One-dimensional linear interpolation

See the document on bilinear interpolation for more details. Assume a grid is represented by $x_i = (i-1)\Delta x + x_o$, and Ψ is a variable represented along that axis. The expression for interpolating to a point between x_i and x_{i+1} may be written as:

$\Psi = (1 - W_x)\Psi_i + W_x \Psi_{i+1}$ [Eq. 1]

where the "weight" along the x axis may be expressed as:

$$W_x = \frac{x - x_i}{x_{i+1} - x_i}$$

Note Eq. 1 is sometimes written as:

$\Psi = \Psi_i + (x - x_i)\frac{\Psi_{i+1} - \Psi_i}{x_{i+1} - x_i}$ or as $\Psi = \frac{x - x_{i+1}}{x_i - x_{i+1}}\Psi_i + \frac{x - x_i}{x_{i+1} - x_i}\Psi_{i+1}$

Linear interpolation using grid indexes

We can rewrite the grid equations to solve for the interpolation point x as

$$x = (float\ i - 1)\Delta x + x_o$$

Then, the floating point i from the interpolated location at x is:

$$float\ i = \frac{x - x_o}{\Delta x} + 1$$

And the weight simply becomes:

$$W_x = float\ i\ - integer(float\ i)$$

after canceling terms, and since the denominator becomes unity. Both i and i+1 are now also known

$i = integer(float\ i)$ $i + 1 = integer(float\ i) + 1$

Now Eq. 1 may be used as before!

Nearest neighbor

Below is an example using *anint*.

$$\Psi = \Psi_{anint(float\ i)}$$

So, for example,

$\Psi = \Psi_{anint(4.3)} = \Psi_4$
$\Psi = \Psi_{anint(4.7)} = \Psi_5$