

Geography 38/42:477
Advanced Geomatics

Topic 3: GIS Models

(What is a Model ?

- # Simplified representation of real world
 - Physical, Schematic, Mathematical
 - Map
 - GIS database

- # Reduce complexity and help us understand how things work

(What is a GIS Model

- # A set of ordered "map" operations applied to solve a problem

- # Map operations = spatial analysis

- # May include a variety of geomatics technologies, but created in a GIS

(Elements of Models

What do models consist of?

- Geospatial data
- Operations
- Analysis
- Results

(Classification of GIS Models

1. Descriptive vs. Prescriptive
2. Deterministic vs. Stochastic
3. Dynamic vs. Static
4. Deductive vs. Inductive

(An Alternative Classification

1. Description
 2. Explanation
 3. Prediction
 4. Problem Solving
 - Expert systems
 5. Decision Making
 - Spatial decision support systems
- # A hierarchical classification

(The Modeling Process

Similar to project management

1. Define problem/goals
2. Deconstruct model
3. Implementation & Calibration
4. Validation

(Why GIS Models?

• Unique ability to:

1. Manage/analyze spatial data
2. Model discrete (vector) or continuously (raster) distributed phenomena
3. Integrate above
4. Link with other modeling tools/software

(Binary Models

- # Results are 0 or 1, true or false
- # Component maps contain nominal, ordinal, interval or ratio values
- # Results based on logical expressions or mathematical operations
- # Commonly used for MCSSA
 - One strike and you're out rule

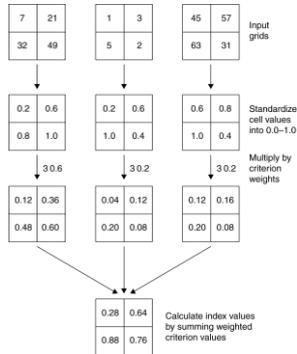


Figure 19.5
Build a raster-based index model requires the following steps. First, standardize the cell values of each input raster into a scale of 0.0 to 1.0. Second, multiply each input raster by its criterion weight. Finally, calculate the index values in the output raster by summing the weighted cell values. For example, the index value of 0.28 is calculated by: $0.12 + 0.04 + 0.12$, or $0.2 \times 0.6 + 0.2 \times 0.2 + 0.6 \times 0.2$.

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(Regression Models

- # Relates a dependent variable to one or more independent variables
- # Once relationship is established, used for prediction, "what if" scenarios
 - Linear
 - Local
 - Logistic

(Process Models

- # Model representing a physical or environmental process
- # Often based on equations derived from measured data (inductive)
- # Or physical laws (deductive)
- # Typically predictive and dynamic
