

GEG 3312: Advanced GIS Mid-Term

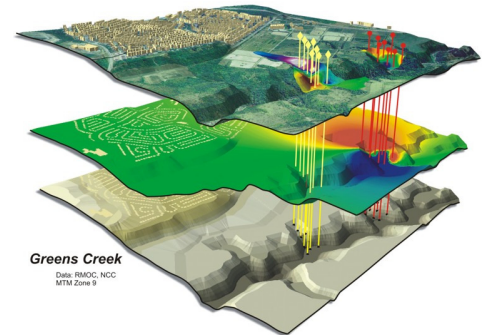
Date

March 3rd, 2011 SMD039&SMD041

The following is composed of 3 sections:

1. [3.5 pts] Section 1 – Multiple Choice
2. [8.5 pts] Section 2 – Short Answer
3. [8 pts] Section 3 – Cartographic Models

The test is marked out of 20 points. Answer all questions within the pages provided herein.



Multiple Choice

Section 1: Multiple Choice Questions (3.5 points)

The following are multiple choice questions. Circle the most appropriate answer for each.

1. Image or raster registration is always an exact transformation.
 - a. True
 - b. False
2. In the extended raster model, any two or more non-contiguous cells with the same value belong to the same region.
 - a. True
 - b. False
3. A VAT only exists for floating point GRID layers.
 - a. True
 - b. False
4. The concept of a region applies only for integer rasters.
 - a. True
 - b. False
5. When mosaicking two or more raster datasets that overlap, you can safely utilize an average to handle overlapping cells.
 - a. True
 - b. False
6. Which of the following statistics would not make sense if you were analyzing a continuous field variable?
 - a. Standard Deviation.
 - b. Maximum.
 - c. Variety.
 - d. Sum.
7. Which of the following is a way to create a smoother IDW interpolated surface?
 - a. Decrease the number of sample points used in the interpolation.
 - b. Increase the power
 - c. Decrease the power
 - d. Decrease the search radius

Keep in mind that this is not an exact transformation; it is only an approximation.

**Short
Answer****Section 2: Short Answer Questions (8.5 points)**

The following are short answer questions; formulate your answer in the space allotted.

1. [0.5 points] List the components of the “simple” or “basic” raster model?

Columns, Rows, Cells, Values

2. [1 points] What do the numbers assigned to reach raster cell represent and how are these numbers reflected in the two GRID data types?

0.5 pts. The numbers represent attribute values, however, the numbers may or may not have numeric meaning, for example, the number 4 could represent water –a nominal class or 4 people – a numeric count.

0.5 pts. Generally, integer grids are used to represent categorical data like landuse and floating point grids are used to represent continuous field variables like elevation and temperature.

3. [2 points] Explain briefly the concept of raster resolution?

1.0 Raster resolution refers to the areal unit of cell representation, that is, the size of a cell in the real-world.

1.0 pts. The cell size chosen to represent a map in a raster layer must take into account the minimum resolvable feature size of representation. So to ensure that for example a 25 m² object could be represented as a distinct entity, then you would choose a resolution that is 1/3 to 1/4 the minimum resolvable object size, so here for example, around 6.25-7.5 m² would suffice.

4. [2 points] Explain the process of image registration/rectification, why it is important and how is accuracy assessed?

1.0 Image registration, georeferencing or rectification is the process of geometric transformation of a grid/image from a local coordinate system into a geographically referenced or projected coordinate system. This process is a statistical one that uses control points that are common to both the image and the real world to transform the coordinate system. It involves the process of resampling as well as any of translation and rotation.

1.0 The accuracy is assessed via reference to the Root Mean Square Error or RMSE. This value is in map units and represents the overall error associated with the transformation between the control points.

Anything reasonable here is good. Graphics could be used.

5. [3 points] Define MCE (Multi-criteria Evaluation) and explain some issues with the use of Boolean overlay in MCE.

Multi-criteria Evaluation or Analysis allows for a number of attributes to contribute to a spatial model. Multiple layers are overlaid in order to achieve a suitability map. All layers participating in the overlay process must have the same scale, usually done via reclassification. The resultant map provides a range of possibilities via the overlay process. In the Boolean case, however, only two possibilities are provided, 1 or 0 and there is nothing in between.

Accept any reasonable answer including the above.

Section 3: Cartographic Modeling (8 pts)

Modeling illustrations

The following questions require that you **fill the cells of the output grid with numbers** (Use “N” to stand for NoData) based on the functions provided. The following example shows the results of the addition of the two input grids.

Input1	Function	Input2	=	Output																											
<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>9</td><td>7</td></tr> <tr><td>9</td><td>8</td><td>5</td></tr> <tr><td>6</td><td>3</td><td>0</td></tr> </table>	9	9	7	9	8	5	6	3	0	+	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>2</td></tr> <tr><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>N</td><td>0</td></tr> </table>	0	0	2	0	0	1	0	N	0	=	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>9</td><td>9</td></tr> <tr><td>9</td><td>8</td><td>6</td></tr> <tr><td>6</td><td>N</td><td>0</td></tr> </table>	9	9	9	9	8	6	6	N	0
9	9	7																													
9	8	5																													
6	3	0																													
0	0	2																													
0	0	1																													
0	N	0																													
9	9	9																													
9	8	6																													
6	N	0																													

1. [1 points]

Input1	Function	Input2	=	Output												
<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>3</td></tr> <tr><td>4</td><td>0</td></tr> </table>	9	3	4	0	Boolean And	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td></tr> <tr><td>N</td><td>0</td></tr> </table>	0	1	N	0	=	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td></tr> <tr><td>N</td><td>0</td></tr> </table>	0	1	N	0
9	3															
4	0															
0	1															
N	0															
0	1															
N	0															

2. [1 points]

Input1	Input2	Input3	Function	=	Output																
<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>3</td></tr> <tr><td>4</td><td>0</td></tr> </table>	9	3	4	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td></tr> <tr><td>N</td><td>0</td></tr> </table>	0	1	N	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>2</td><td>1</td></tr> <tr><td>3</td><td>0</td></tr> </table>	2	1	3	0	Maximum	=	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>3</td></tr> <tr><td>N</td><td>0</td></tr> </table>	9	3	N	0
9	3																				
4	0																				
0	1																				
N	0																				
2	1																				
3	0																				
9	3																				
N	0																				

3. [1 points]

Input1	Input2	Input3	Function	=	Output																
<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>3</td></tr> <tr><td>4</td><td>0</td></tr> </table>	9	3	4	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>1</td></tr> <tr><td>N</td><td>0</td></tr> </table>	0	1	N	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>2</td><td>1</td></tr> <tr><td>3</td><td>0</td></tr> </table>	2	1	3	0	Range	=	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>2</td></tr> <tr><td>N</td><td>0</td></tr> </table>	9	2	N	0
9	3																				
4	0																				
0	1																				
N	0																				
2	1																				
3	0																				
9	2																				
N	0																				

Cartographic Modeling

The following questions require that you **draw** a processes diagram or cartographic model. When doing so, *use the following cartographic modeling components,*

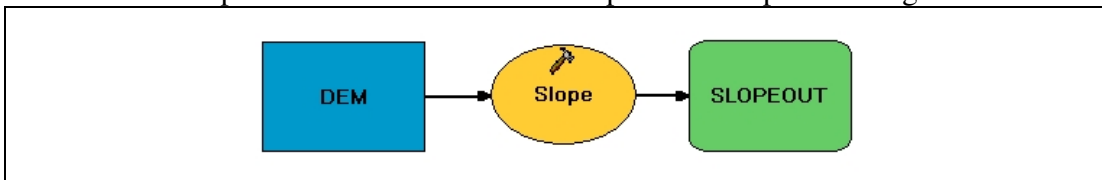
Component	Description
VECTOR	An input/output layer, raster or vector.
FUNCTION/ OPERATOR	A map algebra function or operator.

Elaborate on the function chosen, for example if you choose a local function then say which one (+,-,/ etc..), e.g.,

Local Addition

Local Boolean AND

4. [2 points] In a region, you need to determine slope. Your input is a DEM. Draw the conceptual model/process diagram.



5. [3 points] There is a relation between temperature and altitude such that the temperature at a given altitude is a function of the altitude itself. The function follows this equation:

$$T^{\circ}C = f(Altitude)$$

$$T^{\circ}C = 30^{\circ}C - 0.01^{\circ}C \times Altitude$$

You have a DEM and are asked to create a topoclimatic model for the region using the above equation. Present a cartographic model that would yield the required dataset.

