

Semper 6 Command Reference

sheet

keys:	[from]	<i><number></i>	source picture
	[to]	<i><number></i>	output picture
	range	<i><n1>, <n2></i>	range of z values to be represented by actual source pixel range
	border	<i><number></i>	z value of constant border to be added around the edge
	zorigin	<i><number></i>	z value for view origin
	theta	<i><number></i>	first rotation applied to surface before viewing, anti-clockwise about the positive z axis, in radians
	psi	<i><number></i>	second rotation applied to surface before viewing, anti-clockwise about the new positive x axis, in radians
	size	<i><x>, <y></i>	output picture dimensions
	times	<i><number></i>	magnification factor for output
	value	<i><number></i>	background value for use outside view of surface
	ltheta	<i><number></i>	angle between main light source direction and viewing direction, in radians
	lphi	<i><number></i>	azimuth of main light source direction, anti-clockwise from positive x axis, in radians
	main	<i><number></i>	brightness of main light source
	forward	<i><number></i>	brightness of subsidiary (forward) light source
	ambient	<i><number></i>	brightness of non-directional ambient lighting
	dcontrast	<i><number></i>	depth contrast, brightness difference between front and rear of surface
	sdr	<i><number></i>	ratio of specular to diffuse reflection, describing surface polish

Use the **sheet** command to generate a shaded image of a 3-D surface (*sheet*), the height of which is tabulated in a 2-D picture. **sheet** allows you to vary the viewing orientation, output image size etc.

Examples

```
lorentzian 1 size 150; min=0 max=255; sheet range 10,100 border 0
```

This command generates a shaded image on the display of a 2-D Lorentzian 'spike'. The image is a 100 pixels high with a border that is 10 pixels high.

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```
sheet 1 to 5 theta pi/3 psi pi/6
```

This command generates in picture 5 a differently oriented image of the surface (rotated 60 degrees clockwise in-plane, then tilted 30 degrees, with the top away from you).

```
sheet size 300,200 times 3
```

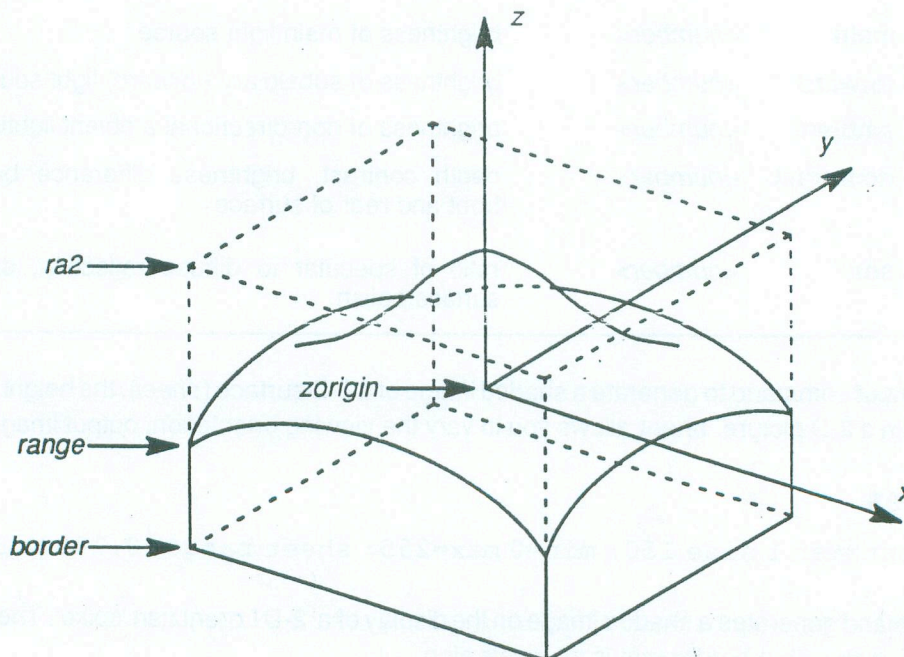
This command generates an image magnified by three, in an output picture sized 300 by 200.

Description

The **sheet** commands allows you to specify keys that affect the following:

- 3-D object (**range**, **border**, **zorigin**)
- orientation of the surface (**theta**, **psi**)
- 2-D output picture (**times**, **size**, **value**)
- illumination (**ltheta**, **lphi**, **main**, **forward**, **ambient**, **dcontrast**, **sdr**)

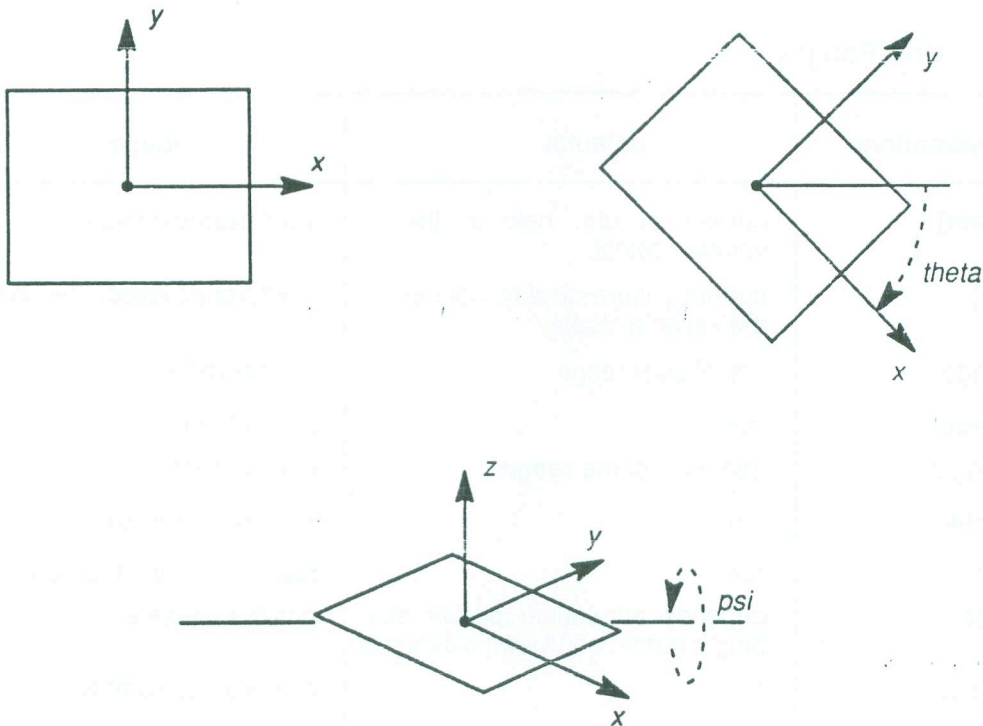
sheet generates a shaded image of the surface defined by interpreting the source picture pixels as height (z) values above the x - y plane. You can scale the source picture to represent a different range of heights using the **range** key. If you specify a **border** value, as in the first command example, **sheet** adds a border that extends to the specified height around the sheet so that vertical walls link the edges of the displayed surface to the specified horizontal level. The **zorigin** key allows you to position the view centre in the z direction, if the default of the mid-point of the height range is not appropriate. The diagram below illustrates these concepts.



sheet

When a 2-D image is displayed, the viewing direction is along the negative z axis, with the x axis to the right and the y axis pointing upwards. With the keys **theta** and **psi** you can alter the orientation of the shaded image away from the standard 2-D orientation. The surface is rotated first by angle **theta** clockwise about the z axis and then by angle **psi** anti-clockwise about the new positive x axis (with the top away from you). The default value for both **theta** and **psi** is $\pi/4$. You should not specify the magnitude of **psi** to exceed $\pi/2$ (that is, attempt to look at the underside of the sheet) as **sheet** does not produce correct results in this instance.

The diagram below illustrates the effects of **theta** and **psi**.



Use the **times** key to increase or decrease the size of the output picture. The **times** key takes fractional as well as integral values, for example **sheet..times .75** or **sheet..times 1.5**. By default, the output picture is created large enough to accommodate the 3-D box enclosing the surface, in the orientation you select.

If you want to force the size of the output picture, for example, to stop the size changing with the orientation, use the **size** key to specify the dimensions. If necessary, **sheet** truncates the shaded

image to fit the specified **size**. Note that the default values for the illumination keys ensure that the output pixel values lie in the range 0–255 allowed for *Byte* pictures, and *Byte* is accordingly the default output form. The surface is normally presented on a background of zero (dark) pixels, but you can change the background value using the **value** key.

A full description of the lighting parameters **ltheta**, **lphi**, **ambient**, **dcontrast**, **forward**, **main** and **sdr** is to be found in *Appendix H, Illumination*. With these you can determine the following aspects of the appearance of a shaded surface:

- ambient lighting (**ambient**)
- depth contrast (**dcontrast**)
- light source intensity/direction (**forward**, **main**, **ltheta**, **lphi**)
- diffuse/specular reflection (**sdr**)

Defaults and Ranges

keys/options	defaults	range
[from]	current picture, held in the variable <i>select</i>	valid picture number
[to]	current picture display, held in the variable <i>display</i>	valid picture display number
range	actual pixel range	real numbers
border	<i>none</i>	real number
zorigin	mid-point of the <i>range</i>	real number
theta	$\pi/4$	real number in range 0 to 2π
psi	$\pi/4$	real number in range 0 to 2π
size	depends on source picture size, height range, and viewing direction	positive integers
times	1	positive real number
value	0	positive real number
ltheta	$\pi/4$	real number in range 0 to 2π
lphi	0	real number in range 0 to 2π
main	154	positive real number
forward	42	positive real number
ambient	40	positive real number
dcontrast	30	positive real number
sdr	0.4	positive real number