CE-676A - Laboratory 1
(2022-23-II Semester)

Familiarizing with LiDAR Data

Objective

To learn about LiDAR data.

Software and data

1. Download fugroviewer from https://www.fugro.com/about-fugro/our-expertise/technology/fugroviewer

2. Download LiDAR data and image .rar file from below. Extract the image file to a .tif file: https://iitk-my.sharepoint.com/:u:/g/personal/blohani_iitk_ac_in/EYAp0NOUgYZAoDhAjQvSQ2MBsAPo31jvcll1WVORB5WpeQ?e=YhEuAZ

   https://iitk-my.sharepoint.com/:u:/g/personal/blohani_iitk_ac_in/EUF0IlM3YjFNrKj8eQ9XSqYBiFPqpW8DTrjqhT0bdn_ssw?e=2m0sBg

3. Download cloudcompare from https://www.danielgm.net/cc/

Methodology with fugroviewer

1. Install fugroviewer and see which directory you have stored the data file 1198500_276000.
2. Run fugroviewer and open the above data file
3. You will notice data are loaded on a window with default view.
4. View the data in 3D by clicking on 

you can rotate and translate this view for better viewing.
5. Change the display to Colour Point By Elevation (Blue to Red) 
6. What are colours indicating in this.
7. Now show as ‘Colour Points by Intensity’ by using 
8. What is colour indicating in this image.
9. Now show as, ‘Colour Points by Classification’ by using 
10. In classification each point is given a class. Can you know what all classes are shown in this data set. You can observe the view and name the classes for which colours are shown.
11. While doing the above you may zoom in and out to view details better. You may also make use of the 3D view to see details better.
12. At any stage when you zoom in or out, if you want to see full data use fit to scale. 

13. Use the, ‘Query Point Data’ tool  to know about each point in data. Click at three points at different colours in the, ‘Colour by Elevation’ view. Take screen shot of what is shown as the property of the point. Make a note discussing what this tool shows.
14. Use the Profile Tool  to create profile. Once tool is selected create a profile on top view by first clicking at point and then extending the section line and then providing this a little width to make a rectangle in cyan colour. Once you have completed the rectangle an additional profile view will open. You can zoom in and out on this view to observe the profile.
15. What happens when the width of the above rectangle is more or less?
16. Show a profile view having trees, power lines and a house.
17. You may use the other tools also of the software.
18. While the above display is on use, ‘Open Reference File’ 
19. Select the image .tif file.
20. Use the tools  do view LiDAR data and image iteratively. Observe the features in both data sets.

Methodology with cloudcompare

1. Install cloudcompare
2. With the understanding developed in the above section display the given .las file in cloudcompare.
3. Carryout / learn the options available at CC as were done in fugroviewer
4. Cut two trees from data and store as tree 1 and tree 2 files.

- Steps to Cut point cloud:
  - Once you have opened .las file in CC, use segment feature  to cut the point cloud.
  - Form a polygon using the mouse, to select an area to cut.
  - After selection use  button to finalize cutting and save the data.
  - In save dialog box, select ‘ASCII cloud’ type and save as .csv file.

5. Calculate the height of these segmented trees. (Hint: By using Z value)
6. Calculate bounding box volume for each tree. (Hint: Area calculated by projecting point cloud on XY plane and then multiplying it with the height OR using the bounding box dimension).

Question:

1. It is desired to create labelled data for deep learning purpose using either of the above software. Suggest a method that how a file as provided can be converted to a format in .csv where each data point record also contains a label value, i.e., label corresponding to the object it represents.
2. It is desired to extract DBH (Diameter at Breast Height) from point cloud of individual trees. Suggest a suitable method for extracting DBH from point cloud using either Fugro Viewer or Cloud Compare or both.