Creative Lab Kit

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CONTENTS

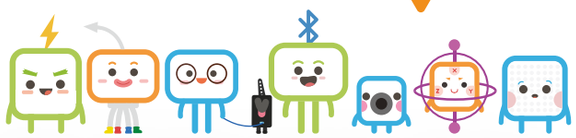
Lesson 1 This is Neuron

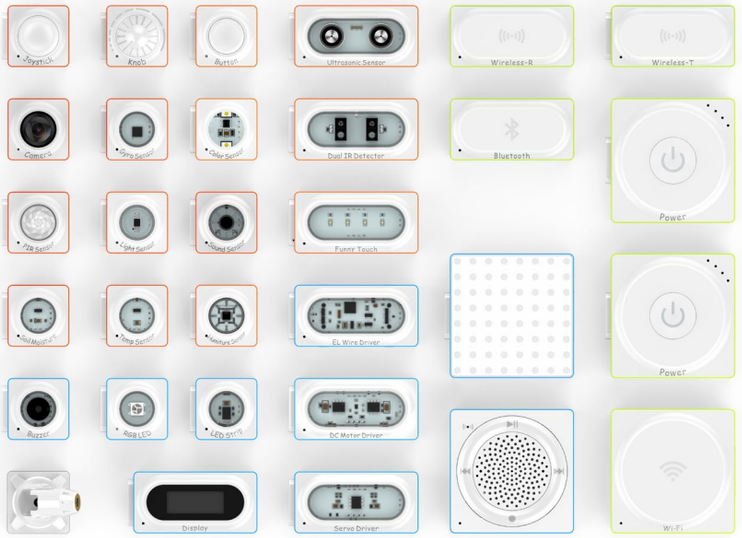
Learning Objectives

1. Learn about the blocks in the Neuron Creative Lab Kit.
2. Learn about blocks by classification.
3. Learn how to connect and combine blocks.

Introduction

Hi everyone, we are some of the electronic blocks you will find inside Neuron Creative Lab. Some of us are responsible for communications, some are in charge of input and the rest do the output part.



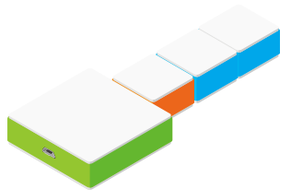


The electronic modules are compact and the magnetic pogo pins make them easy to connect. It is easy to expand Neuron Creative Lab with everyday materials too, so let's start creating!

Intro to Neuron Blocks

Neuron Creative Lab Kit includes a variety of standardized electronic modules.

- Green blocks are energy and communication blocks.
- Orange ones are input blocks.
- Blue ones are output blocks.



Type	Name
Energy & Communication	Power, Bluetooth, Wi-Fi, Wireless Transmitter and Wireless Receiver
Input	Light Sensor, Sound Sensor, Color Sensor, Ultrasonic Sensor, Temperature Sensor, Humiture Sensor, Gyro Sensor, Soil Moisture Sensor, PIR Sensor, Camera, Dual IR Detector, Funny Touch, Button, Knob and Joystick
Output	LED Panel, Servo, EL Wire Driver, EL Wire, DC Motor, Water Pump, RGB LED, LED Strip, LED Strip Driver, Display, Buzzer, Dual Servo Driver, Mic & Speaker, and Dual DC Motor Driver
Others	Servo Accessory Pack, DC Motor Accessory, Tyre and Wheel Hub, Mini Auxiliary Wheel, Water Pipe, Laser Pointer, Neuron Board etc

Matching Game

Match the blocks with the correct categories.

PIR Sensor

Wi-Fi

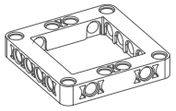
RGB LED

Energy & Communication

Input

Output

Others



Neuron Board

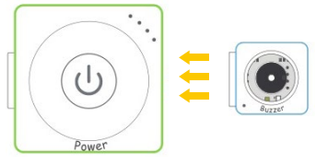
Power

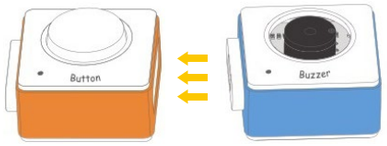
Funny Touch

Connect

Magnetic Pogo Pin connectors are used in the Neuron blocks, which can snap together like toy blocks. You can build your own projects by simply connecting Neuron blocks or attaching the blocks to cardboard.

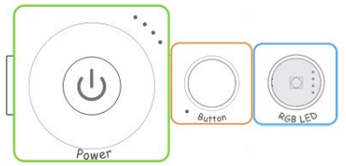
Pogo Pin Connectors Easy to Connect





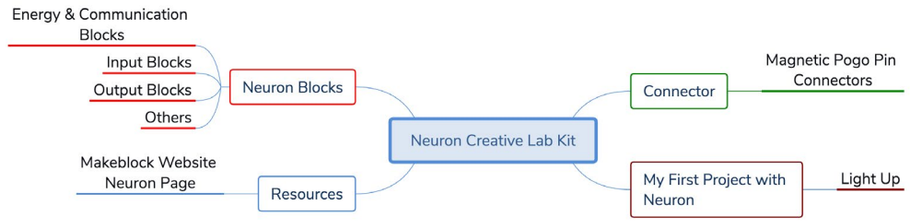
Note: The Input and Output blocks need to be connected to the right-hand side of the Power block.

Try



My First Neuron Project. Share projects with your group members. Did you find out anything?

Wrap-up



Learn More

For more information, please visit:
https://www.makeblock.com/steam-kits/neuron
Watch awesome videos for more fun Neuron projects.

Lesson 2 Neuron and mBlock 5

Learning Objectives

1. Learn how to connect the Power and the Bluetooth blocks to mBlock 5 via a USB cable or a Bluetooth dongle.
2. Learn about the Neuron RGB LED.
3. Learn how to use mBlock 5.

I connected some frequently-used Neuron blocks. Now I'm wondering how to have the blocks do what I want?

You need to learn to program those Neuron blocks with mBlock 5.

mBlock 5

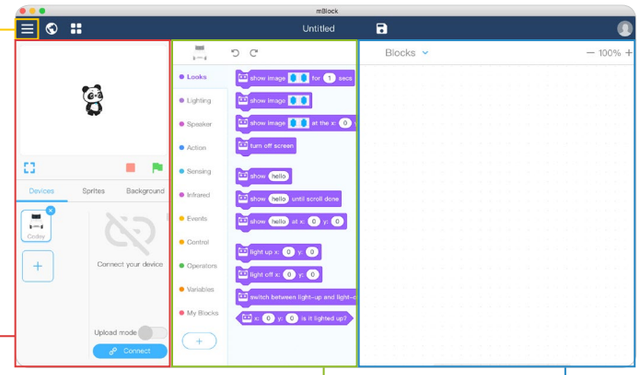
Based on Scratch 3.0 and developed for STEAM education, mBlock 5 is a coding platform supporting block-based and text-based programming. With mBlock 5, users can not only create stories, games and animations, but also program Neuron and other Makeblock products.

1. Download & Install mBlock 5
http://www.mblock.cc/mblock-software/

Please note that mBlock 5 interface might vary due to different versions.

mBlock 5 Tour

Menu If you want to switch to another language, open or save programs, find an example program, or look for help, this is where you should go.



Stage

You can see your project on the stage. Here you can also connect and add devices, view and change sprites, and change background settings.

Blocks Palette

Coding blocks for making scripts can be found in the Blocks Palette. The categories of blocks are color-coded, so you can spot the block you need by its category or color.

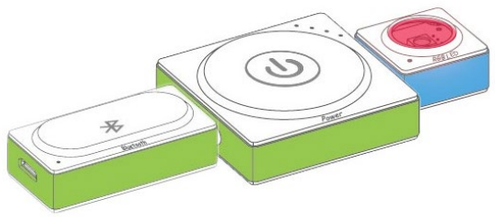
Scripts Area

This is where you write programs. You can drag blocks into this area.

Ideate

Light up!

First, connect the Neuron blocks, **Power**, **Bluetooth** and **RGB LED**. Then connect them to mBlock 5 via a USB cable. The **RGB LED** is turned off at the beginning, and then we need to write programs to make the blocks do the following things: When the green flag is clicked, the **RGB LED** lights up, waits for 3 seconds, and then lights off.



Build

1. Items List

Blocks/Materials	Quantity
Power	1
Bluetooth	1
RGB LED	1
USB Cable	1

2. Intro to Neuron Blocks

Power

It supplies power to other Neuron blocks.

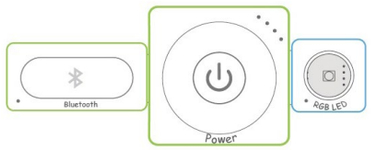
Bluetooth

It establishes a wireless connection between the blocks and your devices such as PCs, tablets and smart phones, and then you can program the blocks with mBlock 5 or Neuron app.

RGB LED

RGB LED means red, green and blue LEDs. You can change its color and brightness with mBlock 5 or Neuron app.
Compared with white LEDs, RGB LEDs combine red, green and blue to produce various hues of light. Three tiny light beads are built on the surface of the **RGB LED** block. They are in red (R), green (G) and blue (B). You can change their brightness to produce a broad array of colors.

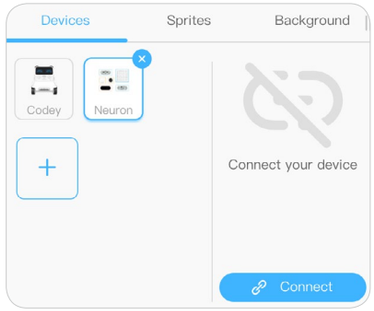
3. Put the three blocks together as shown.

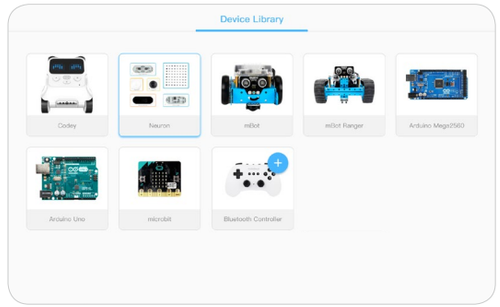


Connect Neuron to mBlock 5

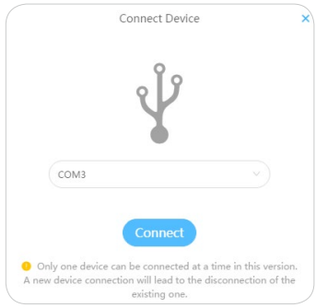
1. Connect the Neuron blocks to your computer via a USB cable. Make sure the cable is connected through the Bluetooth block to the computer. (Note: This step also applies to other projects in this course.)

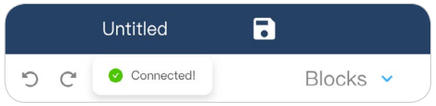
2. Click the + icon in the stage area to add Neuron to mBlock 5.





3. Connect to mBlock 5. Click the Connect icon, select the right COM port, then click Connect. When you see "Connected", it means the Neuron blocks are connected to mBlock 5.





Wireless connection

1. Items List

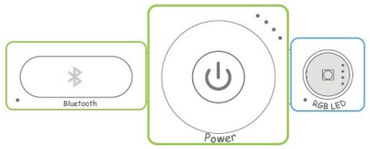
Blocks/Materials	Quantity
Power	1
Bluetooth	1
RGB LED	1
Bluetooth dongle	1

2. Intro to Neuron Blocks

Bluetooth dongle

Makeblock Bluetooth dongle allows you to connect your computer wirelessly to any robotics that has a built-in Makeblock Bluetooth module.

3. Put the three blocks together as shown.



Connect Neuron to mBlock 5

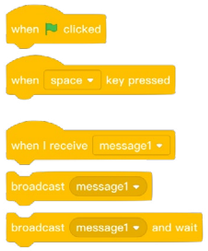
1.Plug in the Bluetooth dongle to our computer.

2.Turn on the Power neuron block and press the button on the Bluetooth dongle, the indicator light will begin blinking more quickly, and enter into paring mode. When the indicator light stops blinking, the Bluetooth dongle successfully connects to our neuron blocks.

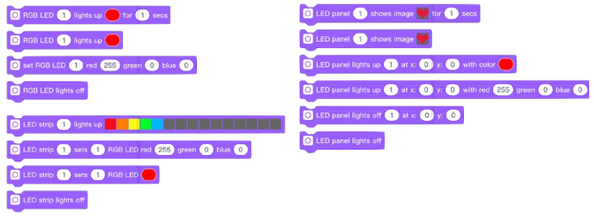
3.Add Neuron and connect to mBlock 5 as the last task.

Coding Blocks

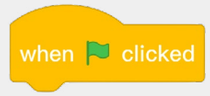
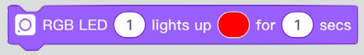
Now let's take a look at the Blocks palette. You can find 8 main block categories, **Action**, **Looks**, **Sound**, **Events**, **Control**, **Sensing**, **Operators** and **Variables**. There is also a custom category, **My Blocks**, which allows you to create your own blocks.



Events Blocks

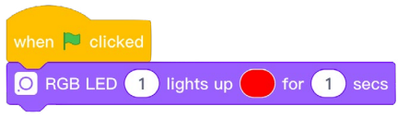


Looks Blocks

Category	Coding Block
Events	 This block runs the scripts when you click the green flag.
Looks	 This block makes the **RGB LED** emit red light for 1 second.

Program

1. Drag a **when green flag clicked** block and an **RGB LED ( ) lights up ( ) for ( ) secs** block to the scripts area. The when green flag clicked block goes first.



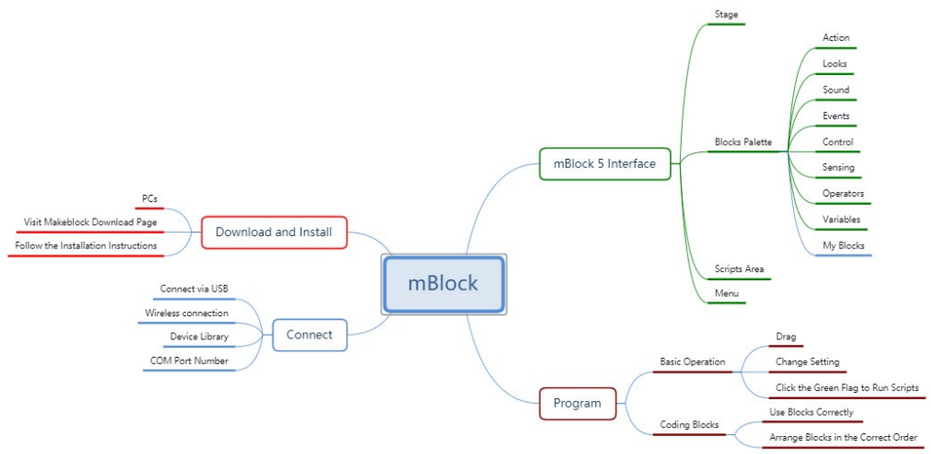
2. Change the duration to 3 seconds.

3. Click the green flag to run the script and see what happens.

Play & Test

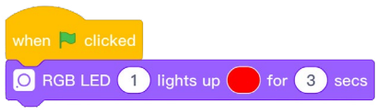
1. Change the duration in the **RGB LED ( ) lights up ( ) for ( ) secs** block, and see what happens.
2. Try to change the **RGB LED's** light color.

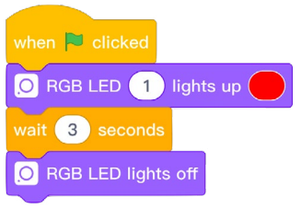
Wrap-up



Open Sesame

Write and run the two scripts below, and see what happens. Can you find any similarities or differences?

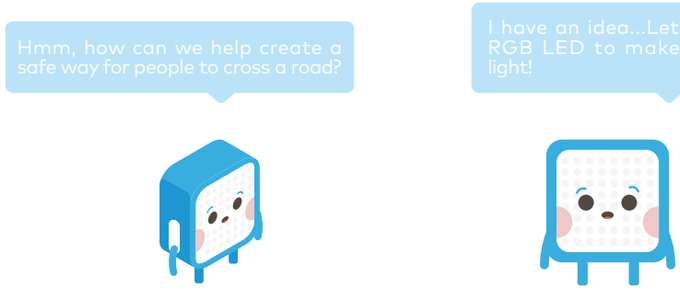




Lesson 3 Traffic Light

Learning Objectives

1. Use the Neuron RGB LED block.
2. Learn about Control blocks in mBlock 5.



Ideate

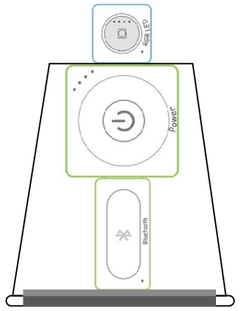
Traffic Light

First, connect the Neuron blocks, **Power**, **Bluetooth** and **RGB LED**. Then program the blocks to serve as a traffic light with mBlock 5.

Once the connection and programming is complete, you can move on to make a pedestal out of a paper cup. When everything is complete, we can place our traffic light in the classroom.

Create

1. Draft Design



Traffic Light

2. To complete the **Traffic Light** project, follow the steps below:
(1) Define: Have a discussion to determine the purpose of your project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect Neuron to your computer, and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

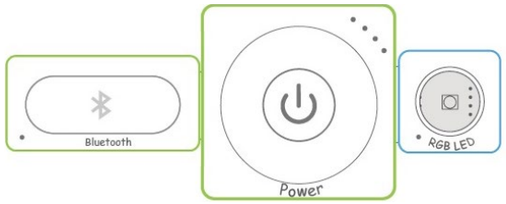
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
RGB LED	1

Materials	
Name	Quantity
Paper Cup	1
Magnet Wire	2
Double-sided Tape Roll	1
USB Cable	1

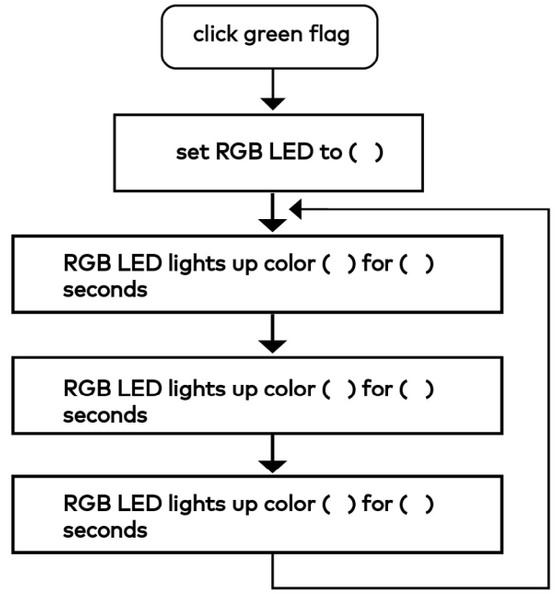
2. Connect the three blocks as shown.



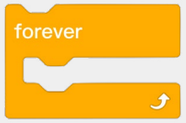
3. Use a USB cable to connect the blocks setup to the computer.

Program

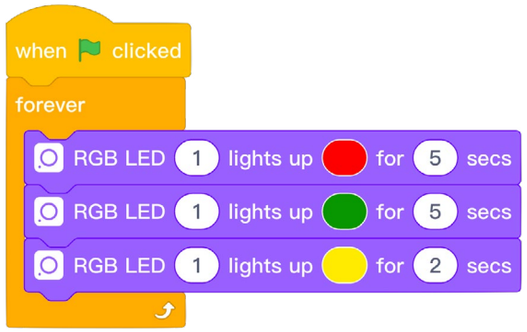
1. Preview



2. Coding Blocks

Category	Coding Block
Control	 This block makes the blocks inside it repeat over and over again.

3. Write Programs



4. Refine Programs

(1) Delete the **forever** block, and run the program to see what happens.
(2) Drag the **forever** block back to place, and rearrange the **RGB LED lights up ( ) for ( ) secs** blocks, run the script and see what happens.
(3) Observe how a traffic light in the real world works. Based on your observations, change the duration in your program to make your traffic light more realistic.

Decorate

1. Find an empty paper cup to make a pedestal.

2. Put the **Power** and the **Bluetooth** blocks in the paper cup. Make a hole in the base of the cup.

3. Insert the cable from the outside of the cup. Connect the outside end to the **RGB LED** and the inside end to the **Power**.

4. Use double-sided tape to attach the **RGB LED** block to the base on the outside. Make sure the block is well attached.

5. Seal the cup with cardboard and double-sided tape.

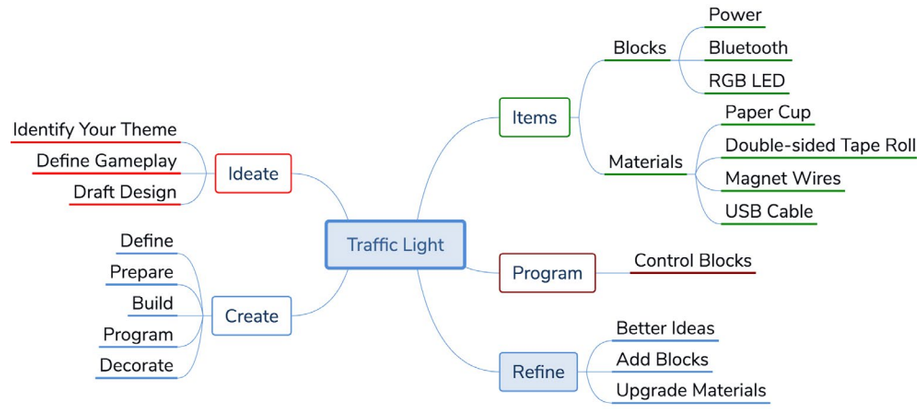
6. Write some road safety rhymes on the cup.

Play & Display

1. Give your project a name and share the project with your group members. Brainstorm more ideas about how you could raise awareness on traffic safety.

2. Vote for the best-designed projects to be displayed in the school.

Wrap-up

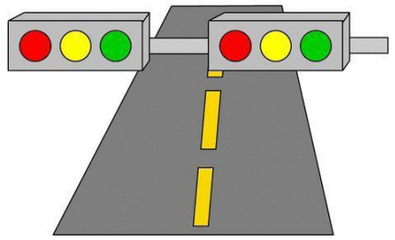


Road Safety Rhyme Example

Traffic Light Song

Tune: Twinkle Twinkle Little Star

Twinkle, twinkle traffic light,
Round the corner shining bright.
Red means stop,
Green means go,
Yellow means very, very slow.
Twinkle, twinkle traffic light,
Round the corner shining bright.

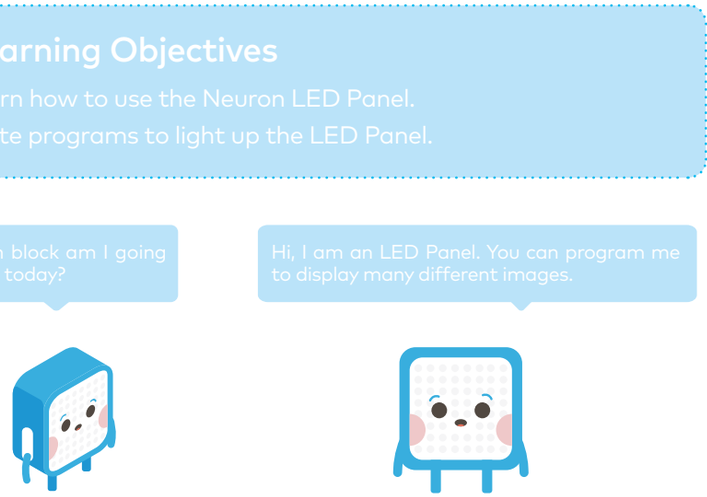


Source: pinterest.com

Lesson 4 Smiley Penholder

Learning Objectives

1. Learn how to use the Neuron LED Panel.
2. Write programs to light up the LED Panel.



Ideate

Smiley Penholder

First, connect the blocks, **Power**, **Bluetooth** and **LED Panel**. Write programs in mBlock 5: When the space key is pressed, the **LED Panel** will show a smiley face for a specified time before switching off. You can also program the **LED Panel** to show other images. So, go ahead and stretch your imagination!

Once the electronic modules part is complete, you can move on to making the penholder that includes the Neuron boards and a gift box. The finished product would be a perfect gift for you or your friend.

Create

1. Draft Design

2. To complete the **Smiley Penholder** project, follow the steps below:

(1) Define: Have a discussion to determine the purpose of your project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect Neuron to your computer, and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

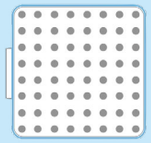
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
LED Panel	1

Materials	
Name	Quantity
Cardboard Box	1
Neuron Board	2
Magnet Wire	1
Colored Card	1
USB Cable	1

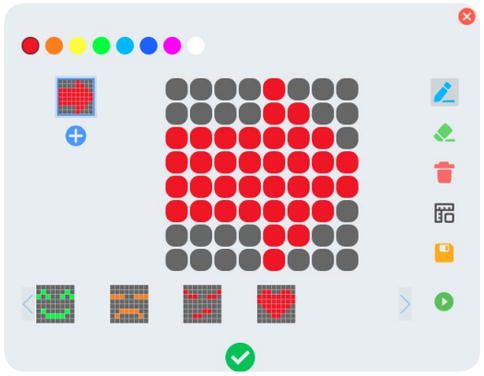
2. Intro to Neuron Blocks



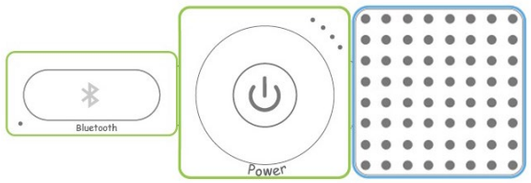
LED Panel

The **LED Panel** has 64 RGB LEDs. We could make animations with the block by writing programs in mBlock 5 or the Neuron app.

Category	Coding Block	
Events	when space key pressed	When the space key is pressed, scripts placed underneath this block will be activated.
Looks	LED panel 1 shows image for 1 secs	This block makes the LED Panel display your animation. (An example is shown below.)



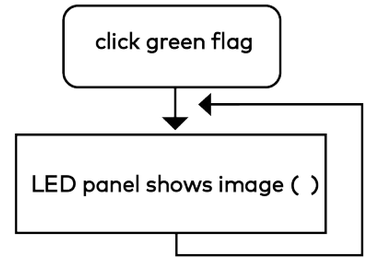
3. Connect the three blocks as shown.

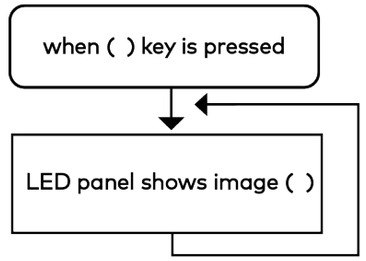


4. Use a USB cable to connect the blocks setup to the computer.

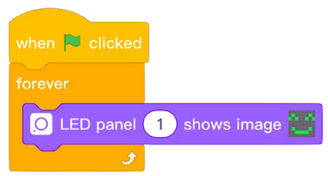
Program

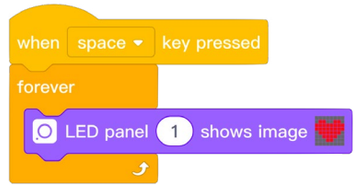
1. Preview





2. Write Programs





3. Refine Programs

(1) Click the drop-down menu of the **when ( ) key pressed** block in your script, and select the right arrow key.
(2) Design an image and have it displayed on the **LED Panel**.

Decorate

1. Make a penholder out of a cardboard box.

2. Decorate the penholder with colored card.

3. Use rivets to fix the Neuron boards together. Place the Neuron blocks on the outer surface of the penholder, then put the Neuron boards on the inner surface to fix the blocks on the penholder.

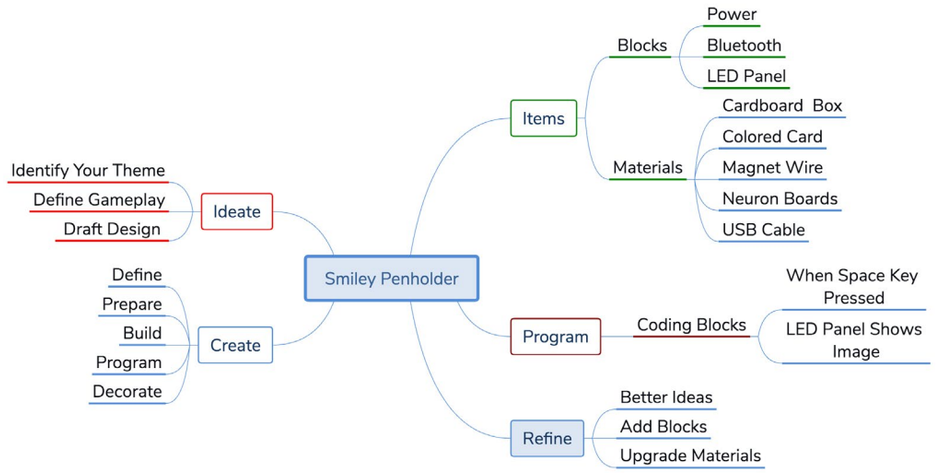
4. Connect the **LED Panel** to the **Power** via a Magnet Wire.

Play & Share

1. Give your project a name and share the project with your group members. Brainstorm some other project ideas where you can use the **LED Panel**.

2. Make a penholder for your friend.

Wrap-up



Open Sesame

Can you make an animation and show it on the **LED Panel**?

Lesson 5 Twinkling Star

Learning Objectives

1. Learn how to use the LED Strip and the Buzzer blocks.
2. Learn how to use mBlock 5 to control multiple Neuron blocks simultaneously.

Ideate

Twinkling Star

First, connect the Neuron blocks, **Power**, **Bluetooth**, **LED Strip**, and **Buzzer**. Then write programs in mBlock 5 to make the star twinkle and play music.

Create

1. Draft Design

2. To complete the **Twinkling Star** project, follow the steps below:

(1) Define: Have a discussion to determine the purpose of your project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect Neuron to your computer, and open mBlock 5 to program the project.
(5) Decorate: Use everyday materials to make your project more attractive.

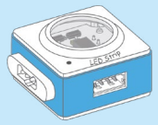
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
LED Strip Driver	1
LED Strip	1
Buzzer	1

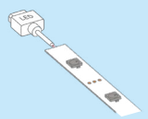
Materials	
Name	Quantity
Colored Card	1
Magnet Wire	1
Double-sided Tape Roll	1
USB Cable	1

2. Intro to Neuron Blocks



LED Strip Driver

The **LED Strip Driver** is used to make the **LED Strip** emit lights.



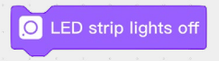
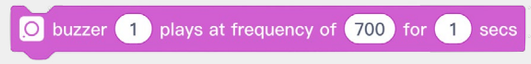
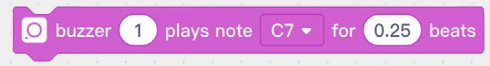
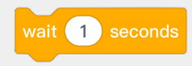
LED Strip

The **LED Strip** has to work with the driver mentioned above. It contains 15 RGB lights, each of which can be programmed to illuminate colors as programmed.

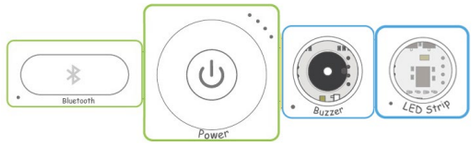
Buzzer

The **Buzzer** makes a buzzing sound when it receives an on signal. You can program it to play different sounds by using mBlock 5 or the Neuron app.

A buzzer is a DC-powered audio signaling device. Buzzers are small, light and inexpensive. The common uses of them include alarm devices, air defense warning systems and electronic toys. There are two types of buzzers—passive buzzers and active buzzers. An active buzzer runs on DC voltage signals and produces a fixed-frequency sound. A passive buzzer requires square wave signals to work and produces sounds at different frequencies, and it can play the notes "Do–Re–Mi–Fa–Sol–La–Si".

Category	Coding Block
Looks	 This block gives the **LED Strip** the colors you choose.
Looks	 This block turns off the **LED Strip**.
Sound	 This block makes the **Buzzer** play at a specified frequency.
Sound	 This block makes the **Buzzer** play a note.
Control	 This block adds a delay of 1 second.

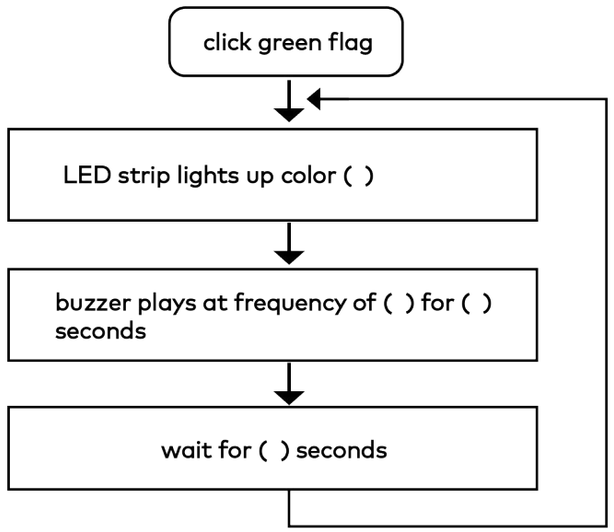
3. Connect the four blocks as shown.



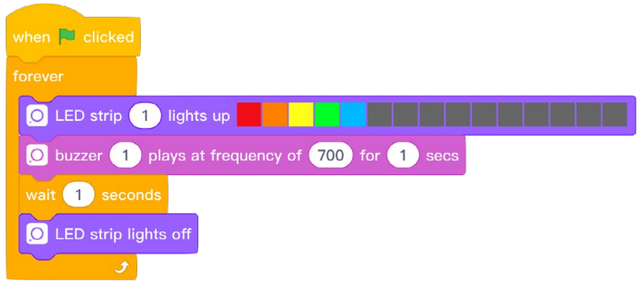
4. Use a USB cable to connect the blocks setup to the computer.

Program

1. Preview

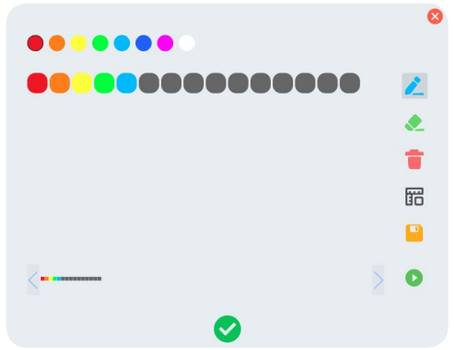


2. Write Programs



3. Refine Programs

(1) Assign colors to the **LED Strip**.



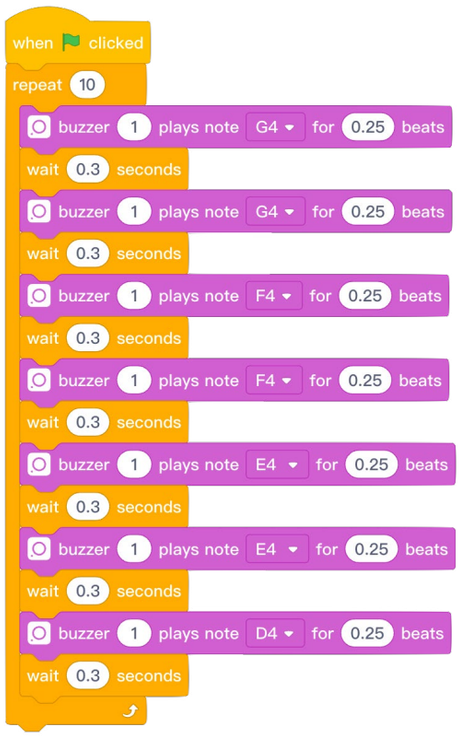
(2) Replace the **buzzer ( ) plays at frequency of ( ) for ( ) secs** block with the **buzzer ( ) plays note ( ) for ( ) beats** block.

Then try to program the **Buzzer** to play a snippet of *Twinkle Twinkle Little Star.*

1=C $\frac{4}{4}$

1 1 5 5 | 6 6 5 – | 4 4 3 3 | 2 2 1 – | 5 5 4 4 | 3 3 2 – |

5 5 4 4 | 3 3 2 – | 1 1 5 5 | 6 6 5 – | 4 4 3 3 | 2 2 1 – ‖



Decorate

1. Cut out a cardboard star. Ensure that the star is big enough to cover all the Neuron blocks you used.

2. Use double-sided tape to attach the blocks to the back of the star.

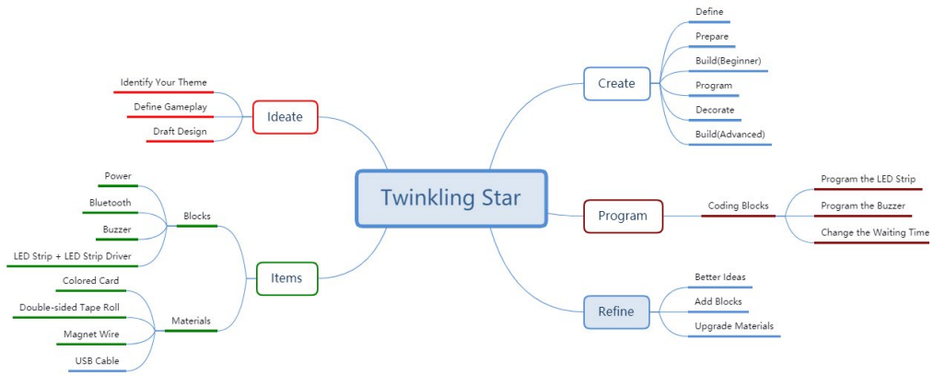
3. Stick the **LED Strip** to the front of the star with double-sided tape.

Play & Display

1. Give your project a name and share the project with your group members. Brainstorm some other project ideas where you can use the **LED Strip** and **Buzzer**.

2. Find a dark place to lay your star and test it out.

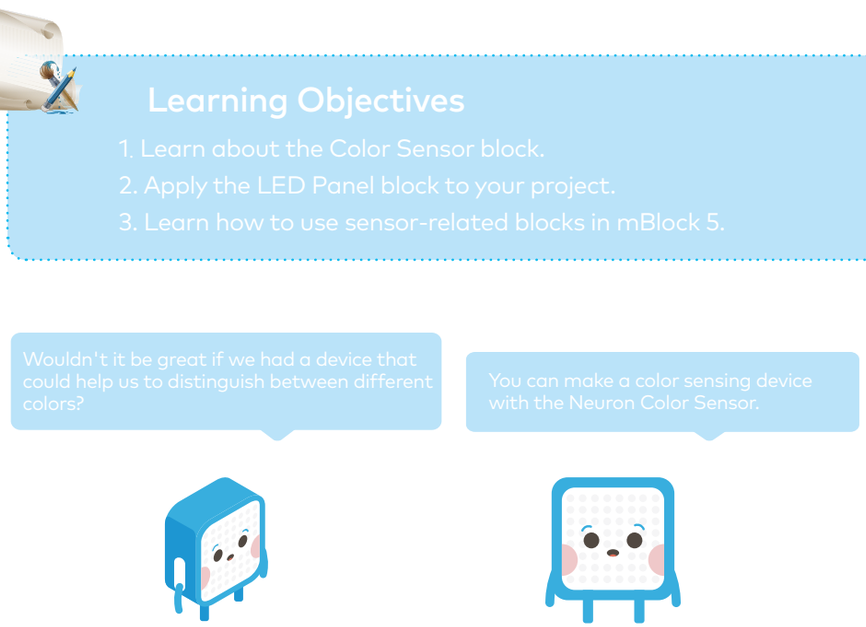
Wrap-up



Lesson 6 Color Sensing Gadget

Learning Objectives

1. Learn about the Color Sensor block.
2. Apply the LED Panel block to your project.
3. Learn how to use sensor-related blocks in mBlock 5.



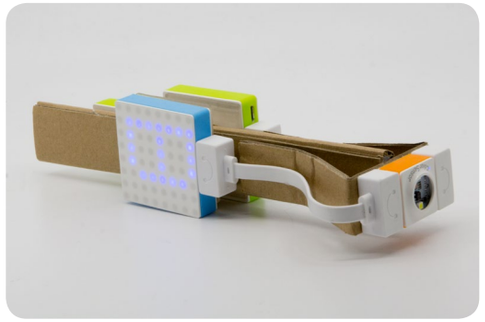
Ideate

Color Sensing Gadget

First, connect the Neuron blocks, **Power**, **Bluetooth**, **Color Sensor** and **LED Panel**. Then use mBlock 5 to program the **Color Sensor** to detect colors and the **LED Panel** to display the first letter of corresponding color.

Create

1. Draft Design



2. To complete the **Color Sensing Gadget** project, follow the steps below:

(1) Define: Have a discussion to determine the purpose of your project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Put the Neuron blocks together.
(4) Program: Connect Neuron to your computer, and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

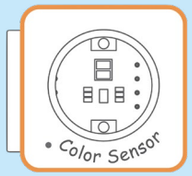
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Color Sensor	1
LED Panel	1

Materials	
Name	Quantity
Cardboard Box	1
Colored Card	2
Magnet Wire	2
Double-sided Tape Roll	1
USB Cable	1

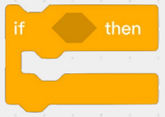
2. Intro to Neuron Blocks



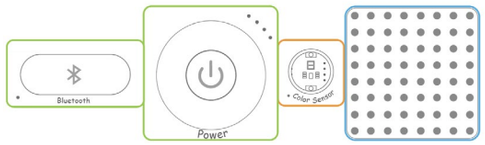
Color Sensor

The **Color Sensor** can detect different colors.

Primary colors of light (Red, Green and Blue) refer to the colors that cannot be made from other colors. They can be combined in different proportions to make all other colors. For example, mixing red light and green light with the same proportion yields yellow light, and mixing red light, green light and blue light with the same proportion yields white light. A color sensor measures the intensity of light reflected from the surface of an object, converts the amount of light to voltage or frequency, compares the measured values with the RGB values and, at last, outputs its color detection result.

Category	Coding Block
Sensing	 This block makes the **Color Sensor** detect colors.
Operators	 This is a relational expression block used to check if the first value is greater than the second value.
Control	 This block runs the code inside it when the statement is true.

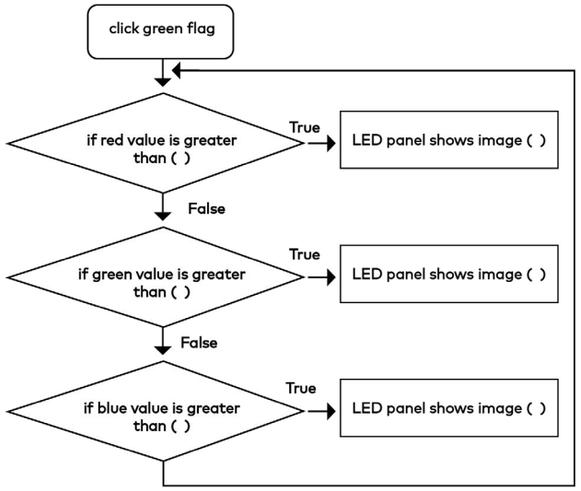
3. Connect the four blocks as shown.



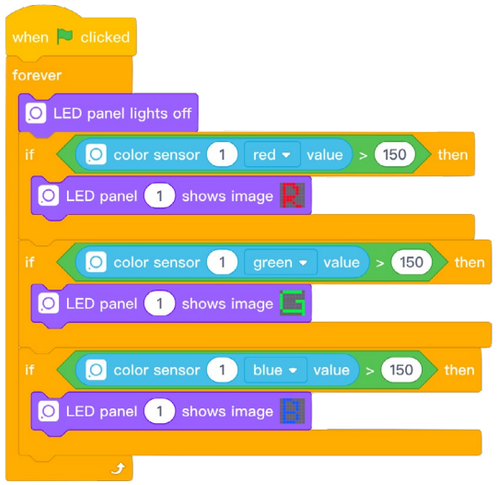
4. Use a USB cable to connect the blocks setup to your computer.

Program

1. Preview



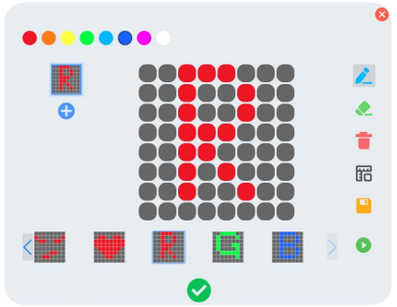
2. Write Programs

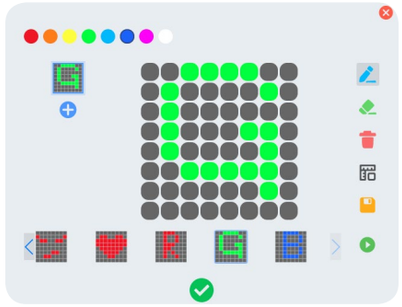


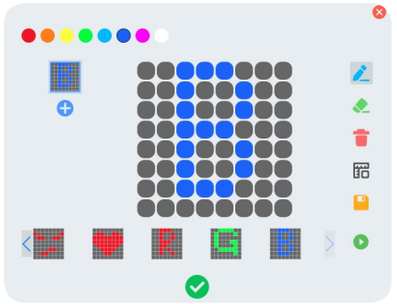
3. Refine Programs

(1) Change the color value in your script to see what happens to the **LED Panel**.

(2) Customize the image shown on the **LED Panel** block.





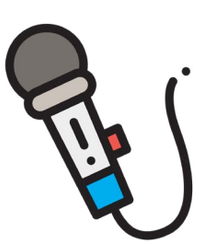


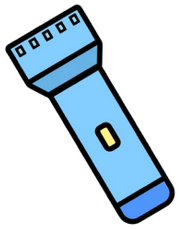
Decorate

1. Cut the cardboard box into a shape that allows you to easily hold the project, and then fix the **Color Sensor** to the front side.

2. Attach the **LED Panel** block to the front side with double-sided tape. Before that, make sure you put the **LED Panel** in the correct place.

3. Connect the **Color Sensor** to the **Power** and the **LED Panel**.



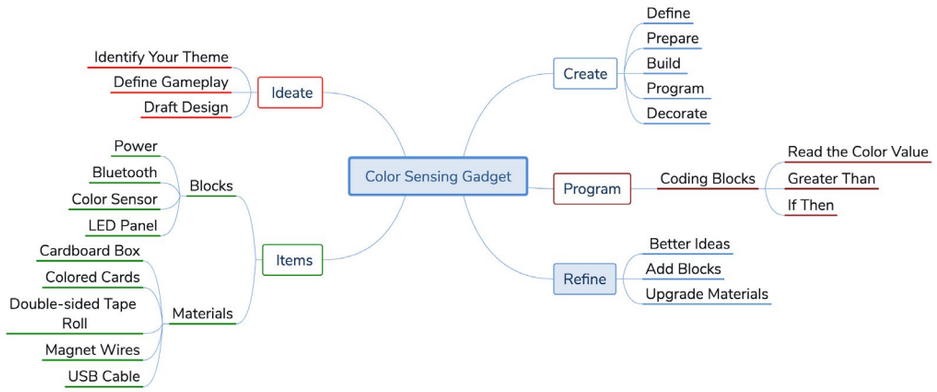


Play & Display

1. Give your project a name and share the project with group members. Brainstorm some other project ideas where you can use the **Color Sensor**.

2. Find a good place at home to lay your project.

Wrap-up



Open Sesame

Can you use other Neuron blocks than the **LED Panel** block to show the detection result?

Lesson 7 Smart Cabinet Light

Learning Objectives

1. Learn about the Light Sensor.
2. Apply the RGB LED to your project.
3. Learn how to use sensors-related blocks in mBlock 5.

It's so dim in the cabinet that I have to use a torch every time I look for something there.

You can make a light-controlled cabinet light with the Neuron **Light Sensor** and the RGB LED.

Ideate

Smart Cabinet Light

First, connect the Neuron blocks, **Power**, **Bluetooth**, **Light Sensor** and **RGB LED**. Then write programs in mBlock 5 to enable the **RGB LED** to turn on/off based on the information gathered by the **Light Sensor**.

Create

1. Draft Design

2. To complete the **Smart Cabinet Light** project, follow the steps below:

(1) Define: Have a discussion to determine the purpose of your project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect Neuron to your computer, and open mBlock 5 to program your project
(5) Decorate: Use everyday materials to make your project more attractive.

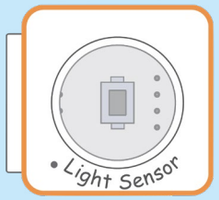
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Light Sensor	1
RGB LED	1

Materials	
Name	Quantity
Cardboard Box	1
Magnet Wire	2
Double-sided Tape Roll	1
USB Cable	1

2. Intro to Neuron Blocks



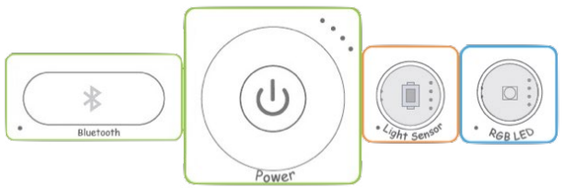
Light Sensor

The **Light Sensor** can detect the light intensity of the surrounding area. The higher the intensity is, the stronger signal the sensor will output.

A light sensor's major component is a photoresistor or photo conductor, which is a light-controlled variable resistor. The resistance of photoresistors decreases as the light intensity increases. Based on this principle, light sensors turn light signals into electrical signals which can be converted into other forms of data telling us the light intensity value.

Category	Coding Block
Sensing	 This block makes the **Light Sensor** detect the light intensity.
Operators	 These are relational expression blocks used to compare two values.
Control	 If the statement is true, the code inside the first gap runs; if the statement is false, the blocks inside the second gap run.

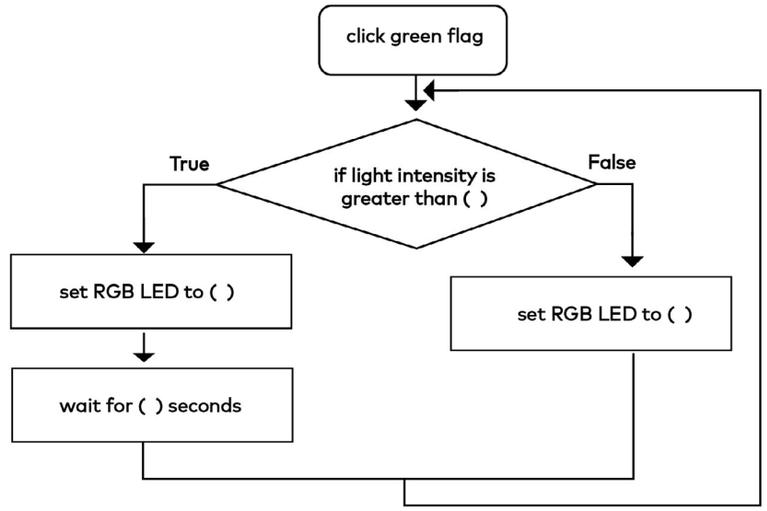
3. Connect the four blocks as shown.



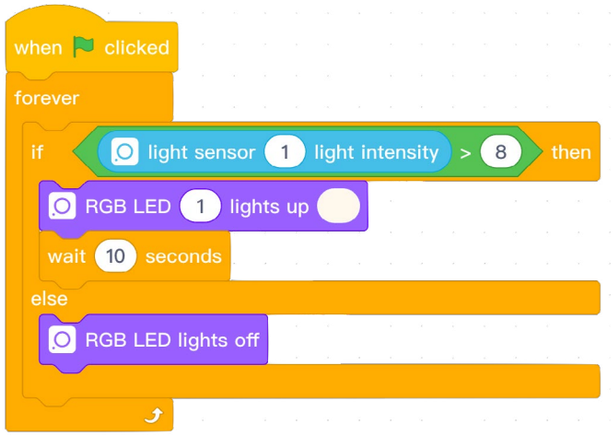
4. Use a USB cable to connect the blocks setup to the computer.

Program

1. Preview

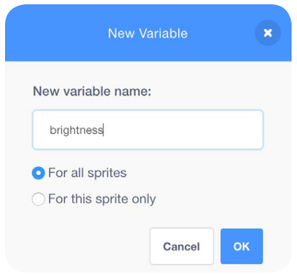


2. Write Programs



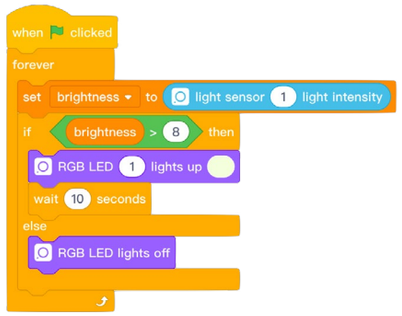
3. Refine Programs

(1) Pay close attention to the light intensity detected by the **Light Sensor** and change the comparison value in the **Operators** ">" block.



Click Variables, then make a new variable named "brightness".

In the top left corner of the stage appears the variable "brightness".



Assign the light intensity value detected to the variable "brightness".

(2) Change the color of the **RGB LED** and the waiting time in your program.

Decorate

1. Make a cabinet out of a cardboard box, and then install the **RGB LED** block to cabinet ceiling.

2. Fix the **Light Sensor**, **Power**, and **Bluetooth** in the cabinet.

3. Connect the **Light Sensor** to the **Power** and the **RGB LED** blocks.

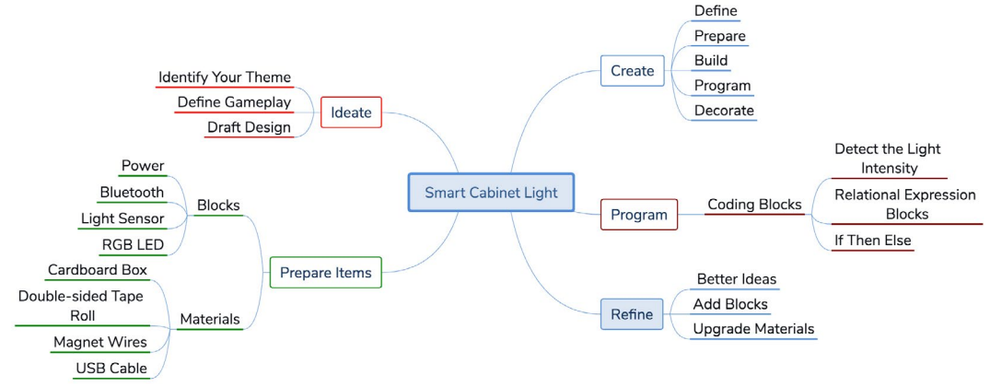
4. Use double-sided tape to keep the blocks together.

Play & Display

1. Give your project a name and share the project with group members. Brainstorm some other project ideas where you can use the **Light Sensor**.

2. Find a good place at home to lay your project.

Wrap-up



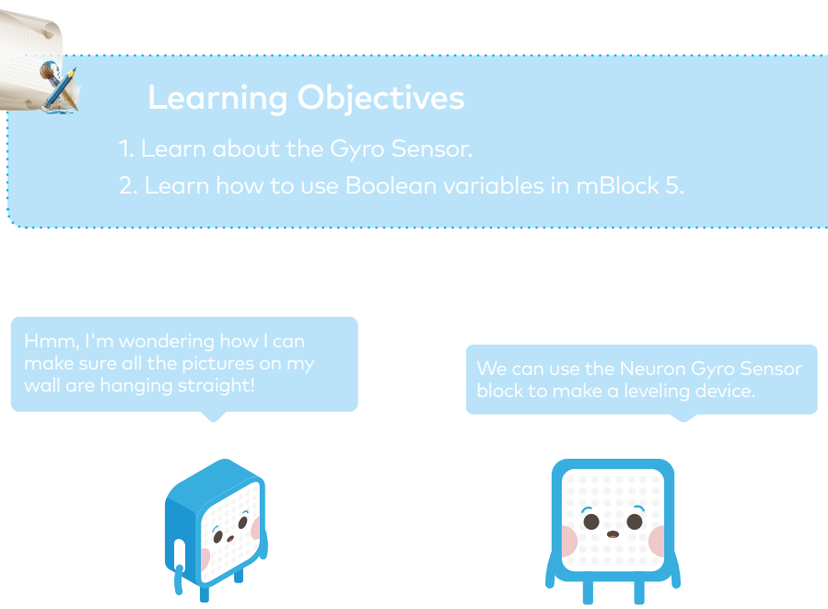
Open Sesame

Can you make a light-controlled street lamp?

Lesson 8 Funny Level

Learning Objectives

1. Learn about the Gyro Sensor.
2. Learn how to use Boolean variables in mBlock 5.



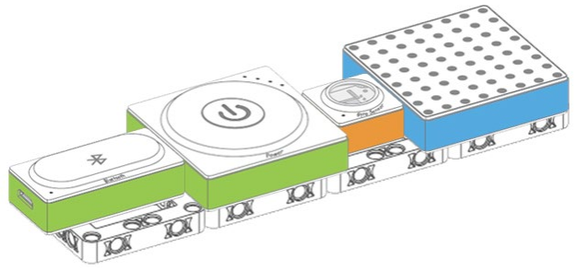
Ideate

Funny Level

First, connect the Neuron blocks—**Power**, **Bluetooth**, **Gyro Sensor** and **LED Panel**. Then use mBlock 5 to program the **LED Panel** to show arrows based on the information generated by the **Gyro Sensor**. In this way, the Neuron blocks serve as a level.

Create

1. Draft Design



2. To complete the **Funny Level** project, follow the steps below:

(1) Define: Have a discussion to determine the purpose of your project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect Neuron to your computer, and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

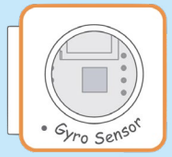
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Gyro Sensor	1
LED Panel	1

Materials	
Name	Quantity
Neuron Board	4
Double-sided Tape Roll	1
USB Cable	1

2. Intro to Neuron Blocks



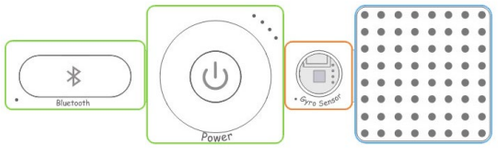
Gyro Sensor

The **Gyro Sensor** is used to detect motions and orientations. It can be used to measure angular velocity and acceleration.

Gyroscopes are designed based on the law of conservation of angular momentum and used for measuring and maintaining orientation.

Sensing	 This block programs **Gyro Sensor** to detect whether it tilts.

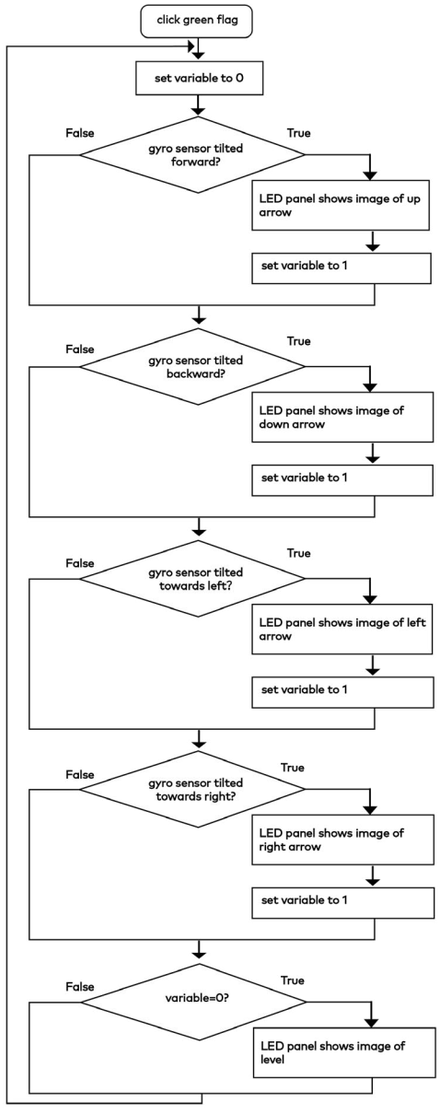
3. Connect the four blocks as shown.



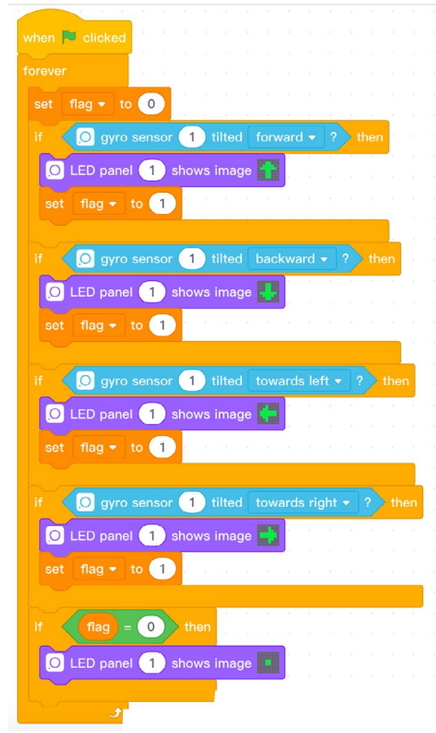
4. Use a USB cable to connect the blocks setup to your computer.

Program

1. Preview



2. Write Programs



3. Refine Programs

(1) Match up different colors with different directions.

Decorate

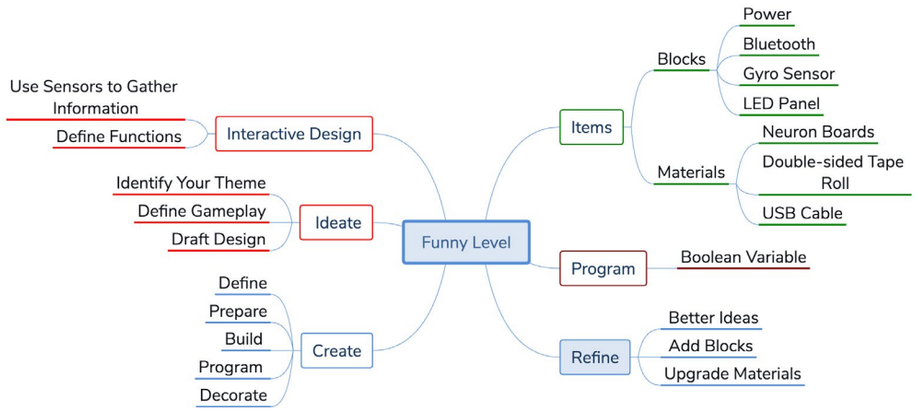
1. Put the Neuron boards together.

2. Place the blocks—**Power**, **Bluetooth**, **Gyro Sensor** and **LED Panel**—on the Neuron boards, and use double-sided tape to attach them to the boards.

Play & Share

1. Give your project a name and share the project with your group members. Brainstorm some other project ideas where you can use the **Gyro Sensor**.
2. Make a leveling device for your friend or family member.

Wrap-up



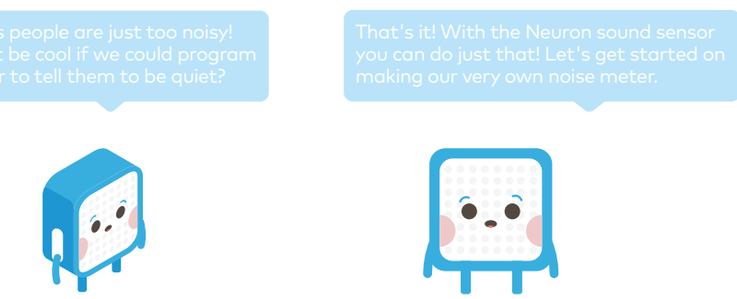
Open Sesame

The **Gyro Sensor** can gather information on roll angle, pitch angle and acceleration. You can further explore the **Gyro Sensor** by making a roly-poly toy, a smart signboard or other projects.

Lesson 9 Noise Meter

Learning Objectives

1. Learn about the Sound Sensor block.
2. Learn about the Servo block.
3. Learn how to use Boolean variables in mBlock 5.



Ideate

Noise Meter

First, build a noise meter by putting the following blocks together: **Power**, **Bluetooth**, **Sound Sensor**, **Servo** and **Dual Servo Driver**.
Then use mBlock 5 to program the noise meter you built: The **Sound Sensor** is programmed to measure the volume. When the noise level reaches a certain threshold, the noise meter will automatically raise a sign board that tells people to be "Quiet" and the volume data will be shown on the **Display** in real time.

Create

1. Draft Design

2. To complete the **Noise Meter** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

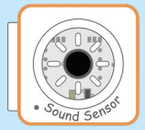
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Sound Sensor	1
Servo	1
Dual Servo Driver	1
Display	1

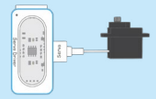
Materials	
Name	Quantity
Cardboard Box	1
Cardboard	2
Magnet Wire	2
Double-sided Tape Roll	1
USB Cable	1

2. Intro to Neuron Blocks



Sound Sensor

The **Sound Sensor** block is used to measure the volume. The louder the sound is, the stronger the signal output will be. The **Sound Sensor** block works in a similar way as our ears detect sounds. It has a built-in electret microphone which is sensitive to sounds. The microphone has a capacitor and the capacitance changes to the rhythm of sound waves. During the process, micro voltages are generated accordingly and the electrical signals are converted into signal outputs.



Dual Servo Driver & Servo

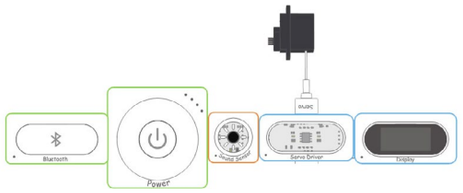
The **Servo** block is used to precisely control the angle of rotation (rotation range: 0~180 degrees). Inside the **Servo** block, there is a DC motor, a control circuit, a speed reducer and more. The potentiometer inside the servo measures the rotation angle and based on the measurements, the control circuit precisely regulates and maintains the rotational angles.

Display

The **Display** block can display the output value that is generated from the previous block. Using mBlock 5 or Neuron app, you can customize what is shown on the **Display** block.

Category	Coding Block
Sensing	sound sensor 1 loudness This block programs the **Sound Sensor** to sense sounds and measure volume.
Action	servo 1 all rotates to 90 degrees This block precisely controls the rotational movements of the **Servo**.
Looks	display 1 shows icon air text hello This block programs the **Display** to show icons and texts.
Variables	set status to 0 This block assigns a value to a variable.

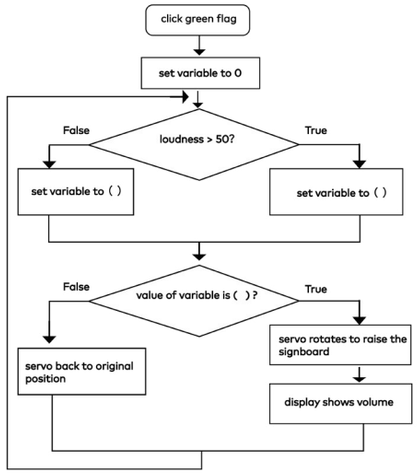
3. Connect the five Neuron blocks in the following order.



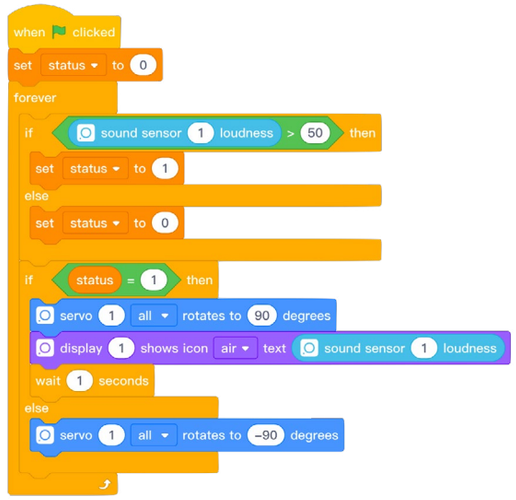
4. Use a USB cable to connect your blocks setup to the computer.

Write Programs

1. Preview



2. Write Programs



3. Refine Programs

(1) Focus on how the variable "status" changes its value and learn more about what role a Boolean variable is playing.
(2) Run your program to test how the sound sensor measures the volume. You can change the volume setting in your code, based on your observations, to make the signboard more sensitive.
(3) You can redefine the waiting time so that the signboard appears for longer, meaning the silence should also last longer!

Decorate

1. Use a cardboard box to build the body part of the noise meter. Cut off the front, back and top of the box. Fold the right and left sides in half to form a triangle shape. Use double-sided tape to consolidate the triangle.

2. Glue the **Servo** to the inner side of the triangle with double-sided tape. Then attach the **Bluetooth**, **Power**, **Sound Sensor**, **Display** and **Dual Servo Driver** to the front side of the box with double-sided tape.

3. Use a piece of cardboard to make a signboard. Write "Quiet" down on the board. Glue the signboard to the servo hub with the double-sided tape.

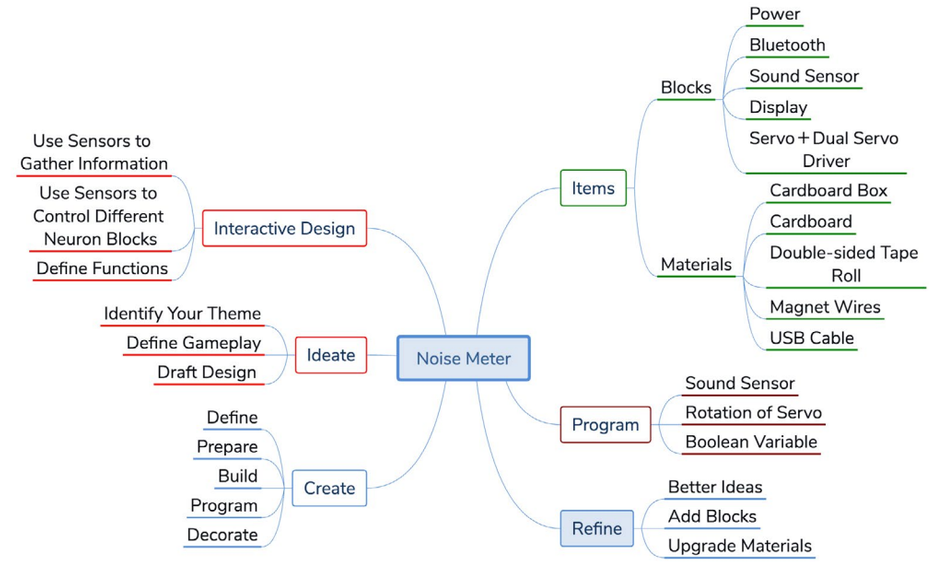
4. Make sure all the Neuron blocks are well connected to each other.

Play & Display

1. Give your project a name and share the project with your group members. Brainstorm about more ideas on where to use the noise meter.

2. Display your project in the school library or the reading room.

Wrap-up



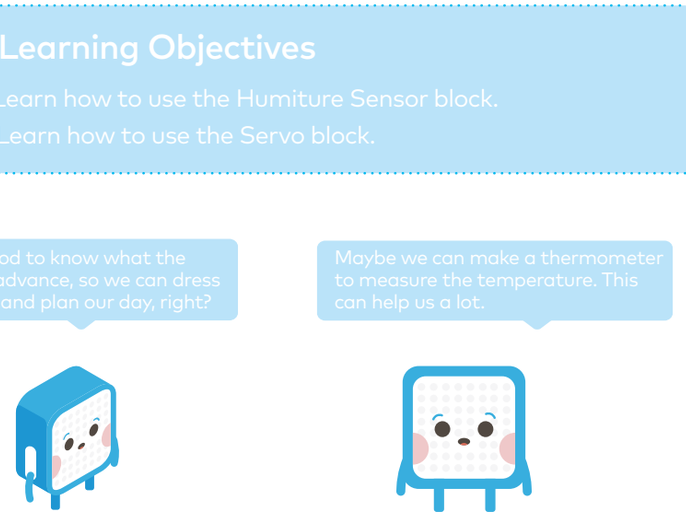
Open Sesame

Noise meters can also be useful outdoors as well as indoors. Use Neuron blocks to design a noise meter that alerts people to noise pollution. Record the measurements generated by the Sound Sensor. Based on your notes, figure out how to make the noise meter better fit your needs, in other words, smarter.

Lesson 10 Cartoon Thermometer

Learning Objectives

1. Learn how to use the Humiture Sensor block.
2. Learn how to use the Servo block.



Ideate

Cartoon Thermometer

First, build a thermometer by putting the following blocks together: **Power**, **Bluetooth**, **Humiture Sensor**, **Servo** and **Dual Servo Driver**.

Then use mBlock 5 to program the cartoon thermometer you just built: The servo automatically rotates to a certain angle based on the measurements generated by the **Humiture Sensor** block. And the meter dial on the thermometer will display the temperature value.

Create

1. Draft Design

2. To complete the **Cartoon Thermometer** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

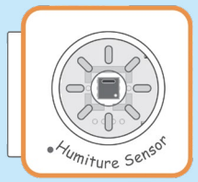
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Humiture Sensor	1
Servo	1
Dual Servo Driver	1

Materials	
Name	Quantity
Calendar Stand	1
Double-sided Tape Roll	2
Colored Card	1
Magnet Wire	2
USB Cable	1

2. Intro to Neuron Blocks

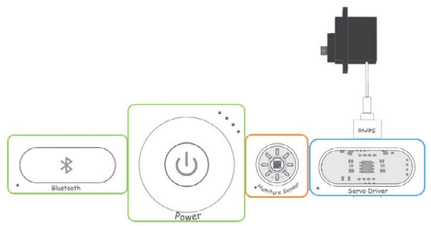


Humiture Sensor

The **Humiture Sensor** block can be used to measure temperature and humidity. The **Humiture Sensor** directly converts physical signals, humidity and temperature, into electrical signals. It consists of a capacitor and a resistor which are highly sensitive to changes in the surrounding environment and can transfer these changes into electrical signals or other information outputs.

Category	Coding Block
Operations	 Mathematical Operations

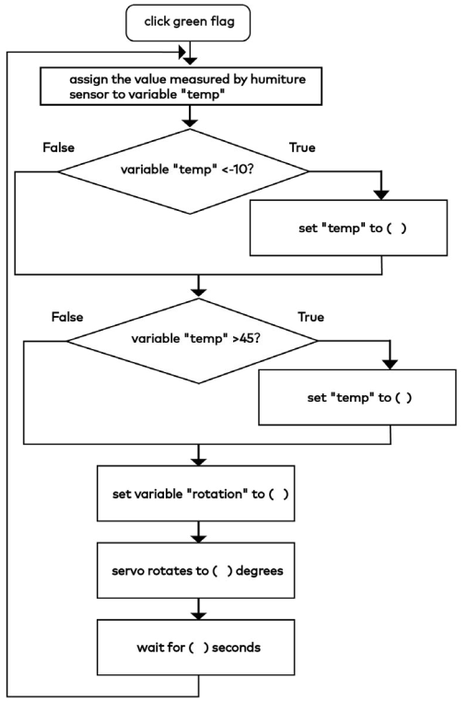
3. Connect the blocks together as follows:



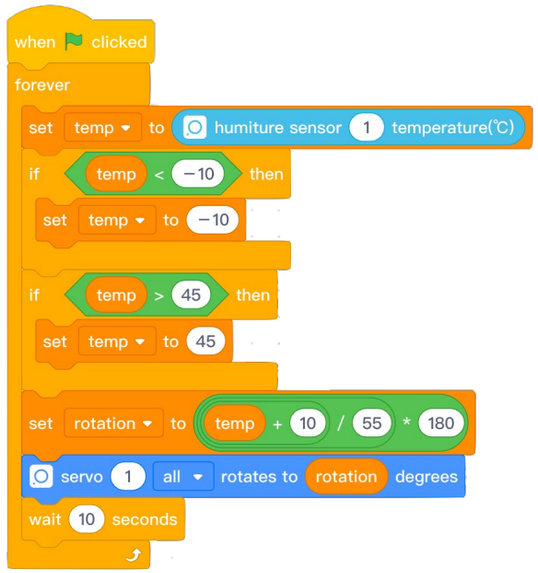
4. Use a USB cable to connect your blocks setup to the computer.

Program

1. Preview



2. Write Programs



3. Refine Programs

(1) Observe how the variable "rotation" changes its value and how it effects the way the **Servo** rotates. Modify your program to make the **Servo** more sensitive and improve the accuracy of the thermometer.

(2) Figure out how to modify the programs to turn your thermometer into a device that can measure humidity.

Decorate

1. Use a calendar stand to make a thermometer.

2. Glue the Neuron blocks to the inside of the calendar stand with double-sided tape. The **Servo** should be attached to the middle of the cardboard as shown in the picture in Draft Design.

3. Cut a hole on the calendar stand to expose the **Servo** to the outside. Cut the cardboard into a meter dial pointer and glue the pointer to the rotating rod of the **Servo**.

4. Glue the **Display** block to the outside of the calendar stand. Connect the **Display** block to the **Power** block via the magnet wire.

5. Mark the scale of the thermometer based on the rotation range of the pointer.

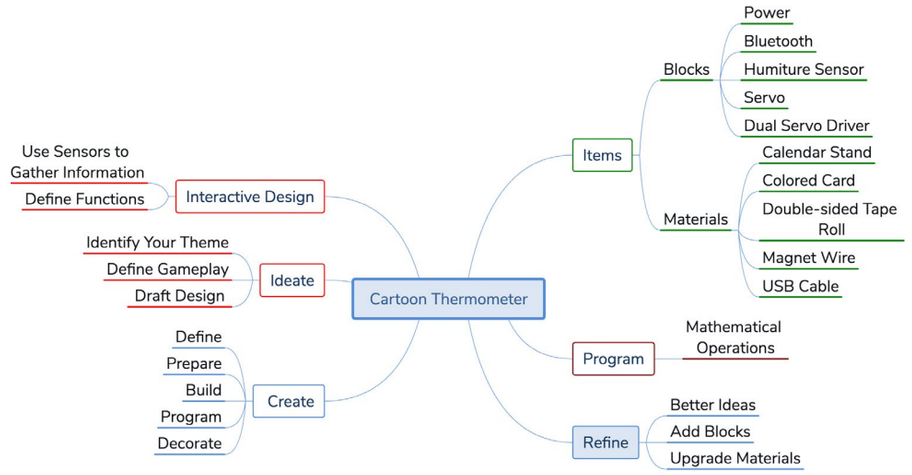
6. Draw cartoon images.

Play & Display

1. Give your project a name and share the project with your group members. Brainstorm about more ideas on where to use the cartoon thermometer.

2. Vote for the best-designed projects to be displayed in the school.

Wrap-up

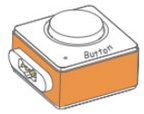


Open Sesame

The **Humiture Sensor** can not only measure temperature but also humidity. Think about this question: How do we use the **Button** block to control the **Humiture Sensor** to switch its role between a thermometer and a moisture meter?

Here's how the **Button** block works:
When the button is clicked (short press), there is connection between two points in a circuit; and when the button is released, the electronic circuit is open.

When the button is pressed for 5 seconds, the connection will remain even after the button is released.



Category	Coding Block
Sensing	button 1 is pressed? This block detects whether the **Button** is pressed.

Lesson 11 Smart Fan

Learning Objectives

1. Learn to use the PIR Sensor block.
2. Learn to use the DC Motor block.
3. Learn to use sensors-related blocks in mBlock 5.

We've used a variety of sensors to create so many projects.

Yes, next we're going to learn about a new sensor - PIR Sensor.

Ideate

Smart Fan

First, put these blocks together: **Power**, **Bluetooth**, **PIR Sensor**, **DC Motor** and **Dual DC Motor Driver**.

Use mBlock 5 to turn the setup into a Smart Fan that can automatically turn on/off based on the **PIR Sensor** output.

Create

1. Draft Design

2. To complete the **Smart Fan** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: : Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

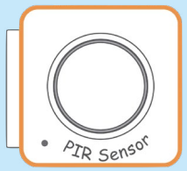
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
PIR Sensor	1
DC Motor	1
Dual DC Motor Driver	1

Materials	
Name	Quantity
Fan Blade	1
Structural Parts	1
Magnet Wire	1
Double-sided Tape Roll	1
USB Cable	1
Cardboard Box	1

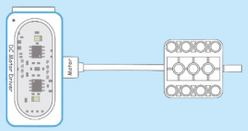
2. Intro to Neuron Blocks



PIR (passive infrared sensor) Sensor

The **PIR (passive infrared sensor) Sensor** block is used to detect whether there are people moving in the sensing range. In this project, the Neuron **PIR Sensor** we use has a detection range of up to 3 meters. When the **PIR Sensor** detects people moving within this range, it will send a Yes signal to the block connected next to it. When people walk out of the range, the **PIR Sensor** will automatically turn off.

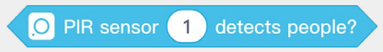
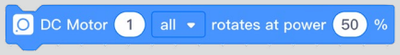
PIR sensors are typically packed with high technologies, making them more energy-saving and environment-friendly.



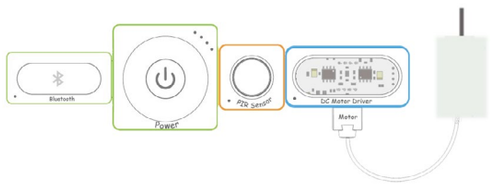
Dual DC Motor Driver & DC Motor

The **Dual DC Motor Driver** is used to drive the **DC Motor** or the **Water Pump**. It can drive two devices simultaneously.

A DC Motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. (Wiki)

Category	Coding Block
Sensing	 This block programs the **PIR sensor** to detect people.
Action	 This block programs the **DC Motor** to rotate at a specific speed.

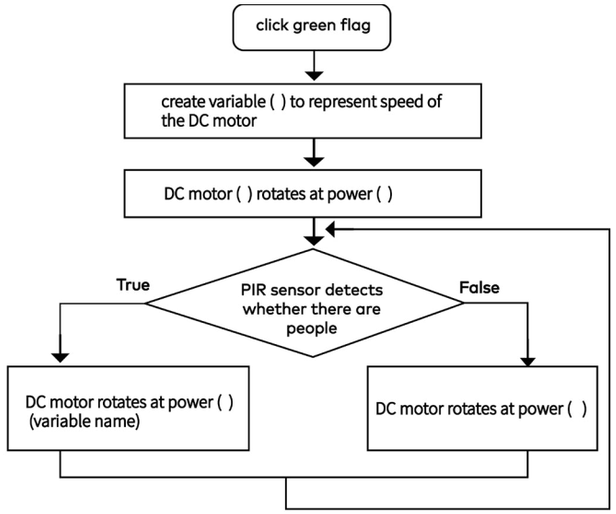
3. Connect the four blocks as shown:



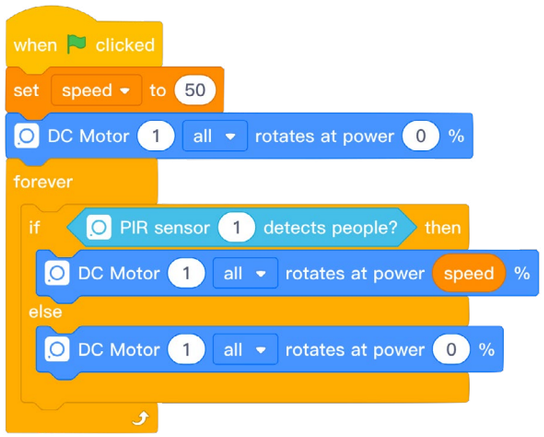
4. Use a USB cable to connect your blocks setup to the computer.

Program

1. Preview



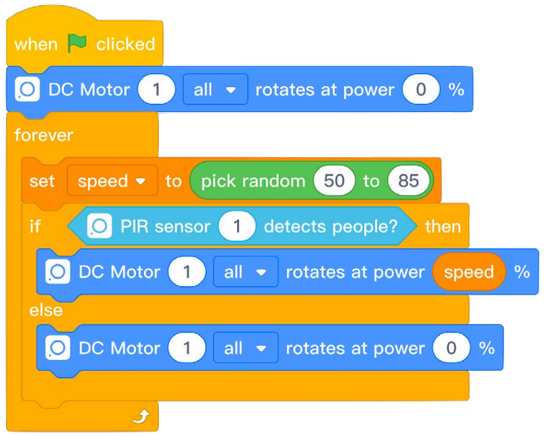
2. Write Programs



3. Refine Programs

The **DC Motor** can rotate at power of 0% -100%. To ensure that the **DC Motor** does not run at an extremely high speed, we can set the rotational speed to a number that is randomly generated within a normal range.

Category	Coding Block
Operators	pick random 1 to 10 This block generates a random number ranging from the first given number to the second.



Decorate

1. Use everyday stuff to build a fan support. Fix the **DC Motor** to the top of the frame. Make sure the motor can keep stable when working.

2. Fix the **Power**, **Bluetooth** and **PIR Sensor** to the support. Connect the blocks using the magnet wires.

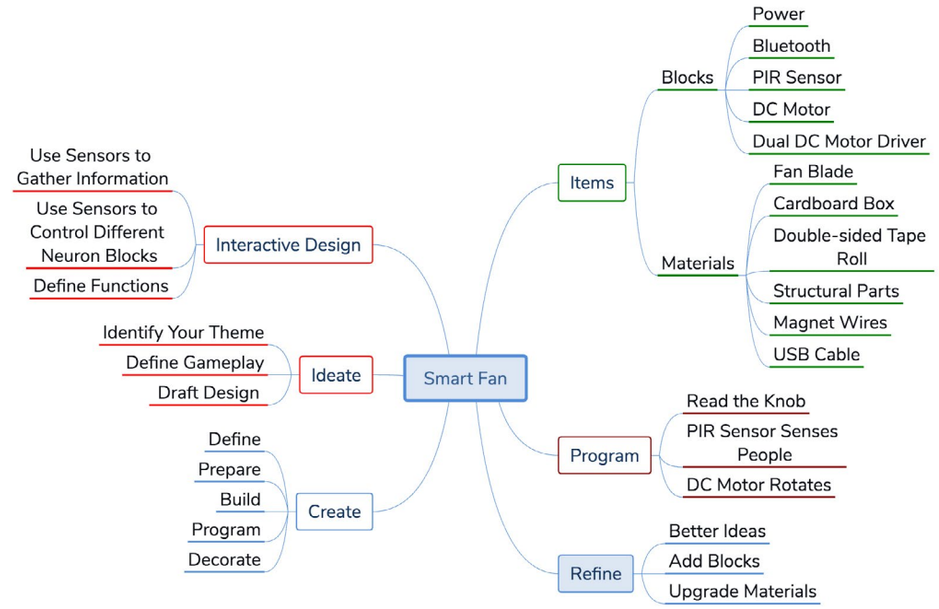
3. Mount the fan on the rotor of the **DC Motor**.

Play & Share

1. Be careful when operating the motor because it might be unpredictable sometimes.

2. Give your project a name and share the project with your group members. Brainstorm about more ideas on how to apply the smart fan.

Wrap-up



Open Sesame

The **Knob** block is an input block that is used to adjust values. By toggling the knob, we can change the value of any output block that's connected to the **Knob**. In this project, we toggle the knob to change the speed of the motor in an attempt to control the speed of the fan.

Category	Coding Block
Sensing	knob 1 value This block is used to read the **Knob**.

People who work outdoors would benefit from a fan, but need their hands free. Brainstorm on how this issue could be solved using the fan you just created.

Lesson 12 Smart Plant Watering System

Learning Objectives

1. Learn about the Soil Moisture Sensor.
2. Learn about the Water Pump block.
3. Explore the Dual DC Motor Driver block.

Even though I really care about my plants, I sometimes forget to water them. I wish I had a gadget to help me out.

Then, we can use the Neuron Soil Moisture Sensor and the Water Pump block to make a smart plant watering system.

Ideate

Smart Plant Watering System

First, put these blocks together: **Power**, **Bluetooth**, **Soil Moisture Sensor**, **Dual DC Motor Driver** and **Water Pump**.

Then use mBlock 5 to program the setup you just built: Write programs to turn your project into a smart plant watering system that can automatically turn on/off its water pump based on the outputs from the **Soil Moisture Sensor**.

Create

1. Draft Design

2. To complete the **Smart Plant Watering** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

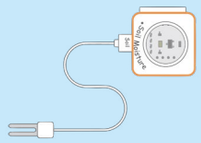
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Soil Moisture Sensor	1
Dual DC Motor Driver	1
Water Pump	1

Materials	
Name	Quantity
Potted Flowers	1
Cup	1
Water Pipe	1
USB Cable	1

2. Intro to Neuron Blocks



Soil Moisture Sensor

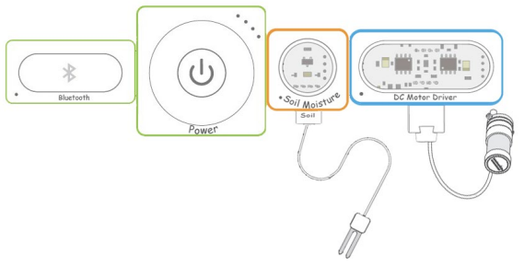
The **Soil Moisture Sensor** is used to measure the water content in soil. The sensor has a capacitor inside that is highly sensitive to the level of humidity. The capacitance is affected by how much water is absorbed in the capacitor. The changes in capacitance will be converted into electrical signals and these electrical signals will then be turned into outputs we humans can see.

Dual DC Motor Driver & Water Pump

We connect the **Water Pump** to the **Dual DC Motor Driver** to make a water suction pump.

Category	Coding Block
Sensing	soil moisture sensor 1 humidity We use this block to read the **Soil Moisture Sensor**.
Action	DC Motor 1 all rotates at power 50 % for 1 secs We use this block to set the speed of **DC Motor** and define how long the rotation lasts.

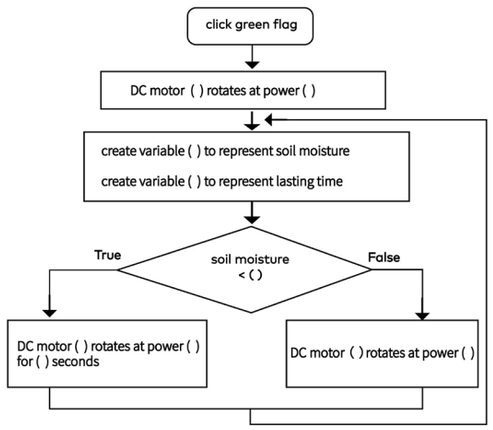
3. Connect the blocks. Put together the four Neuron blocks in the order as shown.



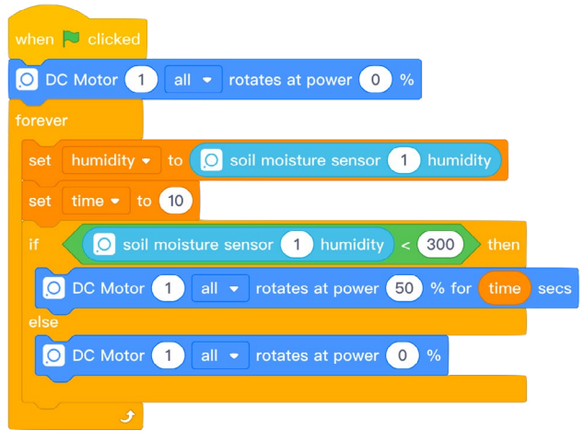
4. Use a USB cable to connect your blocks setup to the computer.

Program

1. Preview



2. Write Programs



3. Refine Programs

(1) Observe how the soil moisture changes. Record the maximum and minimum values.
(2) Define the knob in your code. Program the **Water Pump** to automatically turn on when the soil moisture is below a certain threshold and turn off when the soil moisture rises above the threshold. Make your plant flowering system smarter.

Decorate

1. Use structural parts to build a stand. Attach the **Soil Moisture Sensor** to the top of the stand and hold it in place. Then fix the **Dual DC Motor Driver** and the **Water Pump** to the stand. Make sure the stand is stable when your smart plant watering system is in use.

2. Attach the **Power** and **Bluetooth** to the stand. Connect these blocks with the **Magnet Wires**.

3. Insert the inlet of the **Water Pump** into the cup. Keep the outlet away from the **Soil Moisture Sensor** and insert the outlet into the soil.

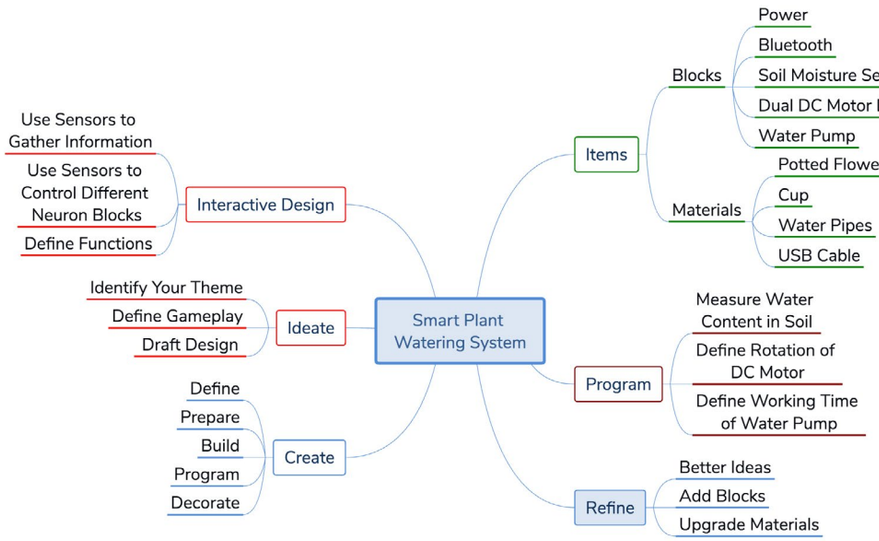
Play & Share

1. The rotation of the **Water Pump** block may be unpredictable at times, so please take care when working with it.

2. Give your project a name and share the project with your group members. Brainstorm about more ideas on where to use the smart watering system in our daily life.

3. Build a smart plant watering system as a gift for your friend or family member.

Wrap-up



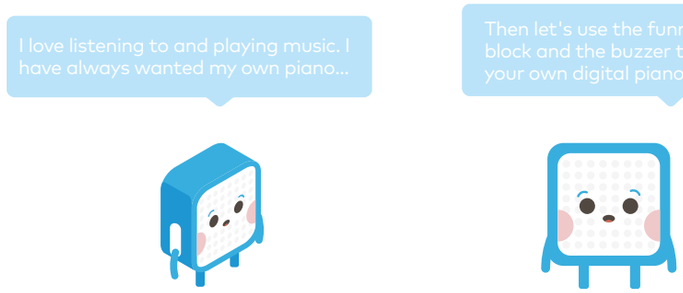
Open Sesame

Brainstorm ideas on how to successfully add a fan to your plant watering system, to improve air circulation while the system is working.

Lesson 13 Fruit Piano

Learning Objectives

1. Learn to use the Funny Touch block.
2. Learn to use mBlock 5 to program multiple Neuron blocks to do things at the same time.



Ideate

Fruit Piano

First, put these blocks together: **Power**, **Bluetooth**, **Funny Touch**, **Buzzer**.

Then, using mBlock 5, you can program the **Buzzer** block to make sounds like a digital piano in response to the signals from the **Funny Touch**.

Create

1. Draft Design

2. To complete the **Fruit Piano** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

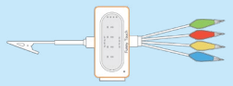
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Funny Touch	2
Buzzer	1

Materials	
Name	Quantity
Banana	8
Structural Part	1
Double-sided Tape Roll	1
USB Cable	1

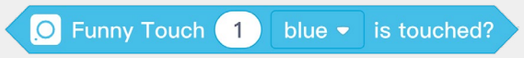
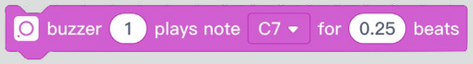
2. Intro to Neuron Blocks



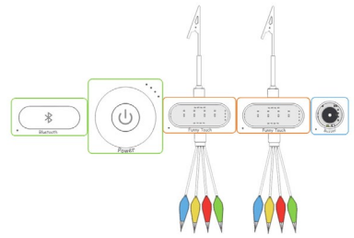
Funny Touch

The **Funny Touch** block can turn any conductive objects (like bananas or water) into a touch switch. The block includes a GND wire and 4 different colored alligator clips.

The **Funny Touch** is triggered when the electric circuit is closed between the GND wire and the alligator clips.

Category	Coding Block
Sensing	 We use this block to sense whether an alligator clip is touched.
Sound	 We use this block to change the note and beat of the **Buzzer**.

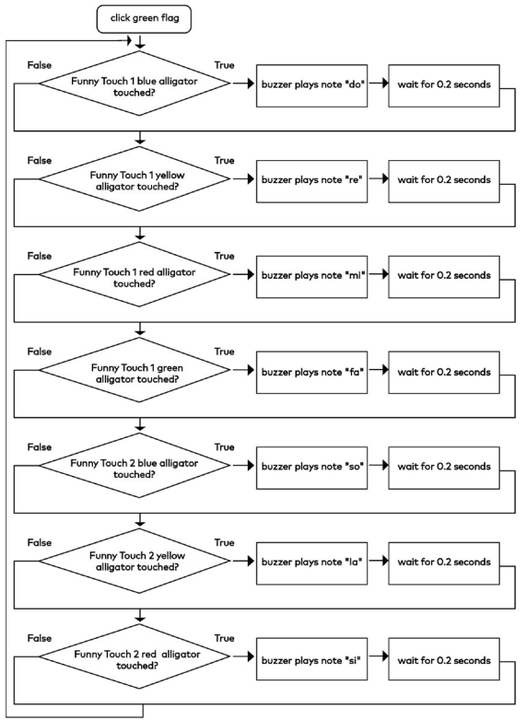
3. Connect the five Neuron blocks as shown.



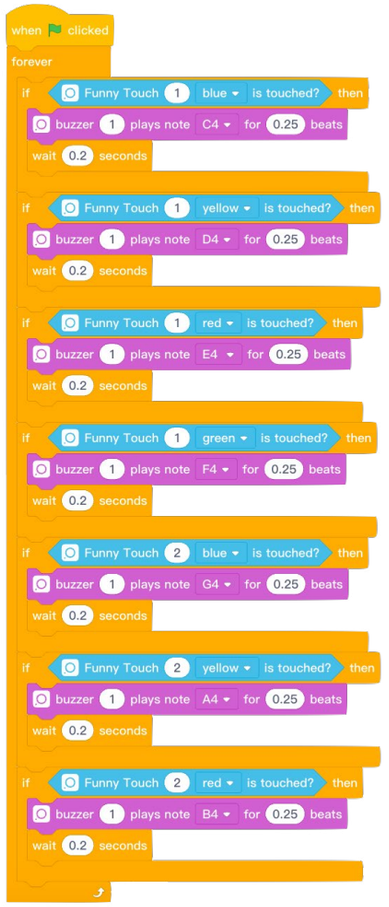
4. Use a USB cable to connect your blocks setup to the computer.

Program

1. Preview

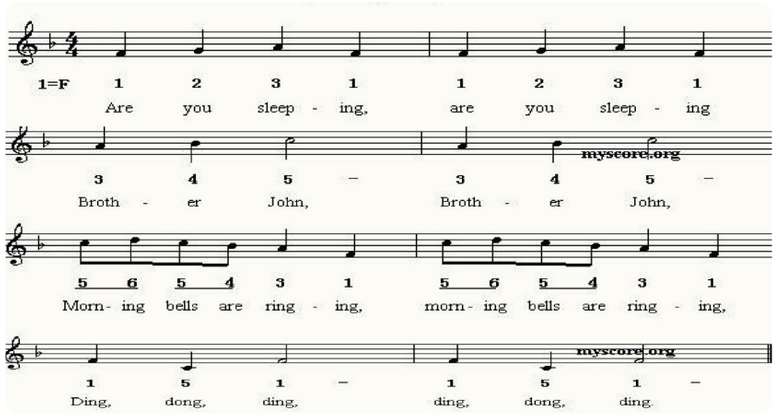


2. Write Programs



3. Refine Programs

Based on the numbered musical notation of the *Are You Sleeping* song, adjust the waiting time to make the song smoother and easy-listening. Try touching the alligator clips to hear your song!



Decorate

1. Use the everyday stuff to build a piano shape. Place the bananas at the correct position to serve as the piano keys. Hold the bananas in place to serve as piano keys, making sure they won't fall off.

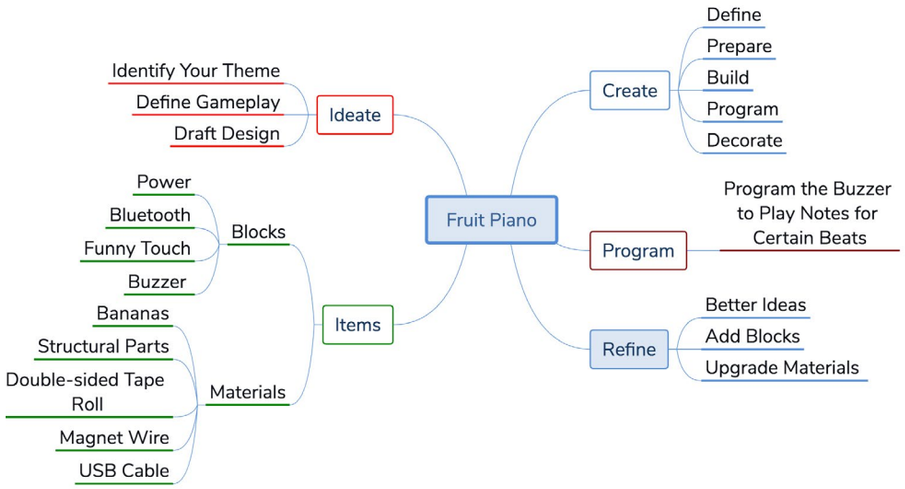
2. Attach the **Power**, **Bluetooth**, **Funny Touch** and **Buzzer** to the piano.

3. Attach the alligator clips to the banana in the correct order.

Play & Share

Give your project a name and share your project with your group members. Use the fruit piano to play a song. Brainstorm more ideas on how to apply the fruit piano in your daily life.

Wrap-up



Open Sesame

Try using other fruits to create the keyboard.

Counting beats is very important when learning to play an instrument. Think about this: how could mblock 5 be used to make a metronome?

Lesson 14 Smart Bubble Blower

Learning Objectives

1. Learn to use the Ultrasonic Sensor block.
2. Learn to use a combination of the Servo block and the DC Motor block.
3. Learn how to write programs to meet different needs.

One of my favourite things to do in summer is blowing bubbles and watching them float away!

We've got a Servo and a DC motor. How about using them to make a bubble blower ?

Ideate

Smart Bubble Blower

First, put these blocks together: **Power**, **Bluetooth**, **Ultrasonic Sensor**, **Servo**, **Dual Servo Driver**, **DC Motor**, **Dual DC Motor**, **LED Strip** and **LED Strip Driver**. Then, use mBlock5 to program the setup you just built: Program the **Servo** to rotate by specific degree as indicated by the Ultrasonic Sensor outputs. The bubble ring should make its way to where the fan is placed. The **DC Motor** will activate the fan, and the ring begins creating bubbles.

Create

1. Draft Design

2. To complete the **Smart Bubble Blower** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project attractive.

Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Ultrasonic Sensor	1
Servo	1
Dual Servo Driver	1
DC Motor	1
Dual DC Motor Driver	1
LED Strip	1
LED Strip Driver	1

Materials	
Name	Quantity
Book Stand	1
Double-sided Tape Roll	1
Plastic Basin	1
Magnet Wire	3
Bubble Ring	1
Wood Block	1
Binder Clip	3
USB Cable	1

2. Intro to Neuron Blocks

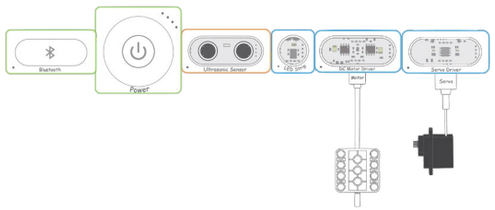
Ultrasonic Sensor

The **Ultrasonic Sensor** block is used to measure the distance to an object in front of it. It has a detection range of 3cm ~300cm.

The **Ultrasonic Sensor** is composed of a transmitter, a receiver, a controller and a power supply. The transmitter sends sound waves with frequency higher than 20K Hz and the sound waves will bounce back if they hit any objects. When the receiver receives the reflected sound waves, the transducer will transform these sound waves into some visible signals. During this whole process, the controller and the power perform their own functions.

Category	Coding Block
Sensing	 This block measures the distance of an object in front of the **Ultrasonic Sensor**.

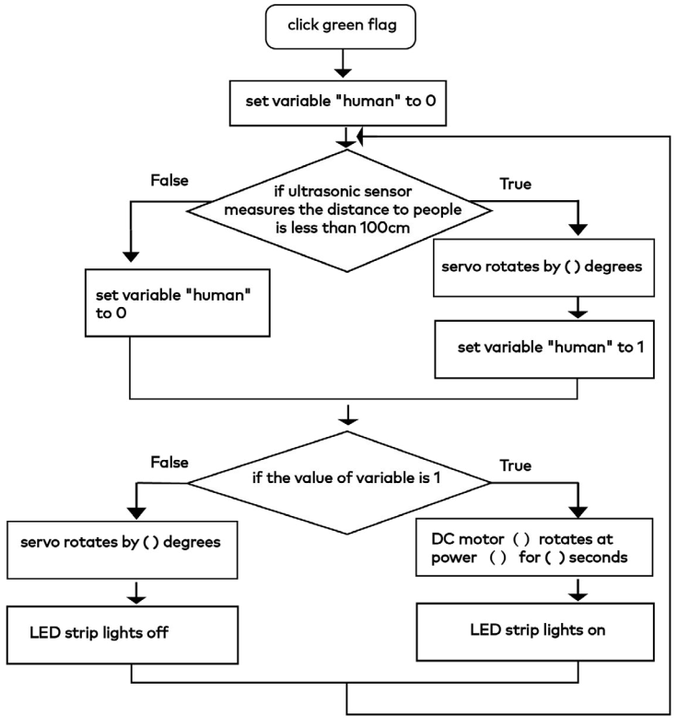
3. Connect the blocks. Put together the six Neuron blocks in the order as shown.



4. Use a USB cable to connect your blocks setup to the computer.

Program

1. Preview



2. Write Programs

3. Refine Programs

Record the maximum distance and the minimum distance that the **Ultrasonic Sensor** has measured. Based on your notes, adjust the rotational angle of the **Servo** block to ensure everything goes well with the bubble blower when it's working.

Decorate

1. Use the book stand and the wood block to build a base. Put the **Servo** on the wood block, the **DC Motor** on the base. Secure them into place.

2. Attach the **Ultrasonic Sensor** block to the front side of the book stand.

3. Attach one end of the bubble ring to the servo hub. Make sure it won't fall off.

4. Fill the plastic basin with bubble solution.

5. Adjust the setup to make sure everything (**Servo**, **DC Motor**, bubble ring, plastic basin) is in its right place.

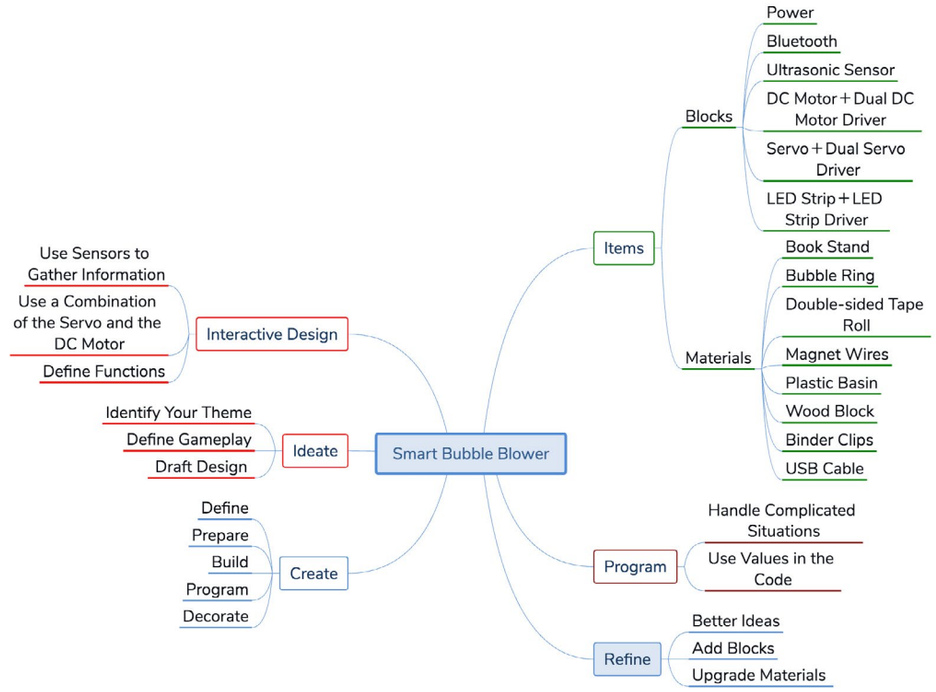
6. Attach the **LED Strip** to the bubble blower with the binder clips.

Play & Display

1. Give your project a name and share the project with your group members. Brainstorm about more ideas on where to apply the bubble blower.

2. Vote for the most well-designed projects to be displayed in the school.

Wrap-up



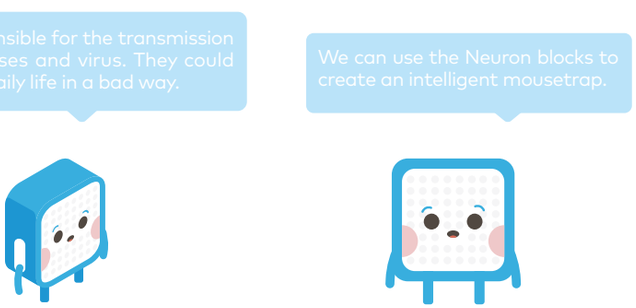
Open Sesame

Figure out how to upgrade your project a little bit by adding a **Buzzer** to the setup. The bubble blower can play music while it's blowing bubbles. Isn't that cool?

Lesson 15 Mini Mousetrap

Learning Objectives

1. Use Ultrasonic Sensor, LED Panel, and Servo wisely to create their project.
2. Learn about Boolean variables and how to use them in projects.



Ideate

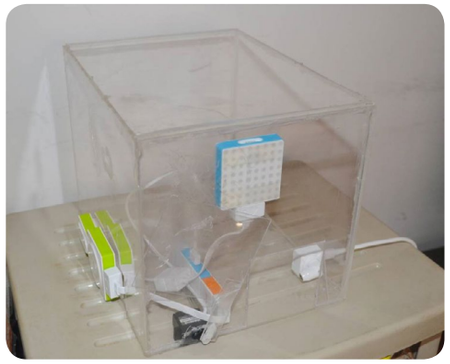
Mini Mousetrap

First, connect these blocks: **Power**, **Bluetooth**, **Ultrasonic Sensor**, **Servo and Dual Servo Driver**, and **LED Panel**.

Use mBlock to program the setup: when the **Ultrasonic Sensor** detects the presence of a mouse, the **Servo** automatically shuts down the gate of the mousetrap. At the same time, the **LED Panel** will tell us the result.

Create

1. Draft Design



2. To complete the **Mini Mousetrap** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project attractive.

Build

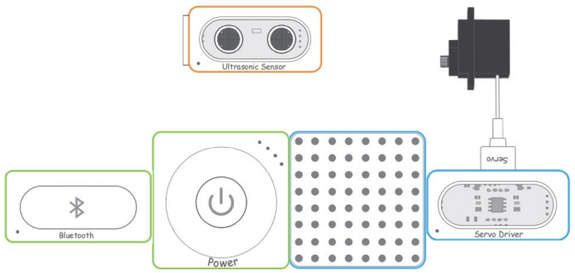
1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Ultrasonic Sensor	1
Servo	1
Dual Servo Driver	1
LED Panel	1

Materials	
Name	Quantity
Translucent Box	1
Magnet Wire	3
Double-sided Tape Roll	1
USB Cable	1

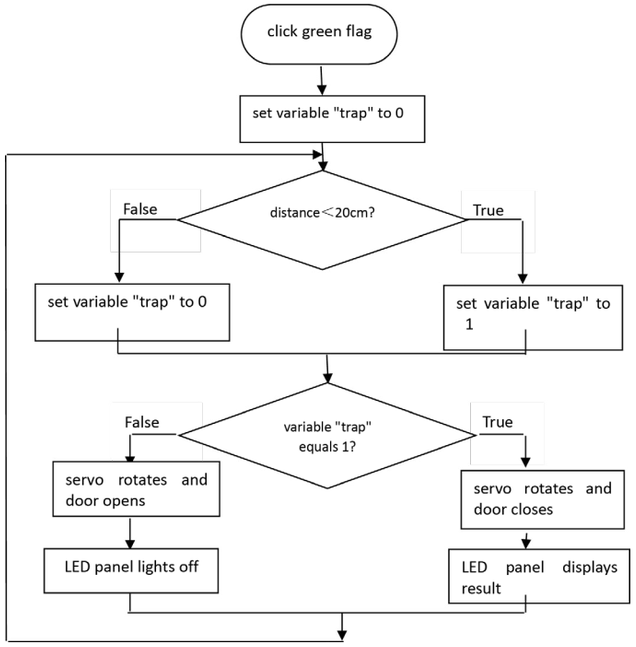
2.Connect the five Neuron blocks as shown below.

3.Use a USB cable to connect your blocks setup to the computer.

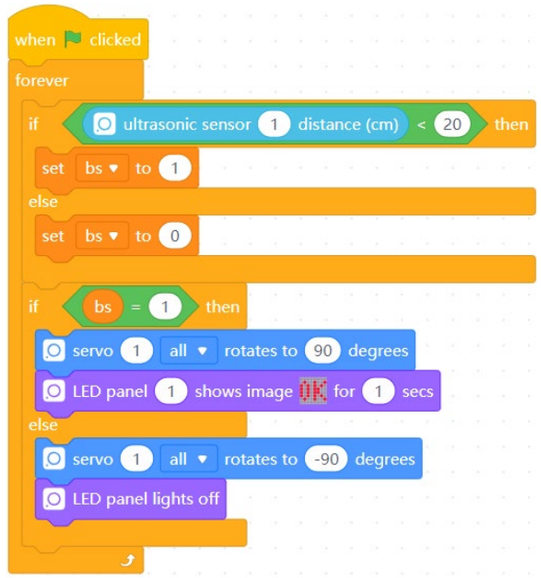


Program

1. Preview



2. Write Programs



3. Refine Programs

(1) Measure the distance between the door and the **Ultrasonic Sensor** so that you can rely on this measurement to modify the "if...then" coding block for the best effect.
(2) Add a "wait...seconds" block to your program to figure out how to make the mousetrap work at its best.

Decorate

1. Use a translucent box to build the body part of your mousetrap. Glue the LED Panel to the middle of the left side of the box with double-sided tape.

2. Glue the Ultrasonic Sensor near the left door to hold it in place.

3. Attach the Servo and Dual Servo driver to the top of the box. Use materials to secure the Servo and Dual Servo driver in place and expose the servo hub to the outside.

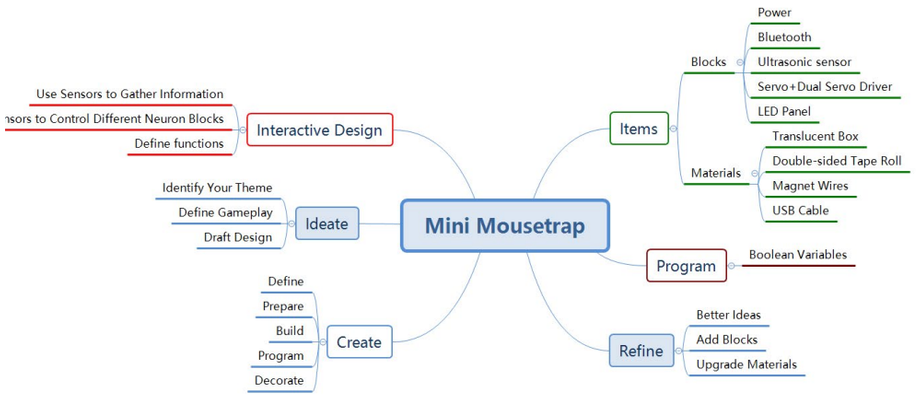
4. Use magnet wires to connect Power, Bluetooth, Ultrasonic Sensor, LED Panel, Servo and Dual Servo driver.

Play & Test

1. Give your project a name and share the project with your group members. Brainstorm about more ideas on how to improve the mousetrap.

2. Pick a proper place in your storeroom and put your mousetrap there. Let's see if it works!

Wrap-up



Open Sesame

The mousetrap we just created is well-designed. But can we upgrade the setup? For instance, how about using an empty translucent water bucket to build a multi-entry mousetrap suitable for places which suffer from mice? When building the multi-entry mousetrap, we should focus on the coordination of multiple servos in order to make the mousetrap smarter.

Lesson 16 Reading Lamp

Learning Objectives

1. Learn about the Joystick block.
2. Learn to use the Servo block.
3. Learn to program a Neuron block to do different things.

I'm happy when I'm reading. So each day, I spend some time reading illustrated books.

You need to protect your eyes when you are reading. How about making yourself a reading lamp?

Ideate

Reading Lamp

First, put these blocks together: **Power**, **Bluetooth**, **PIR Sensor**, **Joystick**, **RGB LED**, **Servo** and **Dual Servo Driver**.

Use mBlock 5 to program the setup you just build: Program the **RGB LED** to be automatically turned on based on the signals given by the **PIR Sensor**. The **Joystick** is used to change the rotational angle of the **Servo** and the brightness of the **RGB LED**.

Create

1. Draft Design

2. To complete the **Reading Lamp** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project more attractive.

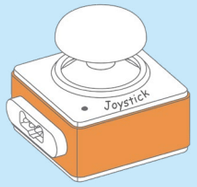
Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
PIR Sensor	1
Joystick	1
Servo	1
Dual Servo Driver	1
RGB LED	1

Materials	
Name	Quantity
File Folder	1
Acrylic Sheet	2
Magnet Wire	4
Double-sided Tape	1
Binder Clip	2
USB Cable	1

2. Intro to Neuron Blocks

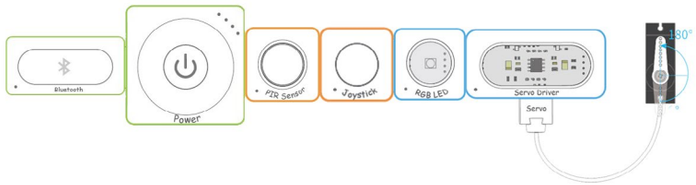


Joystick

Toggle the **Joystick** to control the movements of your project on the x-axis (right/left movements) or on the y-axis (forward/backward movements).

Category	Coding Block
Sensing	joystick 1 forward shaken? We use this block to sense the motions of the **Joystick**.

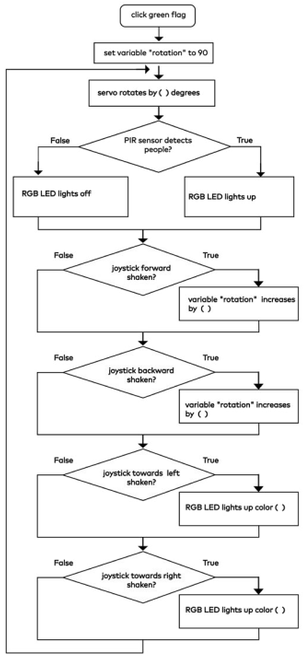
3. Connect the six Neuron blocks as shown:



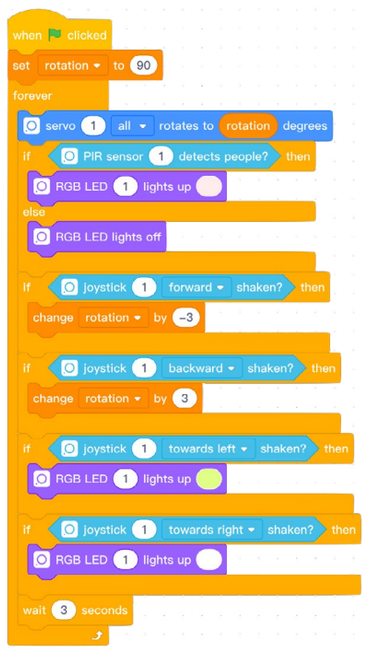
4. Use a USB cable to connect your blocks setup to the computer.

Program

1. Preview



2. Write Programs



3. Refine Programs

(1) Observe how the backward/forward movements of the **Joystick** influence the rotational angle of the **Servo**. Based on your observations, you can define the value in the coding block **change (rotation) by ()** to make the **Servo** work as intended.

(2) Observe how the right/left movements of the **Joystick** influence the brightness of the **RGB LED**. Try using this coding block related to **RGB LED**

set RGB LED 1 red 255 green 0 blue 0 in your programs.

Decorate

1. Use the binder clips to secure the file folder and the acrylic sheets into place.

2. Using double-sided tape, you can attach the **Power**, **Bluetooth**, **PIR Sensor**, **Joystick** and **Dual Servo Driver** to the file folder.

3. Attach the **Servo** to the top of the acrylic sheet with hot melt adhesive.

4. Glue the **RGB LED** to the servo hub with hot melt adhesive.

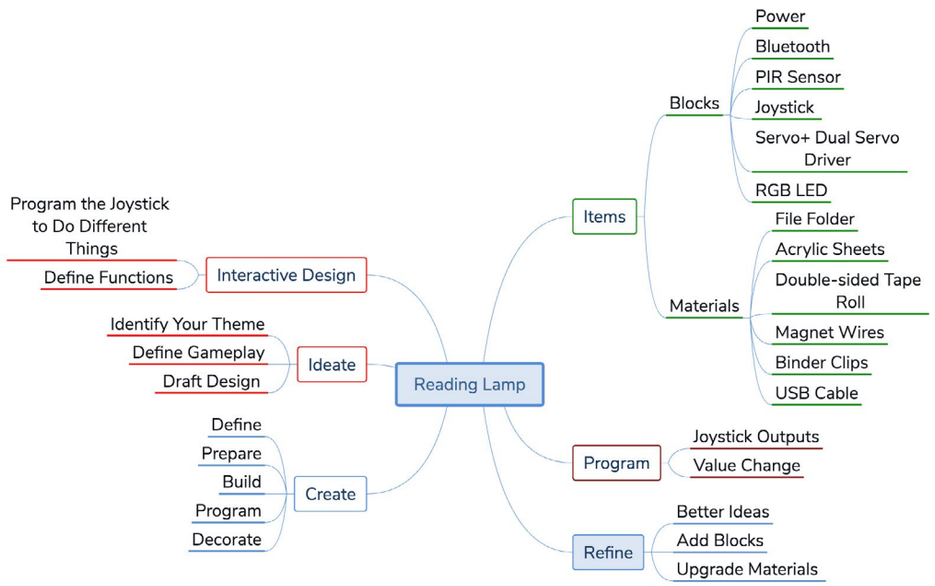
5. Adjust the angle and position of the acrylic sheet. Make sure you are comfortable with the reading lamp when the light is turned on.

Play & Test

1. Give your project a name and share the project with group members. Brainstorm about more possibilities.

2. Create a reading lamp and give it to your sibling or friend as a gift. Don't forget to pick an illustrated book for them as well.

Wrap-up



Open Sesame

Brainstorm about how to add a **Buzzer** block to automatically remind you of taking a break after you sit there too much. You can even program your reading lamp to play music if you want. Remember, it's important to protect your eyes.

Lesson 17 Little Timekeeper

Learning Objectives

1. Learn to use the Dual IR Detector block.
2. Use the LED Panel, Servo, and Dual Servo Driver blocks.
3. Apply Boolean variables and the "broadcast" coding blocks.

Sometimes I'm so busy and engrossed that I forget time. Can anyone help me keep track of the time?

You need to protect your eyes when you are reading. How about making yourself a reading lamp?

Ideate

Little Timekeeper

First, connect the Neuron blocks: **Power**, **Bluetooth**, **Dual IR Detector**, **Servo** and **Dual Servo Driver,** and **LED Panel**. Then, use mBlock 5 to program your project: when the countdown completes, an alarm will sound, the servo will rotate, and the little timekeeper will raise a speech bubble.

Create

1. Draft Design

2. To complete the **Little Timekeeper** project, follow these steps:

(1) Define: Work in groups to brainstorm about the purpose of the project.
(2) Prepare: Choose the Neuron blocks and any other materials you want to use.
(3) Build: Connect the Neuron blocks.
(4) Program: Connect the project to the computer and open mBlock 5 to program your project.
(5) Decorate: Use everyday materials to make your project attractive.

Build

1. Items List

Blocks	
Name	Quantity
Power	1
Bluetooth	1
Dual IR Detector	1
Buzzer	1
Servo	1
LED Panel	1
Dual Servo Driver	1
Servo Accessory Pack	1

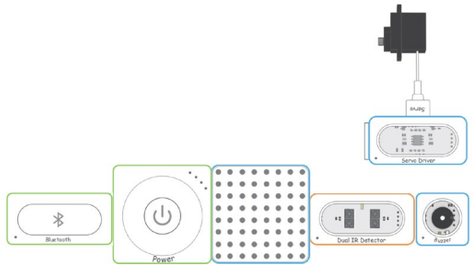
Materials	
Name	Quantity
Colored Card	4~5
Magnet Wire	3
Double sided Tape Roll	1
Scissors	1
Cardboard/Plastic Box	1
Marker	1
Neuron Board	2
USB Cable	1

2. Intro to Neuron Blocks

Dual IR Detector

The Dual IR Detector has two IR switches, left and right. We can program the switches to make different effects when they're triggered. The detecting range of the sensor is 0 to 2 cm.

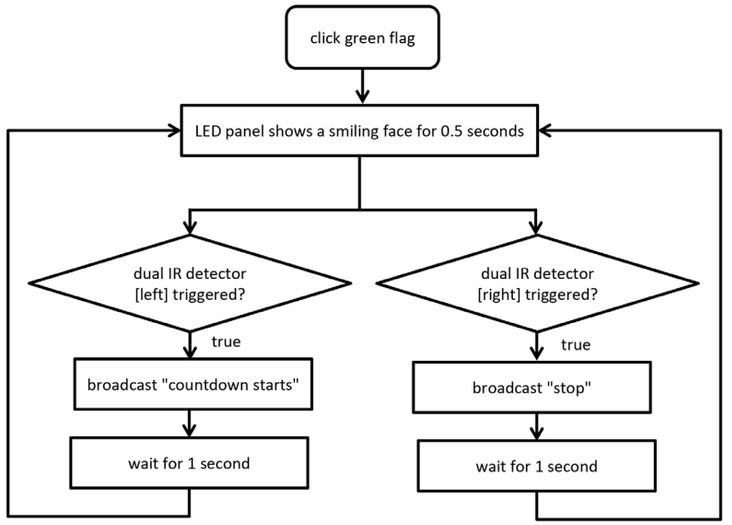
3.Connect the seven Neuron blocks as shown:

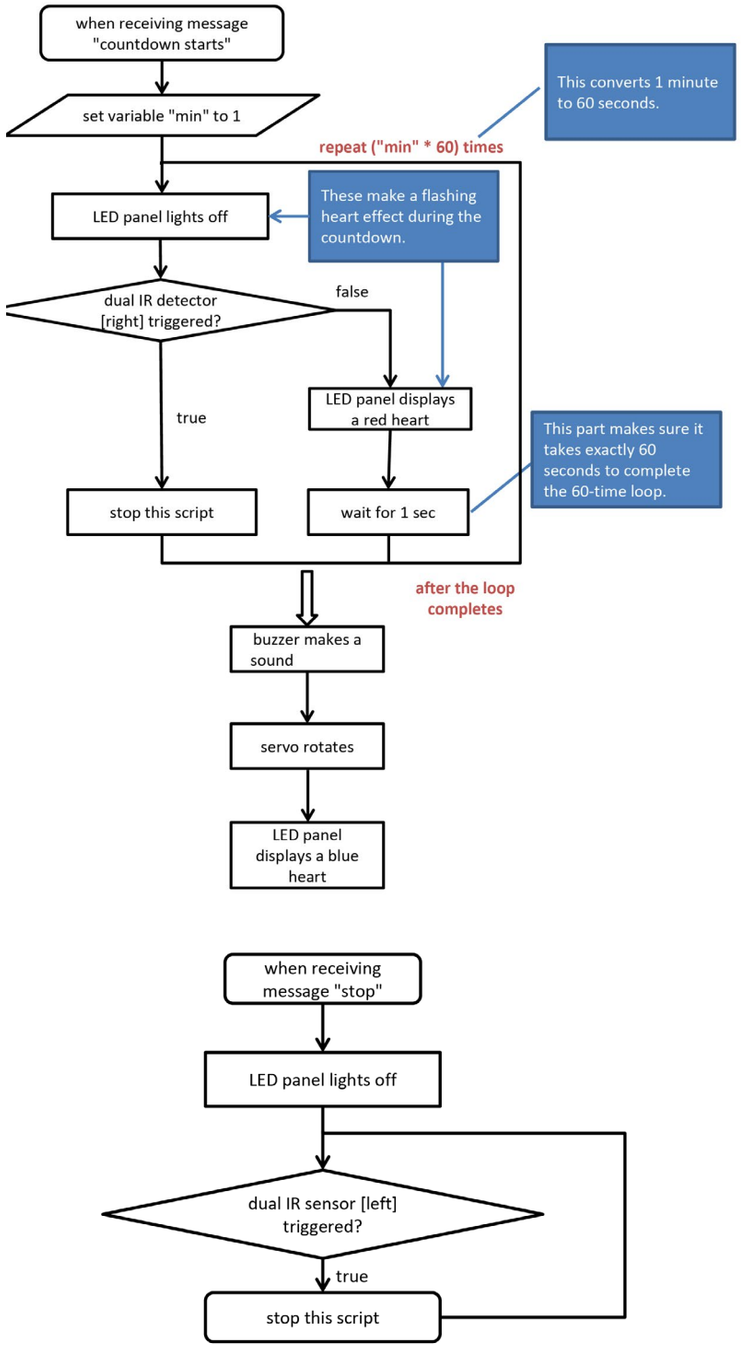


4.Use a USB cable to connect your blocks setup to the computer.

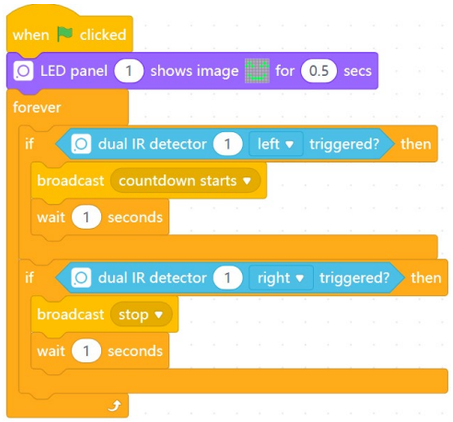
Program

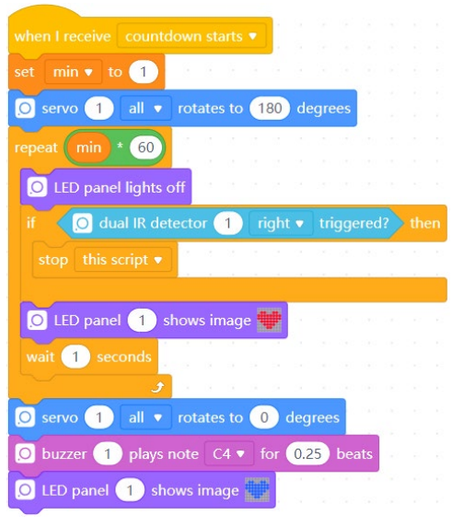
1. Preview

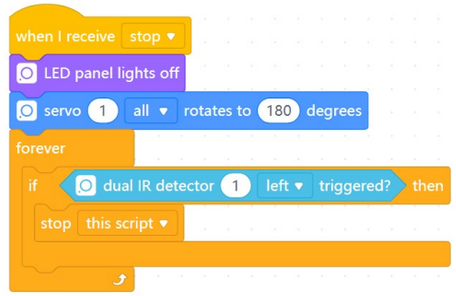




2. Write Programs







3. Refine Programs

(1) You can change the countdown length by adjusting the value of the variable "min". Try setting "min" to 0.5 instead of 1 and see what happens.
(2) Attach the Servo block to the little timekeeper's speech bubble. And run tests to find the best the rotation angle for the Servo.

Decorate

1. Design and draw the timekeeper and speech bubble on the colored card. You need two cutouts of the speech bubbles.

2. Fix the timekeeper to the base. Then, hide the **Power**, **Bluetooth**, and **Buzzer** blocks in the base and glue the **LED Panel** to the top of the base. You need the Servo accessories to mount the **Servo** to the speech bubble cutouts. Make sure the **Servo** can rotate, and hence, the speech bubble.

3. Connect these Neuron blocks: **Power**, **Bluetooth**, **LED Panel**, **Servo** and **Dual Servo Driver**, and **Buzzer**.

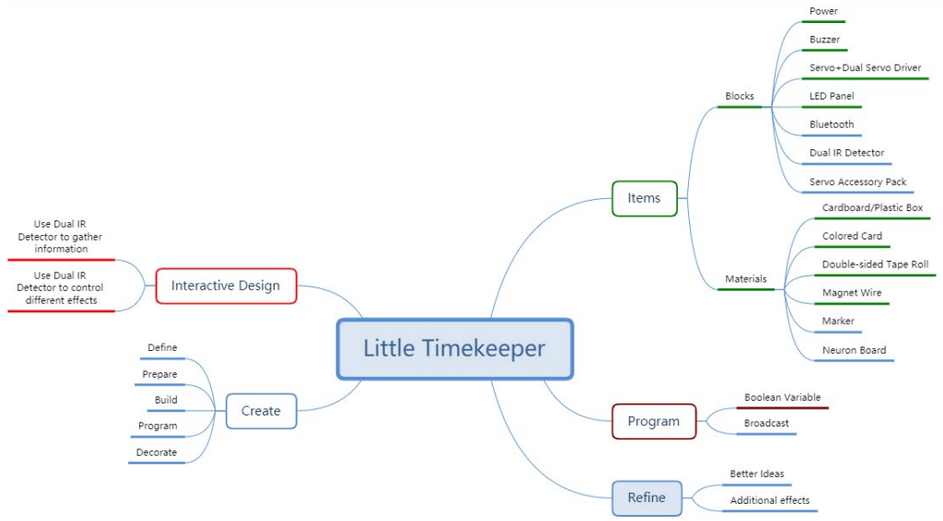
Play & Test

1. Give your project a name and share the project with your group members. Try to generate better ideas about the project.

2. In addition to Dual IR Detector, can you use other Neuron blocks to control the little timekeeper?

3. Can you add other effects to the little timekeeper?

Wrap-up



Open Sesame

The little timekeeper sometimes feels lonely. Why don't we make a weatherman for its company? This little weatherman will be able to change its outfit based on the weather so that we know what to wear when we go out. Oh, the weatherman can measure the humidity as well, telling us whether it's going to rain. If it rains, the weatherman will take out its umbrella.