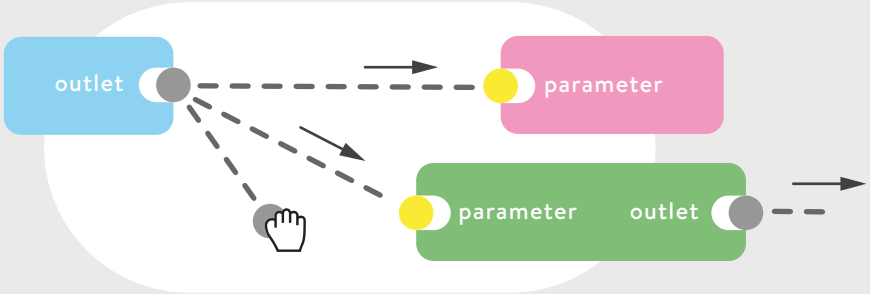


PARTS OF A NODE



CONNECTIONS

Connections let you **send data** from one node to another. You make a connection by dragging the outlet of a node and dropping it in the parameter of another node. Once connected, data flows continuously **from** the outlet **to** the parameter.



PARAMETERS

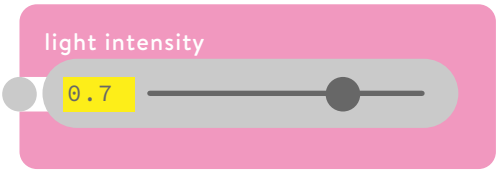
Parameters hold **values** that are important to the node.
By changing the values you change how the node works.
You decide if a parameter is **fixed** or **connected** to an outlet.

FIXED PARAMETER
(value doesn't change)

CONNECTED PARAMETER
(value changes when the connected outlet changes)

NUMBER PARAMETERS

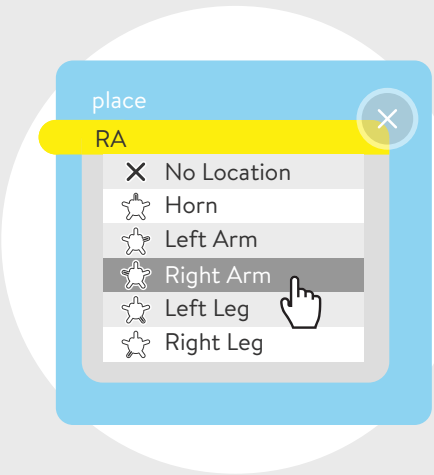
Many nodes have **number parameters.** You can set their value by using the slider or by typing directly into the box. Most numbers parameter go from **0 to 1**, enabling you to connect them directly to most outlets.



OPTION PARAMETERS

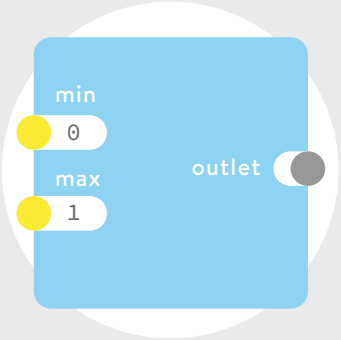
Some nodes have **option parameters.** You can select their value by clicking on a item from the **drop-down** list or by writing the exact name of the option in the box.

Many input and output nodes have a **place** option parameter that represents where they exist in the **physical world.**



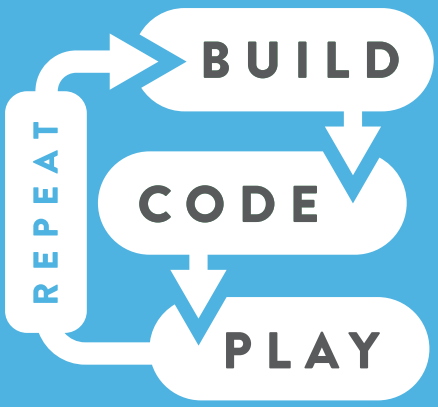
MIN & MAX PARAMETERS

Many nodes have **minimum** and **maximum** number parameters that control the **smallest** and **largest** values sent by the outlet.



UPLOADING YOUR PROGRAM

Once your program is ready you can **upload** it to the Quirkbot by clicking on the **UPLOAD** button. Make sure your Quirkbot is **charged**, **turned on** and connected to a **USB port.** (See the Quirkbot tips & tricks in this booklet on charging)


BUILD
CODE
PLAY
REPEAT

CHALLENGES

CRANKY BAT
MUSICAL INSTRUMENT
AFRAID-OF-THE-DARK PIG
BLINKING STAR
BANANA CRANE
FRIENDBOT

You can find more projects online at learning.strawbees.com with the keyword of each project.

CRANKY BAT

Early to rise in the evening, but really cranky when woken up in the daytime. Use the light sensor with the servo motor to construct a cranky bat when the sunshine interrupts its nap.

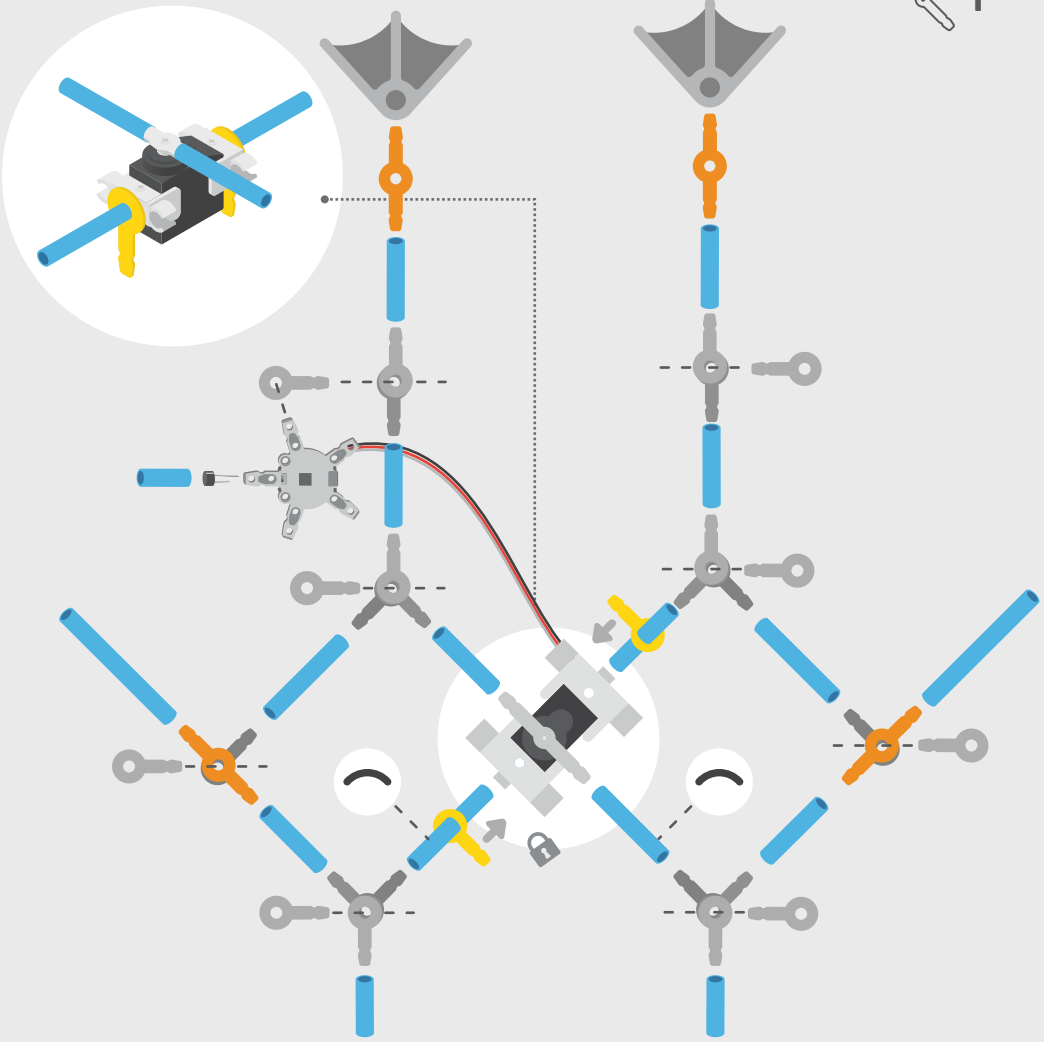
Search for “cranky bat” at learning.strawbees.com/

28 4 2

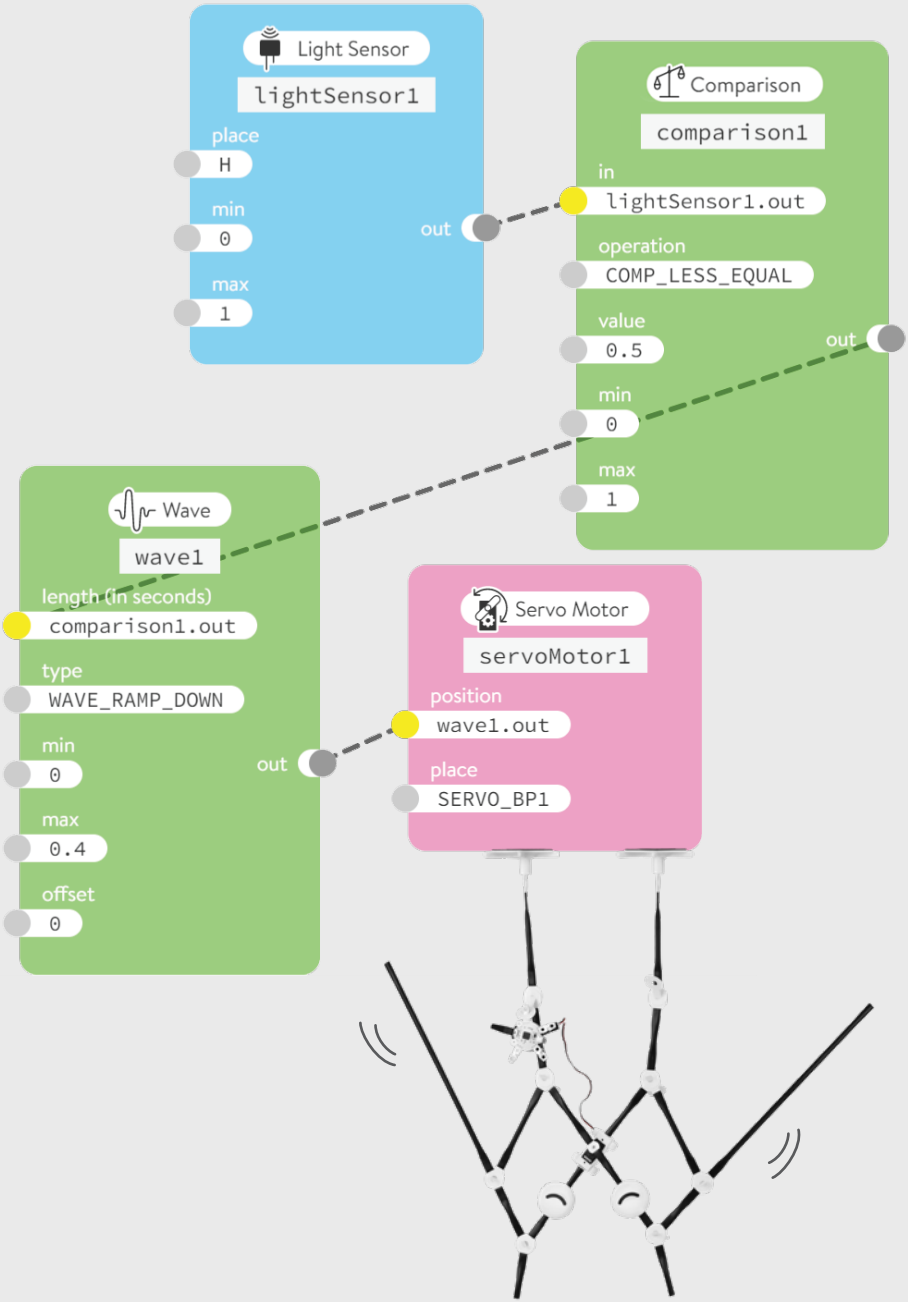
1 2 1

1 1

1



CODE

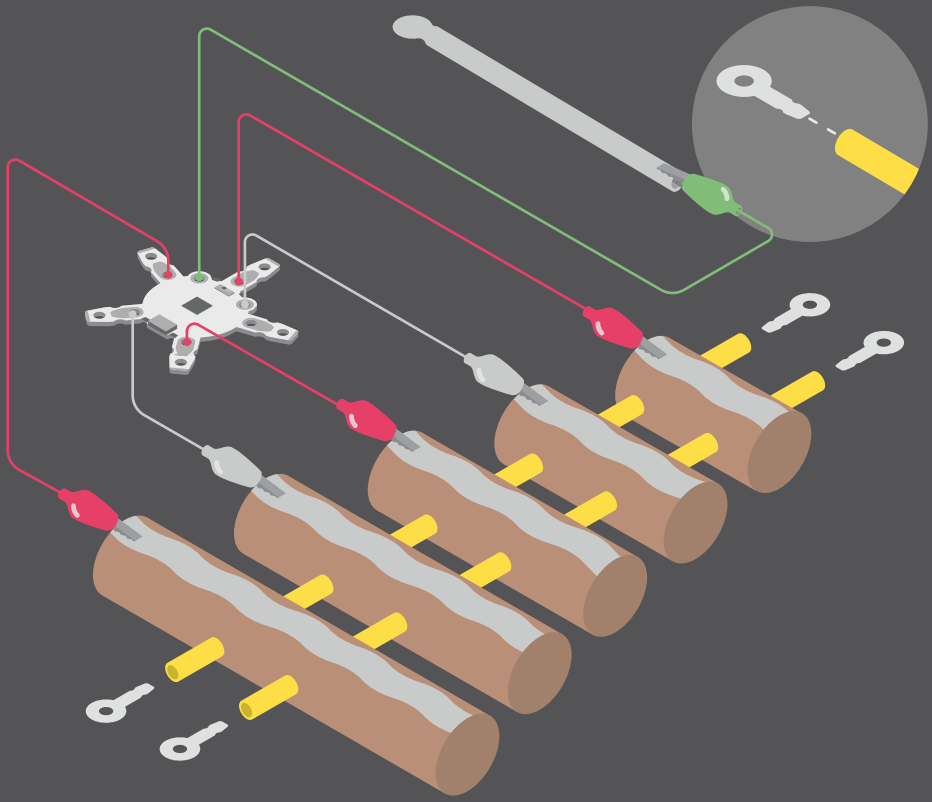

Light Sensor
lightSensor1
place
H
min
0
max
1
out
Comparison
comparison1
in
lightSensor1.out
operation
COMP_LESS_EQUAL
value
0.5
out
min
0
max
1
Wave
wave1
length (in seconds)
comparison1.out
type
WAVE_RAMP_DOWN
min
0
max
0.4
offset
0
out
Servo Motor
servoMotor1
position
wave1.out
place
SERVO_BP1

MUSICAL INSTRUMENT

Rock out with a cardboard instruments made entirely with conductive materials. Program a keyboard with circuit touch and key press nodes to send commands from your instrument to a computer music application and mix sounds.

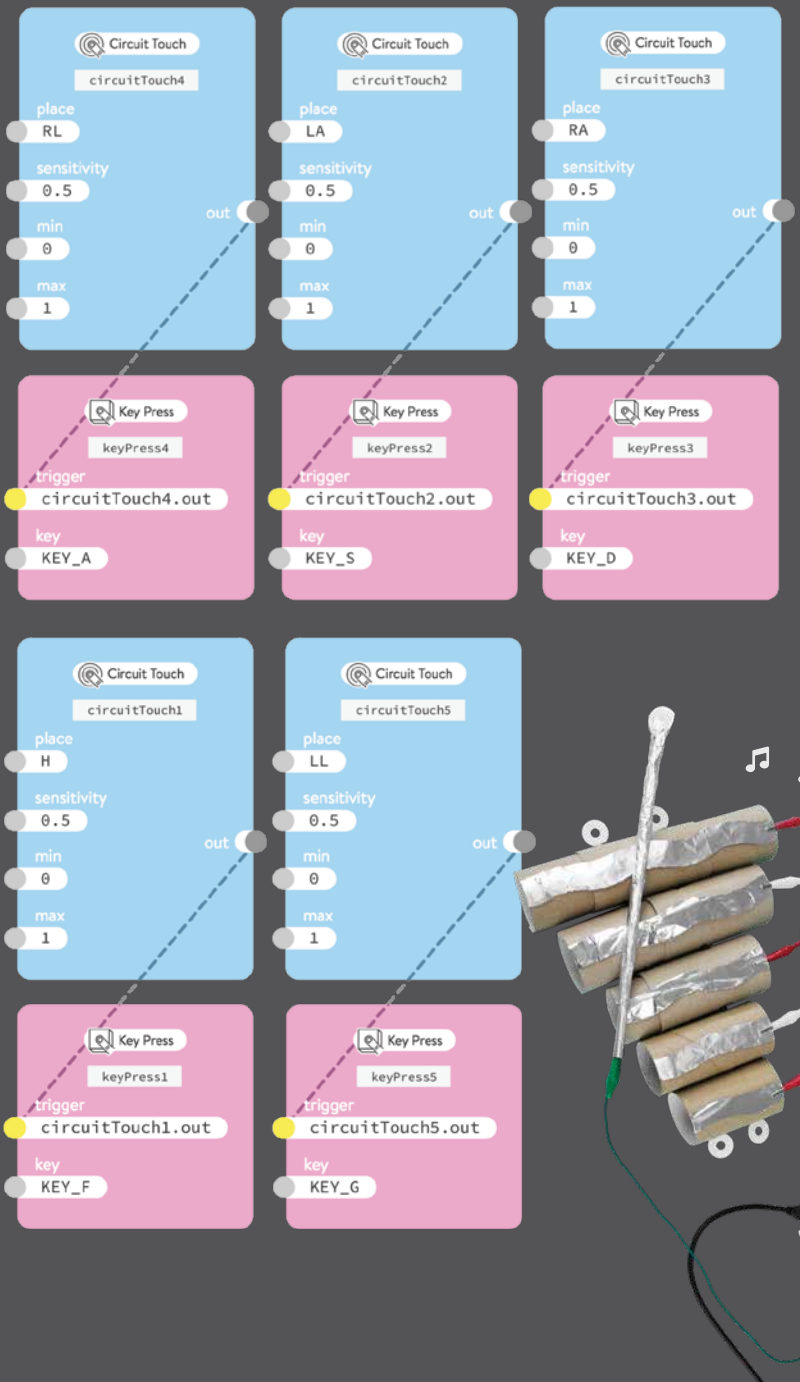
Search for “musical instrument” at learning.strawbees.com/

Materials:
Aluminium foil, computer
4 x Paper towel rolls



For lots of cool sounds go to:
strawbees.com/music

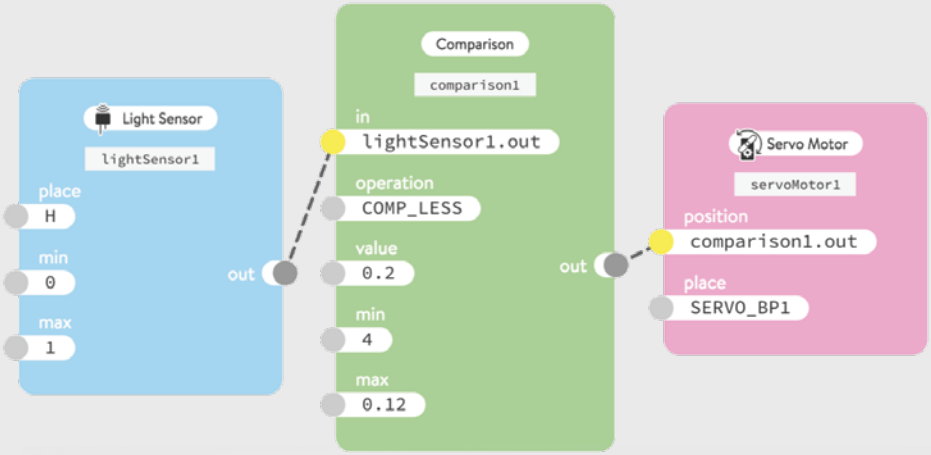
CODE


Circuit Touch
circuitTouch4
place
RL
sensitivity
0.5
min
0
max
1
out
Circuit Touch
circuitTouch2
place
LA
sensitivity
0.5
min
0
max
1
out
Circuit Touch
circuitTouch3
place
RA
sensitivity
0.5
min
0
max
1
out
Key Press
keyPress4
trigger
circuitTouch4.out
key
KEY_A
Key Press
keyPress2
trigger
circuitTouch2.out
key
KEY_S
Key Press
keyPress3
trigger
circuitTouch3.out
key
KEY_D
Circuit Touch
circuitTouch1
place
H
sensitivity
0.5
min
0
max
1
out
Circuit Touch
circuitTouch5
place
LL
sensitivity
0.5
min
0
max
1
out
Key Press
keyPress1
trigger
circuitTouch1.out
key
KEY_F
Key Press
keyPress5
trigger
circuitTouch5.out
key
KEY_G

AFRAID-OF-THE-DARK PIG

The little pig tucked away safely into the house of bricks away from danger. Program a pig shaking in the darkness with the servo motor and light sensor.

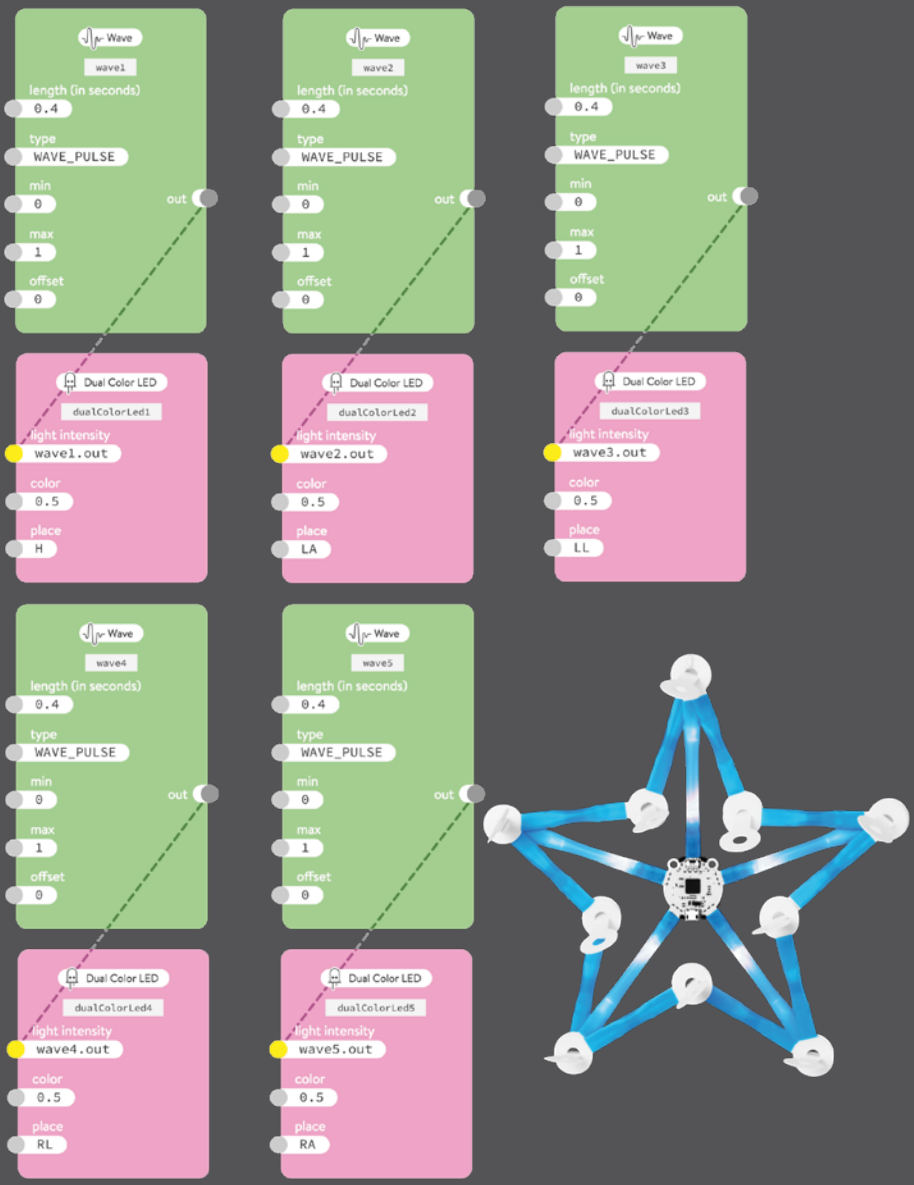
Search for “afraid of the dark pig” at
learning.strawbees.com/



BLINKING STAR

Find a star within your favorite constellation. Create a star and program the behavior of the LEDs to blink like the night sky.

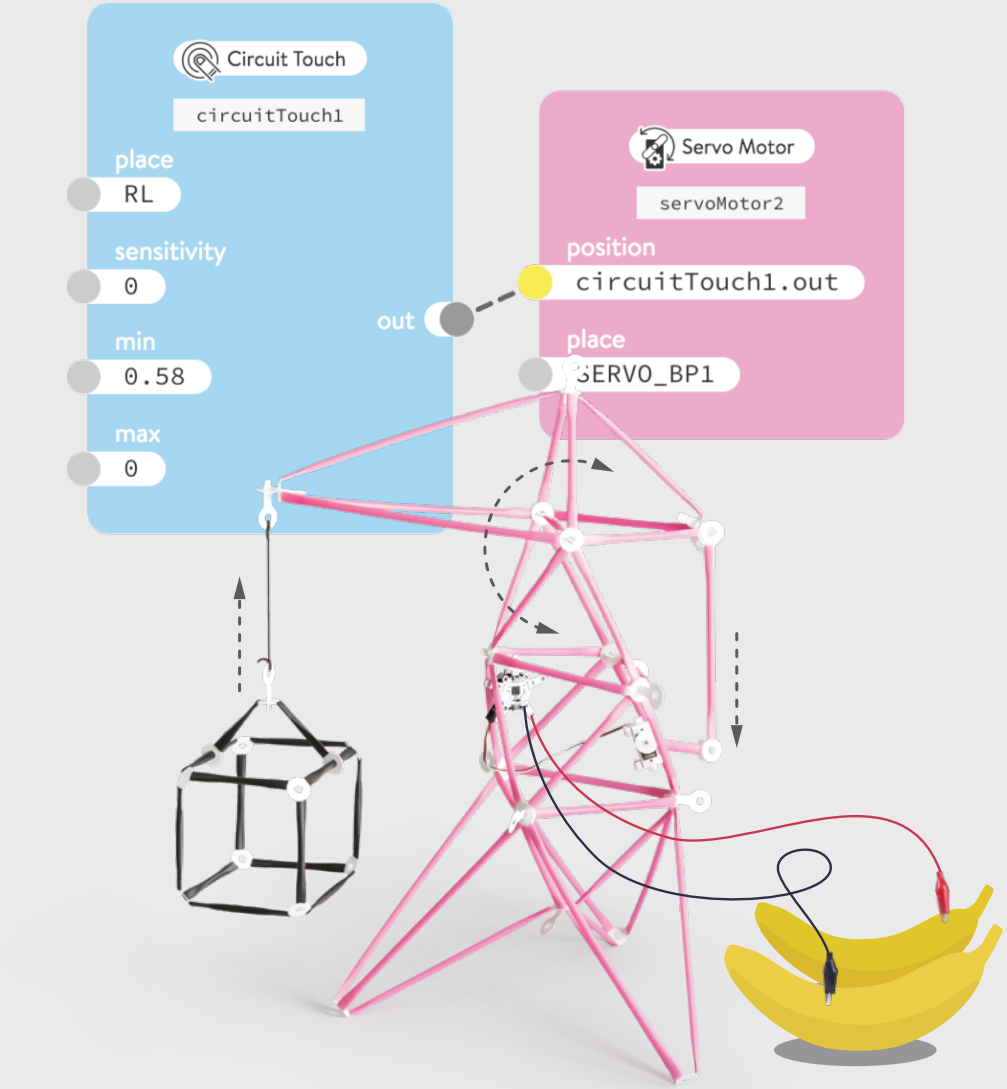
Search for “blinking star” at
learning.strawbees.com/



BANANA CRANE

Redesign a construction crane for the city. Use the circuit touch to lift blocks with the servo motor and Strawbees linkages.

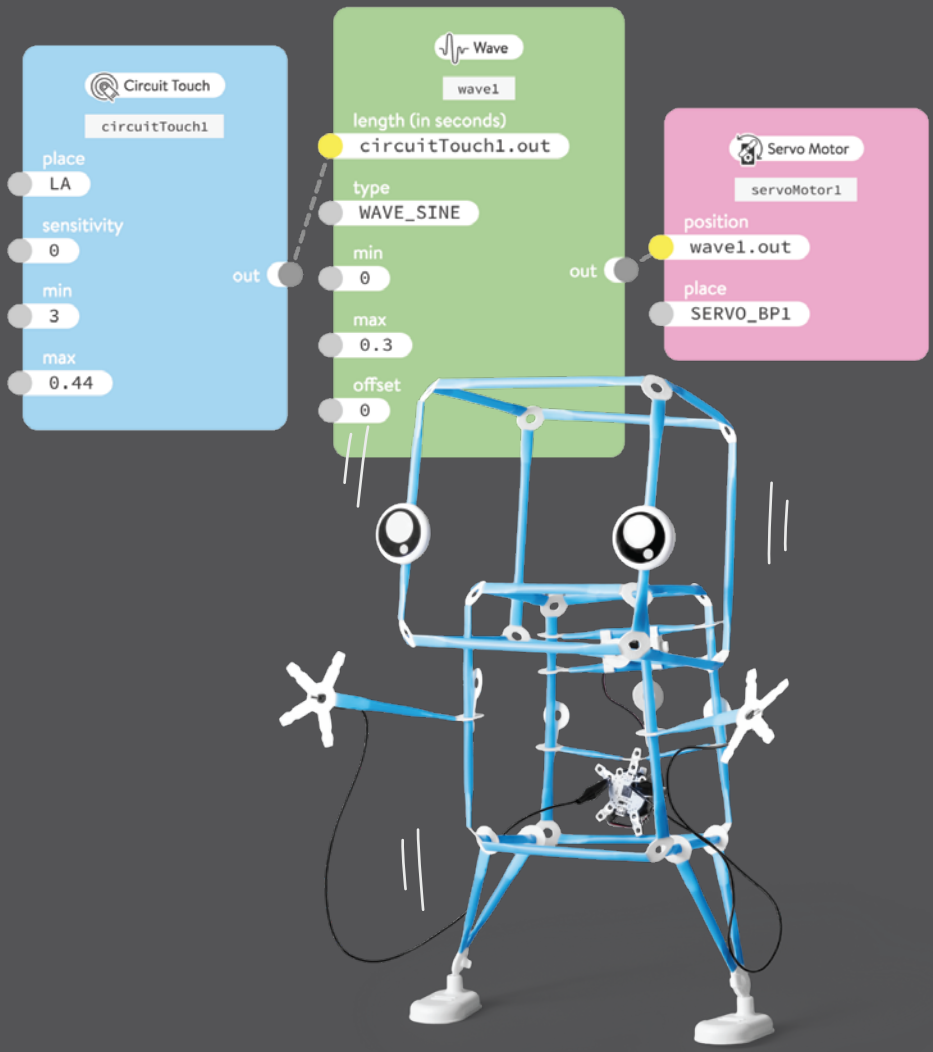
Search for “banana crane” at
learning.strawbees.com/

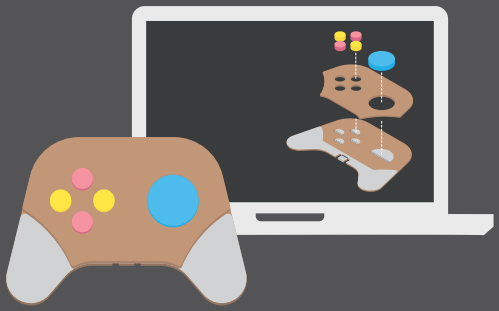


FRIENDBOT

Create an expressive program for your friendbot to share it's excitement when it meets new friends. Hold hands in a circuit circle to see how the Friendbot reacts.

Search for "friendbot" at
learning.strawbees.com/





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LEARNING.STRAWBEES.COM

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STRAWBEES SCHOOL KIT

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