Lab 10 – ESRM 430 FINAL
ESRM430
Instructor: Dr. L. Monika Moskal

Lab Objective:

- Combining LiDAR and imagery for land use and land cover classification

Tools & Data:

- SPRING Software -- version 5.2.7
- Google Earth – version 6.2.2

Imagery:

False Color NIR imagery (GenesseePark.tif)
Band1 – Red
Band2 – Green
Band3 – Blue
Band4 – Near Infrared
Band5 – LiDAR derived height above ground surface model*

Pixel size = 1 meter

* Note that the bands 1-4 were collected in 2009, while band 5 was collected in 2002

KMZ File:

- (FinalProject.kmz) This is a KMZ file that you will use in Google Earth for Task 4 – Accuracy Assessment

What you will hand in:

- This lab will be submitted in a digital format using the Lab 10 drop box on the course website, a write up is required including your accuracy assessment form.
- In addition to the write up you will also turn in a KMZ file that shows a georeferenced classification.

Task 1: Data prep

- Set up a directory on the computer to work from. I suggest using …ESRM430/Lab10
- Copy Lab10 materials to your computer
- Do not work from your flash drive, but do back up the lab folder you have been working with to the flash drive at the end of the lab
- Create a SPRING database to work from for this lab and the various data models.
- Import all of the imagery datasets provided in this lab to the SPRING database. These are all TIFF images. Pixel size is 1m for all the files.
- Display and attach the various imagery datasets in the view tabs on the bottom of your view screen so that you can easily navigate between them; you learned to do this in previous labs. Navigate between the five bands to acquaint yourself with the data characteristics.

Task 2: Supervised object-based classification

Create a land use/ land cover classification using the following classes:

- Trees&Shrubs – Dark Green (Trees and shrubs will be grouped together into one class)
- Water - Blue
- Grass – Light Green
- Roads – Grey (This class should include any types of pavement and gravel paths)
- Buildings with light roofs – Maroon (dark red)
- Buildings with dark roofs - Maroon (dark red)
    - Buildings will be calculated as one class in the final map, but you must separate them for the classification process because of the two types of roofs (light and dark) within the image scene.

Choose three of the five bands for your segmentation that you think would be best separating the classes listed above. Use your best judgment based on image interpretation of each individual band.

1. **What bands did you select for your segmentation? (2 points)**

2. **Explain why you chose each band (I am looking for more detail than just "because it looked the best". Justify your decision for each band that you choose. Remember what we have learned about each band from previous labs and lecture) (3 points)**

3. **What segmentation parameters did you choose? (1 points)**

4. **Why did you choose these parameters? (2 points)**

Use instructions from Labs 4,5, and 6 to help you with these steps.

Use a supervised object based classification approach to classify the image. Use the classes and associated color scheme indicated above to classify the image.

Export your classification as a JPEG with your last name and lab number (File< Save As JPEG Image).

Task 3: Image Overlay in Google Earth

Import your Classification into Google Earth as an image overlay. Do a georectification similar to the one you did in Lab 2. The general location of the imagery is Genesee Park in South Seattle. Note, that it is important to do an accurate georectification so that you will be able to perform the accuracy assessment. If it is not lined up correctly then you will introduce unnecessary error into your accuracy assessment.

5. **Save the georectified classification as a KMZ file to submit to the digital dropbox. Title the KMZ file with your first and last name. Make sure that the transparency is turned off and the classification is fully opaque when you save it. (10 points)**

Task 4: Accuracy Assessment

Load the KMZ file associated with this lab into Google Earth (FinalProject.kmz)

This KMZ file includes 50 random points that you will use to perform an accuracy assessment of your classification data. You will use this KMZ file to create a reference dataset as a "groundtruthing" of your classification.

To create an accuracy assessment:

a.) Create a reference dataset using the form attached at the end of the assignment. For each point identify the land cover class through manual photo interpretation of the most recent aerial photo. Choose between trees&shrubs, water, grass, roads, and buildings. It may be difficult to choose a class for some points, but use your best judgment based on your photo interpretation skills. Write down the reference class in the second column.

b.) In the third column write down how you classified the area below the point using your georectified classification.

c.) In the fourth column note if your classification matched the reference dataset. (if column two matched column three)

d.) Count the number of checks and divide it by 50 to get the overall accuracy of your dataset.

Overall Accuracy = Number of checked boxes / 50

e.) How does the water class skew your overall accuracy assessment results? To figure this out remove the water class from your accuracy assessment. First, draw a line through all reference points in the water class (column 2). Count up the total remaining reference points to calculate your total points (the denominator) to use for your overall accuracy calculation. Count the remaining number of checked boxes (the ones without lines drawn through them) and divide by the remaining reference points to get an overall accuracy.

Overall Accuracy Not Including Water = Number of checked boxes (without lines through them) / Total reference points (not including the water class)

6. Include the filled out worksheet in your write up of this lab. (5 points)

7. What was your overall accuracy including the water class? (2 points)

8. Based on the Accuracy Assessment table and your interpretation of the classification, describe in words your classification accuracy for EACH class. Explain what you think contributed to how well you were able to classify objects. You do not need to provide a quantitative explanation, but please provide a qualitative description. (Hint: consider factors such as the quality of the datasets used in the segmentation, and the similarity of individual classes) (10 points)

9. Both the imagery and the LiDAR were acquired in the summer. How would you expect your classification accuracy to change if all five bands had been acquired in winter? (5 points)

10. What was your overall accuracy not including the water class? (2 points)

11. Agencies, such as the US Forest Service, often require a classification to have an overall accuracy greater than 80%. Map makers often have control over the extent of their map. Discuss how the overall accuracy of a classification of Seattle that included large portions of Puget Sound and Lake Washington might differ from a map that only included the land areas. (5 points)

12. How could you be 100% certain that your classification was accurate? (3 points)

Accuracy Assessment:

1	2	3	4
Point #	Reference - What is on the ground	Classification - (What you classified the point as)	Match ? (Check if yes)
1			
2			
3			
4			
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15			
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23			
24			
25			
26			
27			

1	2	3	4
Point #	Reference - What is on the ground	Classification - (What you classified the point as)	Match ? (Check if yes)
28			
29			
30			
31			
32			
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