Fundamentals of GIS: Applications **Map Algebra and Weighted Overlay Models**

This exercise gives you a chance to practice and demonstrate your understanding of raster GIS, Map Algebra, and cartographic modeling. This problem also ties together all of the issues of designing and evaluating GIS models in decision-making situations. You are welcome to use models similar to those in the pbcRasterDemo toolbox included in in this week's tutorial. Don't use the exact same decision-making scenario as we used in class. See example assignment here.

____ Describe a hypothetical decision-making scenario involving the evaluation two or more conditions which are in geographical relationship. For example, conditions propitious for locating a source of healthy vegetables, or priority areas for squirrel habitat. Or, places of interest with regard to protecting surface water from contamination. See next page for more ideas.

____ Begin your caption with a discussion of two or three conceptual criteria that will be used to evaluate and compare locations in terms of their suitability for creating, modifying, or removing some thing or condition (e.g. a park, farmer's market, garbage incinerator, a new length of bike path.) It would be interesting to use the same experimental scheme that you used in the last vector model project.

____ Use the ArcMap model builder as we did in class to create a two or three models that each generate an evaluation raster. Run each of these through the Reclass function to assign normalized scores to the evaluation values. Then use the Map Calculator to create a new composite evaluation score.

____ Tune your individual score layers or apply weights as necessary in your map algebra expression so that most of the map falls into the not-recommended area, and just a few areas are more strongly indicated, in terms of your conceptual criteria.

____ Create a map that shows the result of your model. Your map should have a full three-layer graphical hierarchy that shows **all streets** and hydrography. Your map should be scaled and framed so that we can see two locations that you are comparing and the just enough, not too much surrounding context.

____ In the foreground of your map, use call-out boxes to summarize the pre-normalized data attribute (e.g. distance form subway stop) and the normalized scores for **two** locations (see example.) It would be interesting if one of these was an existing facility and another was a hypothetically proposed location.

____ The caption of the first map concludes with a comparison of the two sites that you labeled on the map. in terms of the spatial criteria that you simulated.

____ Include a separate page for each of the criteria that you used. Each of these letter-sized landscape format pages should be divided into four panels: Panel 1 includes a map of an exemplary detail from your study area that portrays pre-reclassified data output of your first procedure, along with streets and other reference information. The second panel includes a screenshot of the reclassify dialog. The third panel shows reclassified values of the data-set for the same area as the first panel. The fourth panel on these pages includes a caption that discusses the conceptual model that is being evaluated on the page and the most important concern you might have regarding the fitness of the data for the intended purpose. Discuss the raster procedure that you applied in terms of the challenges of simulating a real-world spatial mechanism. See example assignment here.

____ On the final page, include a screen-shot of the model builder window showing your composite model. And a screen-shot of your map algebra expression. A caption on each of this page should describe the map algebra expression that you used.

____ We know that your model is not a comprehensive evaluation of sites, so please resist the temptation to discuss concepts and relationships that are not part of your model.

____ Your maps should include all of the essential elements of a map as discussed in Elements of Cartographic Style, with the technical aspects of Titles, Captions, scale-bars, source citations and declare your projection case, as discussed in the check-list for the second exercise.

____ Include citations for the source of each of the data-sets on the pages dedicated to each.

____ Format your document for easy reading in letter-size, landscape format. The first page should include your map and text name it yourname_rasterGIS.pdf and upload it to the dropbox for this assignment.

Classic Raster Models:

A very easy way to do this project would be to evaluate locations based on two distance factors. For example, I want to build a donut shop that is near bookstores but far from other donut shops.

Facility location Model:

Favorable Factors:

- Proximity to Favorable things and conditions,
- Accessible to users (consider different modes.)

Unfavorable Factors:

- Distant from unfavorable or competing things and conditions.
- Near or in preservation land

A Fun Co-Location Model

My friend Corky wants to know the definition of a prime urban location.

- Core Service area: An area that is 100 meters from both a coffee shop AND a launtromat.
- Prime urban habitat: Within 500 meters of a core service area.

Preservation Model:

Favorable factors:

- Land of particular value for whatever purpose (this may be a model of its own.)
- Land that is particularly at risk (risk is probably a model in itself.)

Each of these pieces might be made by rasterizing, reclassing and overlaying various layers from MassGIS

If you use Select by Attributes tool to select features from a shape file before using the euclidean distance tool or Polygon to Raster, the distance or output raster will be based on just the selected polygons.

One neat aspect of these models is looking at the geometry and connectivity of patches, corridors, Barriers. Connectivity can be investigated with clever application of the Spatial Analyst tools, Euclidean Distance, Nibble, Thin, RegionGroup, zonal geometry. Explore links on http://waconnected.org/

Terrain Analysis

People interested in more landscape-oriented questions may enjoy using the Slope or Aspect functions from the Spatial Analyst / Surface tool-set to investigate something to do with microclimate or erosion.