Massachusetts Institute of Technology - Department of Urban Studies and Planning

11.520: A Workshop on Geographic Information Systems

11.188: Urban Planning and Social Science Laboratory

Lecture 15: Terrain Models, Cartograms, 3D & Course Wrapup

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Administrative

- Project writeup due today (and must be handed in by Friday to avoid penalty)
  - see Project page for details
- Course evaluations: extra copies are available today if you didn't already turn one in at the Monday project presentations

Test comments

- Test solutions are now online on the Test page. We were pleased with your generally good performance on the test. Take a look at the solutions to clarify your reasoning about the maps and other answers. Here are some specific comments
  - Everyone missed one subtle aspect of mapping town density. The map shows 351 towns but has 600+ polygons in the *matown00* theme due to islands, rivers, and other features that split towns into multiple parts. The quantile classification must be done on the 351 towns, not the 600+ polygons. Hence, the breakpoints for the 20/40/60/80 percentiles should be determined by sorting the density column in the *madoreqv* table before joining to the map.
  - Many of you identified a grid cell in Williamstown as the part of the state that is furthest from major highway exits. However, the southeast part of Nantucket is a 51 km from an exit (3 km further). You received partial credit for the correct distance to the corner of Williamstown.

Terrain Modeling and 3-Dimensional Visualization

- Representing height (Z)
  - Contour lines (each line is the locus of points at a constant elevation)
  - Surface models (2.5D)
    - DEM - digital elevation models (e.g., matrix of 30m elevations)
    - TIN - triangulated irregular network
      - approximate a smooth surface using interconnected triangles
      - quick visualization by shading triangles based on slope and aspect
    - Building a TIN from contour lines
    - Computing slope and aspect
  - 3D models
    - Add Z to points, lines, polygons
    - Add surfaces and volumes as objects defined by a collection of planar polygons
    - Recognize difference between extruding 2-D shapes and allowing sloped roofs with overhang
    - Solid modeling
      - describe objects such as cylinders and spheres by continuous math functions
      - use computational geometry to handle intersections, differencing, etc.
- ArcScene for 3D visualization
  - Example using a TIN for Boston
    - M:\data\bostin\hpy_bos_t contains the TIN model
    - TIN was developed using ArcGIS from elevation (hypsography) data from USGS
    - Use ArcScene to view 3D data
    - Add 3D-Analyst extension for additional capabilities
  - Surface analyses for: contour lines, slope and aspect estimates, hillshading
  - Using slope/aspect or hillshading for visualization and analysis
    - Darken as if lighted from northeast corner
    - Find all the south-facing roads
  - Draping layers on top of TIN: base heights, z-exaggeration, offset.

Course Wrapup

- Review progression of topics/labs during semester
- Highlight other tools/issues that we haven't had time to cover
  - Entering and Editing geometry
  - Handling one-to-many and many-to-many relationships
  - Additional analysis tools: geostatistics, network analysis, etc.
  - Interoperable geospatial services
- Other classes
  - 11.521 (11.523/524) - spatial database management and advanced GIS project
  - 11.522 - research seminar on urban information systems
  - 11.220 - Quantitative Reasoning and Statistical Methods for Planning
  - IAP activities - GIS minicourses taught by Dan Sheehan (IS&T) and Lisa Sweeney (Libraries)
  - Harvard: GSD and Engineering classes
  - BU: remote sensing classes

Last modified 14 December 2005.