Joseph Leonard 10/29/10

Geo 157

Lab 04

1. Attached
2. First we added data containing a theme of the U.S. and set the coordinate system to North American Datum 1983. The next step was to isolate California and save it in a separate layer by using a SELECT command to choose it from a table of state names. The next step was to set view units to decimal degrees in order to manually select and digitize locations of numerous rainfall gauging stations in a table including a unique ID number. Next was to create an excel spreadsheet of points of latitude and longitude each matched with a unique ID which was then added with respect to X-Y coordinates to the GIS. After that the next step was to create a new table of IDs and rainfall values which corresponded to ID values in the last table. We then performed a one-to-one join of the table of coordinates and the table of rainfall values using a primary key of the ID columns in each table. The next step was to label the rainfall gauging stations based on their rainfall values and to create a TIN using those values as Z-coordinates and the latitude and longitude as Y and X coordinates. Next we selected a contour interval of five inches for the TIN to depict as contour intervals and selected a color ramp to properly contrast those intervals. These can apply solely to two dimensional space as the colors and intervals offer a picture of depth, but these features may also be imported into ArcScene which may create a three dimensional model where the highest x values are represented as “peaks” and the lowest as “valleys”. Finally we use 3D Analyst surface analysis to create a contour interval of ten inches rain from the TIN and set contour line color to reflect that change in rainfall which we then draped over the ArcScene 3D analysis.
3. Attached
4. The Kriging method of interpolation works by estimating the value of a point based on the average values of known points nearby. The closer a point of interpolation is to a known point the more it is changed by that point. Kriging is similar to Inverse Distance Weighting in that it may interpolate a large area beyond measured points, however accuracy decreases with distance from points.

Inverse Distance Weighting interpolation is based on distance from points, the further it is from a known point the lower the “weight” of that point becomes. IDW interpolation is similar to Kriging in that they both consider distances between points, however Kriging takes greater consideration of the value of multiple nearby points whereas IDW focuses on whichever point is closest.

Natural Neighbor interpolation considers the projected “area” of nearby points and the constriction of that area based on the values of nearby points and their own “areas”. Interpolations are given a specific value until they leave the “area” of the nearest point into another points “area”. Natural Neighbor is similar to IDW in that it calculates value based on proximity to nearby points, however it is different in that IDW calculations are based on linear distance from nearby points whereas Natural Neighbor values are identical within a given weighted area.

The Triangulated Irregular Network interpolation method works by calculating circles around given points which vary in size based on point value size, at the intersection of these circles lines are drawn which form non-overlapping triangles of varying dimension. TIN interpolation is limited by the jagged nature of the triangles which does not always adequately follow natural data values. TIN is similar to Natural Neighbor in that neither may attempt to extrapolate data beyond the border of their lines due to the nature of the analysis.

1. I think that the Kriging method of interpolation is best for the rainfall data set. Rainfall amount cannot be measured as a true linear function, however some recognition of linear qualities is valuable (areas tend to have the same rainfall overall). Kriging interpolation takes into account the weight of measured points without allowing those points to detract from overall interpolation, it avoids more extremes in “height” both low and high in contour and 3D modeling.
2. Additional datasets that may be useful could be topographic data, data about local vegetation, and perhaps average weather patterns.