TERRAIN MODEL GENERATION FROM POINT CLOUD
CS-513

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INTRODUCTION

Digital terrain model

- Digital terrain model (DTM), also known as digital elevation modelling. It represents the bare ground surface without any objects like plants and buildings
- Practice of creating a digital representation of ground topography and terrain.
- It is only recently that such elevation data has been collected in such a precise digital form as to allow the creation of digital models of the topography of the land.

Why DTMs are used?

- Often required for flood or drainage modelling, land-use studies.
- Used in transportation system planning.
- In model water flow or other movements (for example, to run simulated avalanches or landslides),
- In geological Applications.

METHODOLOGY

ENVIRONMENT

LANGUAGE: Python 2.7

LIBRARIES USED :

- **NUMPY: To convert images in matrix and perform operations on them.**
- **PCL: Used for Point Cloud processing.**
- **COLORSYS: It is for the bi-directional conversions between the color systems HSV and RGB.**
- **BOKEH: For visualization of point cloud data.**

STEPS:

1. Reading the data:

- The data is read line by line and is converted into float and the resulting data is stored in an array.
- We split the latitude, longitude, elevation, intensity and the files in .pcd files.

2. Setting the plot for original data:

- Min and max value of the altitude is found to set the color range.
- Also an object using the scatter plot from original array.

STEPS:

3. To define the colors(using HSV color system):

- Converting the altitude into color.
- The range of altitude is 0 - 0.8 to set the color.
- Highest altitude is represented by blue.
- Lowest altitude is represented by red.

STEPS:

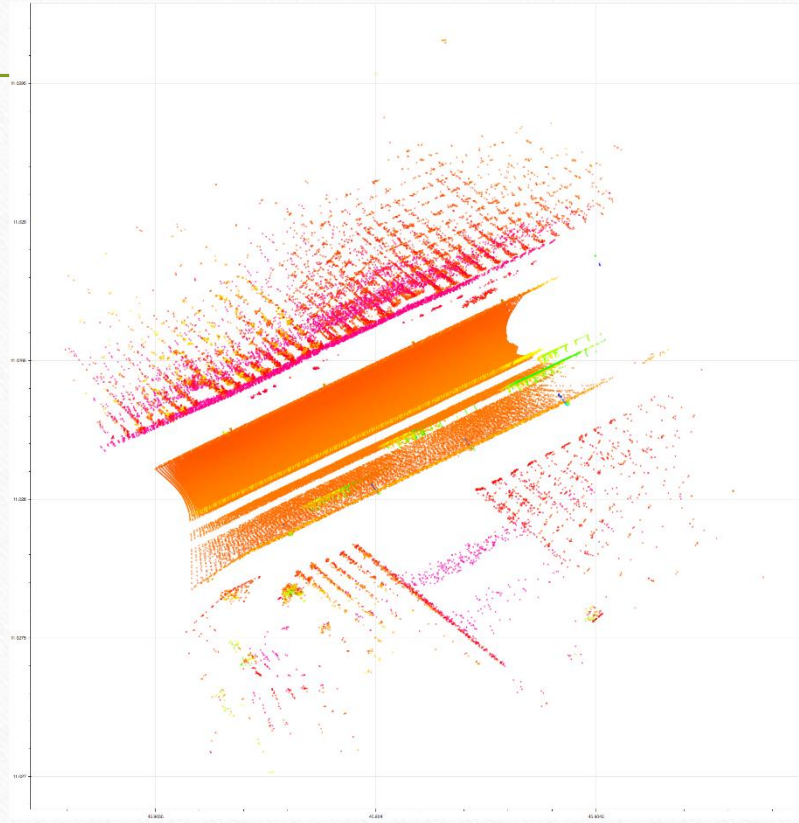
4. Filtering the object:

- The PCL file is loaded and converted into PCD format.
- On the basis of variance filter the data (using make_statistical_outlier_filter()) and stored in pcd object (fil).
- Threshold of standard deviation is set to 0.3 and then K-means is applied.

STEPS:

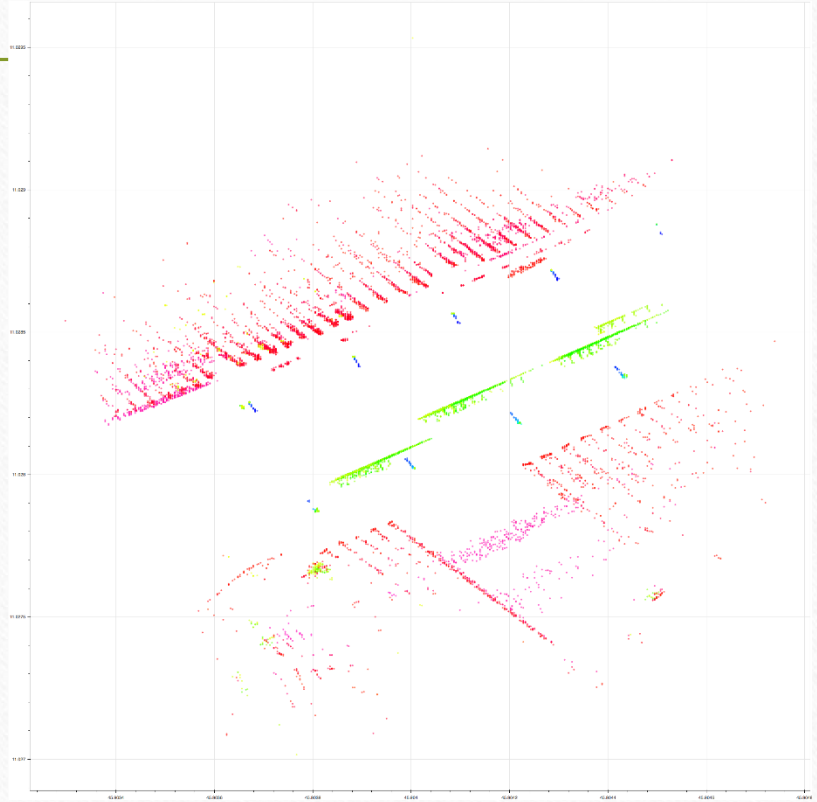
5. Generating inliers and outliers:

- The actual data by the process of filtering the objects, inliers are generated.



STEPS:

- By taking an inverse of the filtered data i.e. the unfiltered data values are set true, outliers are generated.

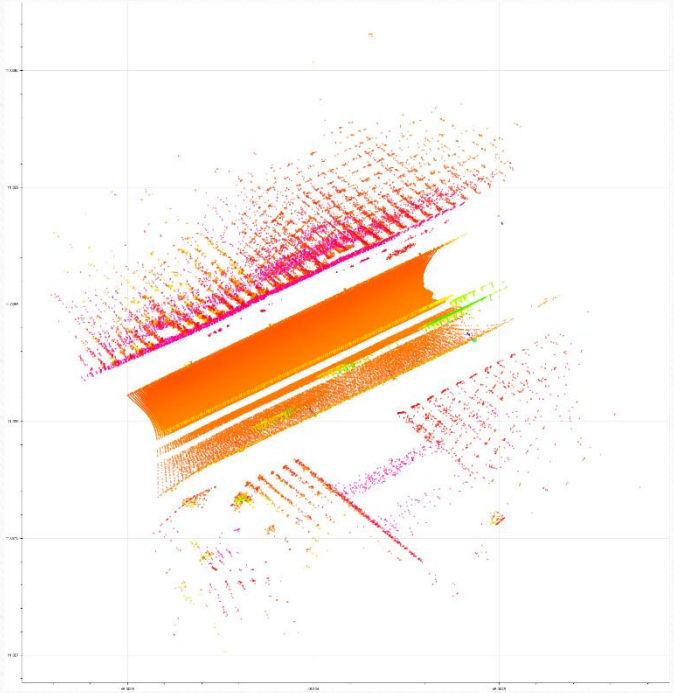


STEPS:

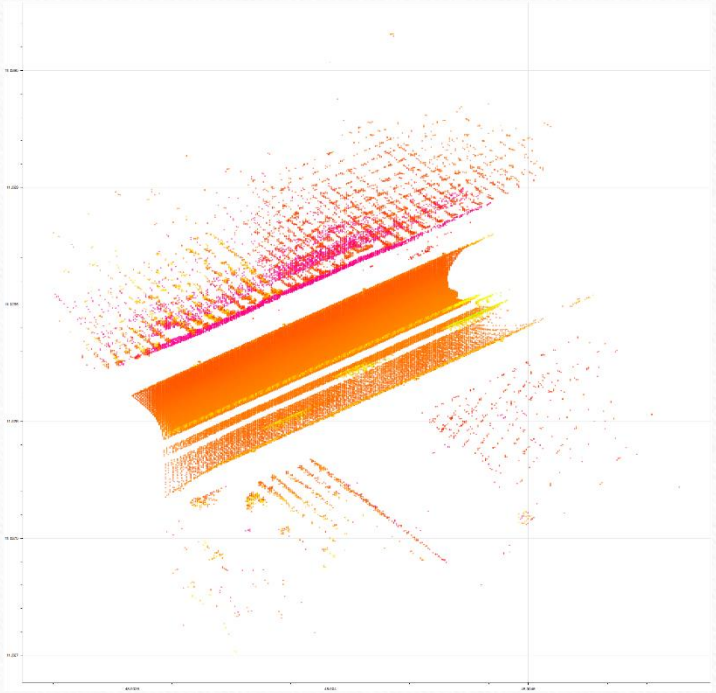
6. The Inliers and Outliers are processed as follows:

- processFile(datafile) function is used to read inlier/outlier data.
- generatePlot(datafile, minimum, maximum) function plot properties for Inlier PCD and Outlier PCD.

7. Plotting the original data, outliers and inliers.



Original point cloud



Final result

REFERENCES

1. https://en.wikipedia.org/wiki/Digital_elevation_model
2. https://www.pointtopointsurvey.com/service/digital-terrain-modeling/

THANK YOU