The Slope algorithm

- The rate of change (delta) of the surface in the horizontal (dz/dx) and vertical (dz/dy) directions from the center cell determines the slope. The basic algorithm used to calculate the slope is:

  slope_radians = ATAN (√ ([dz/dx]^2 + [dz/dy]^2))

  Slope is commonly measured in degrees, which uses the algorithm:

  slope_degrees = ATAN (√ ([dz/dx]^2 + [dz/dy]^2)) * 57.29578

How to find slope of "e" cell

- The values of the center cell and its eight neighbors determine the horizontal and vertical deltas. The neighbors are identified as letters from 'a' to 'i', with 'e' representing the cell for which the aspect is being calculated.

The rate of change in the x direction for cell 'e' is calculated with the algorithm:

[dz/dx] = ((c + 2f + i) - (a + 2d + g) / (8 * x_cell_size)

a	b	c
d	e	f
g	h	i

How to find slope of "e" cell

The rate of change in the y direction for cell 'e' is calculated with the following algorithm:

[dz/dy] = ((g + 2h + i) - (a + 2b + c)) / (8 * y_cell_size)

a	b	c
d	e	f
g	h	i

A Slope calculation example

- As an example, the slope value of the center cell of the moving window will be calculated.

50	45	50
30	30	30
8	10	10

- The cell size is 5 units. The default slope measure of degrees will be used.

A Slope calculation example

- The rate of change in the x direction for the center cell '*e*' is:

[dz/dx] = ((c + 2f + i) - (a + 2d + g)) / (8 * x_cell_size)=

((50 + 60 + 10) - (50 + 60 + 8)) / (8 * 5)

= (120 - 118) / 40

= 0.05

A Slope calculation example

- The rate of change in the y direction for cell 'e' is:

[dz/dy] = ((g + 2h + i) - (a + 2b + c)) / (8 * y_cell_size)

 = ((8 + 20 + 10) - (50 + 90 + 50)) / (8 * 5)

= (38 - 190) / 40

= -3.8

A Slope calculation example

- Taking the rate of change in the x and y direction, the slope for the center cell 'e' is calculated using:

rise_run = $\sqrt{(\ [dz/dx]^2 + [dz/dy]^2\ )}$

$\quad = \sqrt{(\ (0.05)^2 + (-3.8)^2\ ]}$

$\quad = \sqrt{[\ 0.0025 + 14.44\ ]}$

$\quad = 3.80032$

A Slope calculation example

- slope_degrees = ATAN (rise_run) * 57.29578

 = ATAN (3.80032) * 57.29578

= 1.31349 * 57.29578

 = 75.25762

he integer slope value for cell 'e' is 75 degrees.