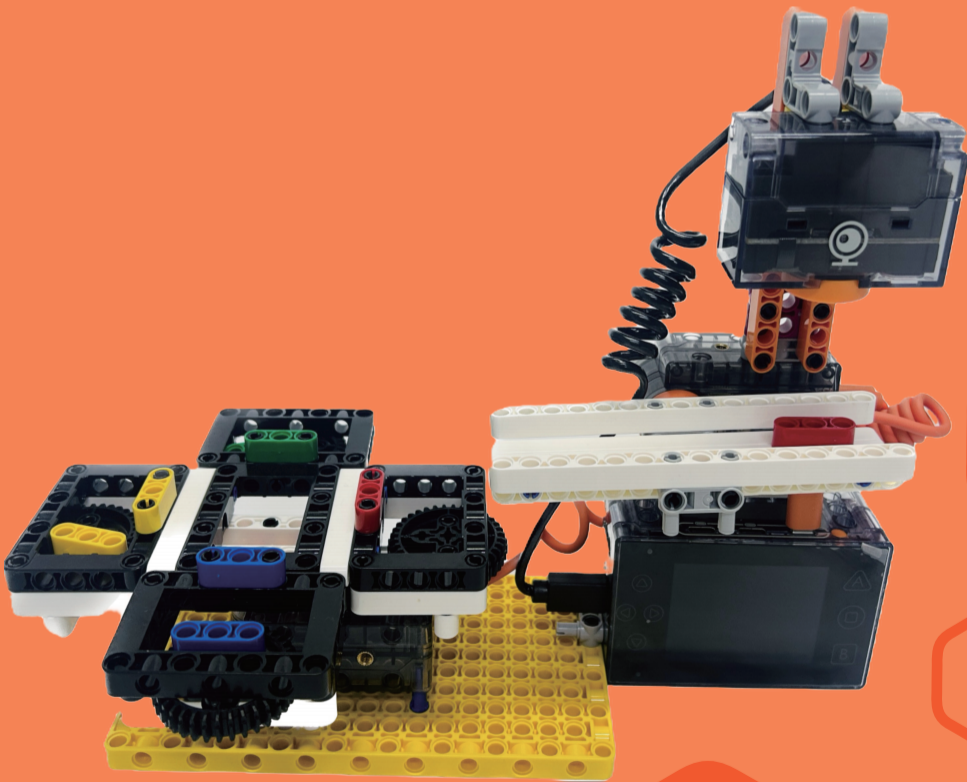


Building, Coding *and* Robotics

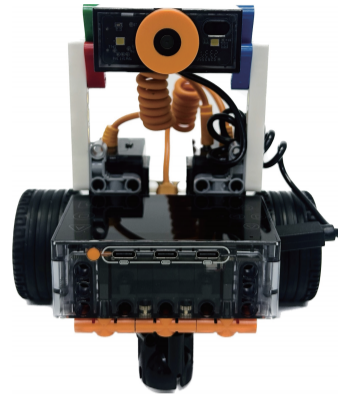
with Nous AI Set



Contents

Nous AI Set

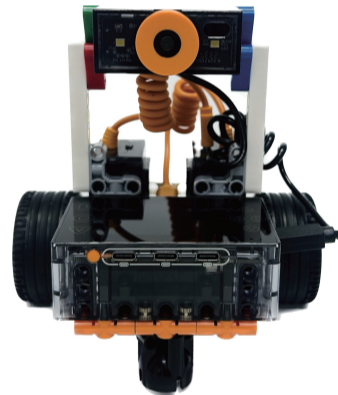
In this lesson, students will learn the definition of AI and AI robots, explore the basic components of the Nous Robot, complete its assembly, and implement basic functionalities through simple programming.



1-7

The AI Capabilities of Nous

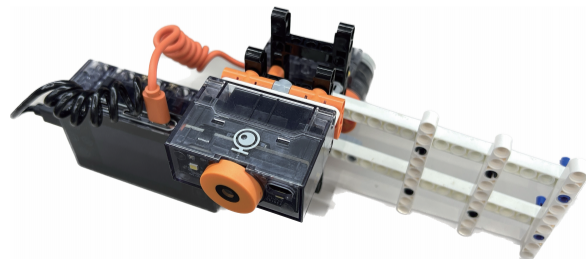
In this lesson, students will learn the concept of computer vision, explore the principles of Nous vision implementation, experience its functionalities, and master the basics of writing simple computer vision programs.



8-17

Nous Automatic Door

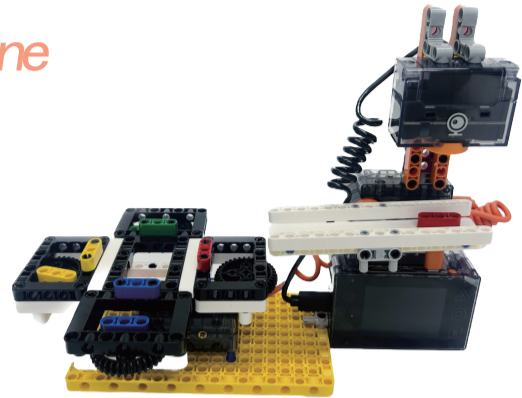
In this lesson, students will explore the structural design and functional capabilities of the Nous automatic door system. After independently constructing the automatic door mechanism, students will program it to operate via face recognition using Nous vision blocks, explore more operation methods of the automatic door.



18-22

Nous Color-Sorting Machine

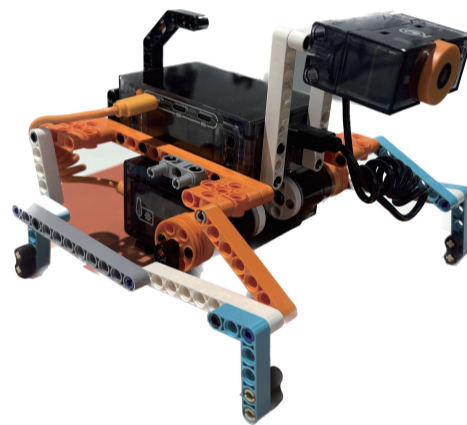
In this lesson, students will learn to identify colors using Nous, build a color-sorting machine, and program it to autonomously sort colored blocks.



23-28

Nous Pet

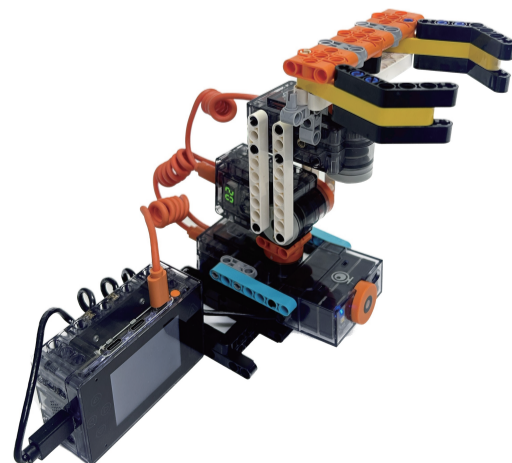
In this lesson, students will learn to create a speech model, collect speech data, train the model, deploy the trained model to the Nous Robot, and finally write a program to transform the Nous Robot into an obedient robotic pet.



29-34

Universal Robotic Claw

In this lesson, students will independently assemble a universal robotic claw and program it to perform gripping and placing operations. They will experiment with integrating visual recognition modules to enable intelligent object identification.



35-38

Lesson 1 Nous AI Set

Time: 45 minutes

Overview

In this lesson, students will learn the definition of AI and AI robots, explore the basic components of the Nous Robot, complete its assembly, and implement basic functionalities through simple programming.

Learning Objectives

By the end of this lesson, students will be able to:

- Understand the concept of AI and identify common AI applications in daily life.
- Define an AI robot and explain the roles of its key components: sensors, actuators, and controllers.
- Recognize the core components of the Nous Robot and classify them by function.
- Assemble the Nous Robot through hands-on practice and program basic movements, screen-button interactions, and sensor responses.

Theoretical Knowledge

What is Artificial Intelligence?

Artificial Intelligence (AI) is a branch of computer science focused on developing theories, methods, and technologies to simulate, extend, and expand human intelligence. AI systems are designed to perform tasks that typically require human cognition, such as learning, problem-solving, and decision-making.

Common AI Applications in Daily Life: Voice assistants, Smart home devices, Autonomous vehicles.



What is an AI-Powered Robot?

An AI robot is a physical embodiment of AI technology, combining artificial intelligence with mechanical hardware to create an autonomous agent. These robots simulate human-like interactions by perceiving their environment and executing physical actions.

Understanding AI Robot Principles through Human Comparison

We can better understand how AI robots operate by comparing their environmental perception and response mechanisms to those of humans.

Human Perception and Response:

Perception: Sensory organs (eyes, ears, skin, etc.) receive external stimuli

Transmission: Nervous system transmits electrical signals to the brain

Processing: Brain integrates, interprets, and makes decisions

Execution: Body performs actions through muscular responses

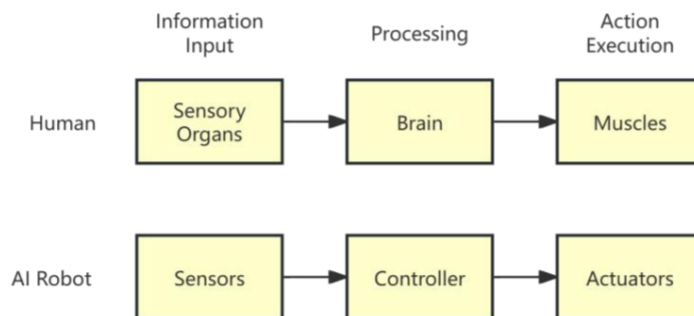
AI Robot Perception and Response:

Sensing: Sensor act as robotic sensory organs to detect environmental data

Signal Conversion: Sensors transform physical signals into digital data

Data Processing: Controller (CPU/micro controller) analyzes information and generates instructions

Action Execution: Actuators (motors, robotic arms) perform physical actions based on commands



Components of an AI Robot

AI-powered robots typically consist of three core components: sensors, actuators, and a controller, which work synergistically to enable autonomous operation.

Sensors - The Robot's Sensory System

Sensors are devices that detect and measure external environmental conditions. They provide the robot with critical data about its surroundings, enabling perception and environmental interaction. Common sensor types in AI robotics include: Cameras, sound pressure sensors.

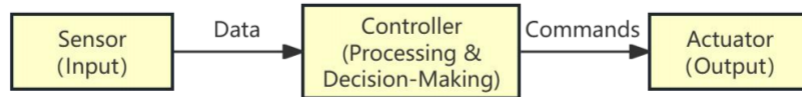
Controller - The Robot's Cognitive Center

The controller serves as the robot's "brain", performing these essential functions: Data

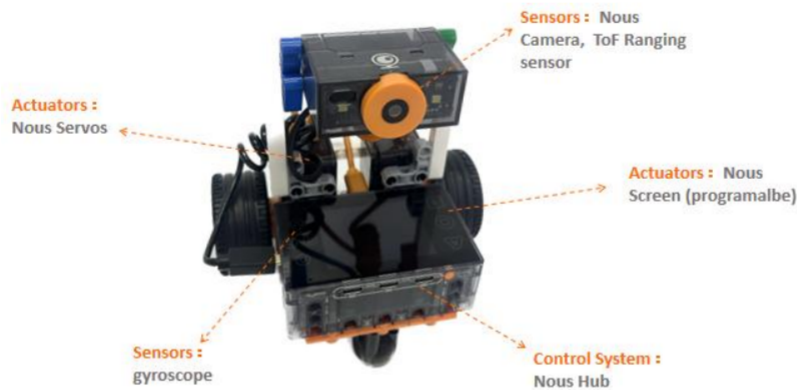
processing: Analyzes incoming sensor data using algorithms. Decision-making: Executes pre-programmed instructions or AI-driven decisions.

Actuators - The Robot's Muscular System

Actuators are the motion-generating components that: Convert control signals into mechanical motion, Enable physical interaction with the environment.



Learn the Nous Robot



Nous perceives external signals through sensors such as cameras, ToF ranging sensors, and gyroscopes, then transmits these signals to the Nous HUB. The controller processes and makes decisions based on the signals before delivering feedback actions via actuators like screens and motors.

Practical Exploration

Task 1: Build the Nous Robot According to Blueprints

Objective: Complete the assembly of the Nous Robot by following the provided building instructions.

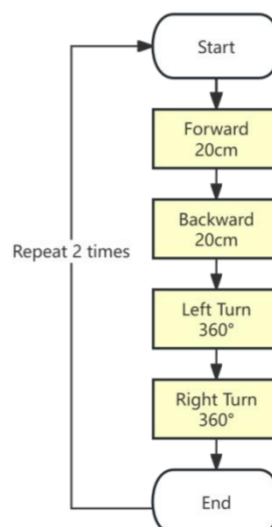
Task 2: Learn Programming Blocks for Nous Robot and Achieve Basic Movement

Map Out the Flowchart:

Objective:

Program the Nous Robot to repeat 2 times the following sequence with 50% speed, accompanied by voice prompts before each action:

- Move forward 20cm
- Move backward 20cm
- Rotate left 360°
- Rotate left 360°

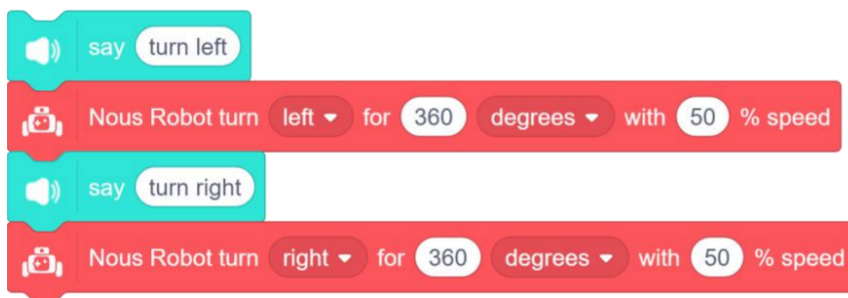


Programming:

Task Objective Analysis: After prompt 'move forward' voice, advance 20cm at 50% speed. Then, after prompt 'move backward' voice, reverse 20cm at 50% speed.

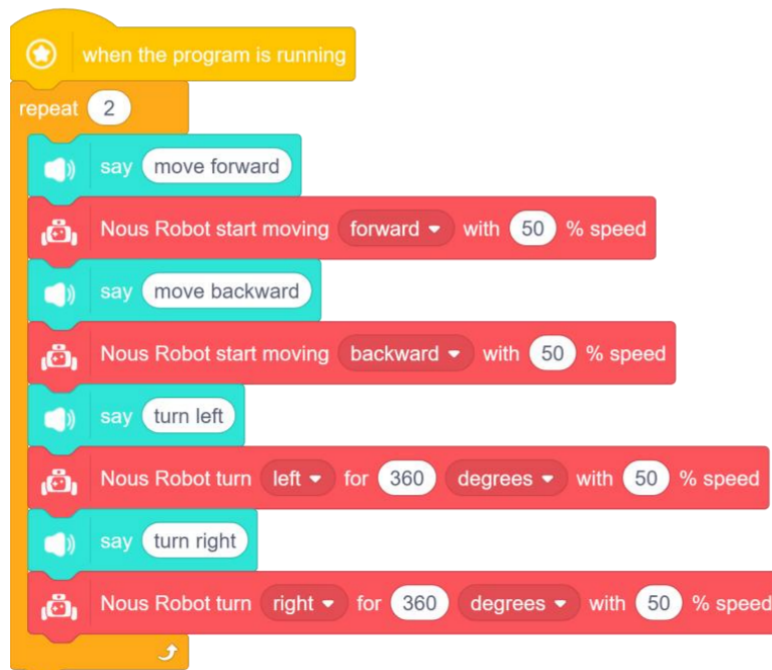


Task Objective Analysis: After prompt 'turn left' voice, make a 360° left turn at 50% speed. Then, after prompt 'turn right' voice, execute a 360° right turn at 50% speed.



After completing the program, please try connecting to the Nous Robot and run the program to make it move!

Complete Program Reference:



Task 3: Settings and Usage of Nous Button Controls

Objective:

Program the Nous robot to display corresponding messages on its screen when different buttons are pressed:

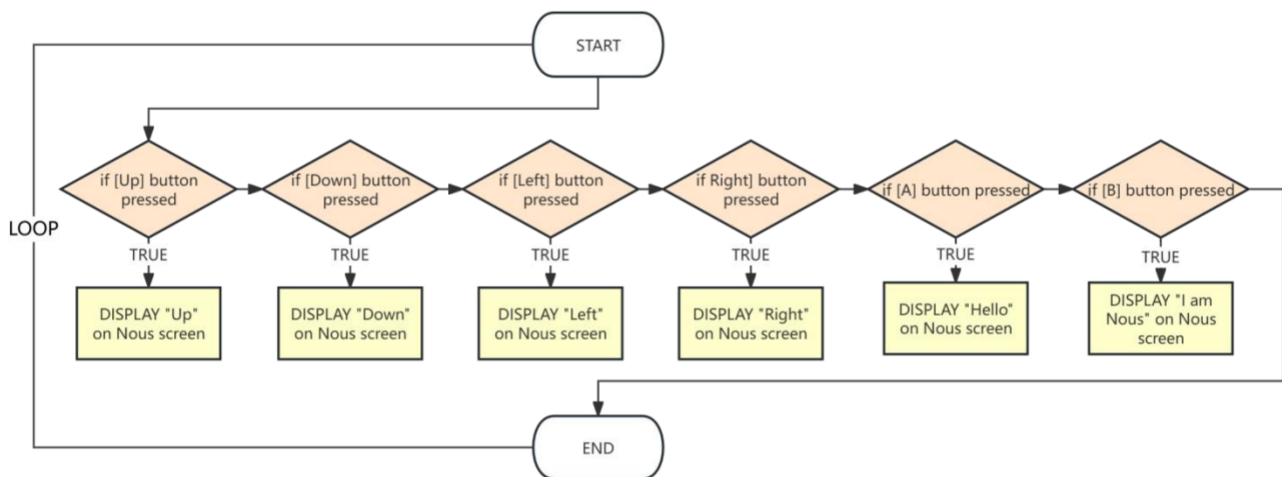
1. Directional Buttons:

- ▲ "Up" button → Display the text "Up" on screen
- ▼ "Down" button → Display the text "Down" on screen
- ◀ "Left" button → Display the text "Left" on screen
- ▶ "Right" button → Display the text "Right" on screen

2. Function Buttons:

- [A] button → Display the text "Hello" on screen
- [B] button → Display the text "I am Nous" on screen

Map Out the Flowchart:



Programming:

Task Objective Analysis: "When the 'Up' button is pressed, display the text 'Up' on the Nous screen."



Task Objective Analysis: "When the 'Down' button is pressed, display the text 'Down' on the Nous screen."



Technical Note:

When displaying multiple characters or graphics simultaneously in the same program, each element must be assigned a unique label to avoid rendering conflicts.

Based on the "Up" and "Down" button implementations, now program the remaining buttons on Nous.

Complete Program Reference:

```

when the program is running
  forever
    if ((*) is UP key pressed? then
      screen display characters: Up starting point x: 0 y: 0 size 1 color pink character label 1
    if ((*) is DOWN key pressed? then
      screen display characters: Down starting point x: 0 y: 0 size 1 color purple character label 2
    if ((*) is LEFT key pressed? then
      screen display characters: Left starting point x: 0 y: 0 size 1 color cyan character label 3
    if ((*) is RIGHT key pressed? then
      screen display characters: Right starting point x: 0 y: 0 size 1 color green character label 4
    if ((*) is A key pressed? then
      screen display characters: Hello starting point x: 0 y: 0 size 1 color yellow character label 5
    if ((*) is B key pressed? then
      screen display characters: I am Nous starting point x: 0 y: 0 size 1 color yellow character label 6
  
```

Task 4: Activate the sensors to achieve object tracking

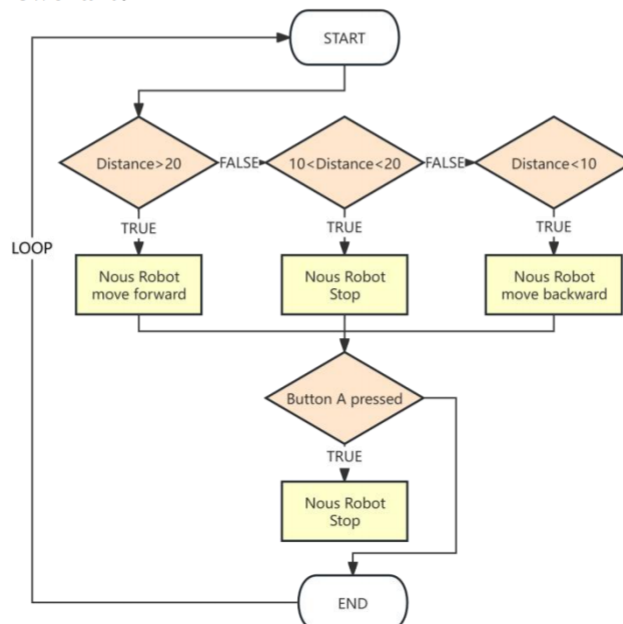
Objective:

Program the Nous Robot to perform object-following behavior using its ToF distance sensor, with an emergency stop triggered by Button A.

the following programmed logic:

1. When measured distance > 20cm: Nous Robot moves forward at 30% speed
2. When distance is between 10cm and 20cm: The Nous Robot stops all movement
3. When distance < 10cm: The Nous Robot moves backward at 30% speed

Map Out the Flowchart:



Programming:

Task Objective Analysis: If the detected distance is greater than 20, Nous Robot moves forward at 30% speed. If the distance is less than 20 but greater than 10, Nous Robot stops moving. If the distance is less than 10, Nous Robot moves backward at 30% speed.

```
if ((●) is ToF distance > 20 ?) then
  Nous Robot start moving forward with 30 % speed
else
  if ((●) is ToF distance < 20 ? and (●) is ToF distance > 10 ?) then
    Nous Robot stop moving
  else
    if ((●) is ToF distance < 10 ?) then
      Nous Robot start moving backward with 30 % speed
```

Task Objective Analysis: When button A is pressed, Nous Robot stops immediately.

```
if ((●) is A key pressed?) then
  Nous Robot stop moving
```

Complete Program Reference:

```
when the program is running
  forever
    wait 0.01 seconds
    if ((●) is ToF distance > 20 ?) then
      Nous Robot start moving forward with 30 % speed
    else
      if ((●) is ToF distance < 20 ? and (●) is ToF distance > 10 ?) then
        Nous Robot stop moving
      else
        if ((●) is ToF distance < 10 ?) then
          Nous Robot start moving backward with 30 % speed
    if ((●) is A key pressed?) then
      Nous Robot stop moving
```