Lab 10
ESRM430 SPRING 2011
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Lab Objective:

- Fusion of LiDAR and Imagery for Impervious Surfaces Classification

Tools & Data:

- SPRING Software -- version 5.1.4

Imagery:

False Color NIR imagery (NIR.tif) - the original 16 bit data was reduced to 8 bit and clipped to a smaller area to assure that you can manipulate the data with ease; all subsequent data sets were clipped to the extent of this image. The imagery has 3 bands representing near infrared, red and green at 0.25 per pixel resolution.
True Color Imagery (TC.tif) - the imagery is similar to the false color NIR data, but a blue band is acquired in place of the near infrared.
NIR Panchromatic Imagery (NIRpan.tif) - this is a one band image capture in the near infrared, it is the same data as the near infrared band in the false color NIR imagery.
Image Texture (homogeneity.tif) - as you know image texture is a useful image attribute that can be easily calculated. The image is a 3 by 3 second order homogeneity texture, it's the texture most commonly used in remote sensing applications. Explore the image and pay special attention to building structures.

LiDAR derived data:

Intensity Image (intensity.tif) - You can read more about how this image was created in the Fusion Manual located in the software folder. As with many of the function in fusion the image was created using a command line utility driven interface. The command used is called 'IntensityImage' and it's derived from the intensity values attributed to the LiDAR point cloud. As will all LiDAR derived data the pixel resolution is 1 m, but the data is resample to 0.25 to match the imagery data.
Ground Model (bareearth.tif) - The bare earth model is a digital terrain model (dtm) created using the LiDAR point cloud from which points not representative of the ground (vegetation and buildings) have been removed. This is a multistep process in the FUSION command line and it involves creating a point cloud that is representative of only ground points (ground model. You can view this point cloud by opening the groundmodel.lda file located in the groundmodel folder in PDQ. The 'GroundFilter' command is used first to extract the ground points. A good description of the methodology behind this process including the papers on which this process is based on in FUSION as well as the thresholds necessary to perform it is given in the FUSION manual. Once the ground filter is evaluated and acceptable (most points are ground points) a dtm is created out of it using the 'GridSurfaceCreate' command, this surface can be smoothed and filtered for outliers, the full process is described in the FUSION manual.
Normalized Canopy Height (canopyheight_normal.tif) - In FUSION CanopyModel creates a canopy surface model using a LIDAR point cloud. By default, the algorithm used by CanopyModel assigns the elevation of the highest return within each grid cell to the grid cell center. CanopyModel provides for smoothing of the generated surface using a median or a mean filter or both, smoothing was used on this particular model. This canopy model was derived by subtracting the ground model to assure that the height were canopy height not elevations.

What you will hand in:

- This lab will be submitted in a digital format using the Lab10 drop box on the course website, a write up is required.

Task 1:

- 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 database to work from for this lab and the various data models.
- Import all of the datasets provided in this lab to spring software. These are all TIFF imagery with a x,y extent of 6564, 1483. Pixel size is 0.25 for all the files. The images do not have georeferencing associated with them.
- Display and attach the various data sets 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 three datasets to acquaint yourself with the data characteristics.

Task 2:

Explore the data that you have and based on your visual assessment of the imagery and LiDAR derived data available to you, as well as some preliminary test you should perform on small windows of the data, describe the process you would use to create an impervious surfaces classification.

Your write up should include the imagery and LiDAR derived datasets you would use, and the range of impervious classes you expect to detect.

You should also include a quality assessment for each dataset you have determined to use in your analysis explain if you are satisfied with the data or if you would improve on it, this is especially true for the lidar data which is only gridded to 1 m resolution but as you recall from your FUSION labs the point cloud data has much finer detail.

Finally, discuss one application of an impervious surface classification, the application can rely on other datasets presented din this lab. For example the classification with a digital terrain model could be used to calculate runoff coefficients.