

project

keys:	[from]	<number>	source picture
	[to]	<number>	output picture
	angle	<number>	projection direction, in radians anti-clockwise from the positive x axis
	mark	<number> <yes> or <no>	mark projection line and direction on the display
options:	horizontally/vertically		project horizontally/vertically
	average		average the intensity projection over the area

Use **project** to project or average a picture, in any direction, to form a 1-D picture. For example, you can use **project** to obtain a relatively noise-free image of linear structures (edges or interfaces). You can also use it, in conjunction with **backproject**, to reconstruct a pictures from its projections.

Examples

```
project 1 to 2 vertically
```

This command sums the columns of picture 1 to form a 1-D picture 2.

```
xwires line; project display to 10 angle theta average
```

This command averages the display picture along the direction specified by the cursor.

```
project 50 to 51 horizontally
```

This command projects horizontally, that is along the rows of picture 50 to form picture 51.

Description

Semper automatically defines the width of the output to just accommodate all projected source pixels, and the origin is placed where the source origin projects. The positive x direction in the projection lies to your right as you look in the projection direction. If you use the **mark** key to specify a display, **project** marks the projection line and direction on the display. See *Appendix C, Semper Keys and Options* for further detail of the **mark** key.

The **horizontal** and **vertical** options perform efficient row and column sums/averages, equivalent to **angle 0** and **angle pi/2**. The command **project .. angle ..** allows you to indicate an arbitrary projection direction instead, in radians, anti-clockwise from the positive x axis. Each source pixel is

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shared between two projection columns in proportion to the distance from the two column centres—fluctuations in the number of points that happen to project into each column can otherwise lead to uneven projections even from smooth source data. Note that there are certain directions that will still give uneven results (when the projection shape is equal to the ratio of small integer values – 1:1 or 45° being the worst case).

The **average** option causes the projection sums to be divided by the area of the source picture that contributes to each sum.

Beware of the possible clash of the **vertical** option with the option **verify**.

Notes

display marking:	projection line and direction
1-D pictures:	faulted
multi-layer pictures:	faulted
forms used internally:	complex
see also:	backproject

Defaults and Ranges

keys/options	defaults	range
[from]	current picture, held in the variable <i>select</i>	valid picture number
[to]	source picture	valid picture number
angle	horizontal projection	real number in range 0 to 2π
mark	mark off	see <i>Appendix C</i>