REPORT ON PROCEDURE

Setting up the project

In ArcGIS I started the project by making a folder connection to the folder where the downloaded Excel tables from Vula were saved. In this folder connection I created a new personal geodatabase and set it as the default.

Using the table for my assigned project I created a spatial feature. The spatial feature coordinate system was defined in the creation process as WGS84. The x and y coordinates were taken from the latitude and longitude values in the table respectively.

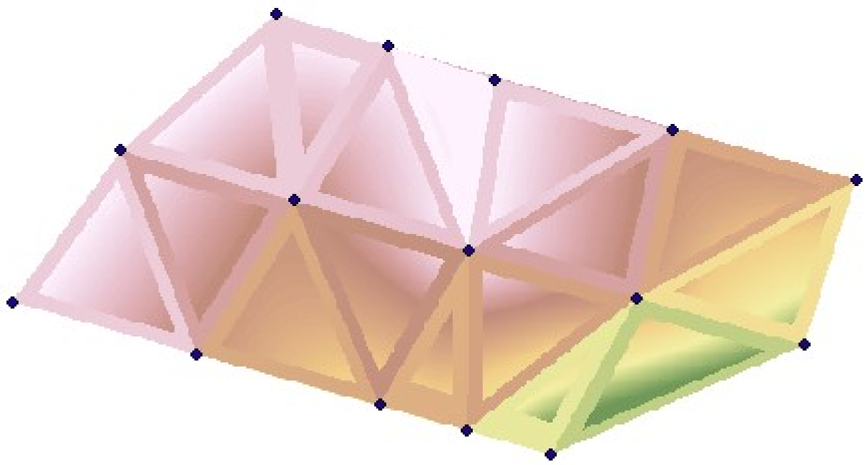
To enable the full use of tools, I had to turn the extensions on in the customize window.

Interpolation Methods

Soil moisture maps for each of the sets of data (for the 8 months of data) were created using different spatial analyst tools in ArcMap. To make this process easier and quicker, when selecting each of the tools, I right-clicked and selected to input a 'batch' and then added each with the corresponding z value as the month and year for which the data was collected.

Natural Neighbour

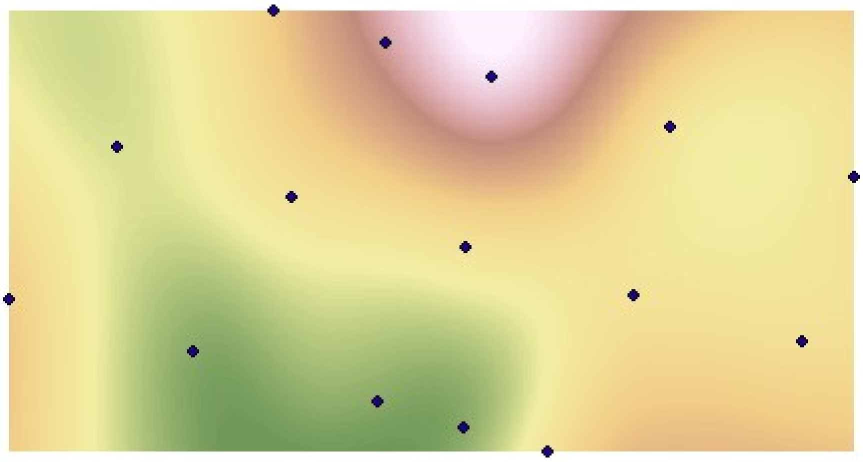
Natural neighbour applies weights to subsets of the input samples based on proportionate areas. This type of interpolation is local and only uses a subset of samples around each queried point and not the entire data set. Nearest neighbour creates Voronoi polygons around each point and creates another Voronoi polygon around the interpolation point and bases the interpolation on the percentage overlap of these polygons.



Nearest neighbour contour pattern for September 2012

Spline

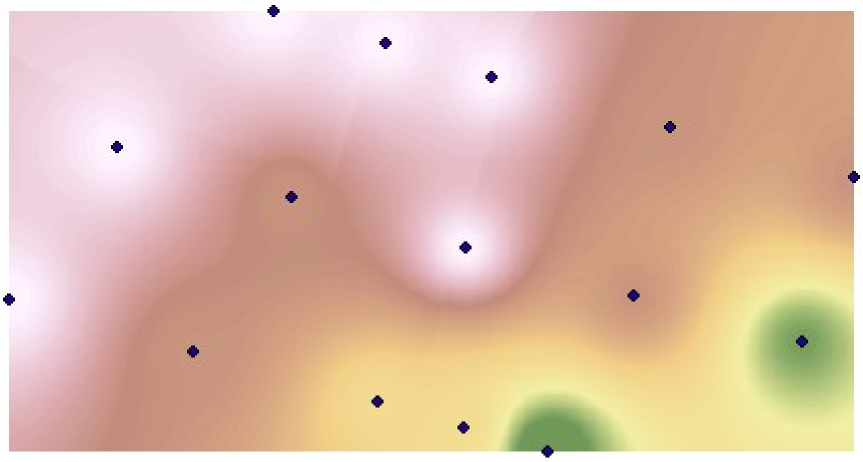
The spline interpolation method works by fitting a mathematical function that minimizes overall surface curvature, resulting in a smooth surfaces that passes exactly through the points from the input data set. Rapid changes can occur around the points and are not properly mapped since the model is not suitable for estimating second derivatives and only outputs continuous first-derivative surfaces. This is a deterministic interpolation method that is directly based on a specified mathematical model that determines the smoothness of the resultant surface.



Spline contour pattern for September 2012

Inverse Distance Weighting

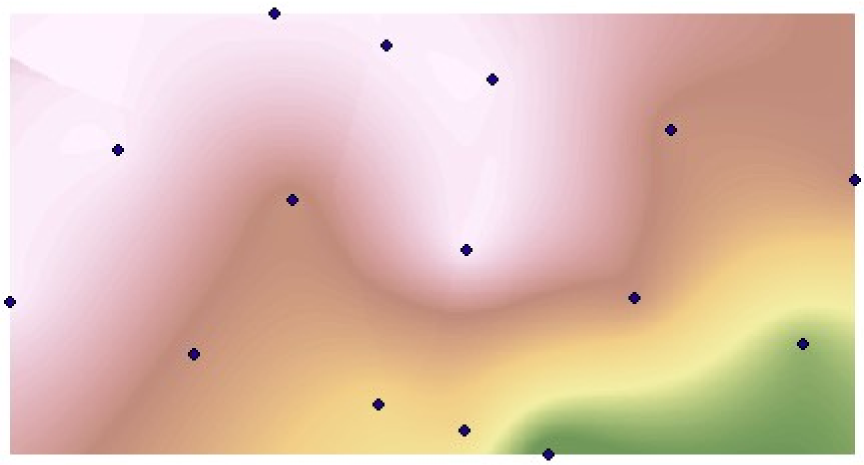
IDW uses a method of interpolation that estimates cell values by averaging the values of the sample data points surrounding each processing cell. Surrounding values that have a value close to the centre cell value have a larger weight than a cell with a value more different in the averaging process. The cell values are linearly weighted. The weight is a function of inverse distance. This interpolation method assumes that the rainfall decreases under the influence of the distance from the sampled location. Since it is a weighted average the IDW is limited to range of values used to interpolate and does not map extreme values. This is a deterministic interpolation method that is directly based on a surrounding measured values that determine the smoothness of the resultant surface.



IDW Contour pattern for September 2012

Kriging

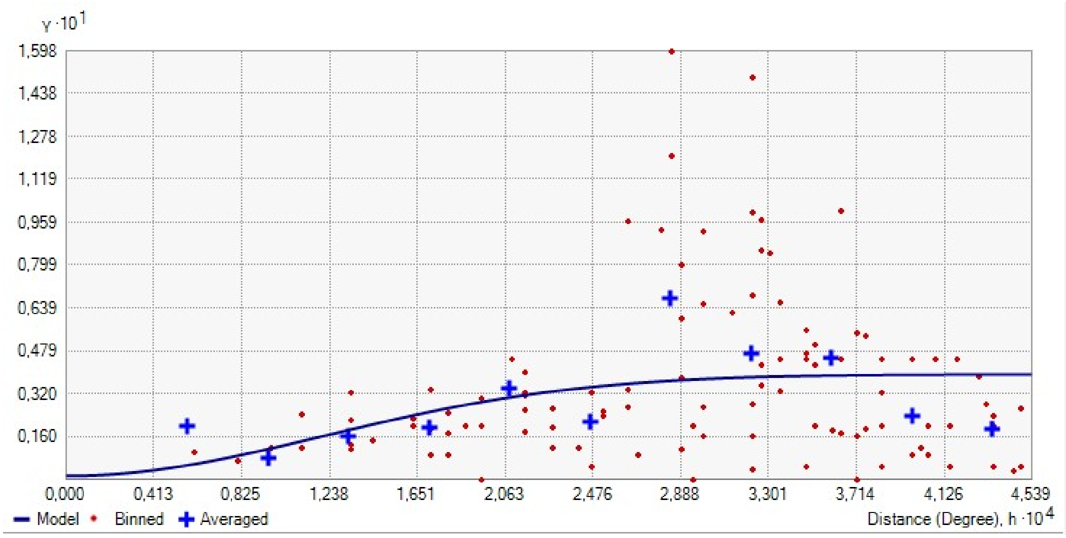
Kriging is an advanced geostatistical procedure that generates an estimated surface from a scattered set of points. The tool involves an interactive investigation of the spatial behaviour phenomenon represented by the z-values (moisture in this instance) before the user selects the best estimation method for generating the output. Kriging assumes the distance or direction between sample points reflects a spatial correlation that can be used to explain variation in the surface. Kriging is based on statistical models that include autocorrelation and not only have the capability of producing a prediction surface, but also provide a measure of the accuracy of the predictions. It works by fitting a mathematical function to a specified number of points or all points within a specified radius to determine output values for each location.



Kriging contour pattern for September 2012

Semivariogram

The empirical semivariogram provides information on the spatial autocorrelation of datasets. A continuous surface or curve is fitted to the semivariogram to ensure the predictions have positive kriging variances. The selected model influences the prediction of the unknown values. I selected the spherical surface for my semivariogram for all of the datasets. This type rises and levels off larger distances beyond a certain range, and shows a progressive decrease of spatial autocorrelation until the distance where the autocorrelation is zero. This model is most commonly used.



Semivariogram for March 2012 and March 2013

The distance where the model first flattens and levels out from the zero is the range. The range is useful in defining autocorrelation. Sample locations separated by distances closer than the range are spatially correlated and locations farther apart than the range are not.

The value on the y-axis at which the range is attained is called the sill. A partial sill is calculated as the difference between the sill and the Nugget. The Nugget effect is when the semivariogram model at a point above zero. The Nugget will be the value of the intersection point. The nugget can be attributed to measurement errors or spatial sources of variation at distances smaller than the sampling interval. Variation at microscales smaller than the sampling distance will appear as part of the nugget effect.

***The outputs for each of the above mentioned methods can be viewed in the attached ArcMap document.*