Lesson 7 Magician on Wood Bricks

Scene lead-in

Nature is carving out our world with an invisible "knife". The soft sandstone forms the Antelope Canyon by the erosion of millions of years of flash floods and wind; the Colorado River originated from the Rocky Mountains of the State of Colorado, running forward around the clock to carve the Grand Canyon on the Kaibab Plateau; typical karst topography creates the Huanglong Cave, and the deep, mysterious and quirky Blue Hole is like the pupil of the sea.

Gorgeous Antelope Canyon

Deep Huanglong Lake

Splendid Grand Canyon

Quiet Blue Hole

Wonderful articles of craftsmen

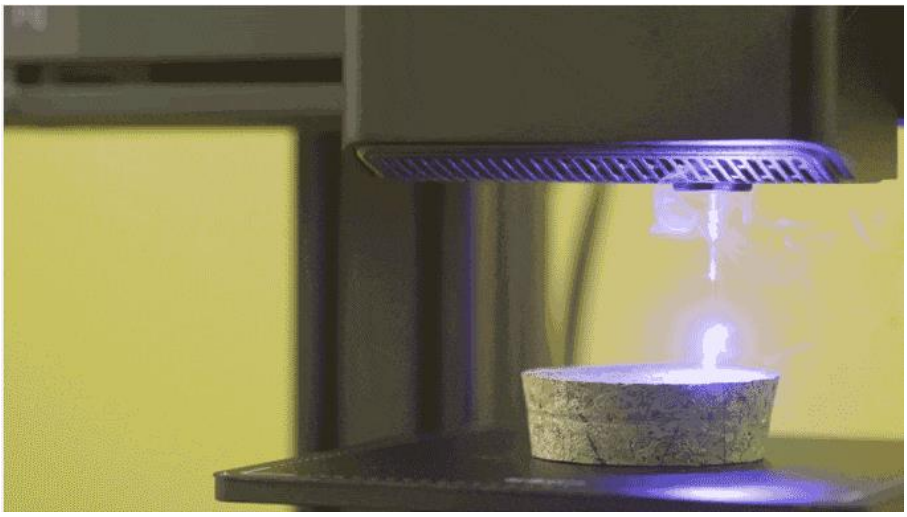
Achieving the same result as the uncanny workmanship of nature, craftsmen use the "knife" to carve timbers and stones to form various lifelike articles, which are still vivid and shining over the years.

Activity 1: understanding of woodcarving flow and tools

Search relevant information about woodcarving on the Internet, and complete below steps and tools.

Steps	Specific work	Tools used
	First, draw the creative draft, and then magnify the draft on the timber.	
Material chiseling	Coarse material: Form the internal and external outline of the article. Fine material: Adjust the proportion and layout.	
	Remove the tool marks and chisel scale in the fine material through fine craftsmanship in carving and thin cutting.	Flat knife, circular knife, oblique knife, etc.
	Sand the woodcarving using coarse or fine sandpapers.	
	Wax the finished product.	

Knowledge class 1: laser engraving



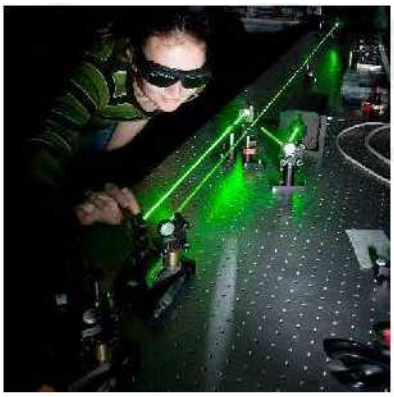
Laser, also called as "the sharpest knife", "the most accurate ruler" and the "brightest light", is another important invention of human beings after nuclear energy, computers and semi-conductors. Laser engraving means to use the focused laser beam with high power density on the material surface or inside to make the material gasify or have other physical changes, so as to present the required graphic pattern on the material by controlling the laser energy, facular size, motion track, speed and other parameters.

What is the working principle of laser engraving?

What are the similarities and differences between laser engraving and the printer? Do they use the same material?

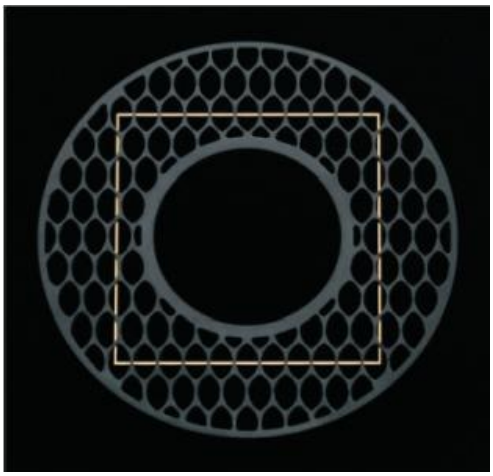
Knowledge class 2: industrial application of the laser engraving

With the progress and development of the photoelectronic technique, laser engraving technology is becoming more mature, and its application is becoming wider. Laser engraving technology is applied not only to advertising, crafts and leatherwares, but also to bamboo ware manufacturing, food processing, beverage processing and packaging.



Laser engraving and jewelry art

With the wide application of laser engraving technology, some artists begin to apply the technology to the creation of jewelry, with diversified materials and technologies. For example, one famous British jewelry designer creates jewelry by using the laser to cut graphics into various materials and combining with precious metals; an American artist creates a series of jewelry products by carving all kinds of patterns onto acrylic materials, and sells them on the brand website, and all of them are very popular.



Acrylic bracelet carved by laser　　Bracelet created by laser cutting

Laser engraving and medical drug labels

The quality of medicine has a direct relationship with the health of the patient; therefore, medicine must be produced in a production environment without dust and pollution, so as to protect the medicine from being contaminated. However, the capsule shell shall be marked with information during the capsule production, with the contents of brand name, capsule weight, production date, validity etc.

What is the problem with the medicine label in case of the use of traditional technology? How to solve the problem of labels of medicine capsules by using the knowledge we have learned in this section?

Creative design

Project practice: pattern carved by the laser

Project requirements: Use the PPT automatic drawing function to design a unique LOGO, and use the robotic arm to carve it.

Project score:

(1)LOGO aesthetics designed by PPT

(2)Accuracy of the time and operation of laser engraving by the robotic arm

1 Installation of the laser engraving kit

The laser kit includes the laser head and clamp, and the installation flow is shown below:

(1) Lock the laser head at the robotic arm end by the butterfly nut;

(2) Connect the 12V power cable SW4 and the TTL control line GP5 to the little arm interface ⑤ and interface ③ respectively.

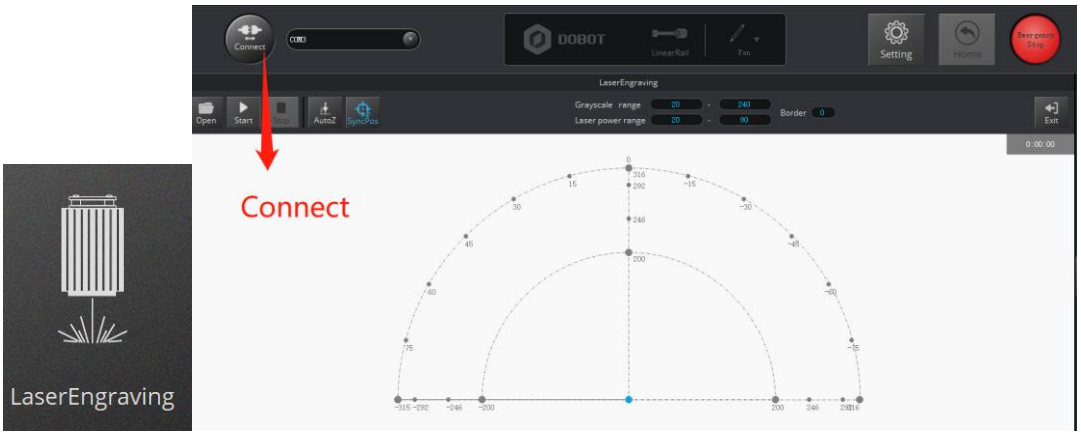
(3) Specifically configure the laser glasses to prevent the laser from injuring the eyes.

Laser kit: laser head and clamp　　Butterfly nut

Power cable SW4 and control line connecting port GP5　　Laser glasses

2 Connect DobotStudio

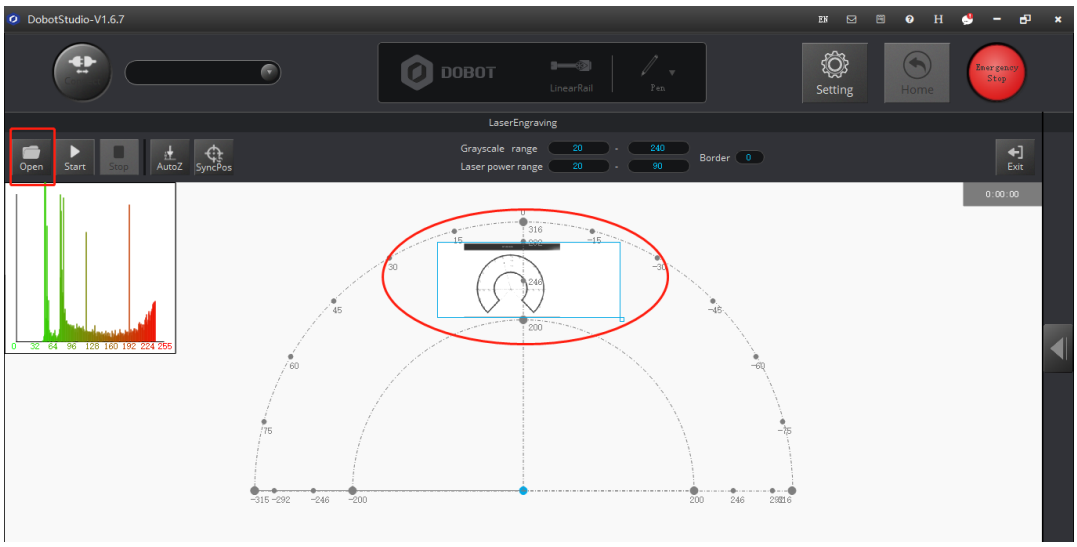
The laser engraving also uses the control software DobotStudio. Open the software and click the laser engraving module to enter the laser engraving interface. The operation scope of the robotic arm is shown in the middle part, as shown in the figure below.



Note: No matter which mode is used for the laser engraving, the material needs to be placed in the annular region of the main interface. If it exceeds the scope, the laser engraving may not be performed normally because of the limits of the robotic arm, and the software will also alarm with the highlighted red.

3 Pattern lead-in

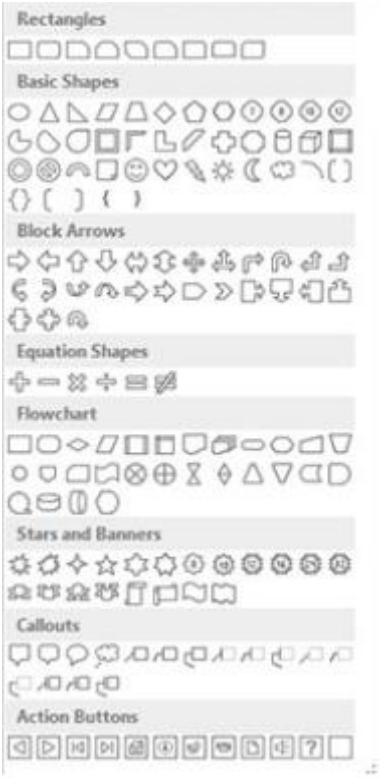
DobotStudio comes with simple graphs for selection. Through the open function, we can directly select the graph provided by the system, or lead in the picture document made in advance. Insert it into the annular region and adjust it to the proper size for the laser engraving, as shown in the figure below.



The PPT drawing function is described as below: It mainly describes the direct drawing of the shape and the use of the curve and arbitrary polygon.

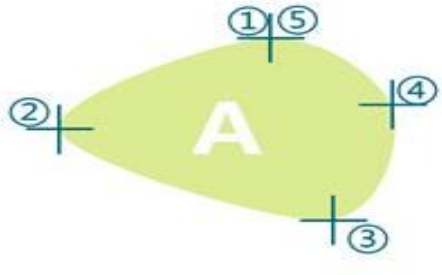
(1)First, it is the direct drawing and use of the shape. The "Shape" function can be found in the Start toolbar of

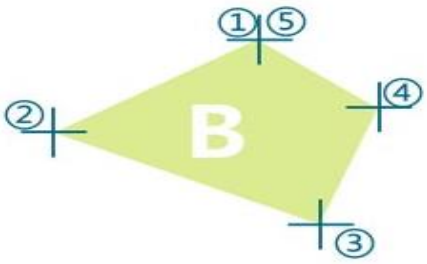
the PowerPoint, or one can also click "Insert - Shape".



(2)Use the curve characteristics to form the radian between two points, and draw special patterns. For example, click the left mouse button in the order of ① - ⑤ to get a round shape A as shown in the figure below. If you hold down the Ctrl key during the click, the arc will disappear and you can get Shape B.

Curve





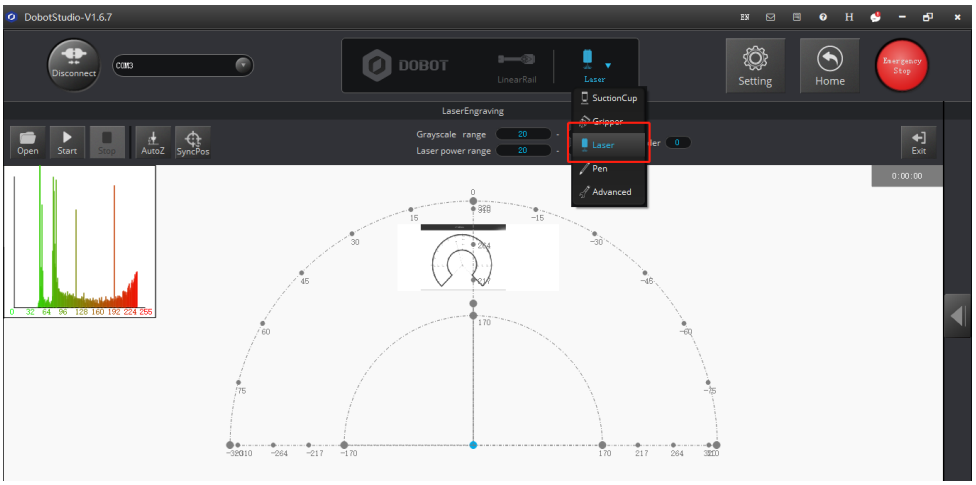
(3)Use a freeform polygon to draw patterns. The operation of the freeform polygon is the same as a curve, except that the line C is drawn by moving the mouse after setting the anchor. If you hold down the left mouse button to move, a curve D is formed.

Freeform polygon

Note: During the drawing, if you accidentally click an anchor at a non-ideal position, press the Del key or Backspace key to delete the final anchor under the current status.

4 Adjust the focal length: Select the end as the laser and adjust the focal length of the laser.

Select the laser at the end clamp of the main interface, and adjust the distance between the laser focus and the surface of the engraved material before carving. Check ON to open the laser, as shown in the figure below:



Press and hold the circular unlock key on the little arm and drag the height of the little arm to adjust the distance between the laser and the material surface. The position where the facula is smallest and brightest is the suitable height. When the laser power is sufficient, it can be found that there are burning traces on the material surface. After the adjustment, uncheck the laser to shut it down.

If it fails to focus, it may be on account of the long focus length of the laser head. Rotate the metal knob at the laser head bottom to adjust it (as shown in figure below), and perform the focusing test after the adjustment.

Note: The laser generates high temperature under the focusing status and can burn paper, wood board, etc. Do not focus on the body, clothing, etc.; do not let children play with the laser; it must be monitored by the staff during the operation. Shut down the equipment in a timely manner after the operation.

Click AutoZ to get and save the current Z value (in this way, there is no need to manually adjust the laser focal length in next carving, lead in the picture directly -> click to synchronize the position -> click Start to begin the carving).

Design individualized patterns or characters, and use the laser engraving function of the robotic arm to display the pattern.

Design drawing:

Evaluation: self-evaluation and mutual evaluation

Evaluation method	Evaluation phase	Evaluation contents	Evaluation criteria		
			3 Excellent	2 Good	1 General
Self-evaluation	**Creative design**	• Be able to express the definition of laser engraving.			
		• Understand the application of laser engraving in different fields.			
	Emotional experience	• Be able to participate in the class activities with active attitude.			
		• Be able to display the magician print diary perfectly.			
	Planning and design	• Be able to use the laser to carve patterns as per individual need.			
		• Be able to obey the safety use manual for laser engraving.			
Mutual evaluation	**Emotional experience**	• Be able to fully describe the use occasions for laser engraving.			

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0 820 820 081
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Technologie Services
Zi du Gavé
42330 Saint-Galmier
Fax : 04 77 94 55 14
Mail : contact@technologieservices.fr

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