Zonal statistics

Sp. Analyst Tools - Zonal

- Choose correct attribute for zones (usually: must be unique ID for each zone)
- Choose which stat(s)
- for each zone:
  - get value raster cells that are inside the zone
  - calculate stat(s) of these cells
  - store stat(s) for this zone in a table
- Tool: Zonal Statistics as Table.
  - creates a standalone table that can be joined to zone layer
  - (ArcMap TOC: list by source to see standalone tables!)
- Tool: Zonal Statistics:
  - stores 1 type of stat in a new raster
  - new raster will have Nodata outside of the zones
  - inside a zone: all cells have the same value (e.g. the mean of the zone)

Zonal functions

- Needs 2 inputs:
  - a zone data:
    - discrete raster or features (polygon, line points)
    - which attribute?
  - a value raster
- Zones don’t need to be continuous!
Spatial Interpolation

- point samples (x, y, “value”)
- fill each cell (center) in raster with an “appropriate” value
- Principle: the closer together points are, the more similar their value (should be)
- (depends on many factors: type of underlying phenomenon, etc.)
- Examples?
- in general: distance and sample value matter

Thiessen (Voronoi) polygons

- Space division scheme
- Assign each sample “its fair share” of space around it
- Raster: fill this space (polygon) with same value
- Keep in mind for Natural Neighbor interpolation method

Raster of point density

- NOT a value interpolation scheme!
- decide on a circle (kernel) size (radius, “bandwidth”)
- go through all cells....
- count how many samples fall within a that circle
- divide the count by the circle’s area
- assign this density value to the cell
- next cell
- Tools: Spatial Analyst - Density
- Point density
- Kernel Density

Kernel Density Analysis of Gun Related Homicides During 1982 in St. Louis, MO
- Kernel Density = EXE3 (kernel squared)
- Cell Size = 20

Samples: have no value, we only care about their location

Housing Density

...the Point Density technique passes a “roving window” over a project area calculating the total number of houses within a specified distance
Interpolating values

- super simple: moving averages
- decide on a radius
- go through all cell centers
- grab all the point samples within the search radius
- Sum these points’ values and divide by their number
- How does size of radius affect results?
- Does sample to center distance play any role?
- How could we deal more fairly with farther away samples (9) compared to closer samples (3)?

Inverse Distance Weighted (IDW) interpolation

- grab all the point samples inside a radius
- When calculating the cell’s value, take the sample distances into account (“weight”)
- Weight of each sample point is an inverse proportion to its distance to the cell
- The further away the point, the less the weight it gets (contributes less)
- effect of exponent (1, 2, 3, ..)?

Effect:

- samples that are closer to the cell (center) to be estimated, get a larger weight (are more important)
- The larger the sample to center distance, the less important the sample is
- (We could use all the samples for each cell’s estimation)
- Using a search radius is more efficient (why?)

Higher exponents: less weight to distant points (point that are farther away)
- (closer point are more important)
- Use more samples: “smoother” distribution
- interpolated value at sample location?

“linear”: exponent = 1
“squared”: exponent = 2
Tool: Spatial Analyst Interpolation - IDW

- point features (here: elevation samples)
- set correct attribute (here: elev)
- encode the parameters in your output raster’s file name:
  - IDW => interpolation method
  - 2 => power
  - Var_12 => Search parameters
  - bar => used barriers

IDW: search parameters

- **size** of search radius: multiples of cell size
- **variable** search radius:
  - grab n (12) closest points, up to a distance of d (default 0, => no distance limit)
- **fixed** search radius:
  - grab ALL points within a distance of (250) units, use at least n points (default 0, => use all)

IDW: using break lines

- line features to limit (block) point “grabbing”
- samples “from the other side” of the break line will NOT be used
- use for: ridges, faults, ...
- Caveats: much slower, some NoData values (extrapolation issues?)

Splines

- smooth surface, non-exact
- based on minimizing curvature
- rubber sheet “bent” around samples
- can over-shoot / under-shoot
- ArgGIS: 2 types - regularized and tension
- ArcGIS: Weight - smoothness “tweak” factor
- gotcha: both have different meaning of weight
- tension (0.1 - 15):
  - low = smooth, high = coarse