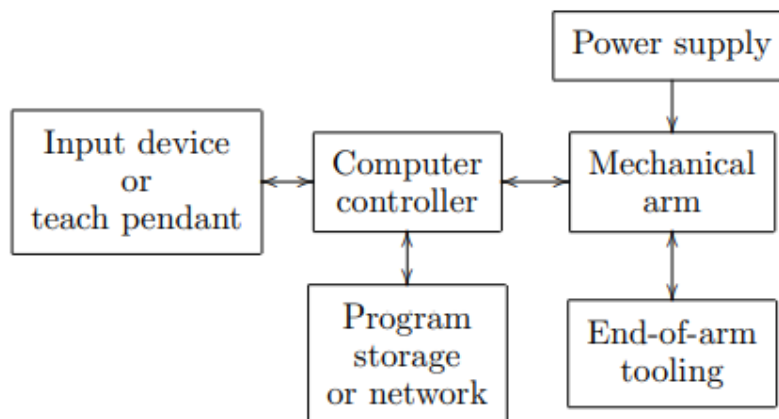


Robotic System (the manipulation robotic system)



Use rectangles to circle components into computer system and robotic arm system.

End effector (End-of-arm tooling)

An end effector is a peripheral device that attaches to a robot's arm, allowing the robot to interact with its task. Grippers are the most common type of end effector.

Grippers

Consisting of vacuum cups, pliers, or finger assembly



The end effector has a big advantage that humans don't have. And that is . . .

This enables the robot to perform a specific task by change the end effector.

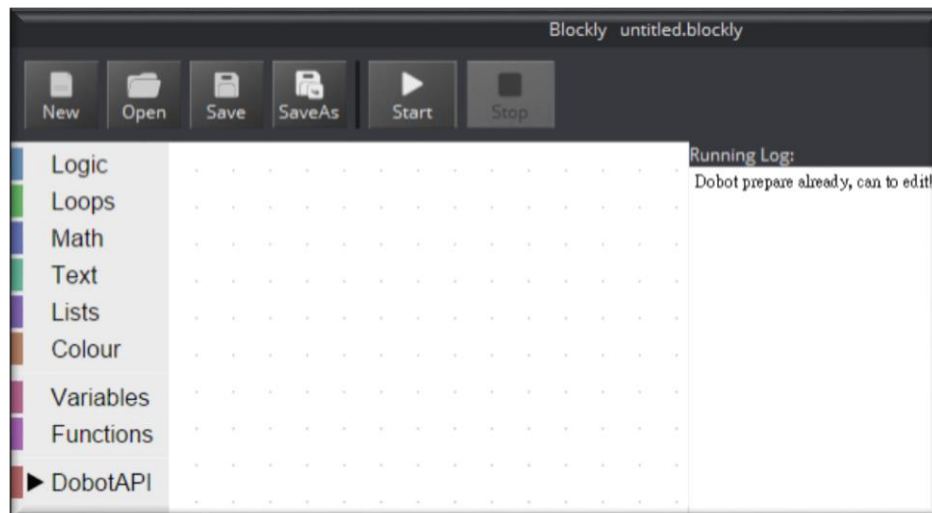
We want to draw lines and figures on paper, what should the end effector be?

Install the pen module to the robotic arm carefully.



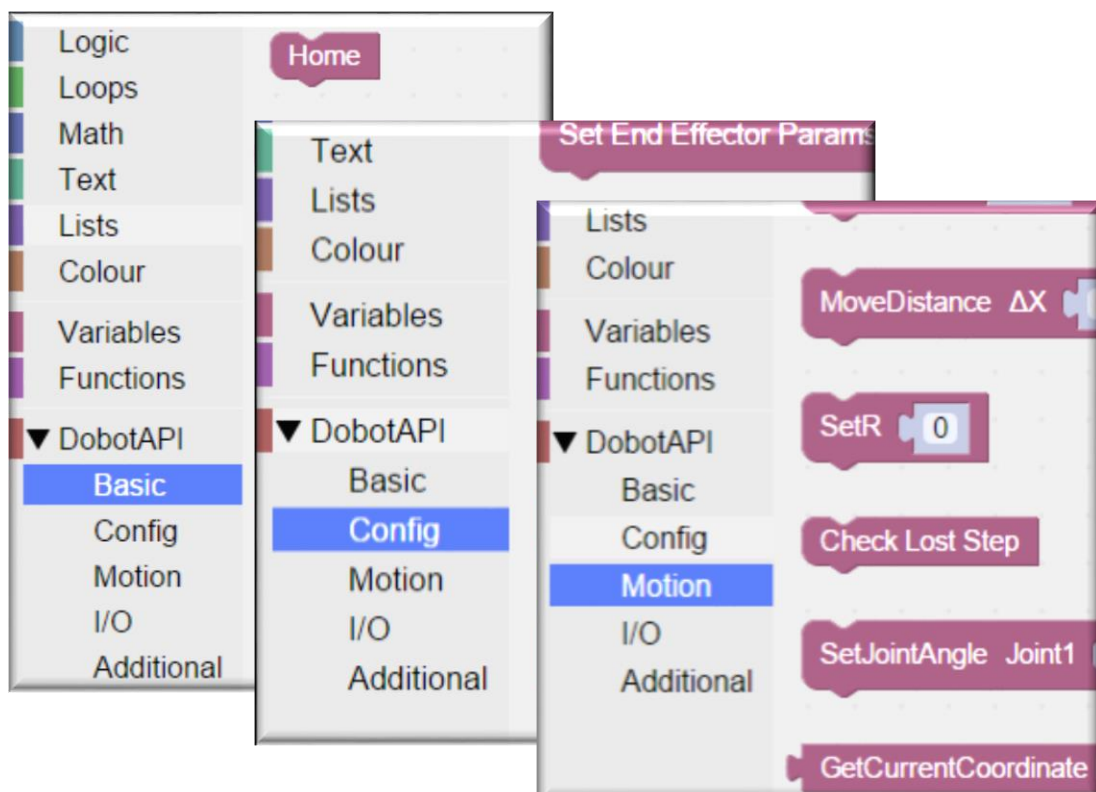
Blockly programming

Blockly uses **visual blocks** that link together to make writing code easier, and can generate code in commonly used programming language e.g. JavaScript, Python . . .etc. The default graphical user interface (GUI) of the Blockly editor consists of a **toolbox**, which holds available blocks and a **workspace**, where a user can drag and drop and rearrange blocks.



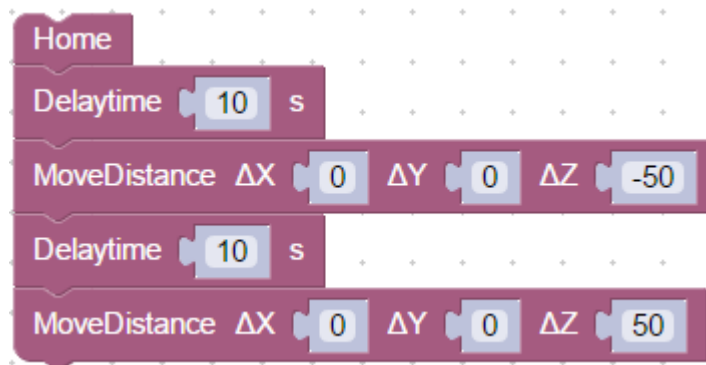
Blockly includes a set of visual blocks for common operations (Logic . . . Functions), and can be customized by adding more blocks (DobotAPI).

Familiar with DobotAPI



Programming01:

Determine the physical length of one unit

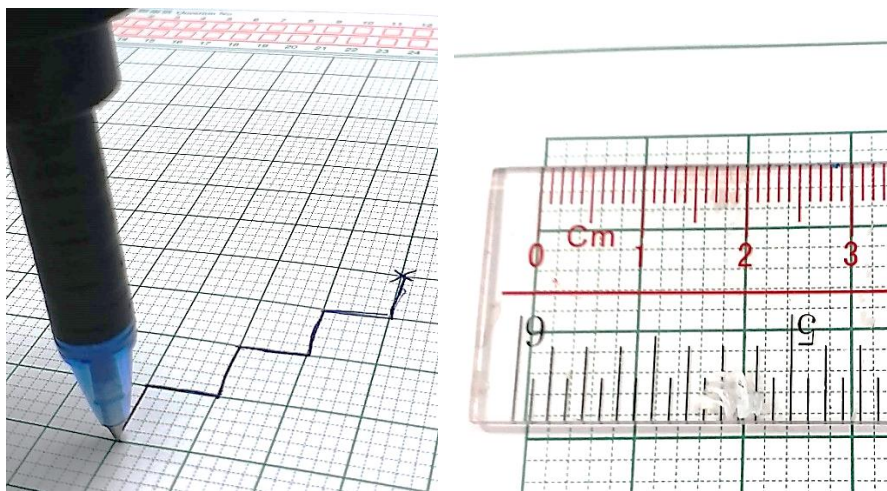


- Use the rule to measure the depth of the movement in mm
- Estimate the exact value of ΔZ to touch the paper
- Program your DOBOT to find the exact value

Programming02

Draw a zigzag path on a graph paper (XY plane)

- Lay a piece of graph paper on the board and adjust the graph paper to one of the intersections of the vertical and horizontal lines as shown in the figure.
- Mark the point in Programming01 as the origin of the reference system
- Try to program your robotic arm to move along the grid line, as shown in the following figure



Advice: You can simulate the sequence of actions by raising the pen

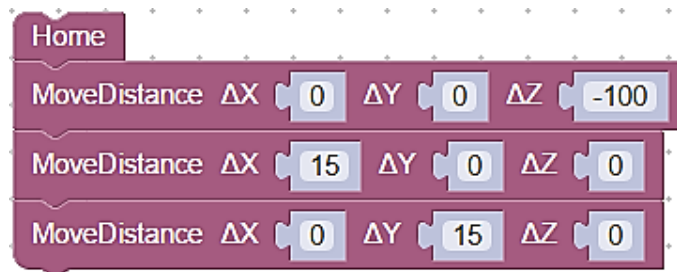
Video Watching

DOBOT is drawing the zigzag path in the air above the graph paper

Think before programming

- What is the width between 2 grid lines?
- Which direction is the X-axis used by DOBOT?
- What precautions have been taken to avoid the misalignments?

Study the following Blockly program carefully.



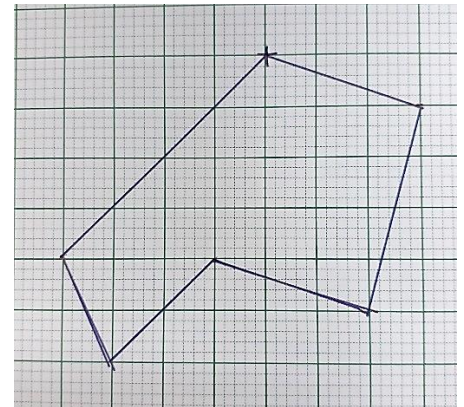
How to modify the value to make the robotic arm follow the grid lines?

Programming03**Draw a polygon on a graph paper (XY plane)**

Peter is thinking to write a program to instruct the robotic arm to draw a polygon.

1 hour later, he shouted, "Use the vertex as the origin to find the coordinates of the next connected vertex relative to this new coordinate system."

Here is his sketch.



Peter write down something near the vertexes

Vertex B

Using vertex A as the origin

$$\Delta X = +40$$

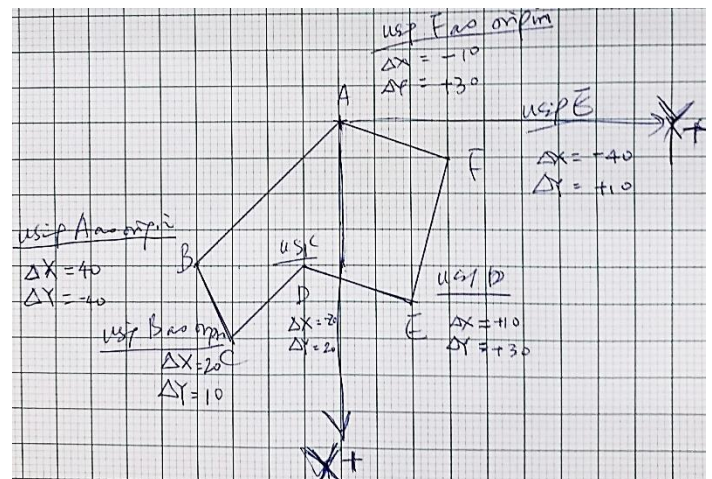
$$\Delta Y = -40$$

Vertex C

Using vertex B as the origin

$$\Delta X = +20$$

$$\Delta Y = +10$$



According to his reasoning, try to

use the following 3 starting blocks to complete the program.

