Lesson 4 Robot Painting Contest

Scene lead-in

Look at the painting on the left. Which school do you think it belongs to?

_____

It's hard to imagine that this lifelike portrait of Einstein was painted by a robotic arm!

Yes, ever since the close combination between robotic arms and AI, now robots can not only complete hard work, but also make delicate artistic creation with pen nibs!

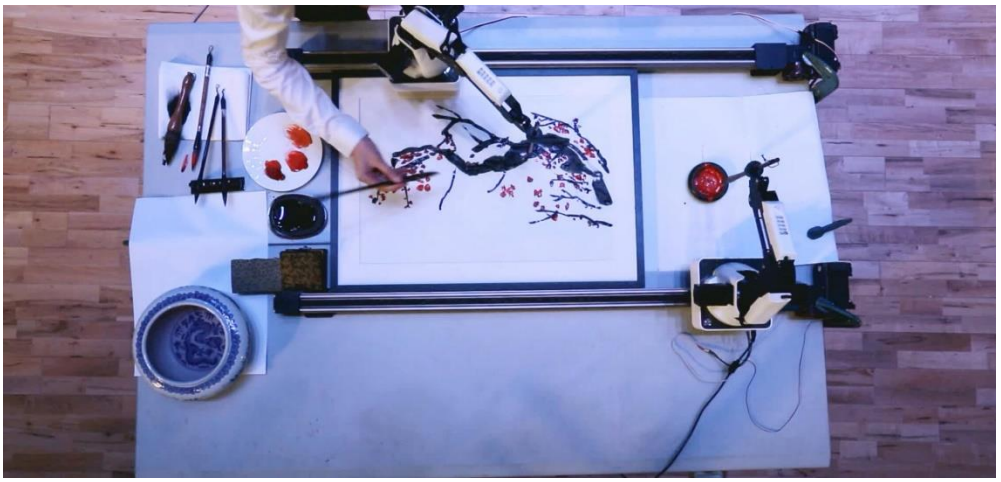
RobotArt International Robot Painting Competition is a grand event combining AI with robotic arms, where teams from different countries develop robots that can paint whatever paintings, just like artists!

The competition was established by Andrew Conru, Doctor of Mechanical Engineering Design, Stanford. He is not only an engineer, but also an art lover.

RobotArt has been held consecutively for three years since 2016. The first match attracted 15 teams from 7 countries or regions, with more than 70 works created.

TAIDA, a robot team from National Taiwan University, was champion of the first competition. The method of robot painting developed by TAIDA is similar to traditional artificial painting. The robot uses its own visual feedback system to mix paints and get perfect colors for its initial creation. It outlines the shape first and then depicts details. After comparing its own painting with the pre-set work repeatedly, it tries to narrow the difference between them.

Do you also want to participate in RobotArt? In this lesson, let's get into the world of painting, AI, and robotic arms!



https://www.youtube.com/watch?v=nDp124yDr14

Watch the portrait of Einstein created by the champion TAIDA!

Log in to https://robotart.org to view more RobotArt competitions!

At the beginning of this lesson, we introduce that the top three winning robots have a certain degree of intelligence, which can be judged by complex reasoning. They belong to the third generation of robots. In this lesson, we will start with an entry-level robot and experience the painting process of this robot.

What representative robots do you know about from the first, second, and third generations of robots?

Different painting schools have different styles. Talk about your favorite artistic style in groups, select a painting as the imitation painting to paint using the robotic arm, and explain the reasons for choosing this painting. Think about what kind of paints and painting tools to use in order to complete this work.

The original work

Reasons:

Creative design

Paintings are a medium of recording thoughts and conveying language for human beings. We often describe calligrapher's writing as dragons and snakes dancing, or clouds and water floating. However, it takes years of practice to master such ability. Through the development of science and technology, we can make everything possible. Even if you are not a painter, you can also use high technology to reproduce famous works. Next, let's learn about this magic robot.

Project practice: Manipulating the robotic arm to paint a picture

Project requirements: use your creativity, design a picture, take pictures and let the robot reproduce the painting.

Project score: 1 The faster the speed, the higher the score (20%)

2. The higher the degree of reproduction, the higher the score (70%)

3. Creative display score (10%)

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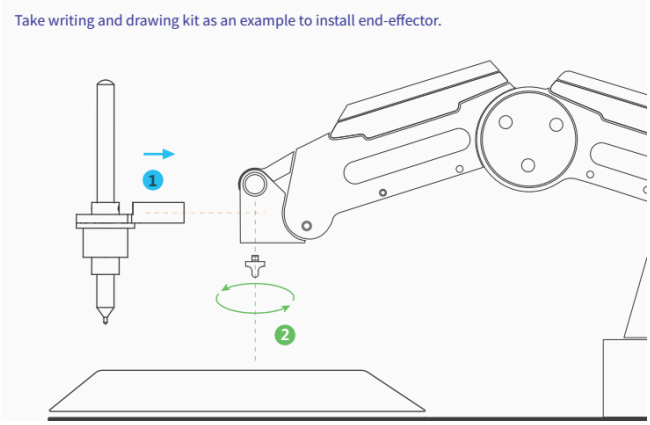
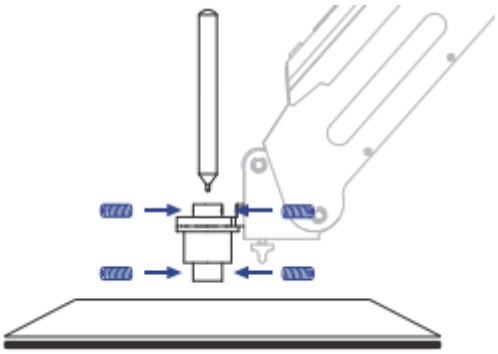
1 Install the writing kit.

The kit contains a pen and a pen clamp, as shown in the following figure:

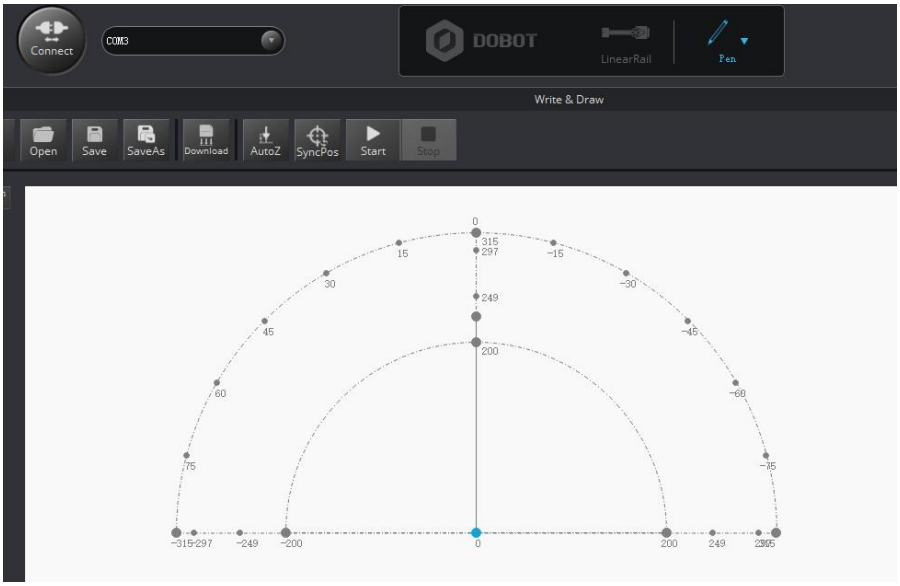


If the pen needs to be replaced, just unscrew the four lock screws on the pen clamp.



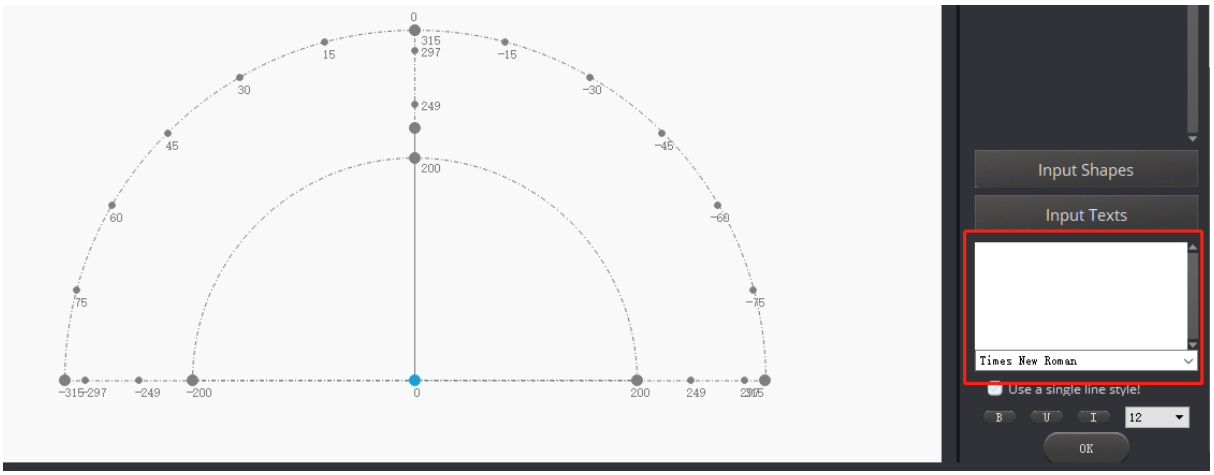
2 Connect to DobotStudio.

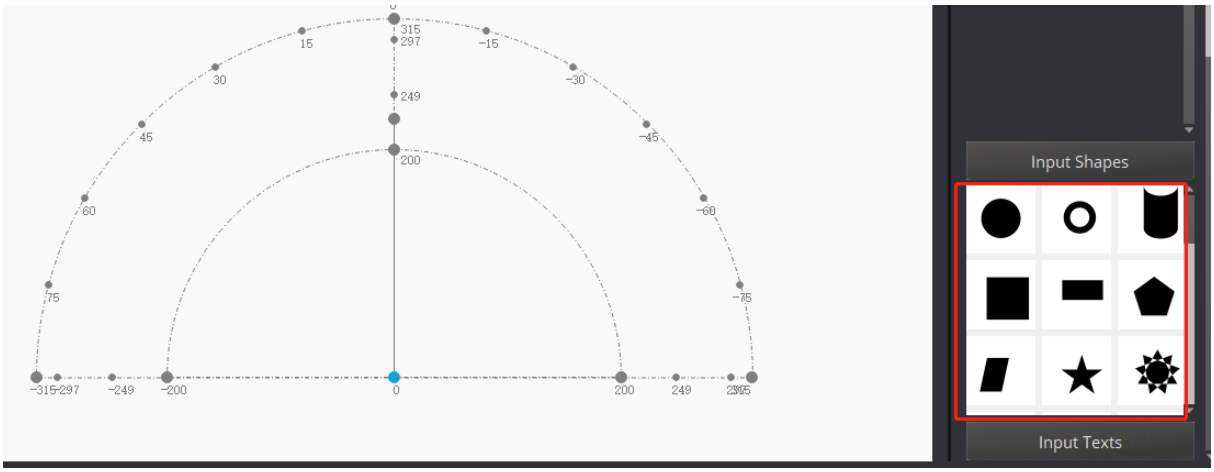
After the installment of the writing kit, connect the robotic arm to the computer and set the software. Firstly, double-click to open the software, click the Writing & Drawing module, enter the Writing & Drawing interface, and click “Connect”.



3 Pattern import

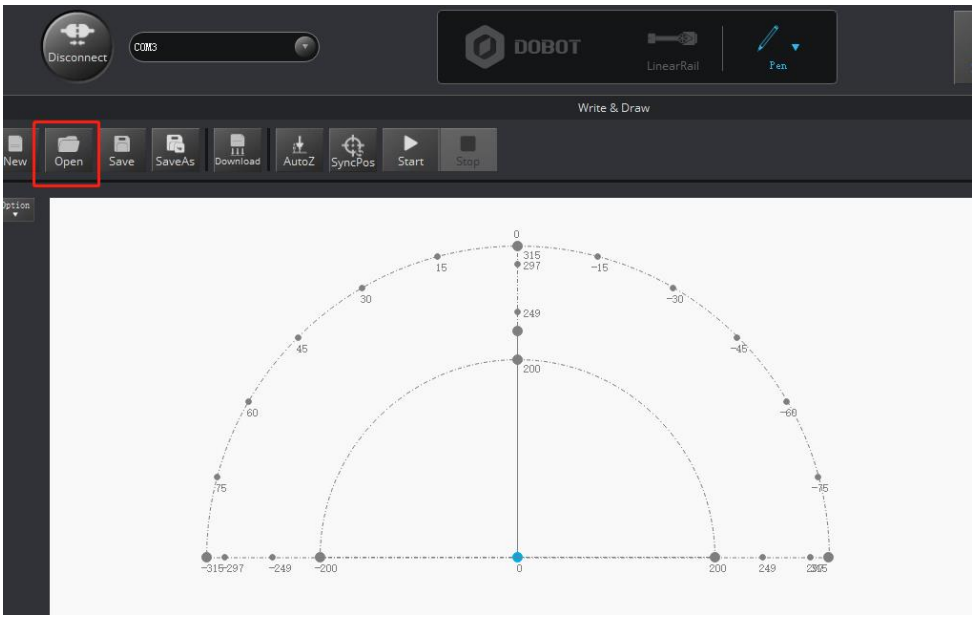
The DobotStudio has simple pictures for printing. Through the insertion function, you can directly select the desired pattern and insert it into the annular region and adjust the size for printing. In addition to pictures contained in the software itself, by pressing the “Enter Text” button below, you can manually enter text for printing and choose the font, font size, and other styles of the text, to whichever specifications you like.





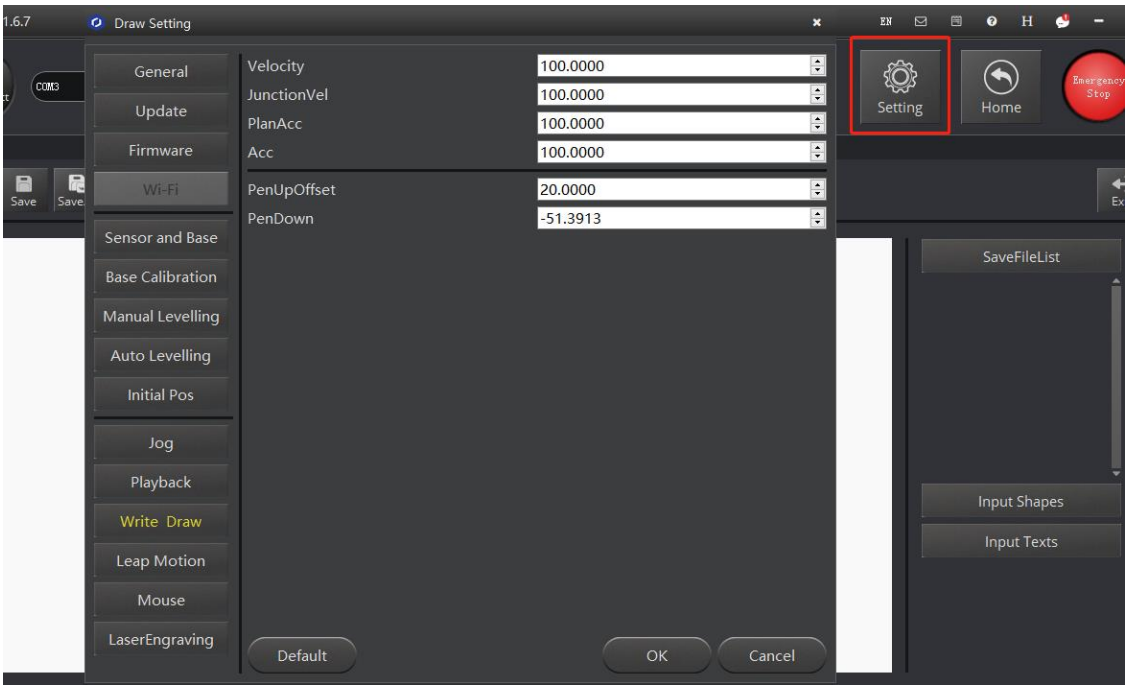
4 Picture import

DobotStudio can also import external pictures for printing. Click the "Open" button to import the picture directly into the annular region or directly import pictures of other formats (such as BMP/JPEG/JPG/PNG), and then convert the pictures into SVG files recognizable by Dobot.



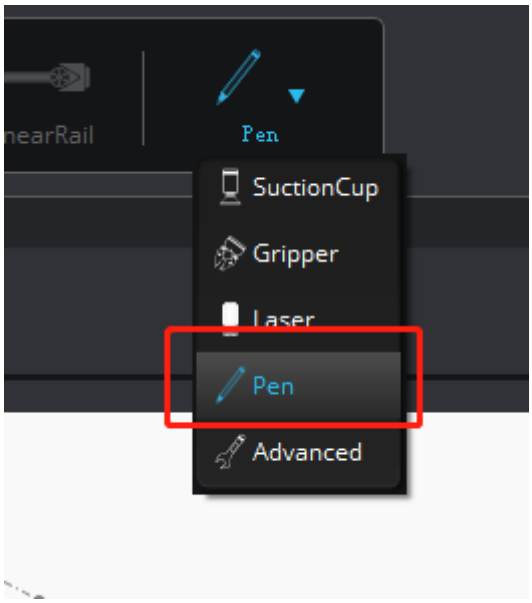
5 Setting writing speed

Corresponding speed, acceleration and pen lifting height can be set. It is suggested to set the speed and acceleration between 0 - 500.



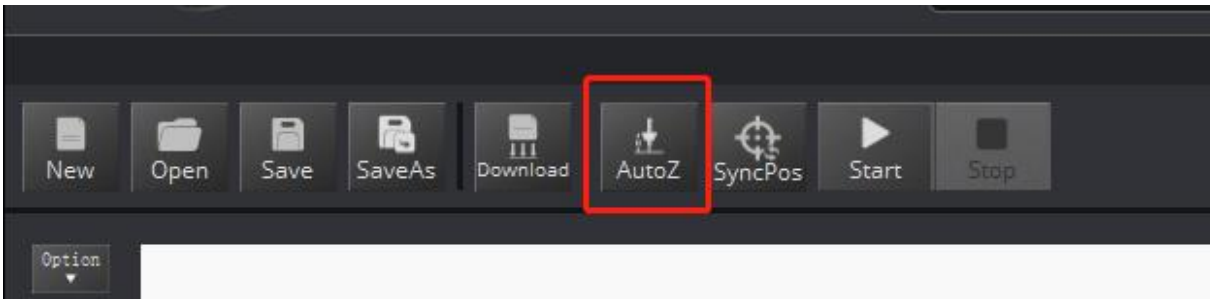
6 Adjusting position

Step I: Set the pen at the end.



Step II: Adjust the position of the pen tip. Place the robotic arm in the middle of the disc using the return-to-zero function. Press the Unlock key to descend the robotic arm about one cm away from the paper surface and then adjust the Z-axis position of the robotic arm with the control panel. The software can acquire and save the current

Z value by clicking the AutoZ button after it reaches the paper surface.



Step III: Click the Position Synchronization button, and then the robotic arm will move automatically to the position right above the start point (pen lifting height).

Step IV: Click the Start button and begin drawing. You can click the Pause button midway through, or simply stop drawing.

Through the above steps, we understand and master the painting principle of the robotic arm. Then please reproduce your favorite painting in groups!

Work display

Knowledge sharing

(1) Briefly describe your method.

_____

_____

(2) What problems have you encountered during operation? How did you fix them?

_____

_____

(3) What are the deficiencies in your completed work? How will you correct them?

_____

_____

Comprehensive evaluation

Review learning contents and activities, and make summary and evaluation.

Evaluation method	Evaluation phase	Evaluation contents	Evaluation criteria		
			3 Excellent	2 Good	1 General
Self-evaluation	**Scene creation lead-in**	• Understand changes brought by AI to the art industry.			
	Creativity	• Be able to design an artistic work.			
	Ability to solve problems	• Be able to operate the robotic arm in a skilled way as needed.			
	Engagement	• Actively participate in group activities and undertake one's group tasks.			
	Team collaboration	• Be able to cooperate with others.			

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