Laser Cutter

3DS Max Contour Tutorial

Tests

Materials

Name:	PLS6.75 and X660
Produced:	Universal Laser Systems
Description:	A laser cutting machine uses a high-powered laser to cut materials with precision.
Homepage:	PLS6.75
See also:	CAD
	Rhino
	3D Printer
Link:	LEARN, The Catalogue
	Post a question to Media Centre
Introduction:	Laser cutting has become increasingly popular owing to its precision, speed and ease of use. It can cut, etch and engrave on a wide variety of flat materials.
Preliminary:	The laser-cutter has certain capabilities and limits which are outlined in the following section. For in depth information see Capabilities below. All projects submitted to the laser cutter for cutting must conform to four preliminary specifications. These are: **Material**: Most materials can be cut on the laser cutter. However, MDF cannot be cut, nor can PVC, and neither can materials with reflective coatings. Note that PVC and acrylic are different. PVC is highly toxic when it burns and if is for this reason that we cannot cut it. The laser cutter can cut acrylic. However, here is a list of materials which are commonly cut with the laser cutter. If you would like to cut a material which does not appear on the list please consult with the Media Centre staff. Bear in mind maximum material thicknesses. **Material size**: The laser-cutter has a maximum platform size on which it can cut/engrave. This is 812.8 by 457.2mm or 32 by 18 inches. **Lineweigh**t: Make sure your lineweights are as follows: • AutoCAD --Set the pen widths to 0.025mm and for colours requiring raster output, set pen widths greater than 0.20mm. • Illustrator - In Adobe set your stroke weight to either 0. 0.025mm or 0.1 points.**Naming**: Name your files as you would for a large format print. i.e. [UPI]*[filename]*[number of copies]copies.cdr e.g. jdoe001_contoursheet1_1copy.cdr Name your materials including your UPI. Bring an off-cut of your material down if possible so the laser can be tested and calibrated before your file is printed.
File preparation:	Correctly preparing your file is an important part of getting your project cut. **1. Standard route** There are many different pathways that will be used to generate a file to be cut on the laser cutter. Most however, will be DWG or AI files that have been generated from a 3D model. For example you may model your project in Rhino then unwrap your model in 3DS Max export the unwrapped faces to Illustrator to tidy up the drawing (getting rid of multiple lines and colour coding your lines, specifying line weights etc) before submitting the drawing to the laser cutter drop folder. However, of course it is possible to make you drawing in AutoCAD and submit it directly from there to the laser cutter drop folder. This tutorial will run you through how to go about doing that with AutoCAD. Note also that a DWG template has been prepared that give you the exact size of the laser cutter platform. **2. Drop-folders** Once your file is ready to be submitted, you must name it in the following way: [UPI]*[filename]*[number of copies]copies.cdr e.g. jdoe001_contoursheet1_1copy.cdr Then submit your file to the laser cutter drop folder and deliver you UPI named material and test off-cut to the Media Centre workshop on Level 1. **1. Contour models**. It is very common for contour models to be cut on the laser-cutter. The following information regarding generating contour lines from you 3DS Max model might be of interest. **2. Check list**: Before submitting make sure you can tick off the following: · *Are your lineweights correct?* Adobe Illustrator - 0.01pt AutoCAD - 0.05pt · *Are your lines coloured correctly?* Green – Engrave: RGB(0,255,0) Blue – Cut: RGB(0,0,255) NB: In addition to having your cut and engrave lines correctly coloured, please place them in separate layers. · *Are your materials the correct size?* Your materials should not be larger than 810mm x 450mm. Bring an extra piece of material. We might run into problems with your job therefore an extra piece will allow us to test before cutting. Leave enough tolerance between the edge of your drawing and the edge of your material. The tutorials recommend 2mm, but to be on the safe side 5mm is better. i.e. If your drawing is 400mm x 400mm, it is advisable the material is at least 410mm x 410mm. **Failure to have the above correct may result in delays or your file not being cut.**
Capabilities:	The capabilities of the laser-cutter are clustered around the following five themes. There is great scope for creativity, limit pushing and innovation in terms of model making with the laser-cutter. Being familiar with the following themes and laser cutting experiments will aid this. **1. Material [experiments in laser cutting material.doc]** **2. Geometry [exp in laser cutting geometry.doc]** **3. Connections [exp in laser cutting connections.doc]** **4. Interface [exp in laser cutting interface.doc]** **5. Engraving [exp in laser cutting engraving.doc]**

Costs:	The laser-cutter currently (Mar. 2010) costs $40 per hour. The amount of time your job takes to cut will be deducted automatically from your Pharos account. Unfortunately there is no easy way to tell you how long your job will take. This depends on the complexity of your file and the material you have chosen to cut on but as a rule of thumb, the more complex your file looks the longer it will take. Media Centre will notify you by email as soon as your file is cut. In order to minimise delays with cutting your file please keep an eye on your email account in case any problems are encountered with your file. Media Centre is often asked the following question: *Does it matter if there are multiple lines are sitting on top each other?* The short answer: yes. If you are engraving, the lines will be engraved multiple times which may result in your engraving lines cut your material. If you are cutting or engraving having multiple lines on your work means that it will take the laser cutter longer to cut your work costing you more money. Sometimes a job time and therefore job cost is trebled due to the lines being staked up on top of each other.
Constraints:	The laser cutter, like any machine, has a number of constraints under which it is operated. Being aware of these will help you achieve better results. **Speed vs. Quality:** The recommended settings for the laser cutter are quite slow. They produce good quality cuts but will be expensive for large/detailed prints. The recommended cutting speed for most materials ranges from 2-4%. The fastest speed the laser should be set at for vector cutting is 14%. Speeds of 8-12% are a good compromise of speed vs. Quality (they will produce some slightly bumpy edges however). At higher speeds the laser head will vibrate after a sharp change in direction (i.e. a corner) causing a slight bumpy pattern on the following edge. For intricate prints or prints with many sharp angles a slower speed is recommended. You may divide your drawing into two speeds to optimise it for speed on long continuous lines and quality in detailed areas by using two colours to differentiate the speeds (blue [0,0,255] and magenta [255,0,255] are the vector cutting colours). When submitting a print, add a note stating if you would prefer it to be fast or high quality. For more detailed information regarding the speed vs. quality compromise, especially in terms of how it impacts on specific materials, see here [speed vs. quality.pdf]. **Outlines and Fills** The driver distinguishes between raster mode (engraving) and vector mode (cutting) by the type of graphic artwork being used. Basically, all graphics other than outlines of very thin line widths will be interpreted as engraved images and the raster mode will be used for output. If laser cutting is desired set the line thickness of the lines that are drawn the graphics software to 0.025mm or the smallest possible line thickness that is available. The printer will interpret these objects as vectors and will cut them out providing that your software has the capability of vector output, use different colours for the fills and outlines since engraving requires different power settings then cutting objects. ***(Please refer to list above)***. When creating cutting objects if the outline thickness is set to thick, the driver might interpret the outline as a filled object and will engrave the outline instead of cutting. Usually 0.2mm or greater will engrave. **Overlapping Fills** If the artwork created has overlapping filled areas, the driver will automatically filter these fills to prevent the overlapped area from being engraved twice. **Overlapping Outlines** The driver does not filter outlines that overlap each other. If placing one outline on top of another both outlines will be cut by the laser system. This is a useful feature that will allow deeper cutting by passing the laser over a single outline path twice or more. To take advantage of this feature, duplicate the outline on top of itself. **Hidden Vector Lines in Artwork** The driver does not automatically filter out outlines that are overlapped by engraved objects such as fills. If there are filled objects with some hidden outlines underneath, the laser system will engrave out the fill and cut the hidden outline on top of the fill. **Speed Optimizing** It is advantageous to engrave an object in its longest direction because total engraving time will be reduced when the motion system has to make fewer stops and starts. If the engraving object is longer than it is tall, rotating the graphic 90 degrees and placing the material in the laser system sideways can achieve a greater engraving speed. If the artwork contains engraved objects of the same colour with a great deal of space between them in the engraving direction, processing time can be longer since the laser must make long strokes to engrave both objects but assign the same power setting to both colours. This will cause the laser to engrave one object at a time, skipping over all blank space, which in many cases will reduce engraving time. On the other hand, if the objects are relatively close together in the engraving direction, then leave them the same colour because it will be quicker to engrave them both at the same time. **Bitmapped / Scanned Images** The laser system can print bitmaps providing that the bitmap image is converted to a monochrome bitmap. The formats available: TIF, KPG, BMP, PCX and others. ¿ Monochrome Bitmaps – scanned images in monochrome should be at the minimum 300 dpi – max 600dpi ¿ Greyscale Bitmaps – scanned images in greyscale mode should me at no more than 300dpi. Gray scale images must be converted into black and white images. **Encapsulated Postscript (EPS) Images** The laser system does not support EPS printing directly, however they can be imported into other software provided in studio. **Postscript (PS) Images** The laser system is not a PS device. All postscript fills, textures and especially POSTSCRIPT FONTS WILL NOT be able to print to the laser system. *NB: If you are having any problems printing a font and you cannot figure out what is going on, select the font and ¿convert to curves¿ or ¿convert to paths¿ in your graphics software. This will convert the font into a bitmapped image and will print correctly to the laser system.*
Strengths/weaknesses:	The laser cutter is especially suited to cutting flat surfaces. For curved surfaces give the 3D printer a go.
Learning support:	
Additional:	You¿ll also likely find interesting: Information on Pharos printing accounting system
References:	
External links:	