CS 980EQ: Topics in GIS & Geoprocessing (Summer 2018)

Assignment 3

Due Date and Time: Saturday, July 7, 2018 at 11:55 PM.

Important Notes:

- Submit your assignment through URCourses
- Include a cover page with your assignment, including your first and last name, student ID, and assignment#
- If you are submitting more than one file, include all the files in one zip file

Total Mark: 50 + 50 = 100

Raster Analysis
Readings: Lecture Notes, Chapter 10

Answer the following questions using your own words. 5 marks for each question:

1. What is map algebra?
2. **W**hy must raster layers have compatible cell sizes and orientations for most raster combination operations?
3. What is a null value in a raster data set? How is this null value typically treated in a raster operation?
4. What is the scope of a raster operation?
5. Perform the listed raster operations

3	2	4	11	9	1	3
1	6	5	20	14	8	7
7	(13)	2	1	△4	9	11
12	11	10	8	5	6	10
3	(2)	1	17	☆12	11	9
8	5	[6]	8	3	13	16
19	17	9	11	⬠12	7	15

Perform the following operations with a 3x3 window, centered on the noted cells

-average, on the circle,
-standard deviation, on the circle,
-maximum, on the triangle,
-value range, on the square,
-average, on the ellipse,
-median, on the star

6. What are the values in cells C5, C7, C10, and C13 in the output layer?

a)

Input

1	3	1	1
0	N	2	-1
1	2	5	0
0	1	N	N

Reclass by table

in	out
0	a
1	x
2	b
3	f
4	c
5	s

=

Output

x	f	x	x
a	N	b	N
x	b	s	a
a	x	N	N

b)

1	3	1	1
0	N	2	-1
1	2	5	0
0	1	N	N

Reclass by ranges

in range	out
0 to 1.5	a
1.5 to 3.5	b
3.5 to 10	c
N	d

=

a	b	a	a
a	d	b	N
a	b	c	a
a	b	d	d

7. What are the cell values for cells C2, C5, C7, and C11 in the output layer, below?

Output = CON((layerA==N), 1, layerA)

layerA

N	N	1	0
1	N	2	N
N	4	N	N
0	1	N	1

Output

C1	C2	C3	C4
C5	C6	C7	C8
C9	C10	C11	C12
C13	C14	C15	C16

8. Does a NOT operation applied to a raster cell value containing a NULL value return a NULL value, a zero value, a 1, or some other nonnull value?
9. Provide the answer for the following logical operations:

0	0	N	3	and	0	5	0	1	=				
1	0	0	3		1	0	0	1					
1	7	1	0		1	0	1	0					
0	N	0	1		1	0	1	1					

0	1	0	0	or	0	1	0	9	=				
0	0	0	1		1	0	0	1					
3	0	0	0		1	1	N	0					
1	0	1	1		0	0	6	0					

10. What is a kernel in a moving window operation? Does the kernel size or shape change for different portions of the raster data set? Why or why not?

Remote Sensing
Readings: Lecture Notes, Textbook: chapter 6, Remote Sensing Tutorial

Answer the following questions using your own words. 5 marks for each question:

1. Describe several positive attributes of images as data sources?
2. What is the electromagnetic spectrum, and what are the principle wavelength regions?
3. Define a spectral reflectance curve. Draw typical curves for vegetation and soil through the visible and infrared portions of the spectrum.
4. How are images from satellite scanners different from photographs? How are they similar?
5. What is a LiDAR? What type of information can LiDAR produce?
6. Describe the different types of image resolution: spatial, spectral, temporal, radiometric
7. What are the major sources of geometric distortion in aerial images, and why? What are other, usually minor, sources of geometric distortion in aerial images?
8. What is photo-interpretation, and what are the main photographic characteristics used during interpretation?
9. What is image classification? Describe the two methods used in image classification.
10. What are three criteria used in selecting the type of images for spatial data development?