Lesson 23. Drawing Machine

LECTURER:

Lesson Objective

Learning Objectives

1. Learn about drawing.
2. Learn about the working principle of the drawing machine.

Possible Difficulties

1. Build a drawing machine.
2. Set different linkage mechanisms and speeds for the drawing machine to draw different patterns.



Background Information



Background Information



Drawing is a form of human expression of thought, and the author manifests his thoughts in this way. Before the advent of writing, humans often used different patterns and symbols to record different things. The tools for drawing are only primitive tools such as colored minerals and coal.

Background Information



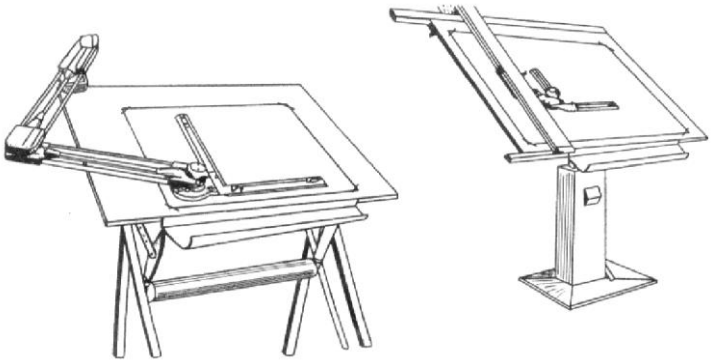
With the development of human civilization, drawing has a richer form of expression, and the tools are gradually perfected. Painters and craftsmen have richer pigments, brushes capable of sketching in different thicknesses, and a sufficiently complete "canvas.”

Background Information



As times have progressed, people have turned to computers for drawing instead of doing it themselves. These machines provide more stable and accurate movements, allowing for precise control over the color, pen position, and direction.

Background Information



In addition to drawing on the calculation, it is also necessary to "draw" it on paper. Common machines include printers, plotters, and so on. Today, we will build a drawing machine to draw different repeating patterns through different linkages.



Knowledge Introduction

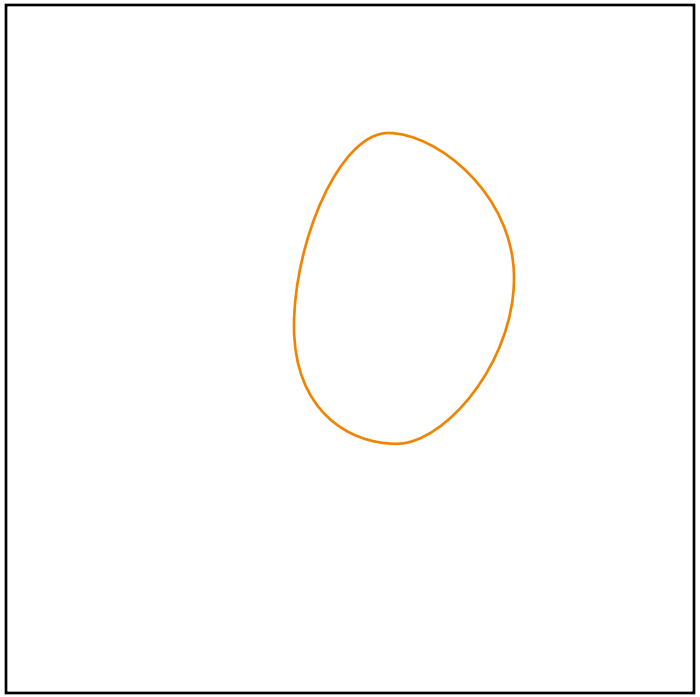
New Knowledge



A plotter is a drawing device controlled by a computer. Different instructions allow the motors in two directions (X, Y) to move or rotate, and actions such as writing, lifting coins, and drawing can be realized.

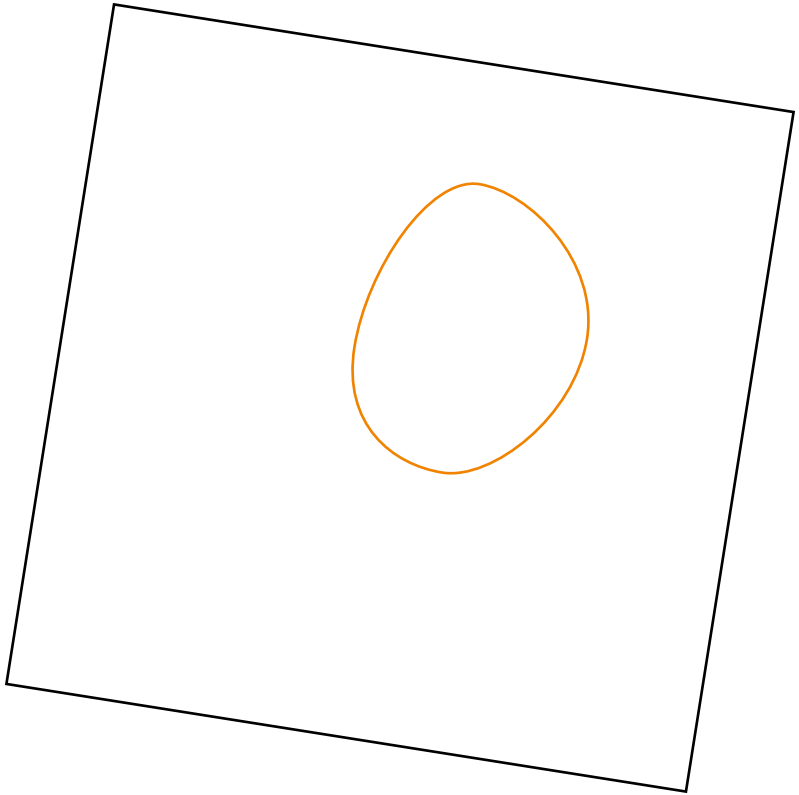
There is not only "one pen" in the plotter. It can draw lines of different thicknesses and various colors through program instructions.

New Knowledge



When the motor drives the linkage mechanism to rotate, the moving track of the paintbrush is fixed, which is the basis for drawing a single figure.

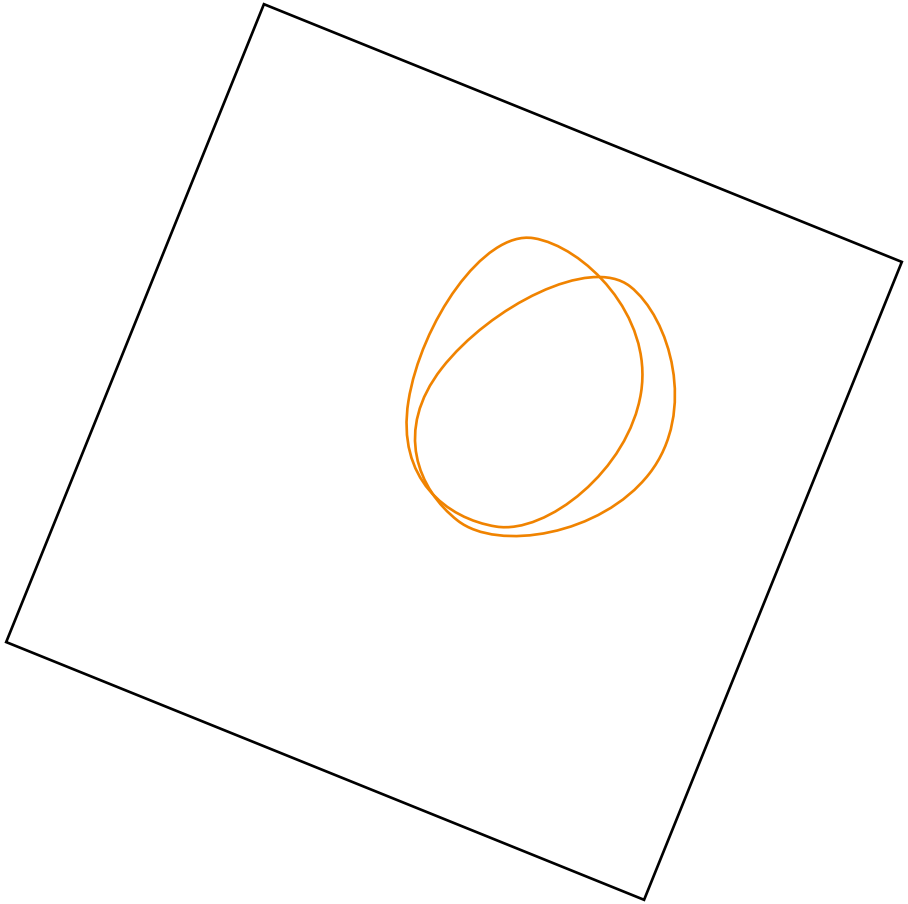
New Knowledge



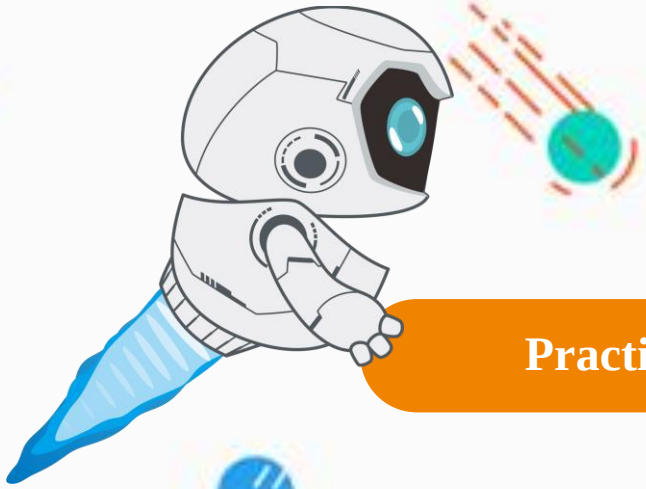
At this time, if the drawing board is rotated, a single graphic will be stretched.

The stretching range is related to the rotation speed of the drawing board.

New Knowledge

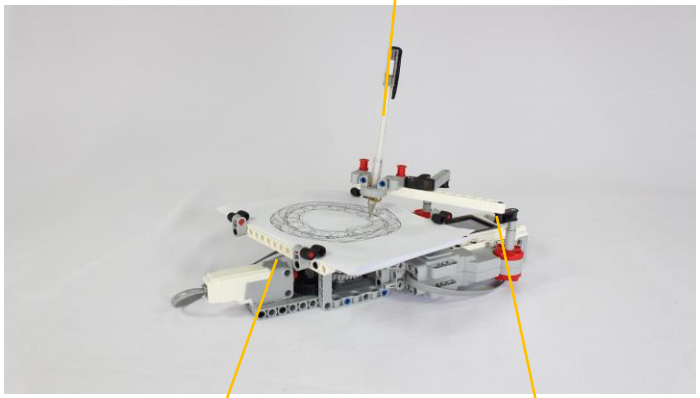


After completing a single pattern, the brush trajectory returns to the starting point, and the following pattern is drawn in the new position on the drawing board.



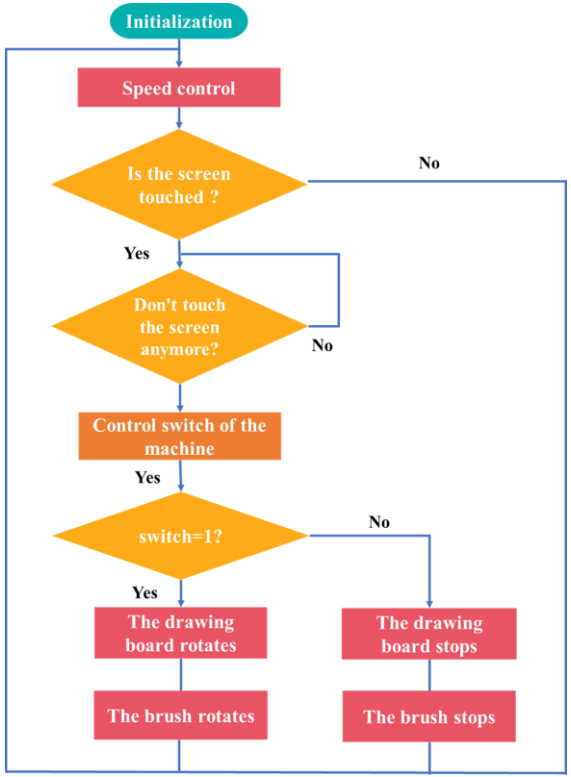
Practice

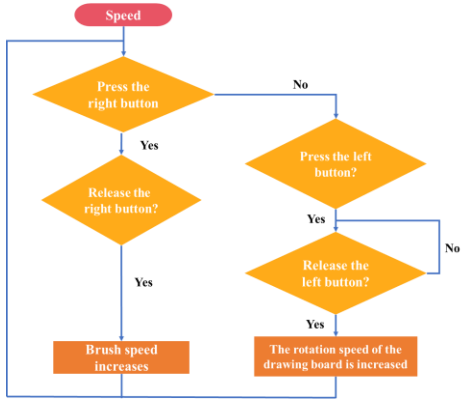
New Knowledge



According to the construction manual, build a drawing machine to realize the function of drawing repeated graphics. It should be noted that the rotation direction of the linkage mechanism should be consistent.

Practice | Flow Chart

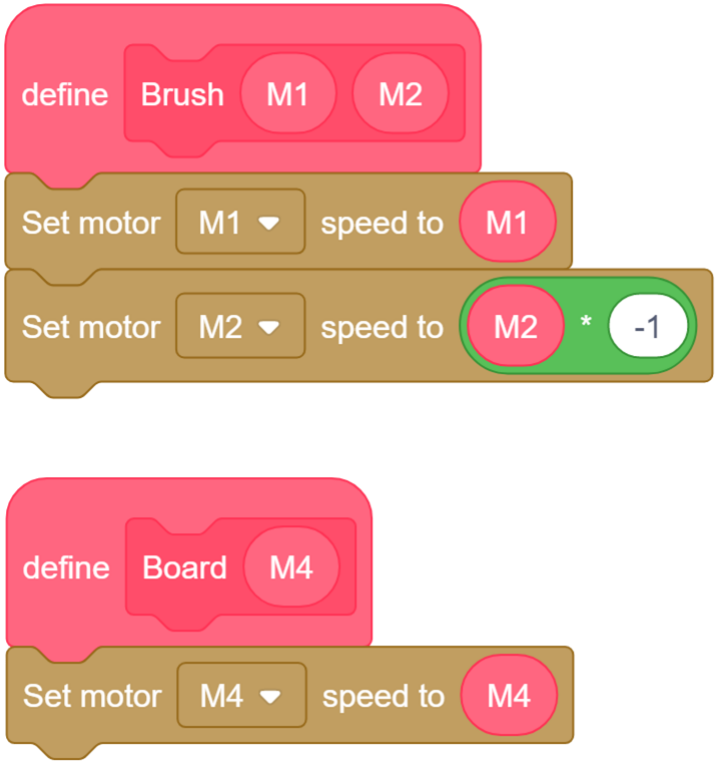




We will control the rotation of each motor through the controller. Among them, the medium motor controls the drawing disc, and the large motor controls the rotation of the linkage mechanism.

Use the left and right buttons to control the rotation speed of the paintbrush and the painting wheel. Note that speed cannot be reduced. Draw after touching the screen, and stop drawing after touching again.

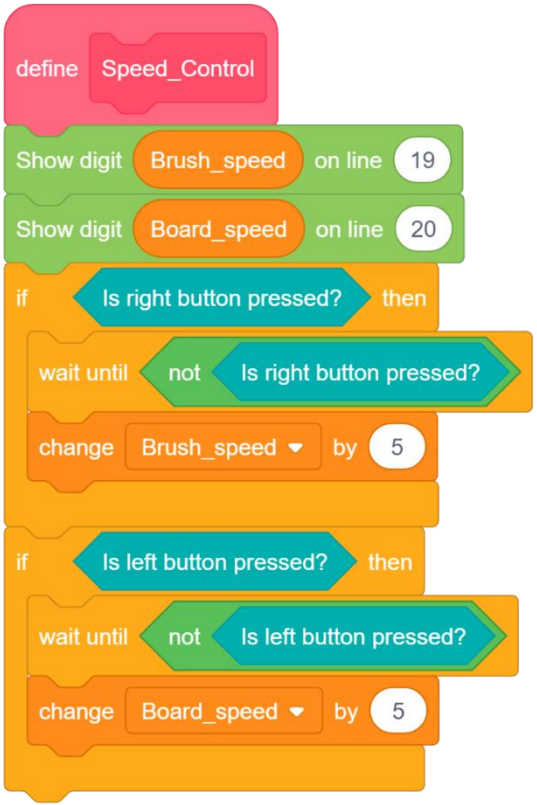
Practice | Programming



Functions – Brush and Drawing board

Both functions are used to control the motor rotation. The rotation directions of M1 and M2 should be the same for programming convenience. It can be set in the function module to make M2 perform reverse rotation.

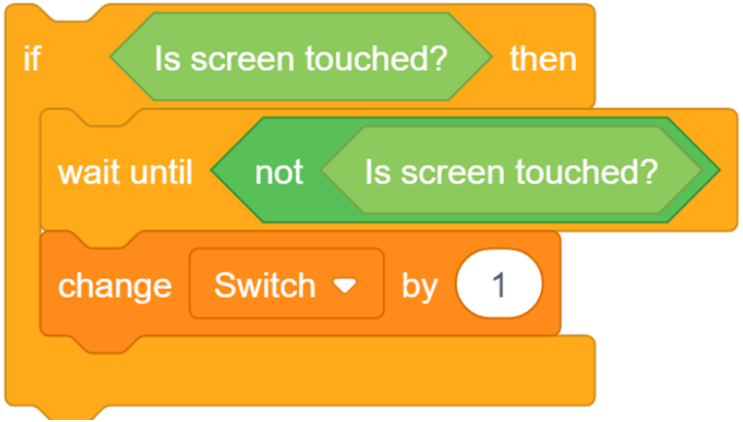
Practice | Programming



Function – Speed Control

Two speed values are displayed, and the left and right buttons of the controller control the brush (big motor) and the drawing board (medium motor) respectively.

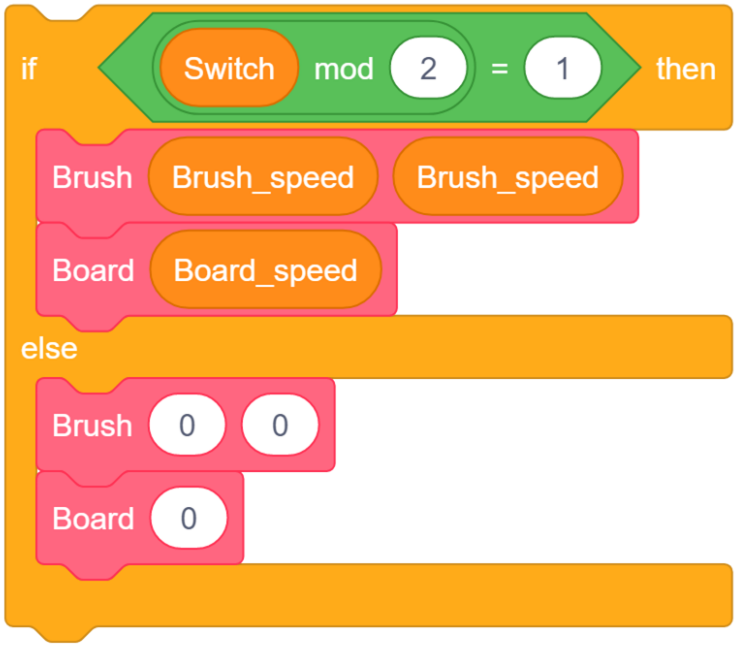
Practice | Programming



Control program on or off

Each time the screen is touched and released, the switch variable increases by 1.

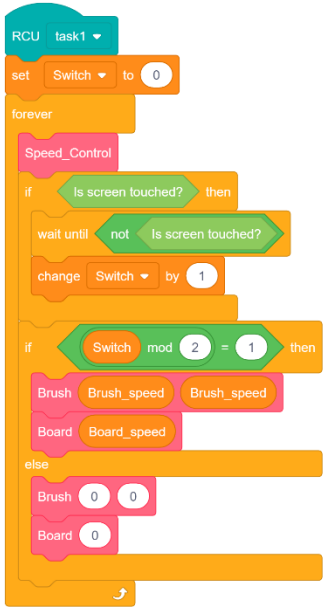
Practice | Programming

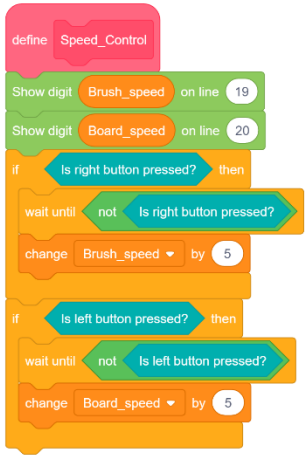


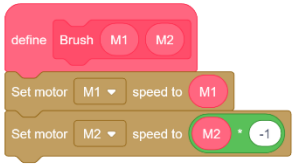
Switch control

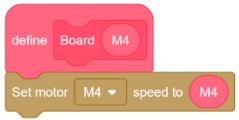
The result of dividing the switch variable by 2 is 0 or 1. When the result is 1, start drawing; when it is not 1, stop drawing.

Practice | Programming





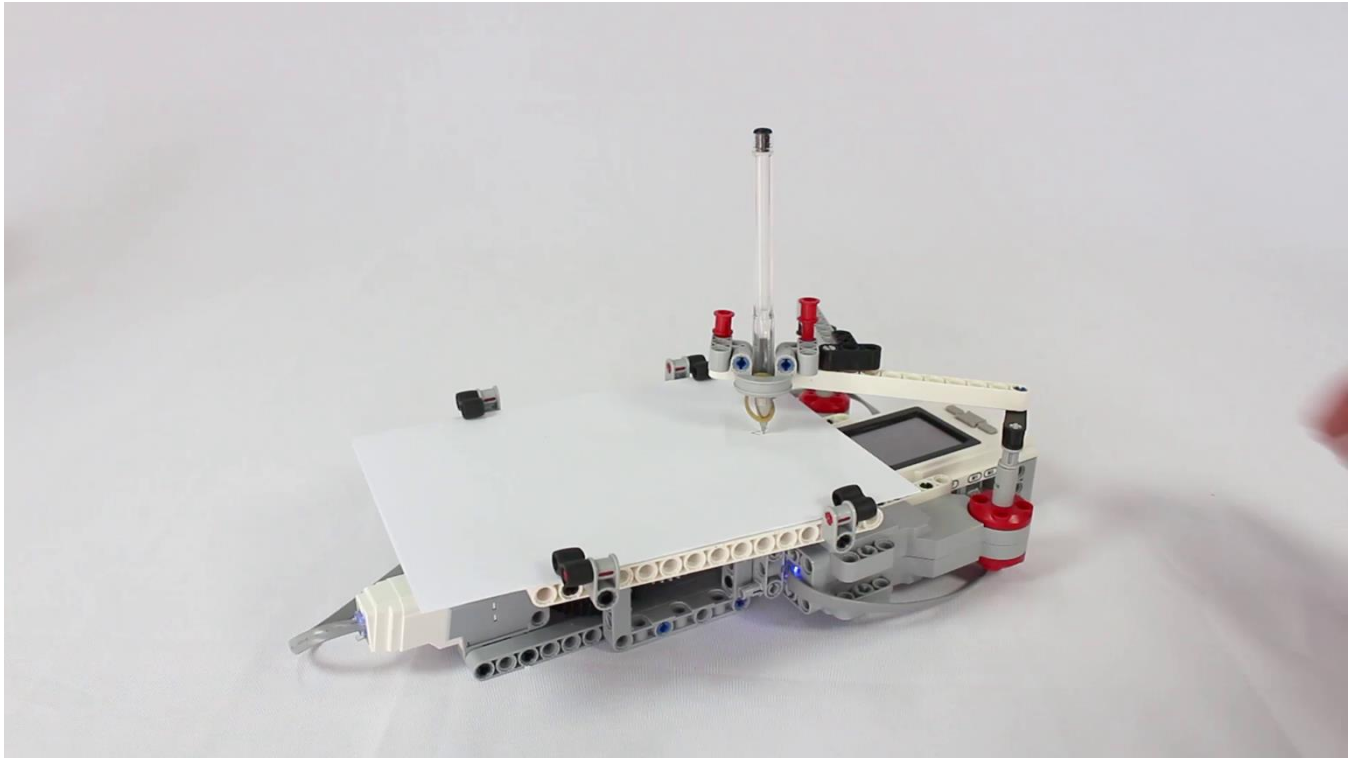


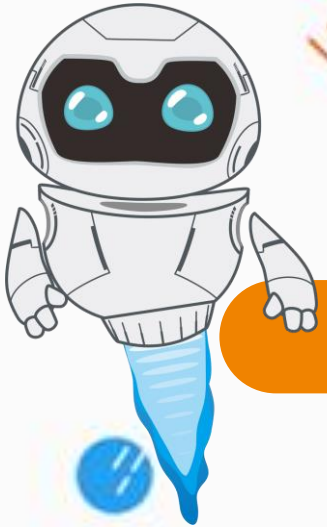


Integrate the program

Integrate the program according to the flowchart.

Practice | Programming





Results



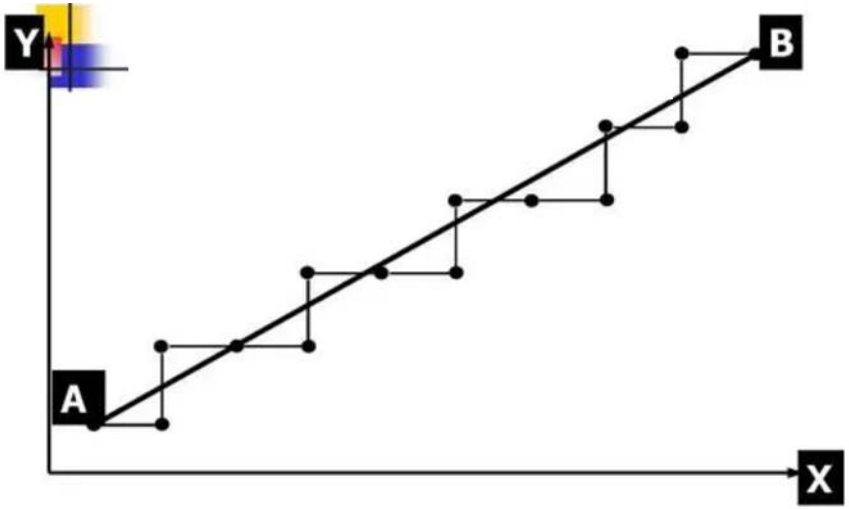
Program Optimization

In this lesson, we have implemented the drawing function of the drawing machine.

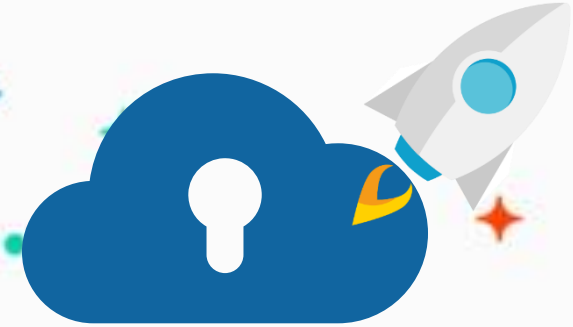
Modify the program or structure so that the drawing machine can draw different patterns. When changing the linkage mechanism, you should pay attention to whether the linkage is locked. You can manually simulate and then program.

Requirements: Change the linkage mechanism and draw different patterns.

Further Reading



The plotter draws a complete pattern through one point when drawing, and it cannot draw a continuous line in principle. Currently, a specific calculation method, the interpolation method, is required. The pen head can draw curves to draw multi-segment lines through the interpolation method.



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Thanks!

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