

Bilinear Interpolation



http://pipin.gimp.org/image_processing/chap_resampling.html

Geog 493/593
Jesse Nett

Interpolation & DTM:

- Interpolation can be used to determine a height value of a point by using known neighboring points - - - > ASSUMING...
 - Terrain surface is continuous and smooth
 - High correlation between neighboring data points or phenomenon

And this means...

- Basically it is linear interpolation in **both** X and Y directions (or rows and columns) (and Z if 3D)
- Interpolation can be used for estimating the values on a continuous grid based model
- Interpolation can also be used for estimating the value of a point by using 4 other known neighboring point values on proximity basis.

Definition

- **Bilinear Interpolation** : is a resampling method that uses the distance-weighted average of the four nearest pixel values to estimate a new pixel value.
- The four cell centers from the input raster are closest to the cell center for the output processing cell will be weighted and based on distance and then averaged.

Another Use...

- ArcGIS tool : Extract Values to Points
- Uses Bilinear Interpolation to extract the values from a grid into a point feature class.
- Used as a result of the distance weighted average for interpolating such values.
- For more info see:

http://webhelp.esri.com/arcsw/arcswhelp/9_3/index.htm?c=61&id=6135&topicname=Extract_values_to_Points

Equation

$$Z = A_0 + A_1X + A_2Y + A_3XY$$

Where A_0 , A_1 , A_2 , and A_3 are coefficients...
determined by four equations using the
REFERENCE POINTS

Quiz

- How many neighboring cells does Bilinear Interpolation use when interpolating a value ? A) 1 B) 4 C) 8 D) 16
- T / F : Bilinear Interpolation can only be performed with a grid based system
- What are two assumptions when employing Bilinear Interpolation ?
- T / F : Bilinear Interpolation uses a distance weighted average when interpolating an unknown value.

Answers

- 4
- False
- The surface is continuous and the neighboring points are related.
- True

Sources

- Chang, Kang-Tsung. "Computation for Bilinear Interpolation." *Introduction to Geographic Information Systems*. 5th ed. New York, NY: McGraw-Hill, 2009. Print.
- Lillesand, T. M., Kiefer, R. W., and Chipman, J. W. (2004). *Remote Sensing and Image Interpretation, 5th edition*. John Wiley & Sons.
- ESRI 9.3 Desktop Help. "Cell Size and Resampling in Analysis". 2009.
- ESRI 9.3 Desktop Help. "Extracting Values to Points". 2009.
- "[Bilinear Interpolation](http://en.wikipedia.org/wiki/Bilinear_interpolation)". [Wikipedia.org](http://en.wikipedia.org/wiki/Bilinear_interpolation). 2009.
- http://pippin.gimp.org/image_processing/has_resampling.html