matata studio

BASIC
Teacher Manual

AI, Coding and Robotics

with Nous AI Set

The Artificial Intelligence Education form MatataStudio

Founded in July 2017, MatataStudio (from MATATALAB) is striving to provide innovative learning and entertainment experiences through technology, and empowers children with the skills, mindset, and confidence to excel in arapidly evolving world.

MatataStudio is a platform full of fun, excitement, and as an educator, potential. Throughout these 12 lessons you will see how robotics can be used to teach your students AI in ways that are sure to inspire. The students will experience a variety of artificial intelligence technologies and functions, including machine learning, neural networks, machine vision, speech recognition, image recognition, ChatGPT, AIGC, and Autonomous driving capabilities. Besides, they will also learn and apply the 4 steps of Machine Learning: model creations, data acquisition, model deployment, and programming.

We iterate by making mistakes, evaluating them, revising our plans, and trying again. We continue to do that until we get it right. The value of this process cannot be understated. Iteration is not just how we learn to code, but how we learn.

This constant state of failure and improvement though does not have to be painful. By using the robot, you can turn errors into opportunities for students to see not a mistake but a chance to try again. They will learn from these moments and savor their successes. Also critical in this learning is what educators call "21st Century Skills". These are a core set of competencies educators believe modern students are going to need to have more than anything. They include Teamwork, Collaboration, Creativity, Imagination, Critical Thinking, and Problem Solving. The near future is fraught with complex issues that the current generation of students are going to have to resolve. The future also is likely to be filled with countless opportunities to, literally, do things that are out of this world.

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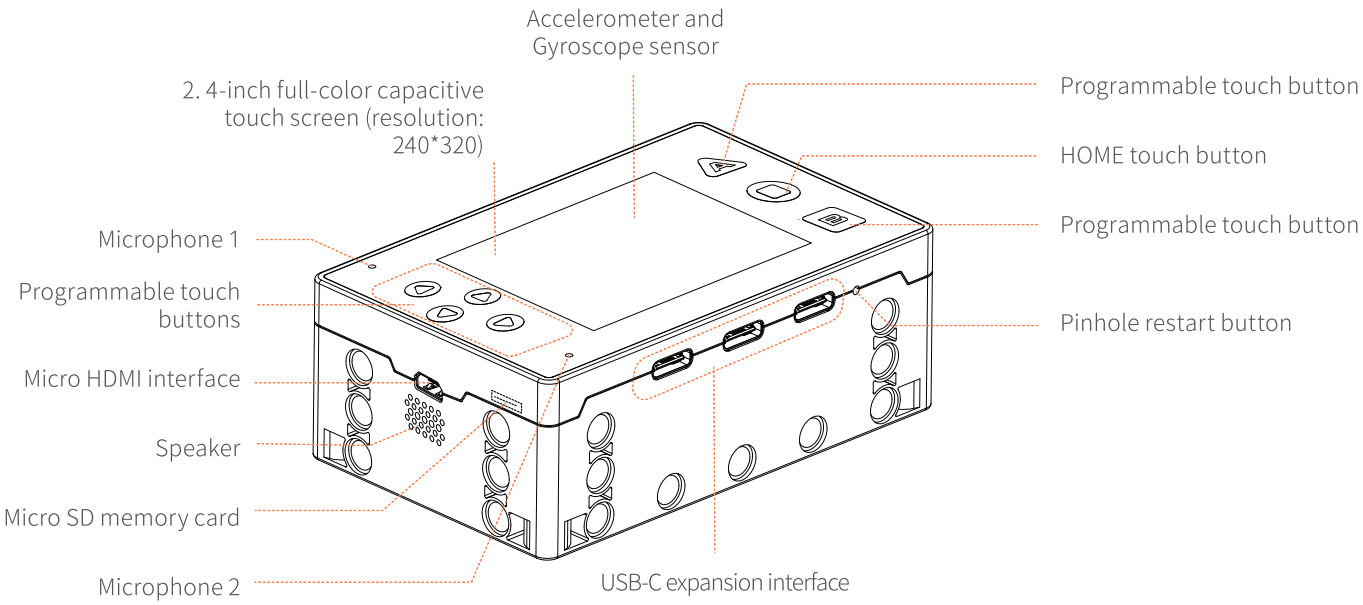
Teacher Guide

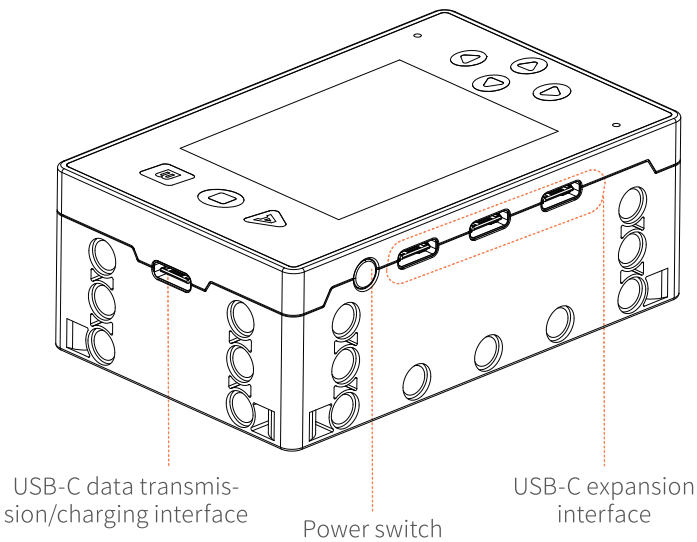
Nous AI Set Overview

Part One: Electronic Modules of Nous

1.Nous Hub

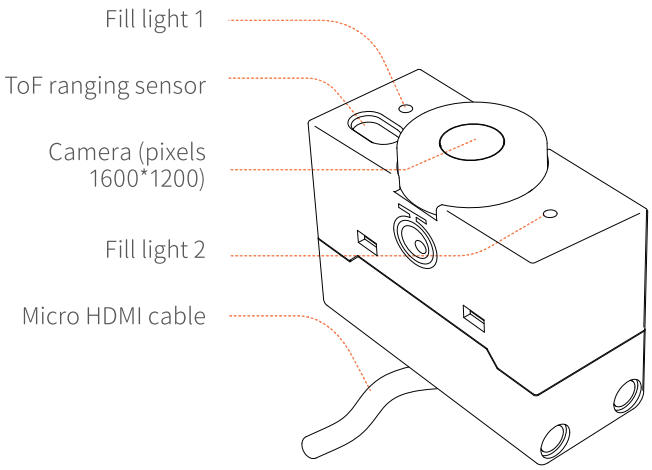
Nous Hub is the core of the Nous and acts as the Nous's brain.





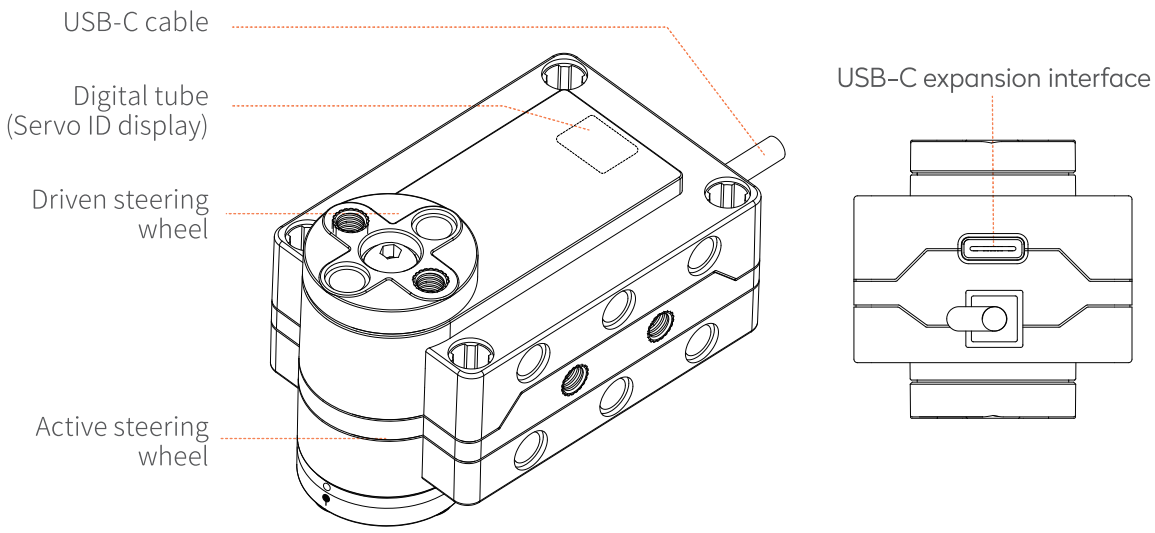
2.Nous Camera Module

Nous Camera is the Nous' eyes. As shown in the picture, in addition to the camera, we can also see two camera fill lights and a ToF (Time of Flight) ranging sensor.



3.Nous Servo Module

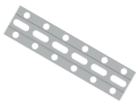
Nous Servo Module has motor mode and servo mode, which can meet a variety of usage scenarios.



Part Two: Structural components of Nous

The list of Nous' structural components is as follows.

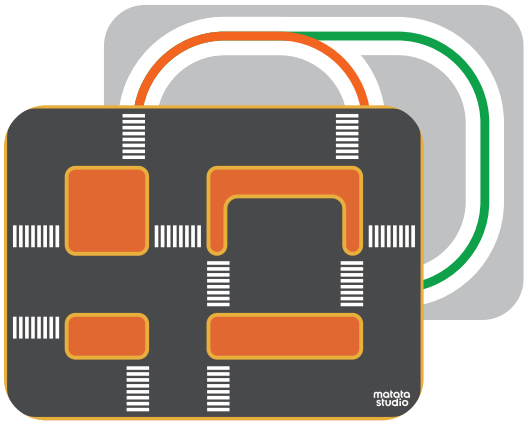
Structural Components of Nous

Name	Picture	Qty
camera bracket		1
3×3 L-shaped bracket		5
1×4 square hole beam		2
2×2 double hole beam		1
2×3 double hole beam		2
2×4 double hole beam		1
2×5 double hole beam		2
2×6 double hole beam		2
135° single head connecting piece		2
3×6 connecting piece		1
Ø68mm tire		2
Ø58mm wheel hub		2

Name	Picture	Qty
universal wheel		1
transmission fixed plate		2
Ø4-60mm axis		1
Ø7-2mm plastic sleeve		6
Ø7-4mm plastic sleeve		6
Ø7-8mm plastic sleeve		6
Ø7-10mm plastic sleeve		4
M4-6mm screw		14
M4-12mm screw		30
M4-16mm screw		14
M4-20mm screw		4
M4 nut		6

Part Three: Double-sided Map

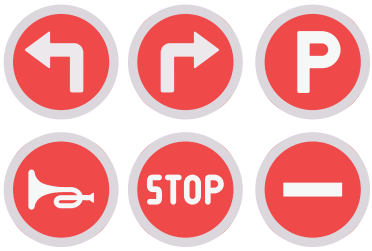
The line-following map and autopilot map for Nous.



Self-driving map x1

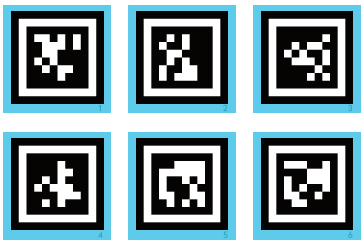
Part Four: Cards

These cards are important props for achieving image recognition and AprilTag detection.



Traffic sign x6

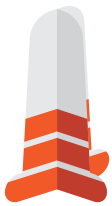
Card x6



AprilTag card x6

Part Five: Others

Card holder: Helps keep the cards standing
USB-C cable: Connects Nous to a computer for data transfer and serves as a charging cable
User guide: Helps users understand the Nous AI Set.



Card holder x6

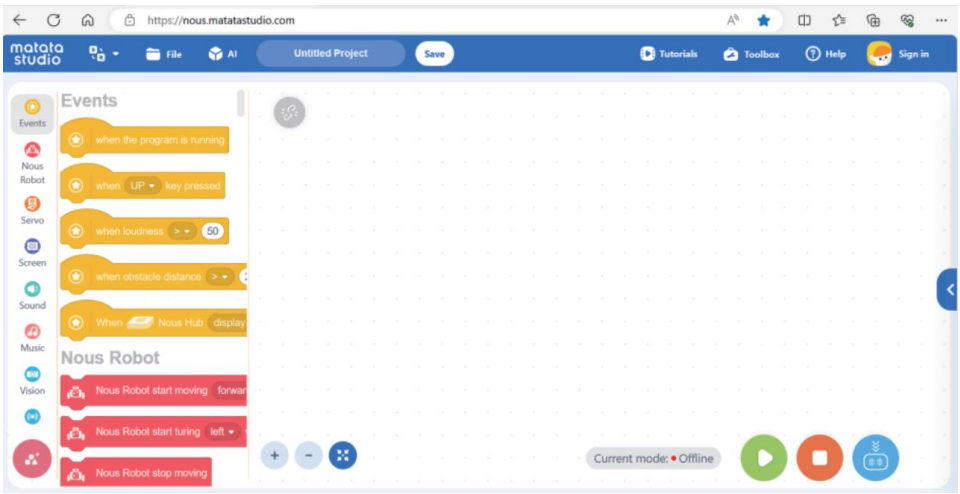
USB-C cable x1

User guide x1

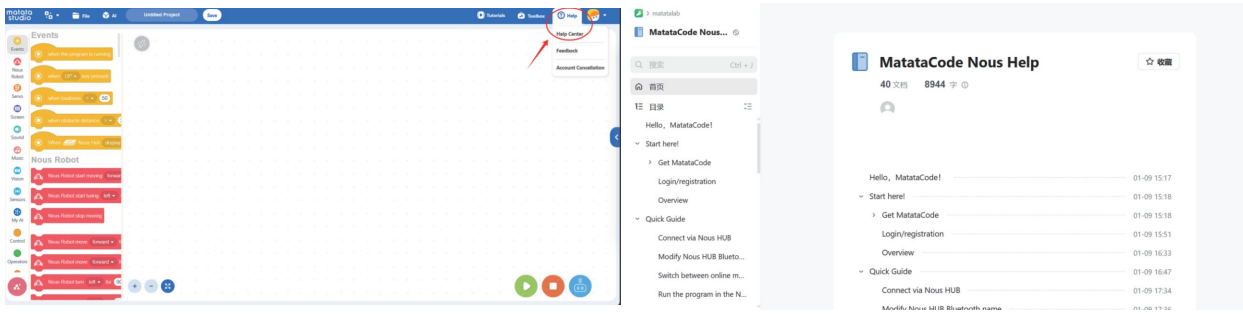
MatataCode for Nous

Nous' online programming platform: https://nous.matatastudio.com

Please use graphical programming language and Python to write programs for Nous.



For detailed instructions on Nous' programming platform, please refer to the Help Center on the programming platform.



To download the app for Android, Apple, and all other tablets and PCs, follow these steps:

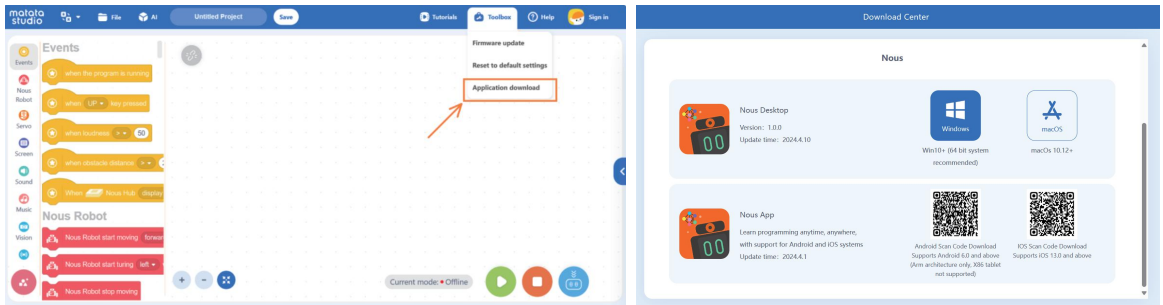
Go to the Nous programming platform.

Navigate to the "Toolbox" section.

Click on "Application download."

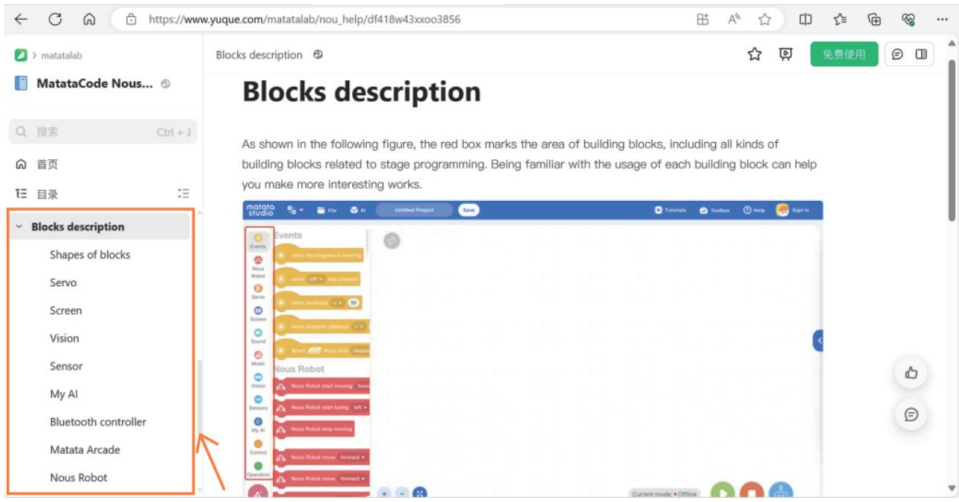
Choose the appropriate version of the app based on your device's operating system (Android or Apple).

Follow the instructions to complete the download and installation.



Explanation of Nous's graphical coding blocks

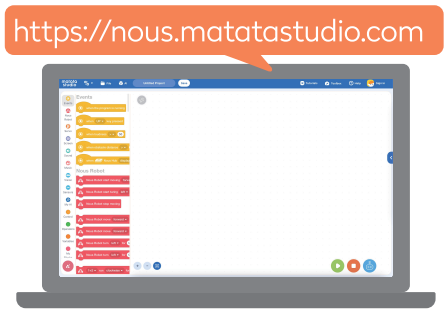
There are various categories of blocks on the programming platform, each with detailed explanations of their meanings and usages. Please refer to the Help Center for more information.



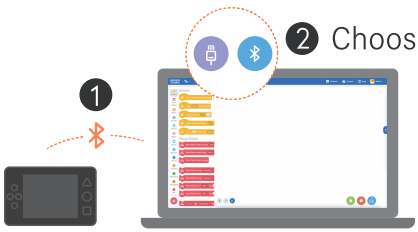
The Connection and Firmware Upgrade

The connection between Nous and MatataCode

Log in to the web programming platform: https://nous.matatastudio.com



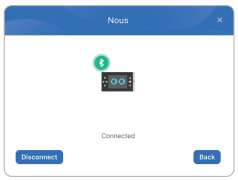
Select the USB data cable (USB-C) or Bluetooth connection method to connect the Nous Hub to your device.



2 Choose how you want to connect

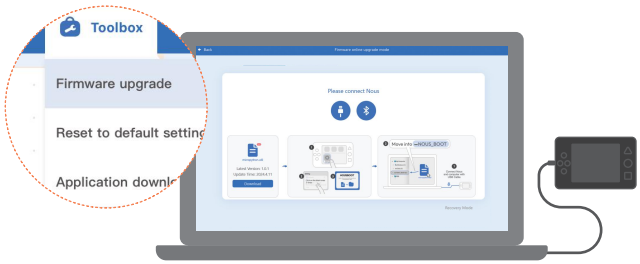
It is recommended to use USB data cable connection to ensure efficient and stable data transmission

3 After the connection is successful, your device will automatically pop up a prompt.

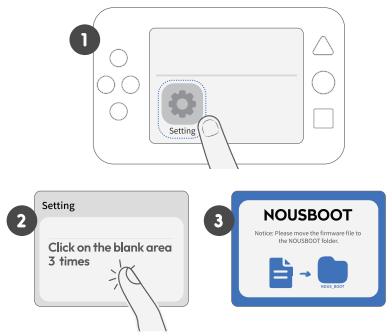


The steps for firmware upgrade

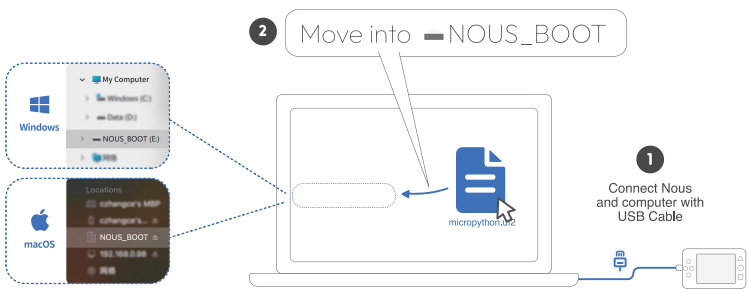
Log in to nous.matatastudio.com and connect Nous Hub to MatataCode. Select Toolbox-Firmware Upgrade to check if Nous Hub has latest version firmware. If not, download latest version firmware. connection between Nous Hub and computer device. If fails, log in to Help Center at nous.matatastudio.com for detailed guidance.



Enter the Nous Hub system operation interface, select Settings,Click on the blank area 3 times to call up firmware upgrades and professional development tools.



After connecting Nous Hub to my computer via USB-C cable, 'NOUS_BOOT' disk appears. Drag the latest version downloaded firmware into disk, and Nous Hub will automatically update firmware and restart.



During upgrade process, don't interrupt connection between Nous Hub and computer device. If fails, log in to Help Center at nous.matatastudio.com for detailed guidance.

Unit 1

Lesson 1 to Lesson 4

Nous' Brain — Nous Hub

Overview

The Nous Hub is Nous' brain. In this unit, students will learn the functions of Nous Hubs. First, they will learn connect a Nous Hub to MatataCode and explore two pre-set AI applications: MatataChat and MatataDraw. Then, they will learn to use Nous through simple programming tasks. Next, they will learn the four steps for embedded machine learning by creating and using a speech model. The four steps are model creation, data collection, training and deployment, and programming.

Objectives

- To learn the functions of Nous Hubs.
- To master Nous' programming process.
- To understand the four steps of Tiny ML – model creation, data collection, training and deployment, and programming.

Learning Objectives

- To learn to connect a Nous Hub to MatataCode.
- To experience the functions of MatataChat and MatataDraw.
- To learn about screen blocks, and to program Nous to display texts and patterns on-screen.
- To learn about sound blocks, and to program a Nous Hub to generate speech and sound effects through programming.
- To learn about music blocks, and to program a Nous Hub to sing "Twinkle, Twinkle, Little Star".
- To understand the four steps of embedded machine learning (Tiny ML) by creating and using a speech model. The four steps are model creation, data collection, training and deployment, and programming.

Standards

ISTE:1a, 1b, 1c, 1d, 2a, 2c, 4a,4c,4d,5a,5b,5c,5d,6b

CSTA (Grade 6-8) :2-CS-01, 2-CS-02, 2-CS-03, 2-NI-04, 2-NI-06, 2-DA-07, 2-DA-08, 2-DA-09, 2-AP-12, 2-AP-13, 2-AP-16, 2-AP-17,2-IC-21

Materials

Nous Hub, USB cable, PC or tablet

Lesson 1 Programming Nous

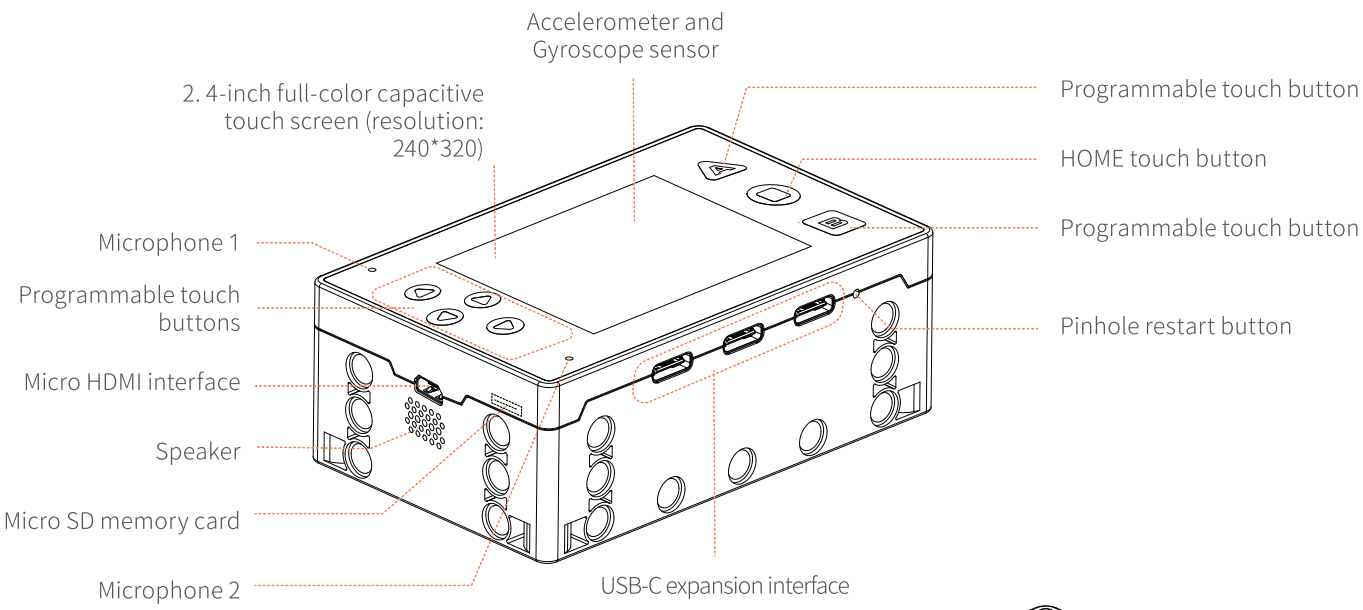
45min

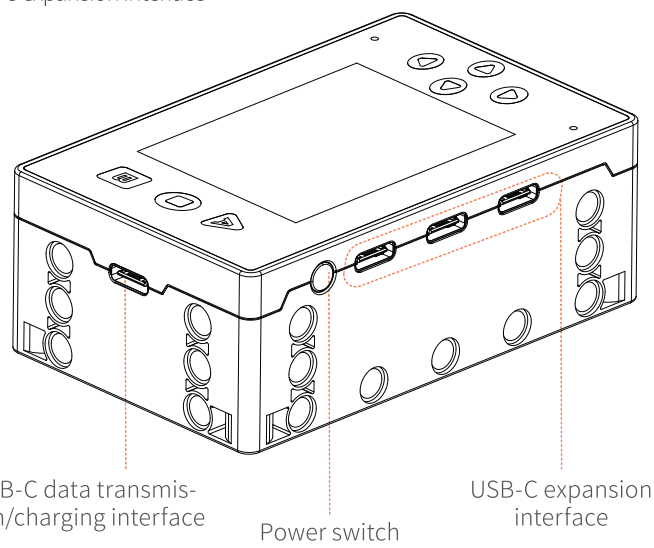
Instructions for Students

Nous Hub basic instruction

Nous Hub

Nous Hub is the core of the Nous and acts as the Nous's brain. As shown in the picture, in the front, there is a 320 x 240,2.4-inch full-color capacitive touch screen, 6 programmable touch buttons on both sides of the touch screen, including "up, down, left, right" and "A, B", as well as a "Home" touch button. In addition, Nous Hub also contains two microphones, a speaker, 6 type-C expansion ports, a data transmission interface to connect Nous Camera to Nous Hub, and a data transmission interface to connect Nous Hub to MatataCode/computer devices (both interfaces can be used to charge Nous Hub). Of course, we can also see the orange switch button in the upper right corner, and the pinhole reset button in the lower right corner of Nous Hub. Additionally, there is a gyroscope inside Nous Hub which can't be seen.





Connect a Nous Hub with a PC/tablet with a USB cable or Bluetooth

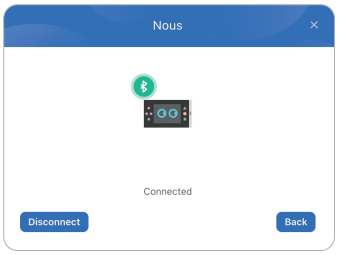
Select the USB data cable (USB-C) or Bluetooth connection method to connect the Nous Hub to your device.

① ② ③

Choose how you want to connect

It is recommended to use USB data cable connection to ensure efficient and stable data transmission.

After the connection is successful, your device will automatically pop up a prompt.



Default program

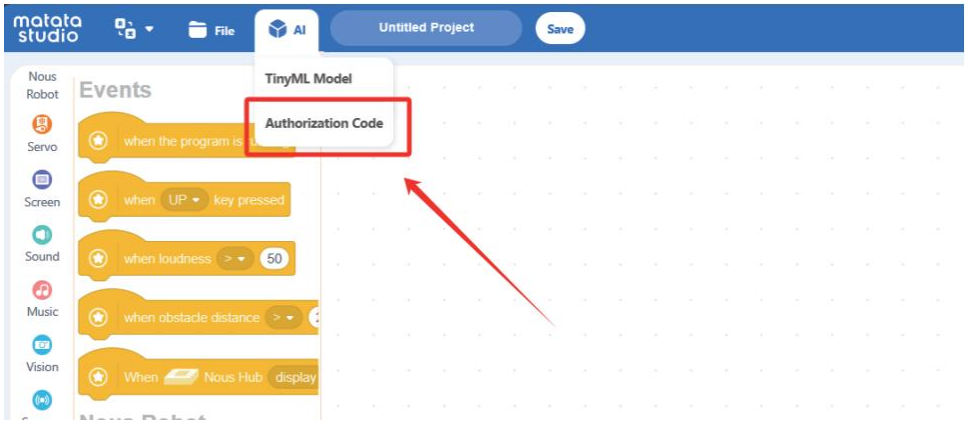
The Nous Hub provides a series of interesting default programs (e.g. MatataChat and MatataDraw) you can easily experience with one simple click.

MatataChat

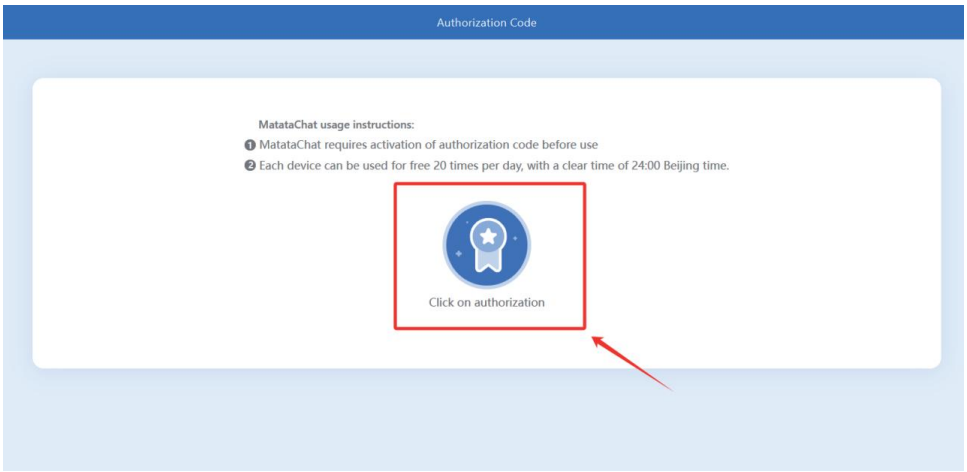
MatataDraw

Before using MatataChat or MatataDraw in a Nous Hub for the first time, you need to get an authorization code from your connected PC/tablet.

1. Connect your Nous Hub to MatataCode.
2. In the top menu, find "AI" and select "Authorization code" .



3.Click the authorization icon to complete the authorization.



How do I use MatataChat?

1.Press the MatataChat icon on your Nous Hub, select Wi-Fi, and then enter the Wi-Fi password (if needed).

2.After successful WiFi connection, press "Chat" and ask your Nous Hub questions as prompted.

3. Wait for about 20 seconds, and the Nous Hub will answer your questions by voice.

Note: You should first select a language for speech recognition and response in the top-right corner.

How can you use MatataDraw?

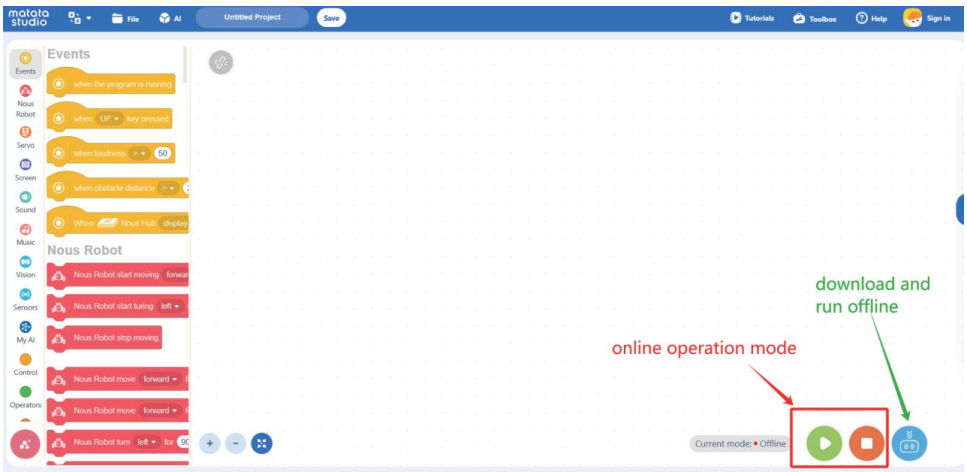
1.Press the MatataDraw icon on your Nous Hub, select Wi-Fi, and then enter the Wi-Fi password (if needed).

2.After successful Wi-Fi connection, click the "Input" button, and describe the picture you want.

3.Click "Draw" .

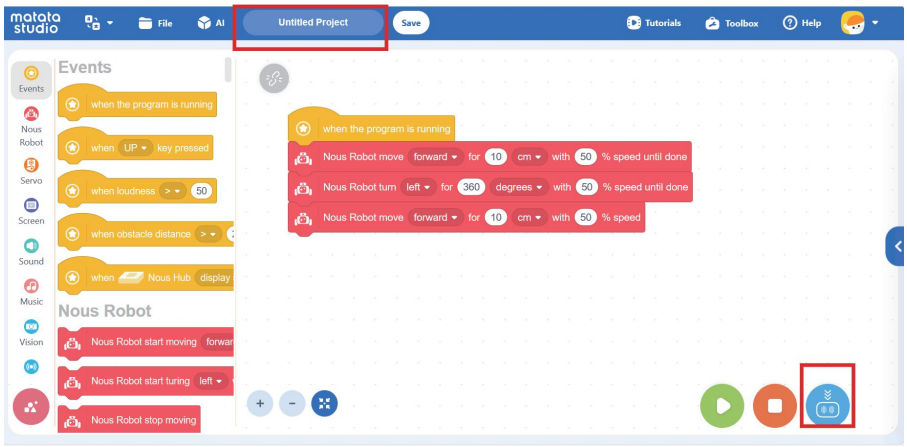
4.Wait about 20 seconds, and the Nous Hub will display the picture on-screen.

Online and offline operational modes



Run programs on Nous Hub

Click “download” to download the created programs for your Nous Hub.



In the Nous Hub's operational interface, you can see the programs you have just created.

Created program

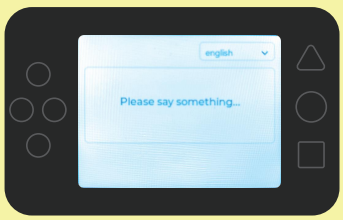
Note: If there are files with the same name, the previous version will be automatically overwritten.

- The Nous Hub supports storing multiple programs. If you want to switch from the currently running program to another, you can press “Home” to exit, and then select the corresponding program.
- When you want to delete a program you have created, you can press and hold the corresponding program icon for a while. The system will prompt you to confirm whether you want to delete it or not. Please select “confirm” to delete it.

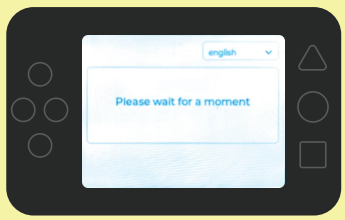
Activity

Activity 1: Students will experience the functions of MatataChat and ask “What date is today?” in their native language.

Choose your native language.

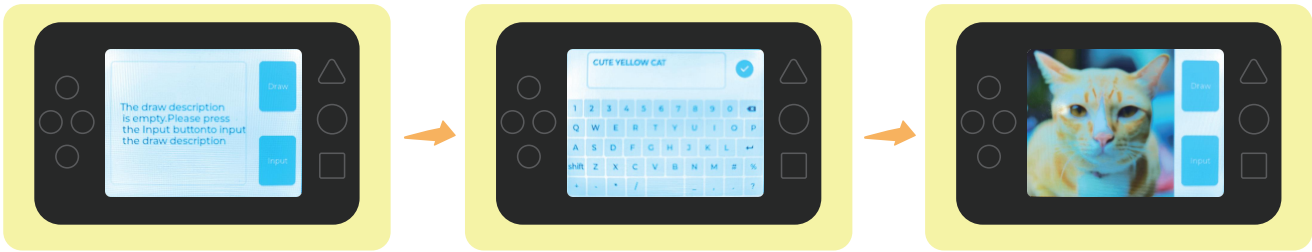


Ask your question when you see "Please say something" .

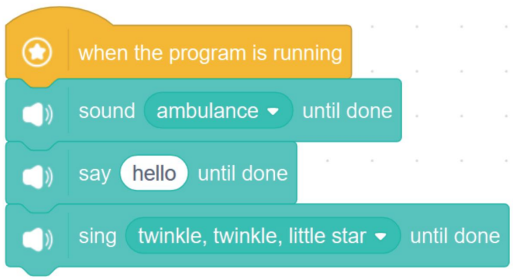


Wait for the answer when you see "Please wait for a moment" .

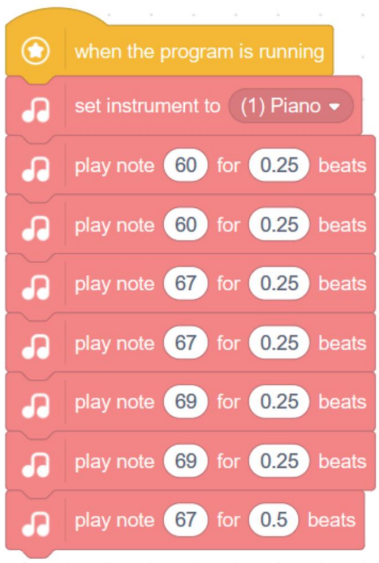
Activity 2: Students will experience the functions of MatataDraw. Describe the picture named "cute cat" , and press "draw" to get the picture.



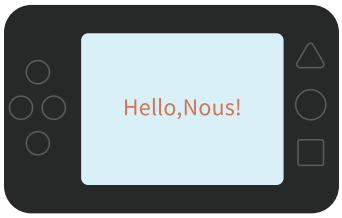
Activity 3: Students will learn about sound blocks and to program Nous Hubs to produce various sound effects or voices.

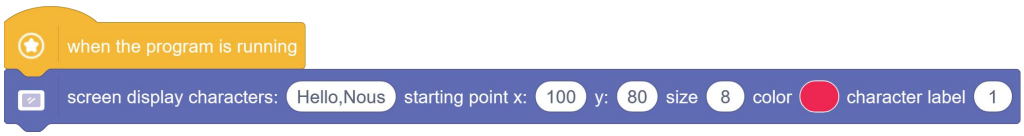


Activity 4: Students will learn about music blocks and to program Nous Hubs to sing "Twinkle, Twinkle, Little Star".

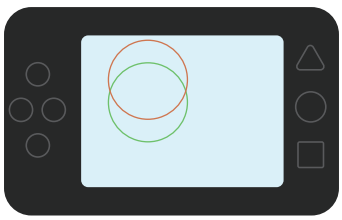


Activity 5: Students will learn about screen blocks and to program a Nous Hub to display "Hello, Nous!"





Activity 6: Students will program a Nous Hub to display two cycles on-screen.



Note: When we need to display multiple graphics or characters of the same type on-screen (e.g. two circles), we need to label each of them.

Students discuss, create, and share

1.What are the two ways to connect a Nous Hub to a PC/tablet?
2.How many programs can be downloaded and stored on a Nous Hub?
3.What happens if there is already a program named "Hello Nous" stored on the Nous Hub and you have downloaded a new one with the same name?
4.What do we need to do before using MatataChat and MatataDraw for the first time on a Nous Hub?
5.What technologies do MatataChat and MatataDraw use?
6.What should we pay attention to when programming a Nous Hub to display two circles on-screen?
7.What other fun programs have you thought of? Give them a try!

Lesson 2 Nous Loves to Draw

45min

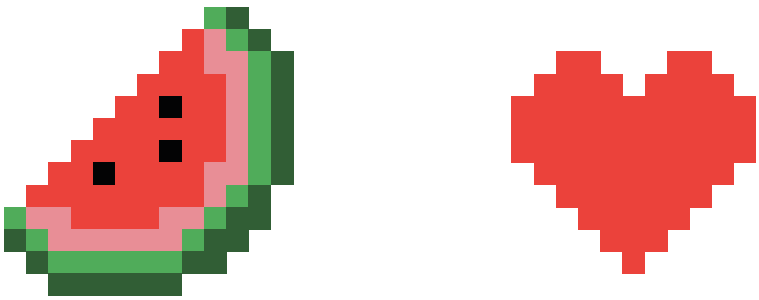
Instructions for students

Pixels and resolution ratios

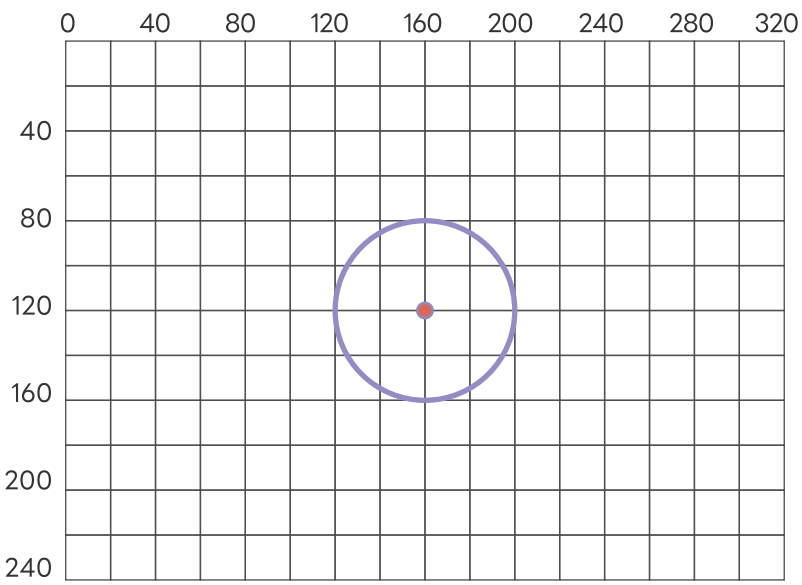
Why can we program a Nous Hub to display characters or graphics on-screen? To answer this question, we need to understand two important concepts: pixels and resolution.

Simply put, a pixel is a point, and many pixels can be combined to form an image we see.

Meanwhile, resolution ratios are used to indicate the number of horizontal and vertical pixels.

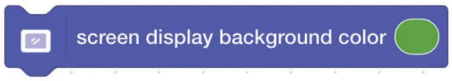


The Nous screen has a resolution ratio of 320x240. With this information and coordinates, we can determine how to display basic patterns on-screen. For example, we can draw a circle with a radius of 40 points from the screen center, whose coordinates are 160 in x and 120 in y.



Screen coding blocks

Screen coding blocks



This sets the screen's background color.

On-screen characters:

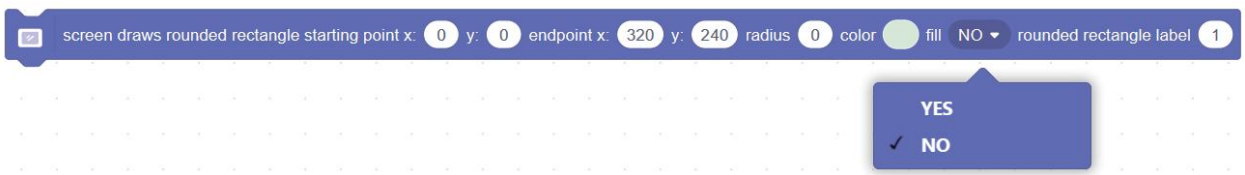
- 'text': Characters
- x, y: The x and y coordinates for the center of a character; x has a value range of 0-320 while y 0-240.
- size: The character size, whose valid value ranges from 1-11.
- color: Select a color.
- label: A positive integer from 1 to 20.

Segments in screen rulers:

- x0, y0: The x and y coordinates for the start of the line segment
- x1, y1: The x and y coordinates for the end of the line segment
- color: Select a color.
- label: A positive integer from 1 to 20

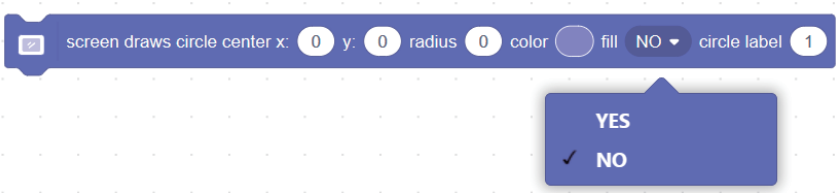
Draw a rectangle on-screen

- x0, y0: The x and y coordinates for the rectangle's starting point
- x1, y1: The x and y coordinates for the rectangle's ending point
- "False" shows the color of the rectangle's unfilled part; "True" shows the filled part's color.
- color: Select a color.
- label: A positive integer from 1 to 20.



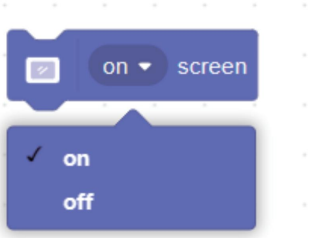
Draw a rounded rectangle on-screen

- x0, y0: The x and Y coordinates for the rounded rectangle's starting point
- x1, y1: The x and Y coordinates for the rounded rectangle's ending point
- r: The radius of the rounded rectangle's central point
- "False" shows the color of the rounded rectangle's unfilled part, while "True" indicates the filled part's color.
- color: Select a color
- label: A positive integer from 1 to 20

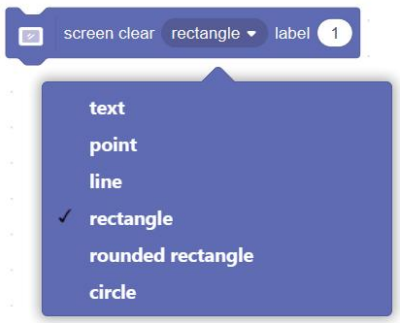


Draw a circle on-screen

- x, y: The coordinates of the circle's central point
- r: Circular radius
- "False" shows the color of the circle's unfilled part, whereas "True" indicates the filled part's color.
  color: Select a color
- label: A positive integer from 1 to 20.

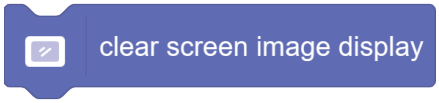


Turn on or off the screen



"Screen clear" removes all tag images on-screen.

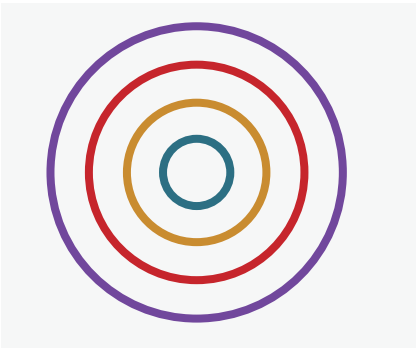
- "Label type" : Characters, line segments, rectangles, rounded rectangles, circles
- "label" : A positive integer from 1 to 20



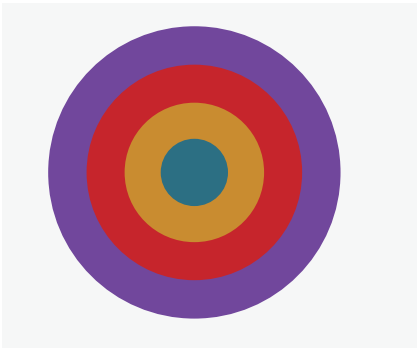
The above option removes all images on-screen.

Activity

Activity 1: Students will program to display the two types of concentric circle on a Nous screen.

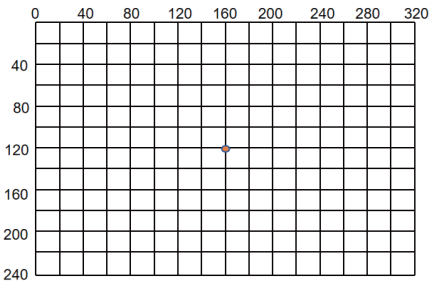


2-1-1



2-1-2

Step1 Find the center of the concentric circles

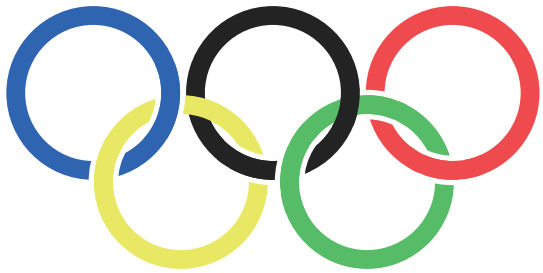


Step2 Determine the radius of each circle, such as 20,40, 60, 80……

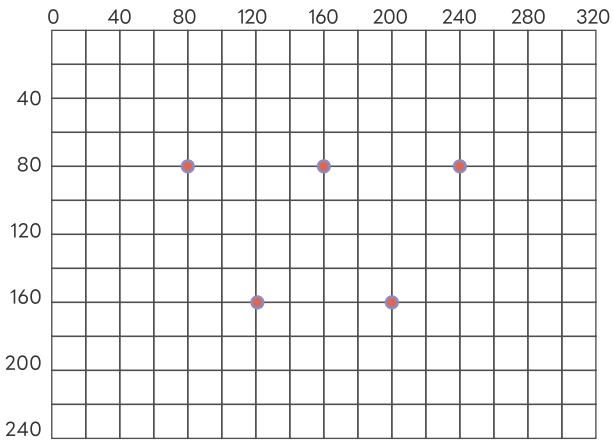
Step3 Determine the color for each circle

Step4 To display the pattern 2-1-1, pay attention to the circle label for each circle. To display the pattern 2-1-2, note that each circle should be displayed in order from largest to smallest.

Activity 2: Students will program to display the Olympic rings on a Nous screen.



Step1 Find the center of each circle.

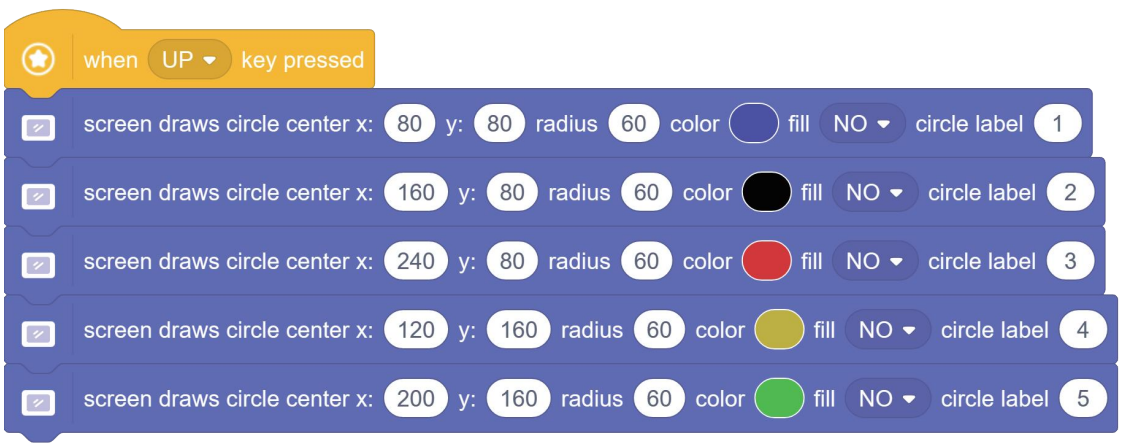


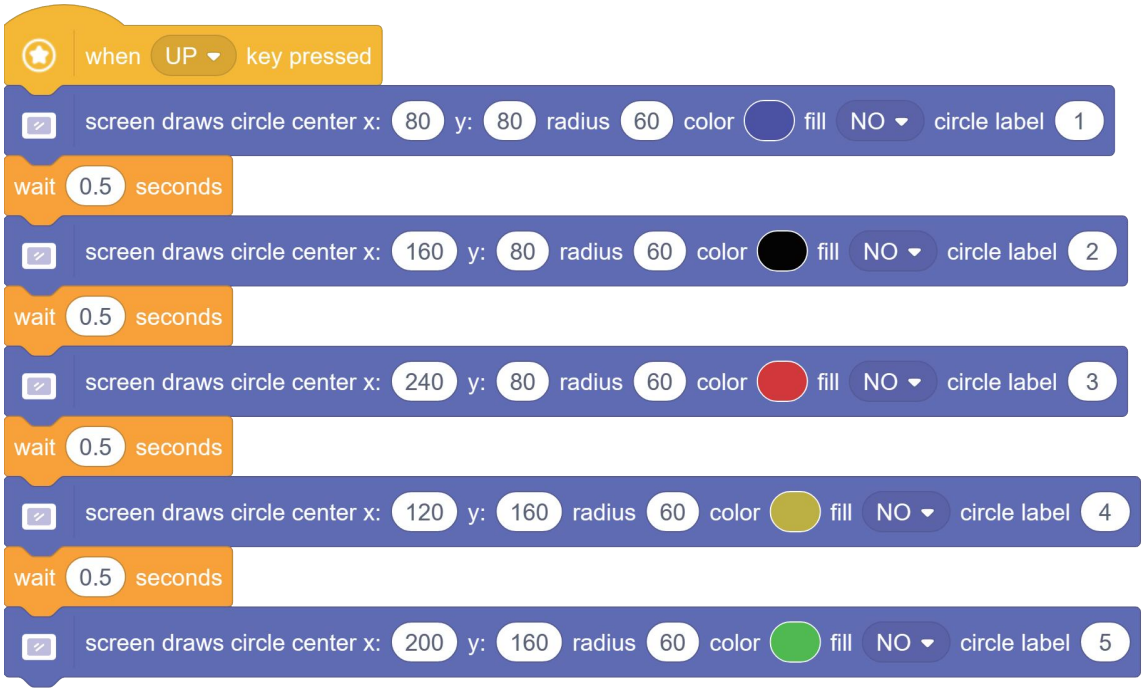
Step2 Determine the radius of each circle, such as 60.

Step3 Determine the color for each circle.

Step4 Add animation effects

Demo Program:





Students discuss, create, and share

1.What geometric shapes can be displayed on a Nous screen?
2.What is the Nous screen's resolution?
3.What is the significance of the "label" in screen coding blocks?
4.What programming blocks are needed to animate a complex pattern step by step on the Nous screen?
5.What are the programming steps to display a complex pattern on a Nous screen?
6.Design a program to display your own pattern on a Nous Screen.