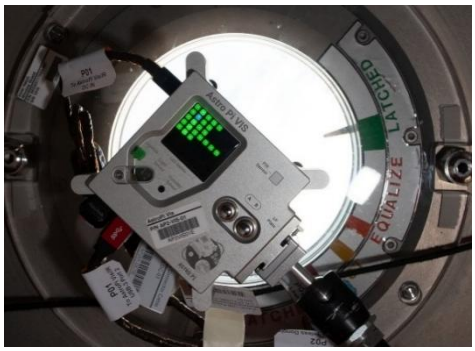
Program your Astro Pi

Astro Pi Mission Zero Project



Project Mission Zero

The International Space Station (ISS), the result of a collaboration launched in the late 20th century between the European, Japanese, Canadian, Russian and American space agencies (with the latter two being the primary investors), has a major objective: to study the effects of microgravity on humans and matter. To this end, many scientific experiments are carried out continuously on board, ranging from research into cardiovascular system function and the analysis of fluid and material properties to the observation of plant growth.
Since 2015, the ISS has hosted Raspberry Pi computers, originally installed by astronaut Tim Peake. As part of the Astro Pi project, these computers enable students to design simple computer programs intended to run in orbit, offering them the opportunity to conduct scientific experiments in space.
A notable example is the Mission Zero project, which invites students to code a simple program that reads a measurement from an Astro Pi sensor aboard the ISS and displays a personalized image for astronauts to see while performing their daily tasks.

French astronaut Thomas Pesquet next to the Astro Pi on board the ISS ©NASA/ESA

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Adapted and translated by ESERO France and CNES, 2026

Activity 1: Program your Astro Pi computer

A. Design your own drawing

Your mission in the Mission Zero project is to create a program that will run for 30 seconds aboard the ISS. This program will use the 64 LEDs on the Astro Pi unit to display an image of your choice. The program must be able to display a different image depending on whether it is dark or light inside the ISS.

A.1. The Astro Pi computer

1) Circle the sensors in red and the components that perform an action in green.

A.2. Design your own drawing

Before you start programming, imagine what your design will look like on the Astro Pi unit. To do this, color in the squares below with different colors to create your design, using both a dark version and a light version.

Clear drawing:

Dark drawing:

B. Program your Astro Pi

B.1. Write your own program

Before programming in software, it is often helpful to write down the script for the program you want to create on a sheet of paper. For example, to program a light that turns on when it detects someone, we would write a 'pseudo-program' (a pseudo-program is not an actualprogramming language; it helps you to understand the logic of what you want to do)

IF someone is there
Then
Turn on the light
Else
Turn off the light

1) Write a pseudo-program using the following sentences (if this happens, then do that; otherwise, this happens):

- Display image 1
- Display image 2
- It's dark
- It's clear

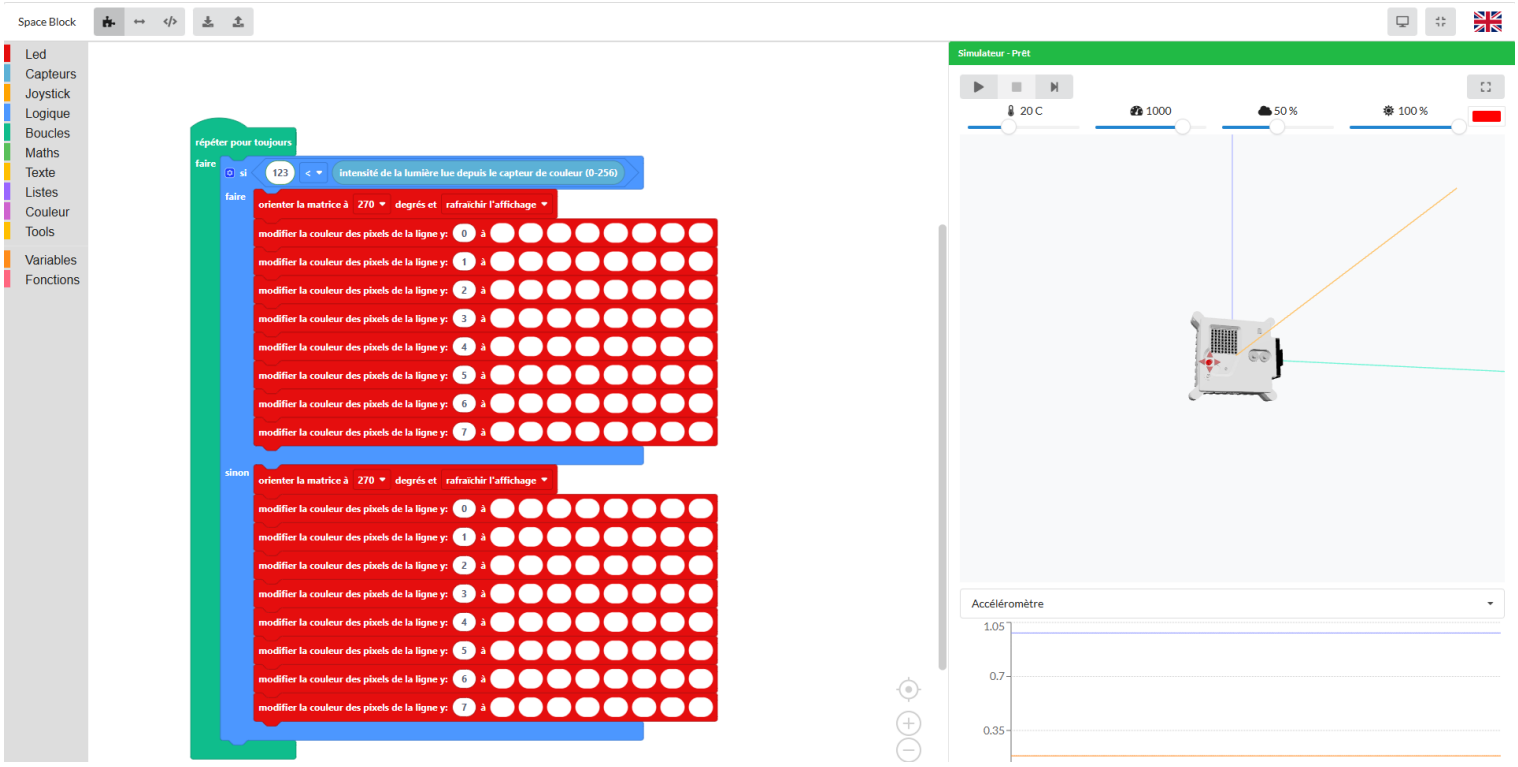
IF .....

THEN .....

IF .....

THEN .....

2) Now, go to the spaceblock website, complete the program with your images, and then test it:



Activity 2: Putting knowledge into practice

Programming involves instructing an object to perform actions autonomously, without direct human intervention.

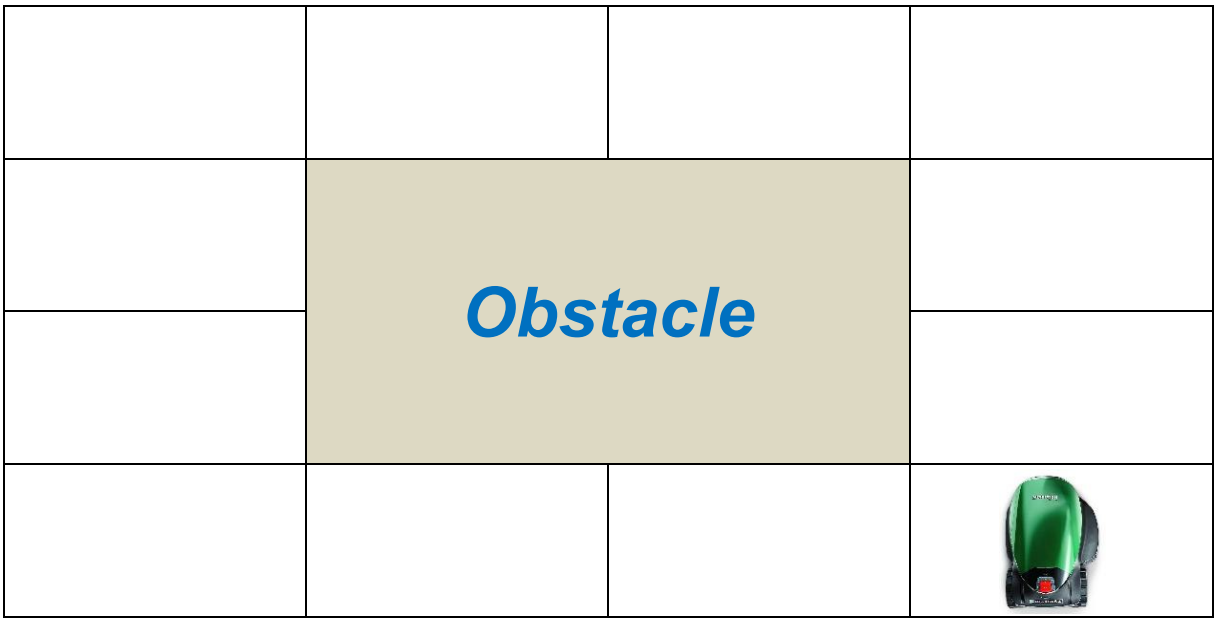
A. Program your robot lawnmower

The programming skills you acquired while working with the Astro Pi unit can easily be applied to programming everyday objects. Apply your new skills to program a robot lawnmower.

To do this, imagine a robot lawnmower that can perform the following tasks:

- Turn left
- Detect a wall on the left
- Move forward one square
- Stop the robot
- Repeat the following steps until there is no longer a wall to the robot's left.

1) Suggest a "pseudo program" that allows the robot to move around an obstacle. To do this, you can use the list of robot actions provided above. Choose the actions you consider most appropriate.



Conclusion:

There is no single way to create a program. You can make it complicated by telling the robot to perform the same actions several times, or you can make it simpler and more efficient by telling it to repeat certain actions.