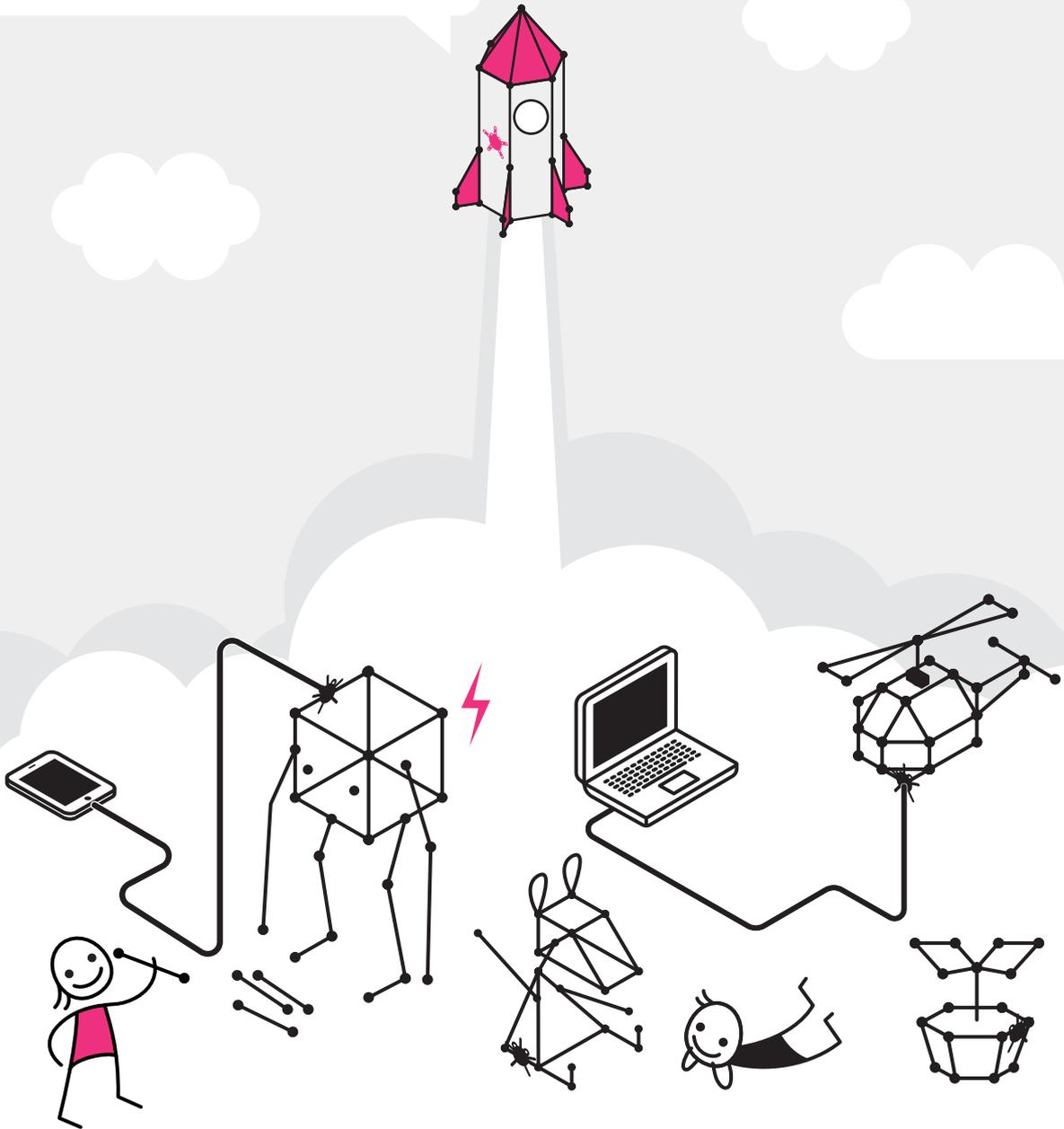


Full lesson plans on  
[learning.strawbees.com](http://learning.strawbees.com)



**C O D I N G &  
R O B O T I C S**  
**SCHOOL KIT**



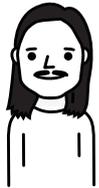
# EDUCATION TEAM

We are committed to empowering teachers to help **students believe in their own ideas and DREAM BIG** in order to create our future.

## COMMUNITY, CONTENT, COURSE & LESSON PLANS



**Lindsay Balfour**  
Content and Community Manager



**Carl Bärstad**  
Community Outreach

## EDUCATIONAL SALES & EVENTS



**Angelica Rådman**  
Sales Manager



**Joakim Larsson**  
Sales Support

## INVENTORS & TECHNICAL DEVELOPMENT



**Erik Thorstensson**  
Research & Development



**Kristofer Hagbard**  
Chief Product Officer



**Paulo Barcelos**  
Chief Technology Officer

## ARTWORK, DESIGN & CONCEPTUAL IDEAS



**Qianxin Zhang**  
Designer



**Dan Henriksson**  
Art Director

## CONTACT

[strawbees.com/support](https://strawbees.com/support)

## ONLINE LEARNING PLATFORM AVAILABLE AT

[learning.strawbees.com](https://learning.strawbees.com)

# DEAR TEACHER

## Education is Changing

Groundbreaking technology creates new opportunities for and expectations on us humans. When today's children grow up they will work in professions that no one has yet heard or thought of. In order to make a living in the future, humans will need to be more creative than robots. Everyone will need to understand more about technology and this will have a big impact on teaching.

## When Learning is Fun We Grasp More

Effective learning also requires us to create safe spaces where questions and experiments are encouraged and all students feel supported. When students are encouraged to dream and set their own goals their potential for learning is virtually unlimited.

## Explore Together With Your Students

Your students will likely come up with ideas for projects that we didn't imagine. Different age groups are intrigued by different features and opportunities. In addition to programming, there are ample opportunities to learn more about mechanisms, construction, design and interaction. Enjoy your students becoming construction and programming experts - teaching you. You will not need to know all of our materials before you start exploring.

## Supporting Students

You help students set up their hypothesis and designs, find the tools to put them to the test, and reflect upon the result. With our open ended learning system you can also encourage learning through play - by testing and making, observing what became and modify the result in an iterative process. Expand student skills to build and program their own projects using the three Strawbees CODE modes available at [code.strawbees.com](https://code.strawbees.com).

## Full Lesson Plans & Activities For All Student Ages Online

You can introduce basic tricks to your students, or you can simply ask them to investigate the different ways to use Strawbees are before starting your first challenge. Most of our lesson plans can be broken down into two 45-minute sessions, totaling about 2 hours. Should you want more inspiration we provide full course and lesson plans categorized by age ranges 5-7, 8-9, 10-13, 14-16, as well as 17+ at [learning.strawbees.com](https://learning.strawbees.com).

Welcome to our global teacher community supporting the creators of our future - happy making!

The Strawbees Education team

## LEARNING BY DREAMING AND CREATING

The Strawbees Educational team puts a lot of effort into investigating and exploring the full potential of learning together with teachers and students all over the world.

The most amazing thing about kids is that they can learn almost anything. **The key to being able to overcome almost any learning challenge is to really want to conquer something new.** This incentive is best created by someone's own clear vision of what we wish to achieve (change, make, explore).

This is why one of our most important tasks is to help all students believe in their own ideas and DREAM BIG. We encourage questions and suggestions, and support everyone to try out their ideas.

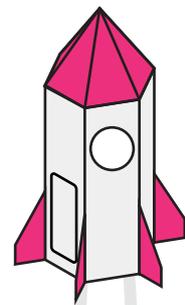
Our unique solution provides an intuitive first introduction to programming for infinite opportunities to gradually build more advanced projects. **Students use an online platform with 3 forms of programming to use with electronics to prototype for real-world applicable projects** across the globe. In our online tutorials, course and lesson plans we show you how!

## WHAT PROGRAMMING IS

By programming we mean to frame and express a problem in such a way that a computer can help us solve it.

In order for a computer to actually assist us in solving a problem we need to phrase the input in such a way that a particular programming language can interpret our data (or sensor signals), then design and write the algorithms to analyze it and determine what output should be provided.

The Strawbees Learning Platform provides several different approaches and programming languages, as well as compatibility with a full scale professional development environment for advanced users to create any project and employ it anywhere.



## HOW HUMANS & ANIMALS WORK

### HOW DO WE RECEIVE INPUT?

Humans and animals can receive input from their surroundings through their senses. Most of us can hear someone call out our name, read books, see someone waving from a distance, feel the warm summer breeze against our face, and enjoy a friendly hug.

### HOW DO WE MAKE OUR VOICES HEARD?

We can also use our voices and body to communicate and interact with our environment. We can be the ones

responding to the person calling out our name, writing our own book, waving back to our friends and reciprocating a hug. All of this can be viewed as our output - signals to and impact that we make on the world.

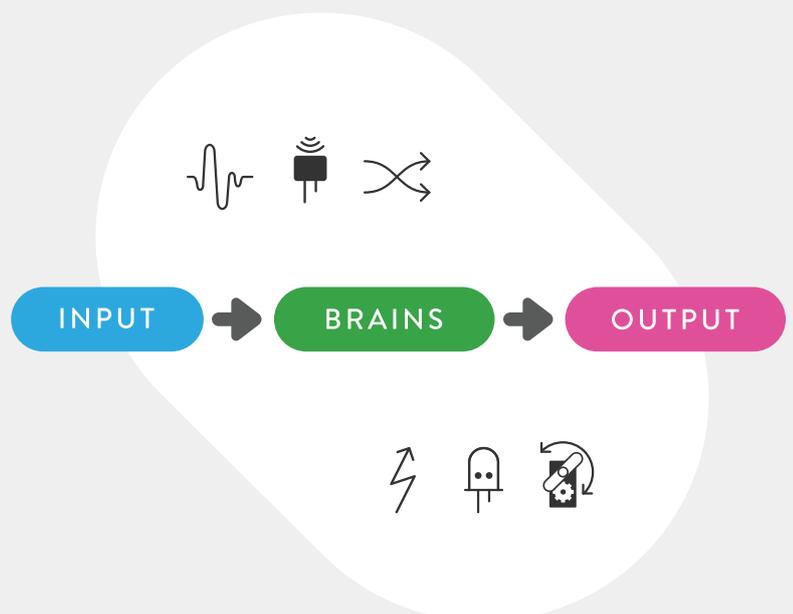
### WHAT IS THE APPROPRIATE REACTION?

Inside your head and spine you store the most amazing processor, much more sophisticated and many times more advanced than what we have been able to replicate by computers - your central nervous system. Your fabulous brain helps you determine when to hug your friend back or answer a question.

## THIS IS ALSO HOW COMPUTERS AND QUIRKBOTS WORK

The Quirkbot circuit boards that you have just purchased offer infinite opportunities for learning, exploring and inventing. Our unique way of introducing flow programming is based on presenting different ways of giving INPUT to your Quirkbot in order for it to communicate back by OUTPUT such as servo motors, LEDs - or any other additional piece of electronics that you like.

Please enjoy the rest of this inspirational guide for input, and welcome to our online Teaching Center which provides teacher support such as detailed course and lesson plans for students of all ages.

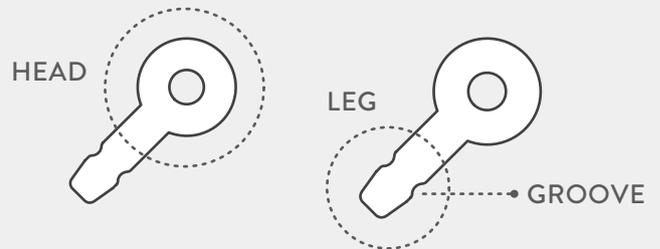


# STRAWBEES TIPS AND TRICKS

This is a collection of tips and tricks you can use for understanding the basics of using the connectors. Try making each part as you read through in this guide.

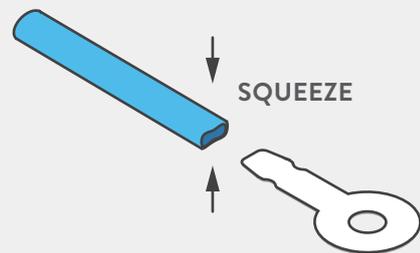
## STRAWBEES CONNECTORS

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



## CONNECTING TO STRAWS

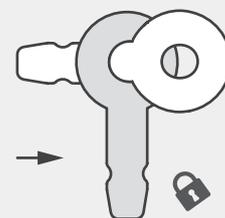
Squeeze the opening of the straw for easy insertion.



## CONNECT & LOCK



OR

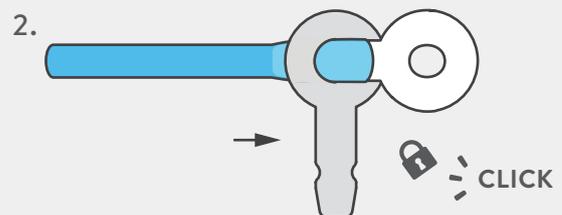
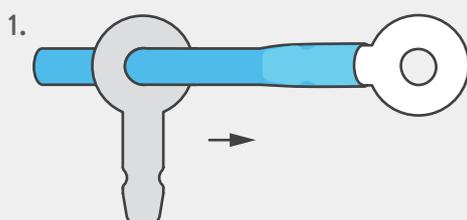


Slip the head into the groove of the leg and **listen for the click**. This will secure connectors and allow rotation.

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

## LOCKING STRAWS

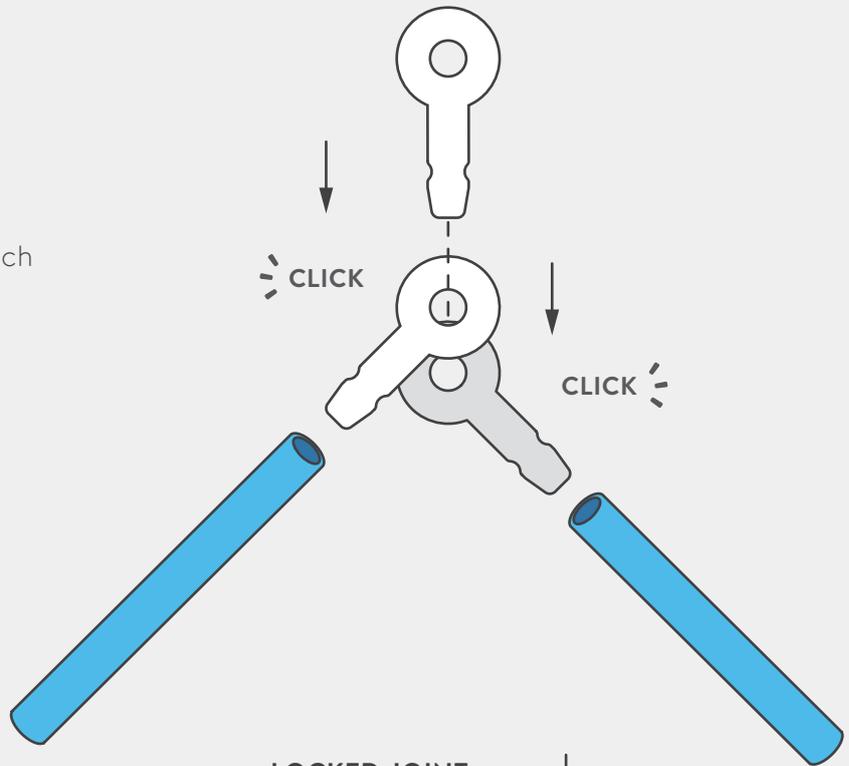
You can lock the straws in place to prevent slipping.



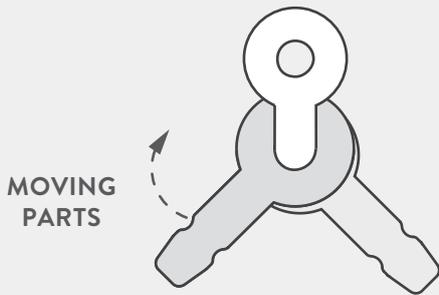
Snap onto the **groove**.

## JOINTS

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

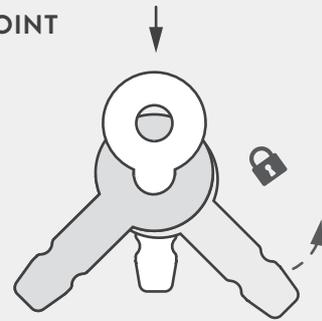


### MOVING JOINT



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

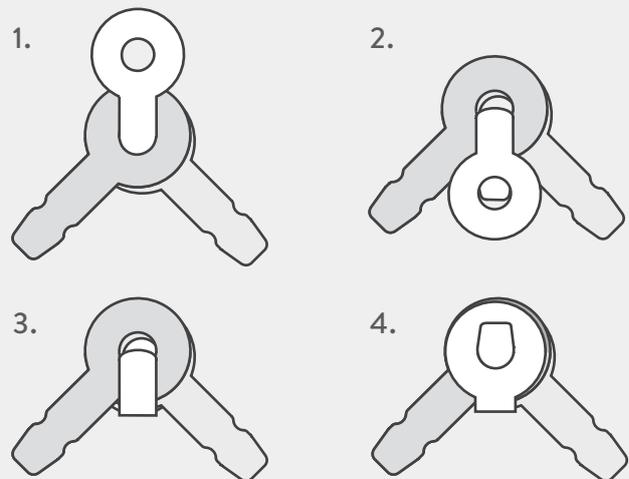
### LOCKED JOINT



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

## FRICITION 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.



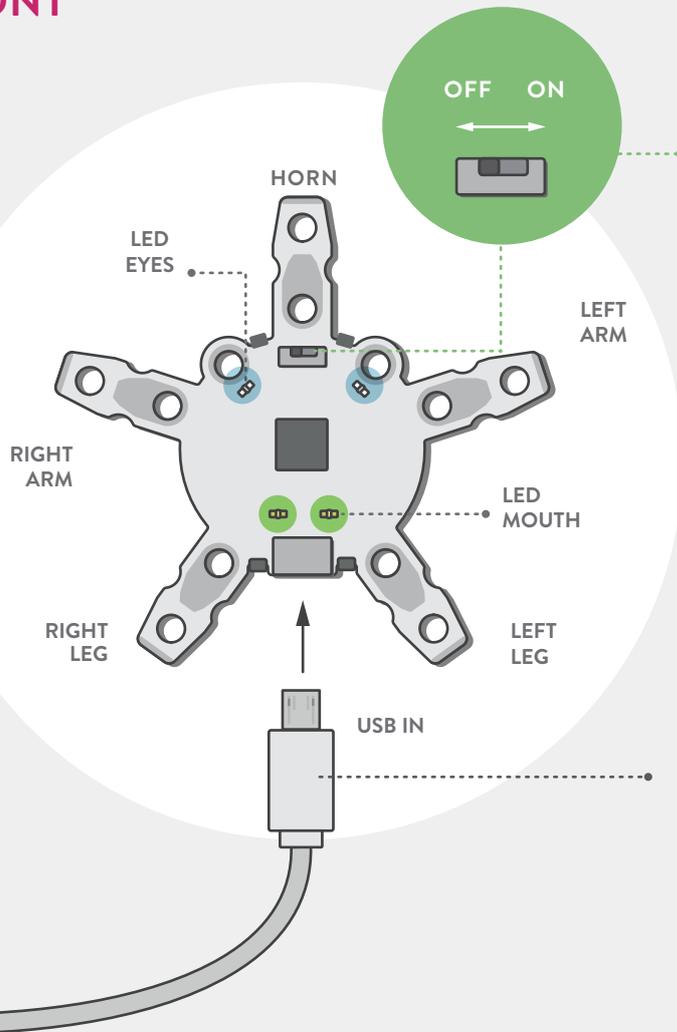
FOLD THE HEAD  
ALL THE WAY TO  
THE BACK

PUSH THE LEG  
THROUGH THE  
HOLE TO LOCK

# QUIRKBOT TIPS AND 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. Everytime you turn on the Quirkbot it will start blinking to say, "Hello!"

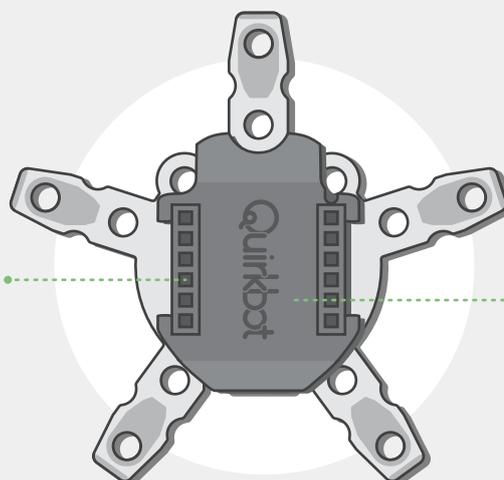
### CONNECTING & CHARGING

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.



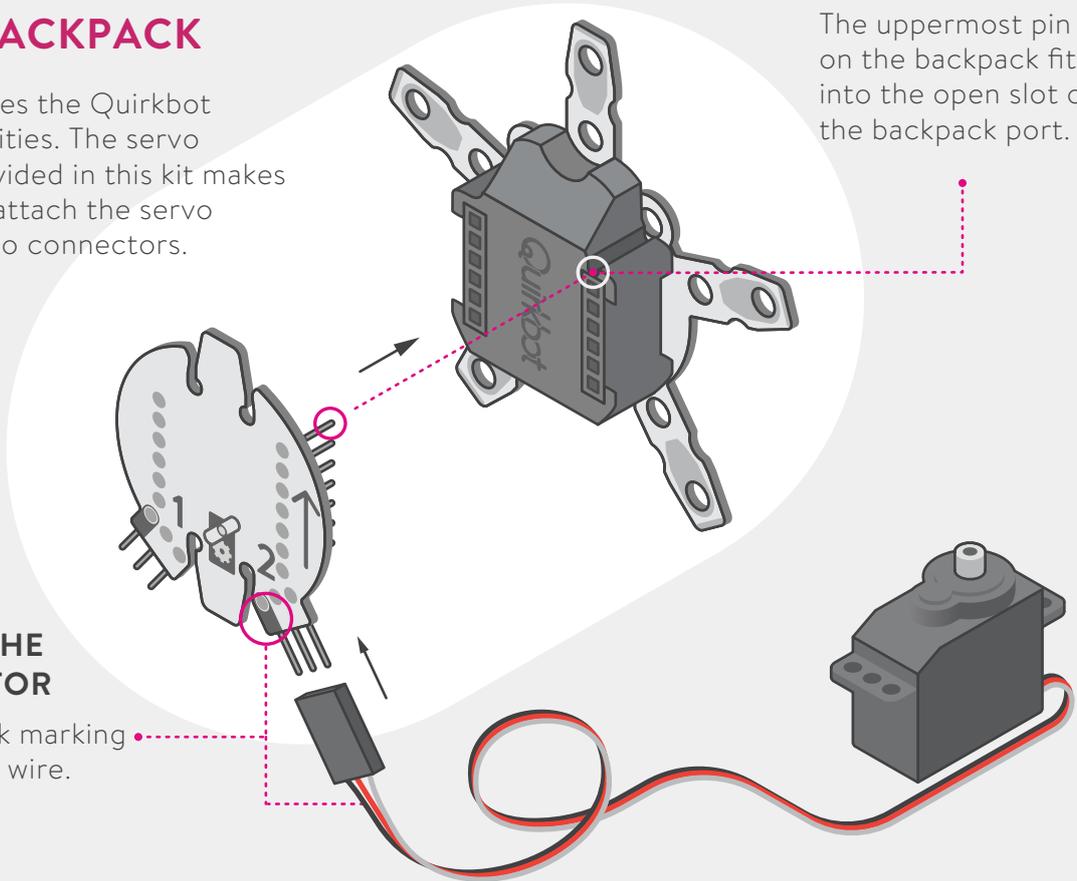
### BATTERY

The rechargeable battery.

## 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

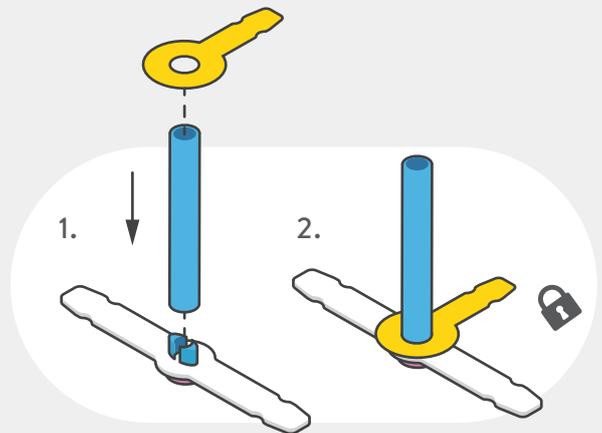
Align the black marking with the black wire.

## STRAWBEE SERVO ARM

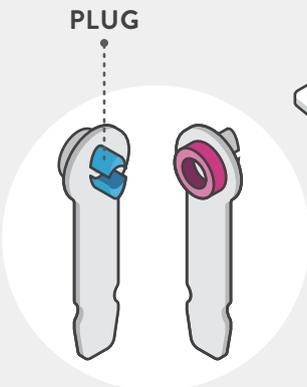
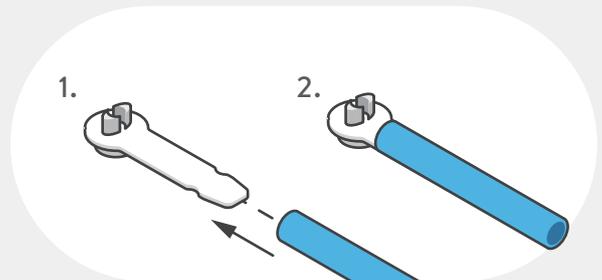
This is the servo arm to attach to the servo. Optionally fasten the arm with screws.

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

### CONNECT TO PLUG

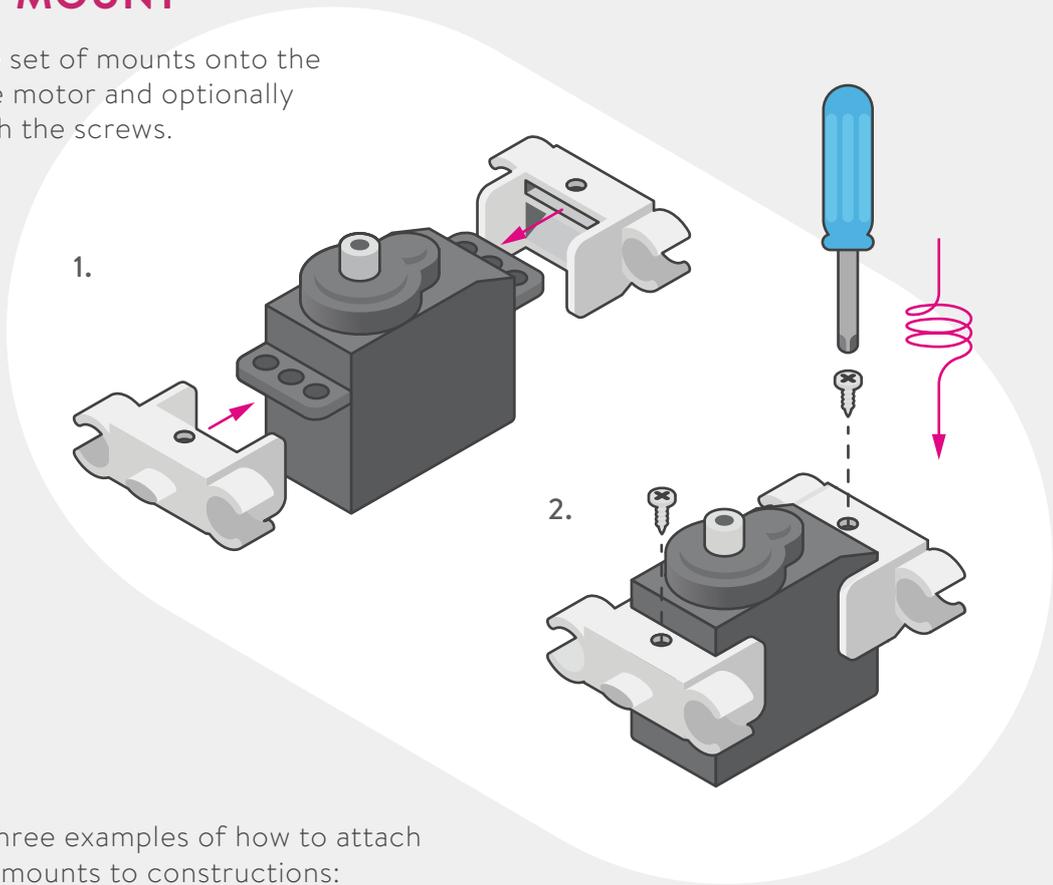


### CONNECT TO ARM



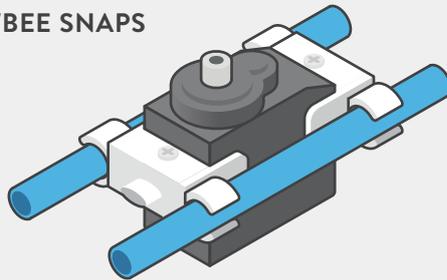
## SERVO MOUNT

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

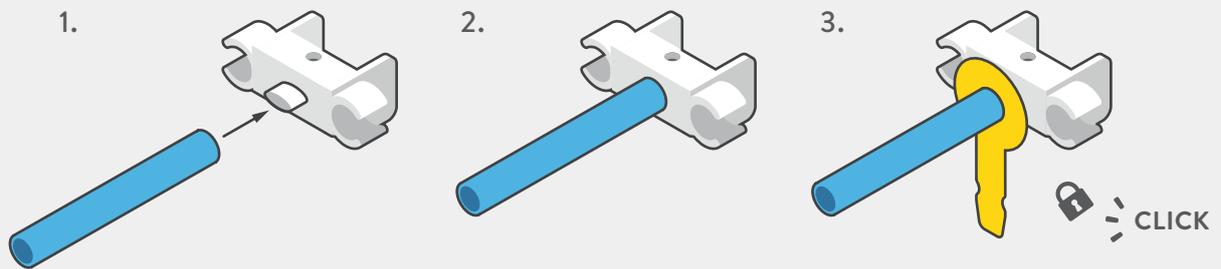


Here are three examples of how to attach the motor mounts to constructions:

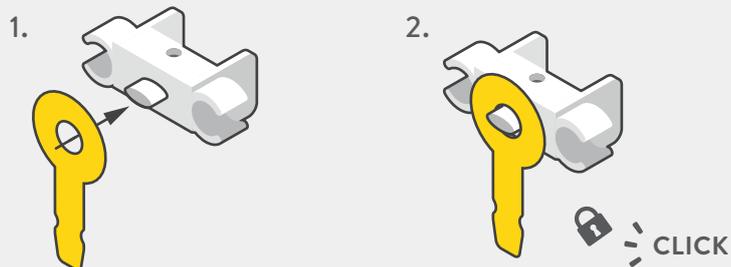
### STRAWBEE SNAPS



### STRAW PLUG

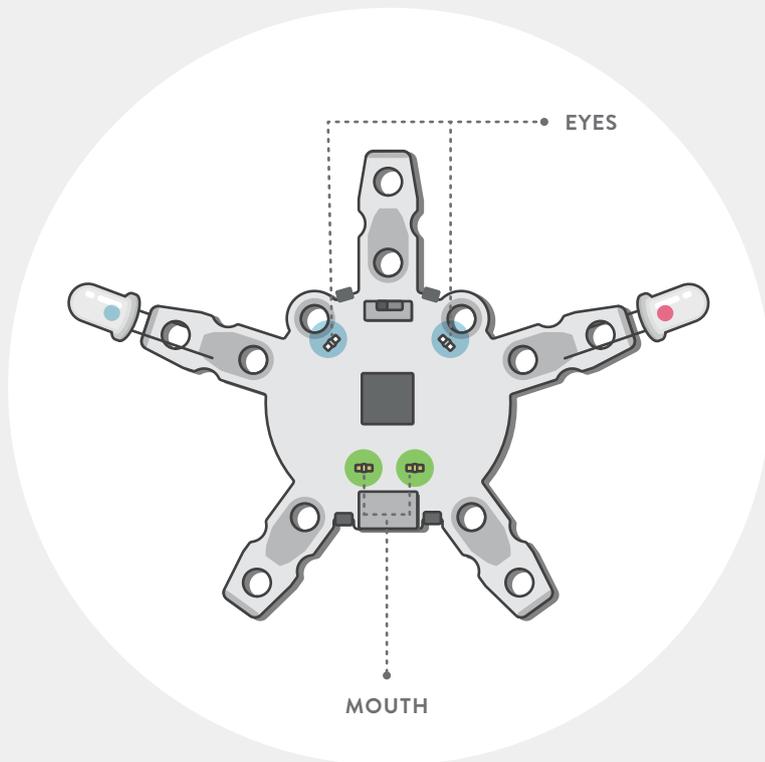


### STRAWBEE PLUG



## LEDS

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

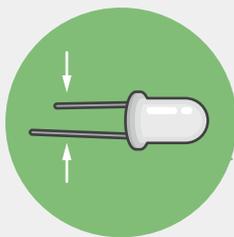


### BUILT-IN EYES AND MOUTH

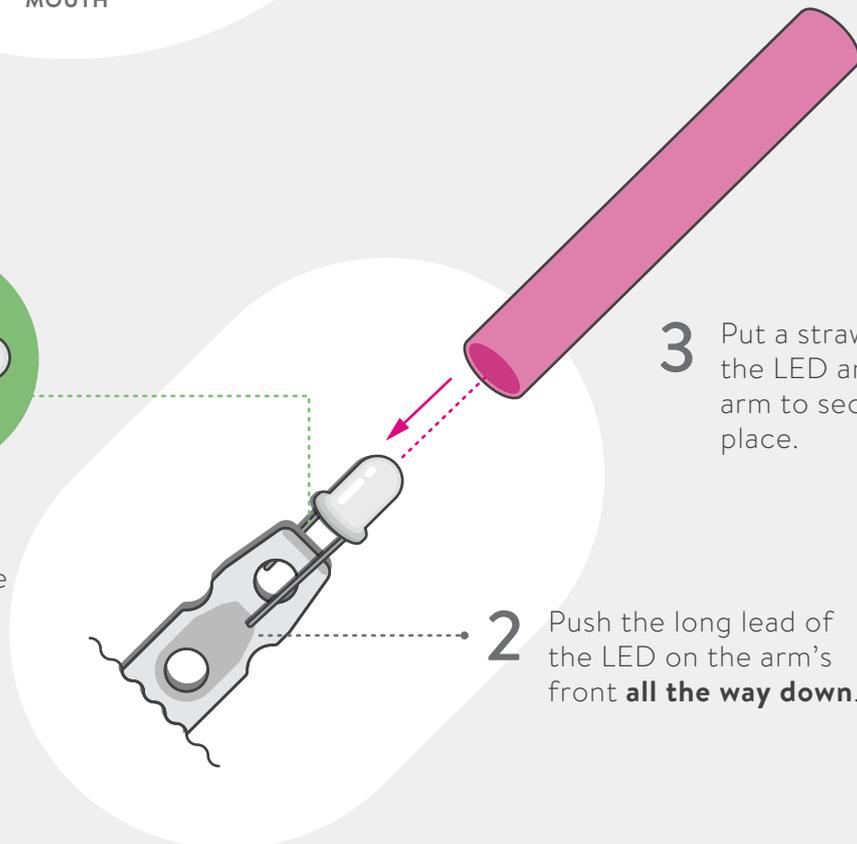
The Quirkbot has 2 blue LEDs for eyes and 2 green LEDs for the mouth. Program these with the LED node.

### 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.



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

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

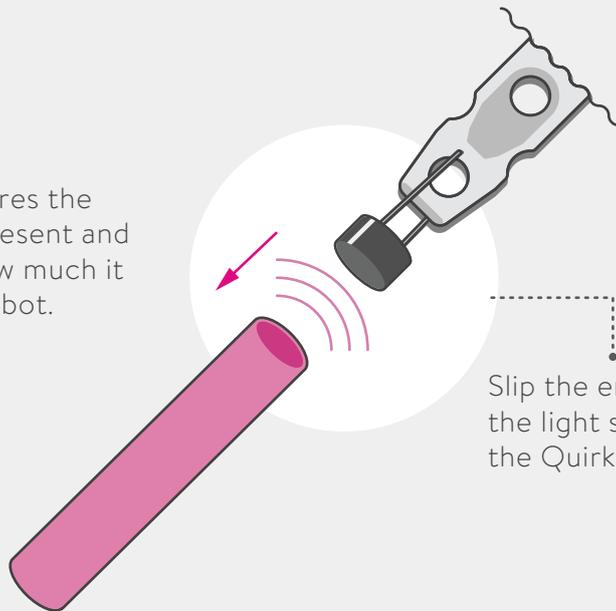
Try It!

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

## LIGHT SENSOR



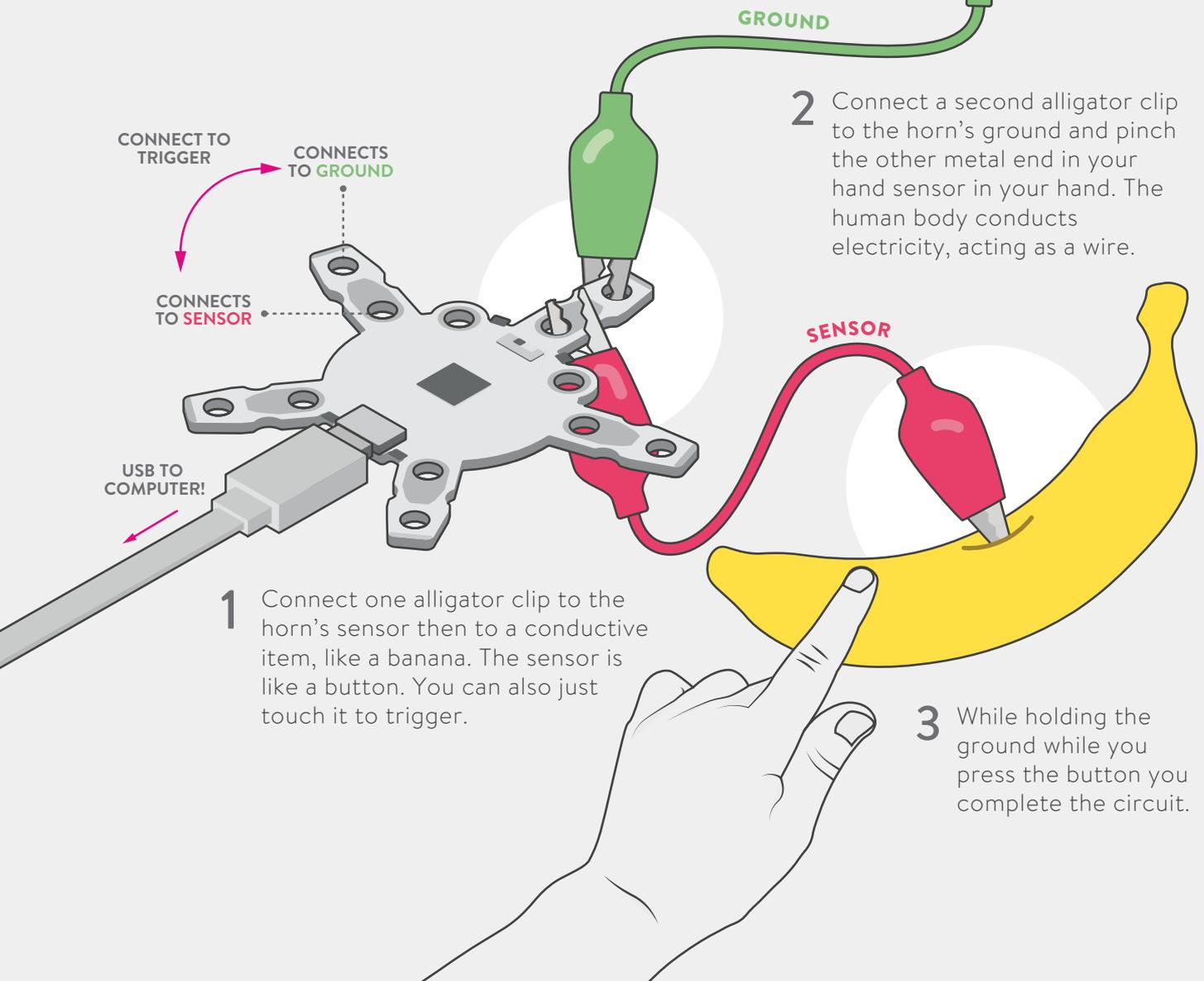
This sensor measures the amount of light present and communicates how much it reads to the Quirkbot.



Slip the end over the light sensor on the Quirkbot's 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.

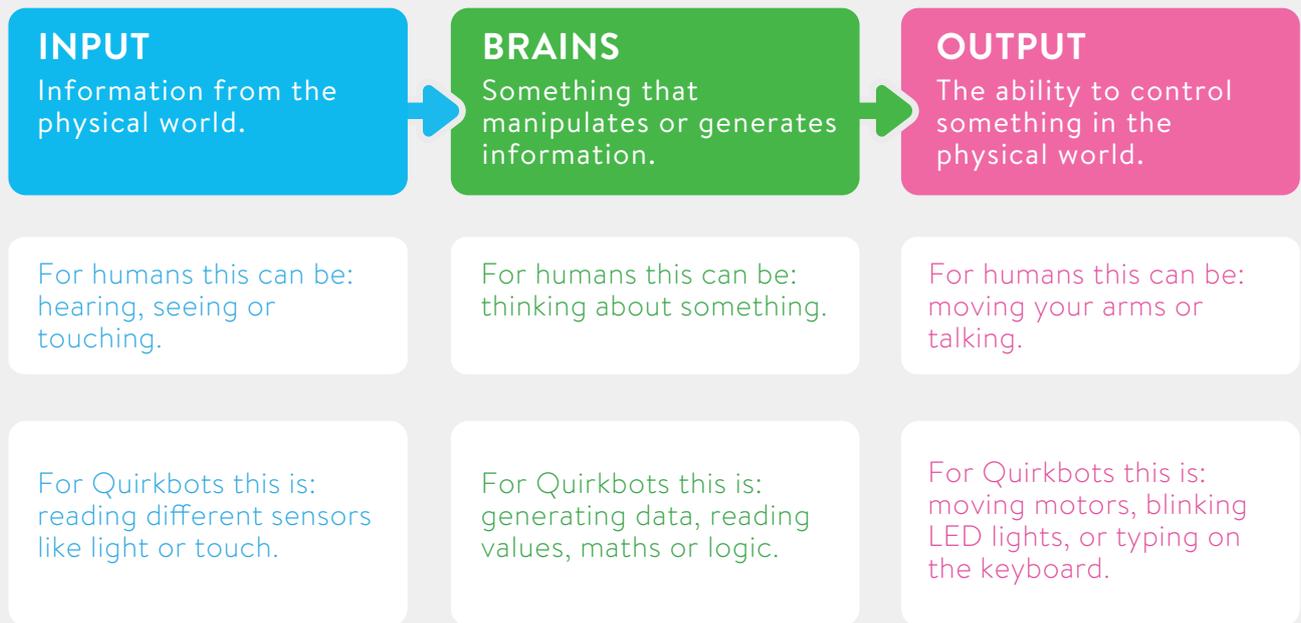


# FLOW-BASED PROGRAMMING

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

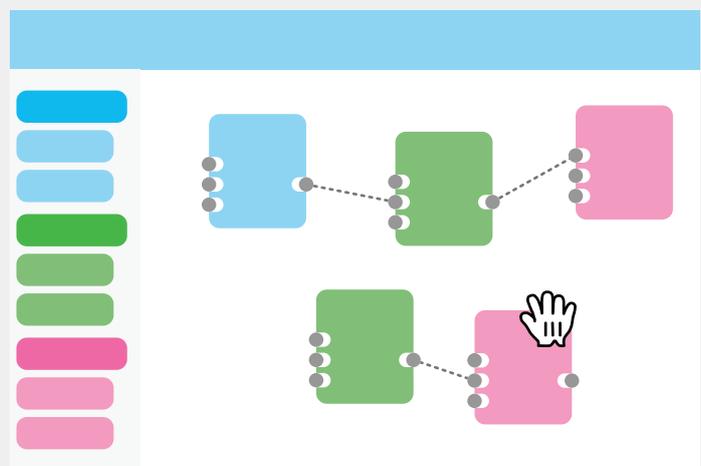
## NODE CATEGORIES

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

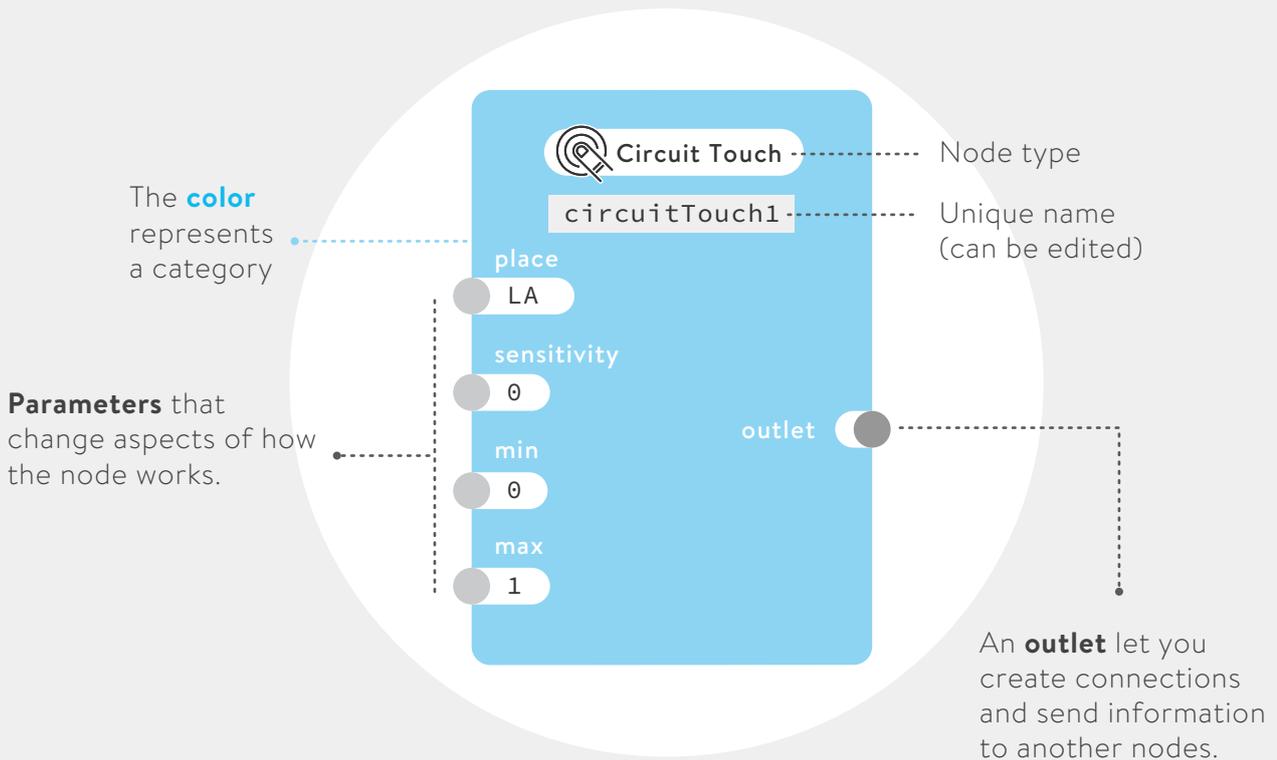


## PROGRAMMING WORKSPACE

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.

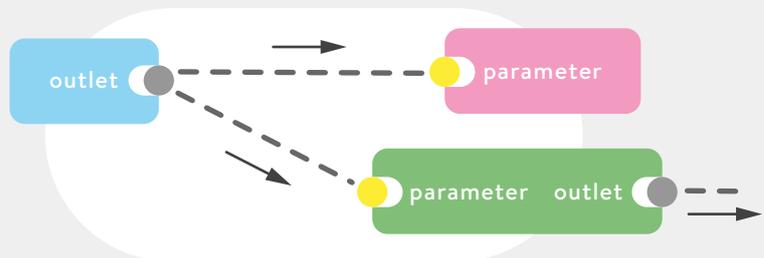


## PARTS OF A NODE



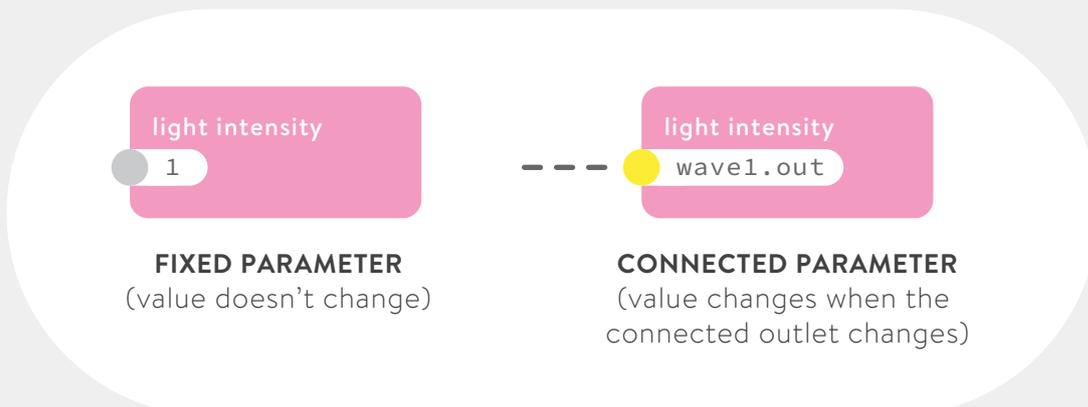
## CONNECTIONS

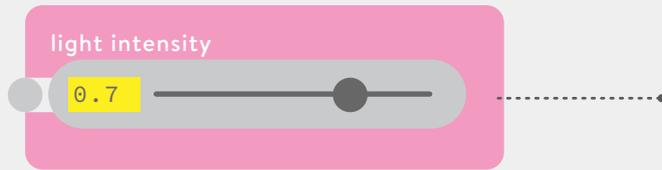
Connections let you **send data** from one node to another. You make a connection by dragging the outlet of a node and dropping it in the parameter of another node. Once connected, data flows continuously **from** the outlet **to** the parameter.



## 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.





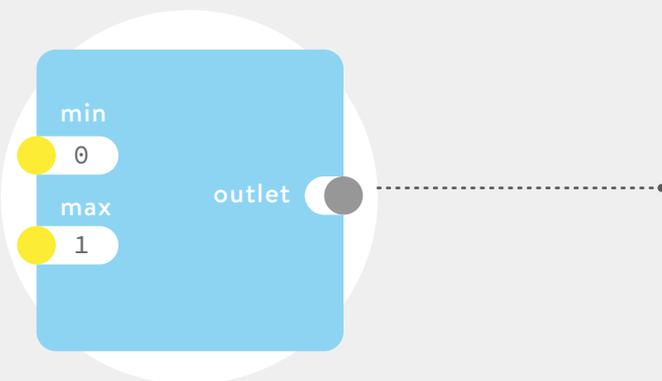
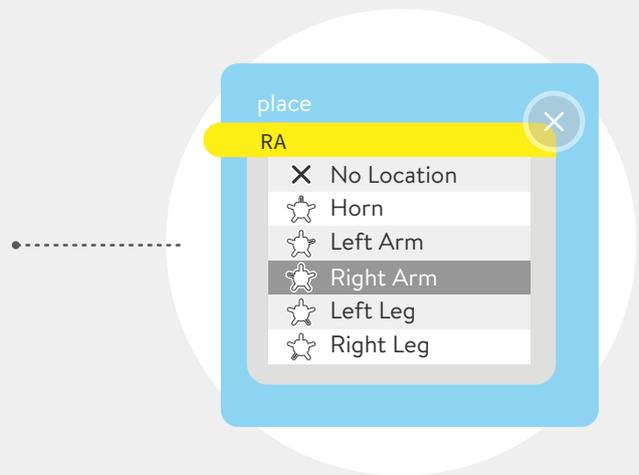
### NUMBER PARAMETERS

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 **dropdown** 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

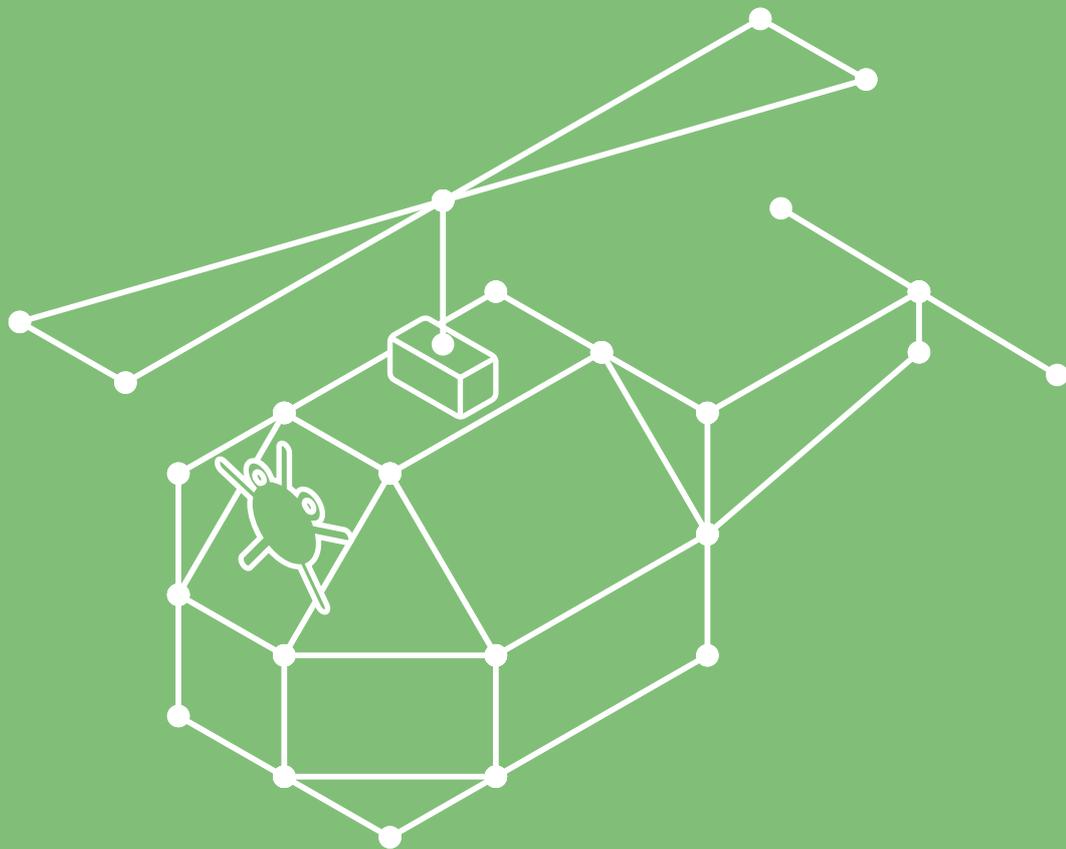
Once your program is ready you can **upload** it to the Quirkbot by clicking on the UPLOAD button. Make sure your Quirkbot is **charged, turned on** and connected to a **USB port**. (see page 1 in this booklet on charging)

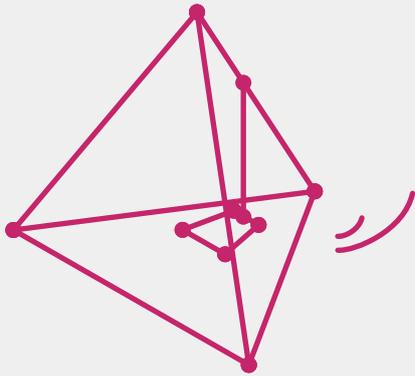


# LESSON PLANS



You can find and print full lesson plans at **[learning.strawbees.com](https://learning.strawbees.com)** with the keyword of each lesson.





## INTRO TO QUIRKBOT “ROBOT RACE”

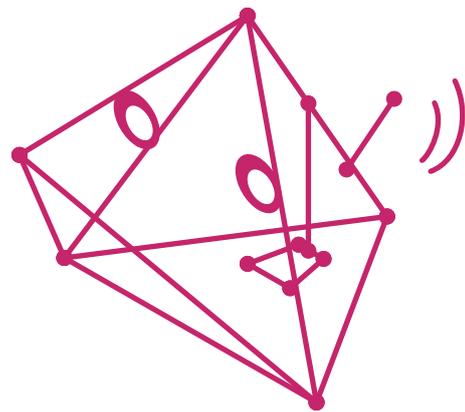
Build a walking robot for a big race and see which ones cross the finish line. Create the body of the robot and adjust the servo motor tinkering with the quirky movement of the legs in motion.

🔍 Search for “**Robot Race**”  
at [learning.strawbees.com](https://learning.strawbees.com)

## FIRST ROBOT

Take robotics to the next level and explore movement and animation for your robot to walk, wave, wag a tail, and more.

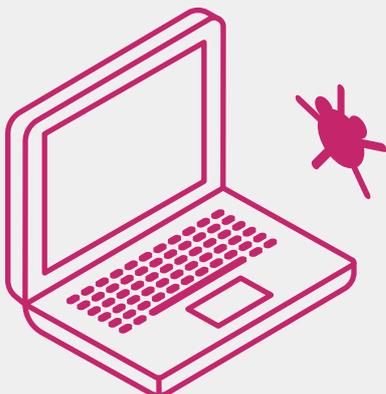
🔍 Search for “**First Robot**”

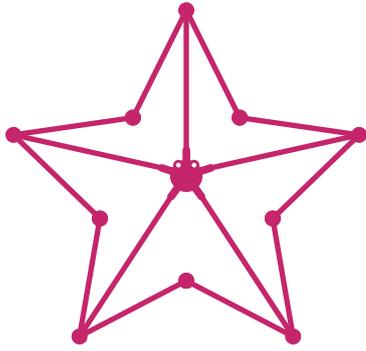


## PROGRAMMING WITH QUIRKBOT

Learn the interface of robotics and construct a code to change the behavior of the robot’s movement.

🔍 Search for “**Programming**”





## BLINKING STAR

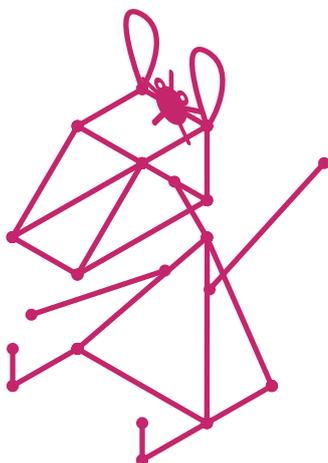
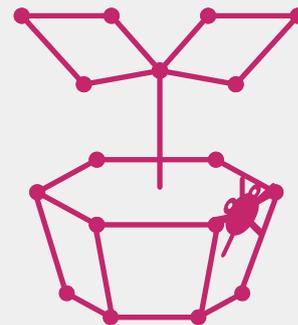
Recreate a star in the universe and match the color and blinking patterns. Program the behavior of the LEDs to blink like the night sky.

🔍 Search for “**Blinking Star**”

## LIGHT SENSITIVE PLANTS

Design a new plant species open and close according to light exposure. Program the servo to control the movement of papercraft opening and use the light sensor to react to darkness.

🔍 Search for “**Plants**”



## EXPRESSIVE ROBOTICS

Create an expressive program for your robot to react when it meets new friends. Learn to program the motion of a servo motor as funny, useful or meaningful movement.

🔍 Search for “**Expressive Robotics**”

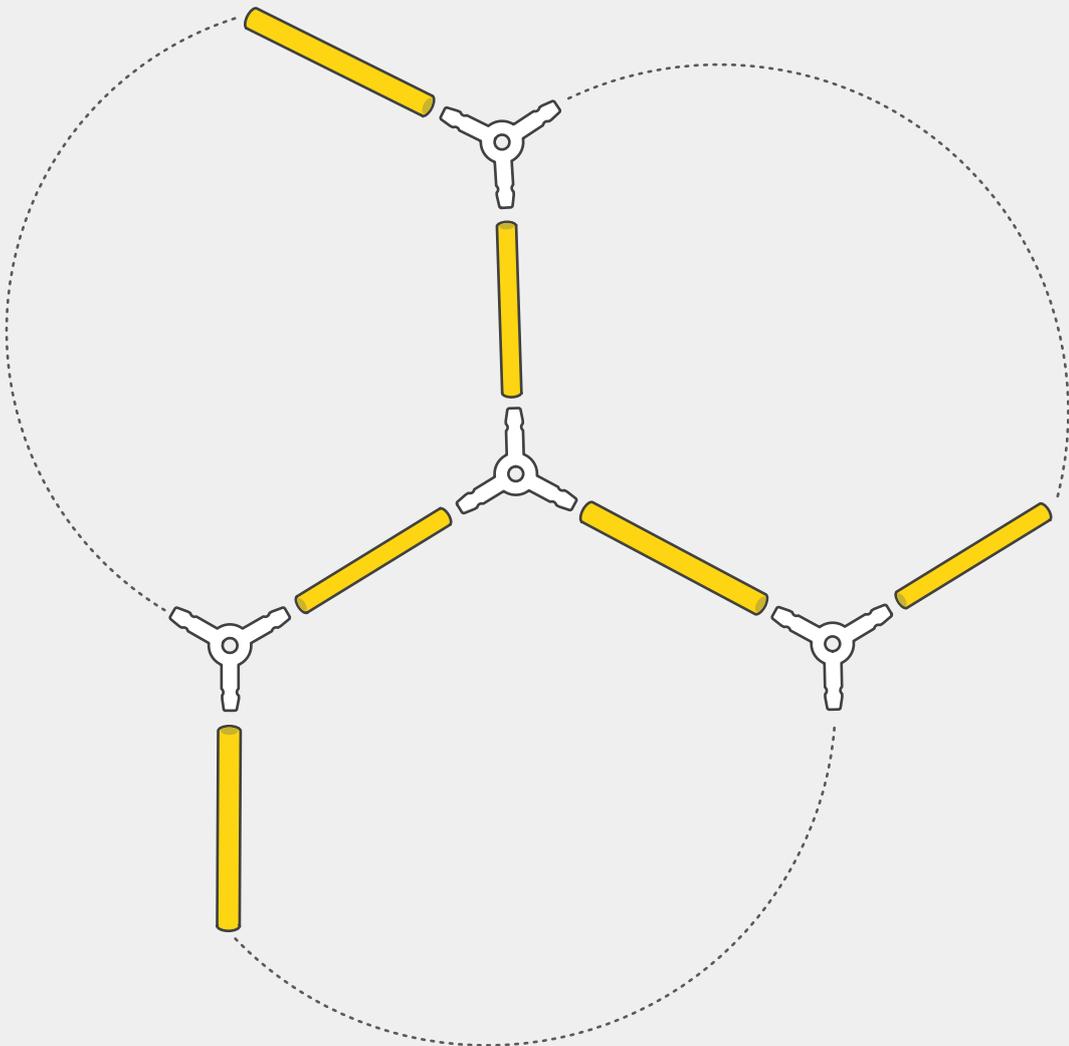
# TRY IT OUT

## 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.

🔍 Search for “first robot” at [learning.strawbees.com/](https://learning.strawbees.com/)

- 1 Build the body of your walker using geometric shapes.





# 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/](https://learning.strawbees.com/)

**Wave**  
wave1  
length (in seconds)  
0.4  
type  
WAVE\_PULSE  
min  
0  
max  
1  
offset  
0  
out

**Dual Color LED**  
dualColorLed1  
light intensity  
wave1.out  
color  
0.5  
place  
H

**Wave**  
wave2  
length (in seconds)  
0.4  
type  
WAVE\_PULSE  
min  
0  
max  
1  
offset  
0  
out

**Dual Color LED**  
dualColorLed2  
light intensity  
wave2.out  
color  
0.5  
place  
LA

**Wave**  
wave3  
length (in seconds)  
0.4  
type  
WAVE\_PULSE  
min  
0  
max  
1  
offset  
0  
out

**Dual Color LED**  
dualColorLed3  
light intensity  
wave3.out  
color  
0.5  
place  
LL

**Wave**  
wave4  
length (in seconds)  
0.4  
type  
WAVE\_PULSE  
min  
0  
max  
1  
offset  
0  
out

**Dual Color LED**  
dualColorLed4  
light intensity  
wave4.out  
color  
0.5  
place  
RL

**Wave**  
wave5  
length (in seconds)  
0.4  
type  
WAVE\_PULSE  
min  
0  
max  
1  
offset  
0  
out

**Dual Color LED**  
dualColorLed5  
light intensity  
wave5.out  
color  
0.5  
place  
RA

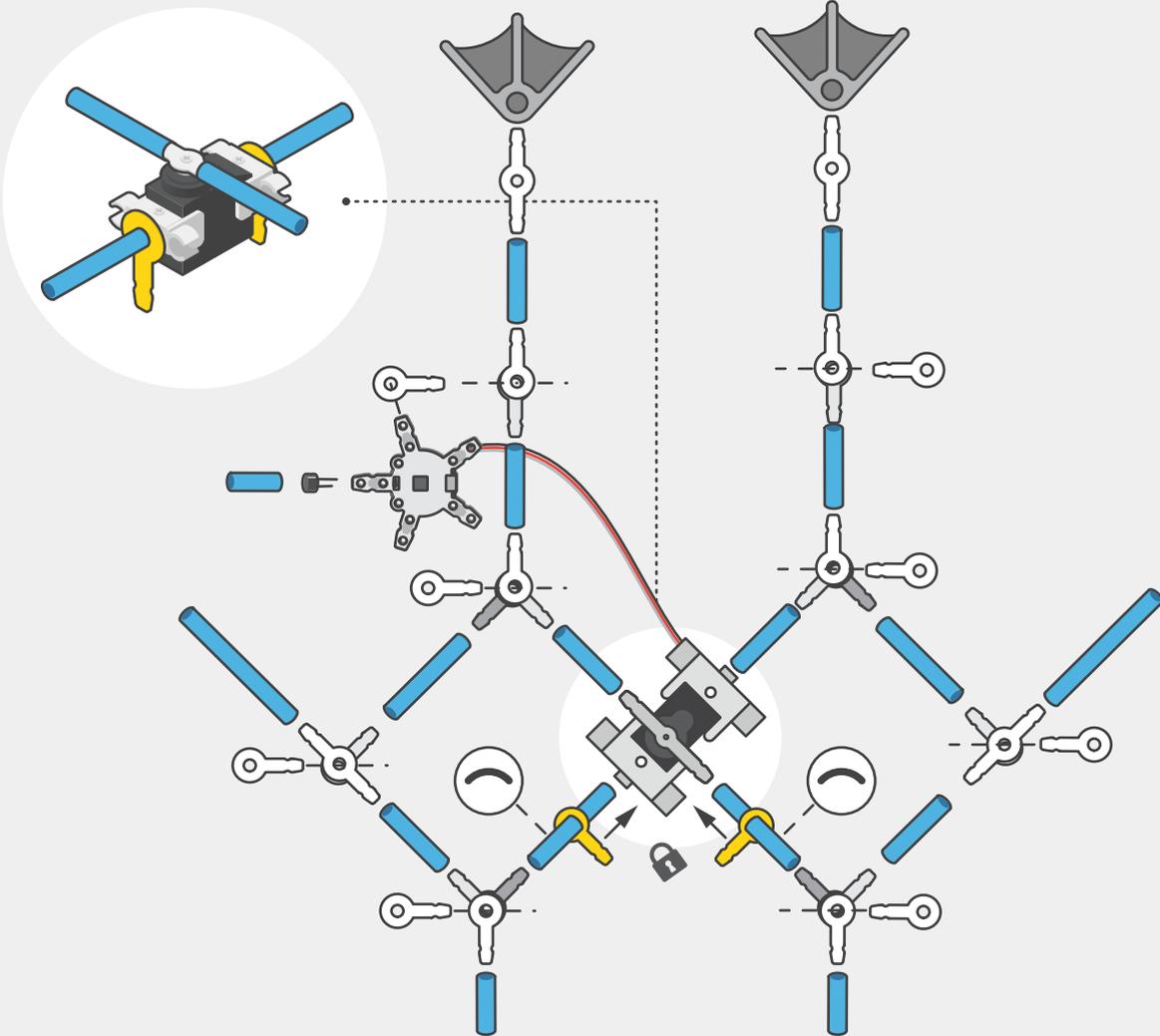


# CRANKY BAT

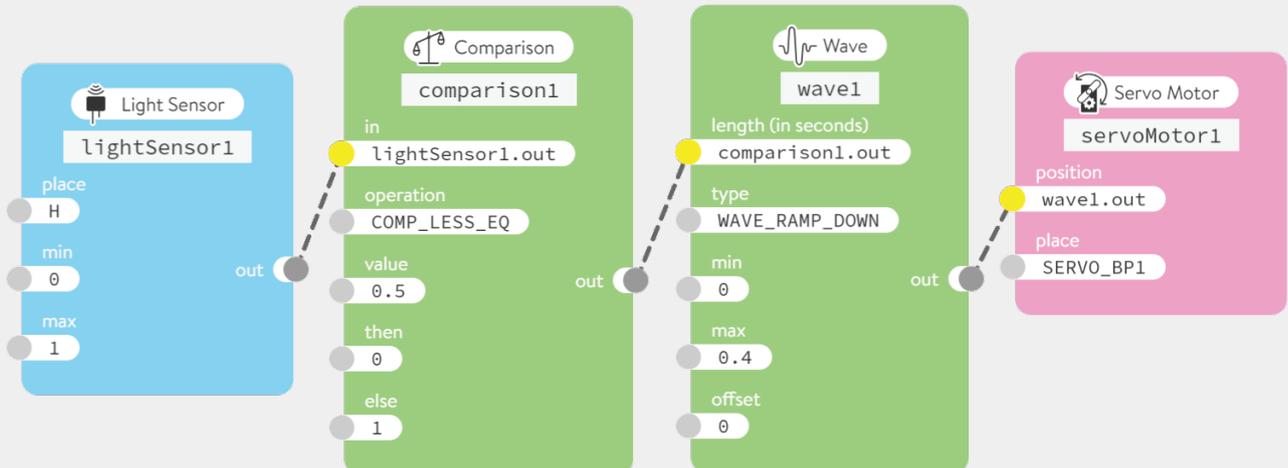
Early to rise in the evening, but really cranky when woken up in the daytime. Use the light sensor with the servo motor to construct a cranky bat when the sunshine interrupts it's nap.

-  28
-  4
-  2
-  1
-  2
-  1
-  1
-  1
-  1

Search for "cranky bat" at [learning.strawbees.com/](http://learning.strawbees.com/)

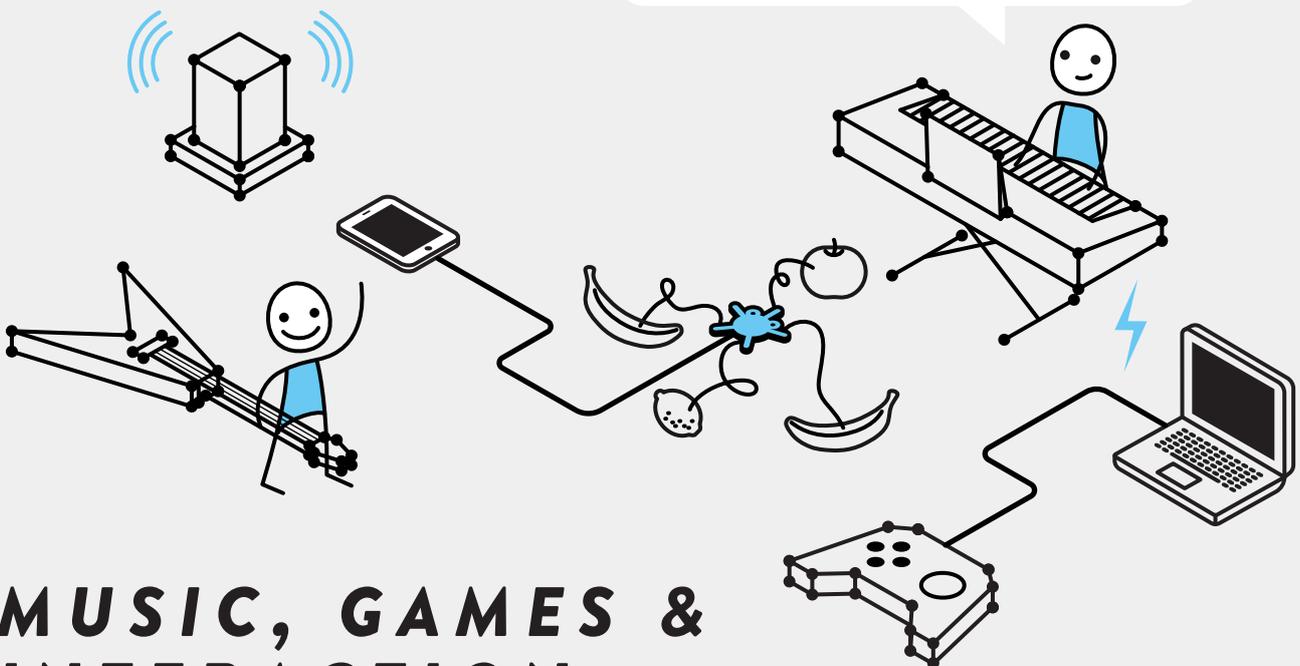


## CODE



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