Assignment-1

LIDAR

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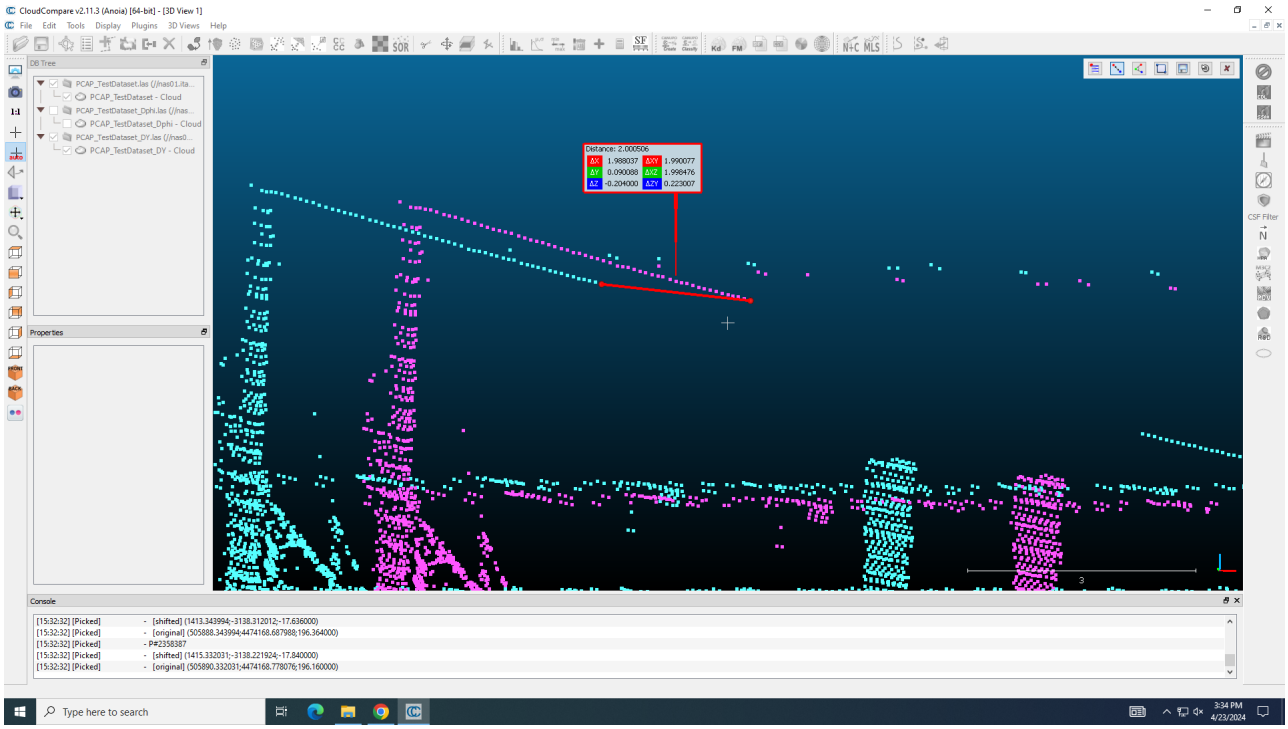
CloudCompare v2.11.3 (Anoia) [64-bit] - [3D View 1]
Distance: 2.000506
Console
Type here to search

Figure 1: DY1

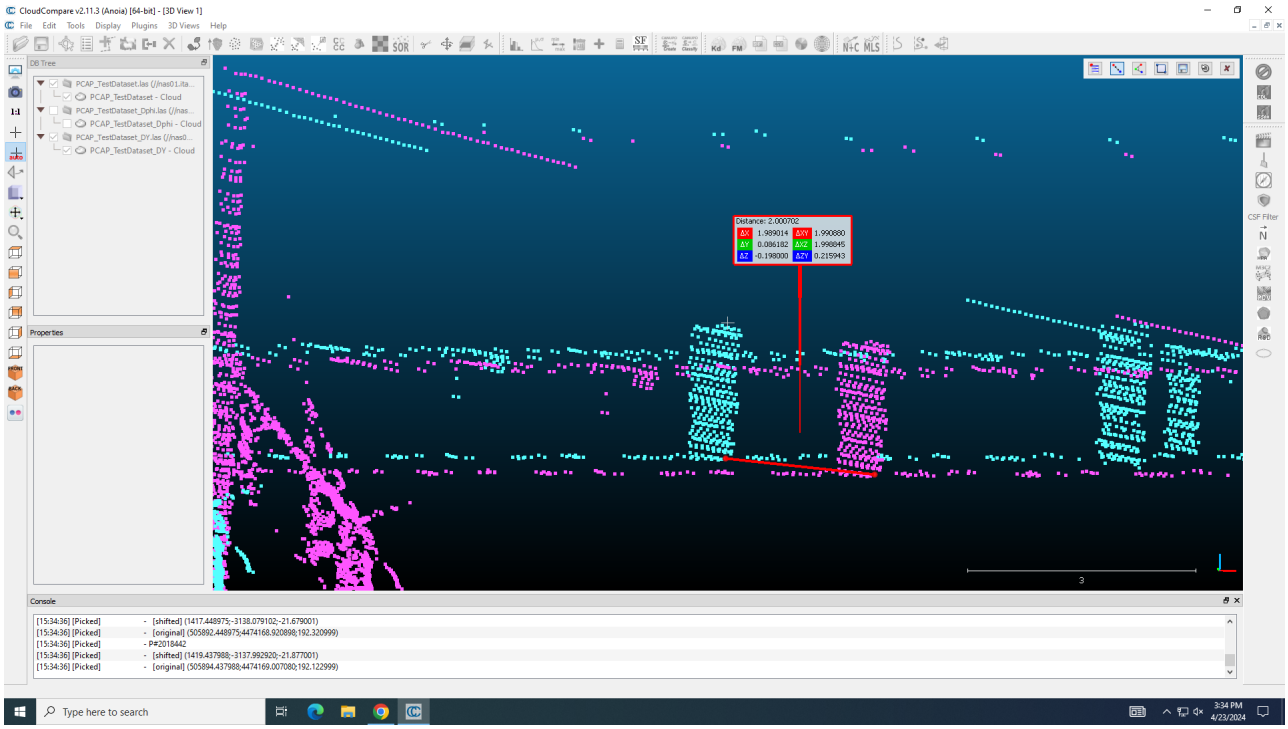

Figure 2: DY2

Conclution:

- The images provided from a software cloudcompare used for analyzing LIDAR data, possibly comparing point cloud datasets to detect systematic errors. From the trend of the Y values (which represents the difference in the Y coordinate between compared datasets), we can infer the following:
- In the first image, the Y is around -0.0988.
- In the second image, the Y is around 0.01682.
- In the third image, the Y is around 0.08396.
- There is a clear trend of increasing Y values from the first to the third image. This indicates that there is a systematic drift or error in the Y coordinate that is getting larger with each successive dataset. This could be due to various factors such as sensor misalignment, environmental effects, or other errors in the LIDAR system's data acquisition process.
- The systematic error in Y mentioned in the analysis of the images indicates a trend or pattern in the discrepancy of measurements along the Y-axis. This might suggest an inconsistency in the LIDAR system's calibration. Identifying and correcting for such systematic errors is crucial in ensuring accurate distance measurements,

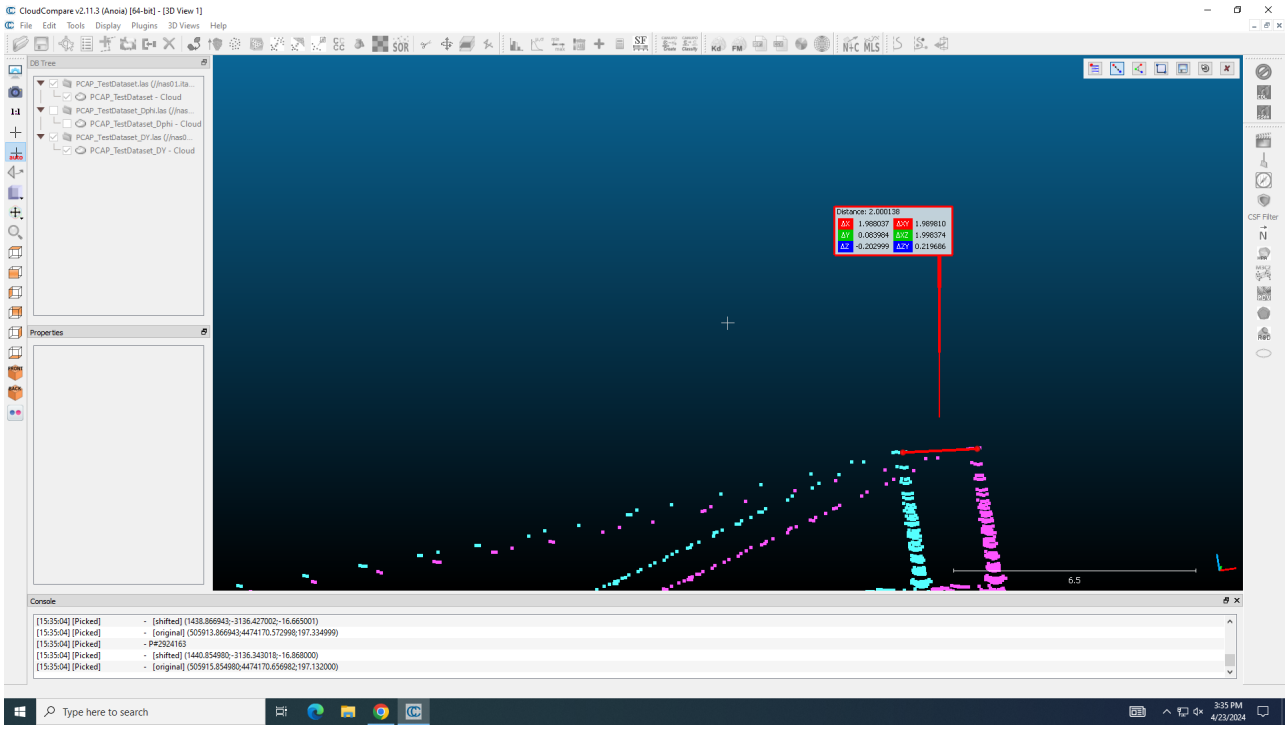

Figure 3: DY3

whether for creating precise maps, modeling environments, or in other applications where spatial accuracy is paramount.

- The progression suggests a consistent trend in the error, which could be linear or follow some other pattern depending on additional data points and the context of the measurements. To fully characterize the trend and determine the root cause, a more in-depth analysis, possibly including regression or error modeling, might be necessary. This would also involve considering the X and Z values, as they can also provide insight into the nature of the systematic error affecting the LIDAR system.

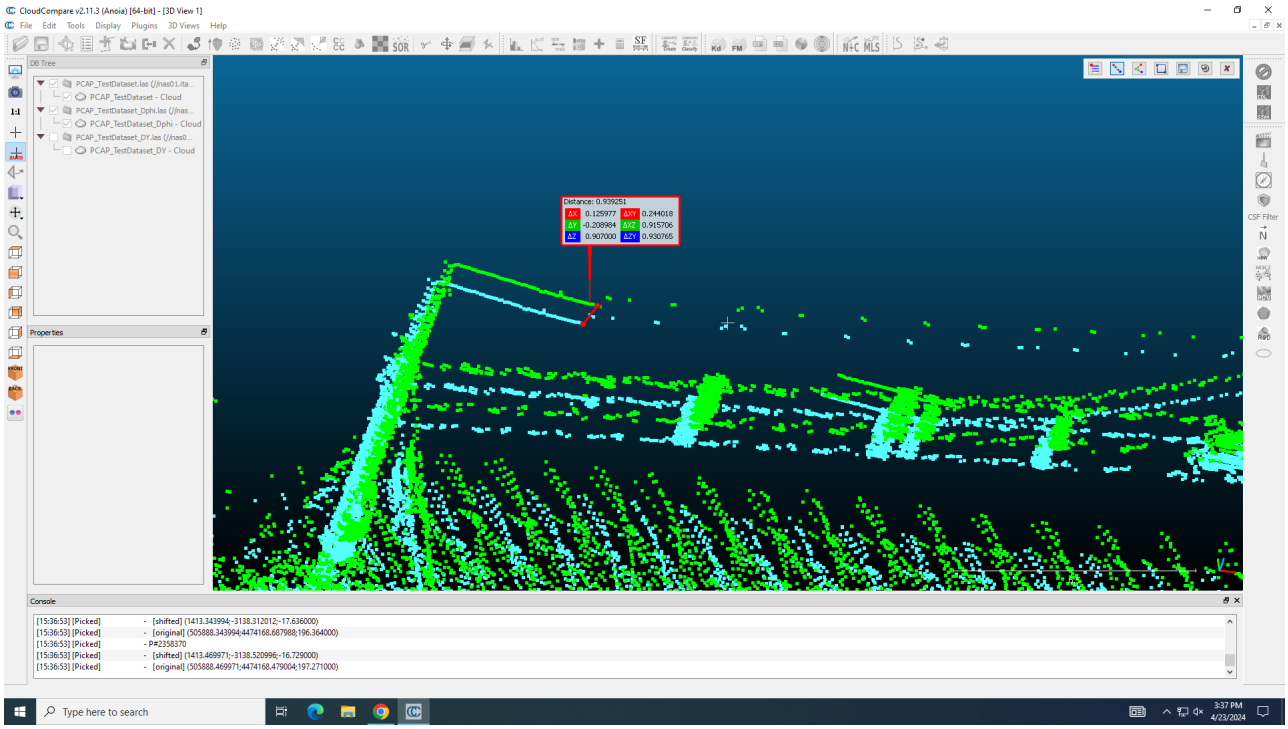

Figure 4: DPHI1

Conclution:

- The images provided show point cloud data with associated distance and PHI measurements. PHI likely represents the angular change or deviation in the horizontal plane from a reference point or axis. In LIDAR systems, PHI is often used to denote the azimuthal angle, which is the angle of the scanned point relative to a true north or a set reference direction.
- By analyzing the PHI values across these images, we can attempt to discern the systematic error trend with respect to the LIDAR system:
- In the first image, PHI is approximately 0.25804.
- In the second image, PHI is approximately 0.37654.
- In the third image, PHI is approximately 0.39235.
- The trend here shows an increasing PHI from the first to the third image. This suggests that there is a systematic error in the azimuthal angle measurements that is growing larger with each image or scan. This could indicate that the LIDAR system might be experiencing drift in its angular measurements or that there might be an issue with the system's calibration.
- This kind of error could stem from several sources:
- Mechanical instability or drift in the LIDAR's rotating components.

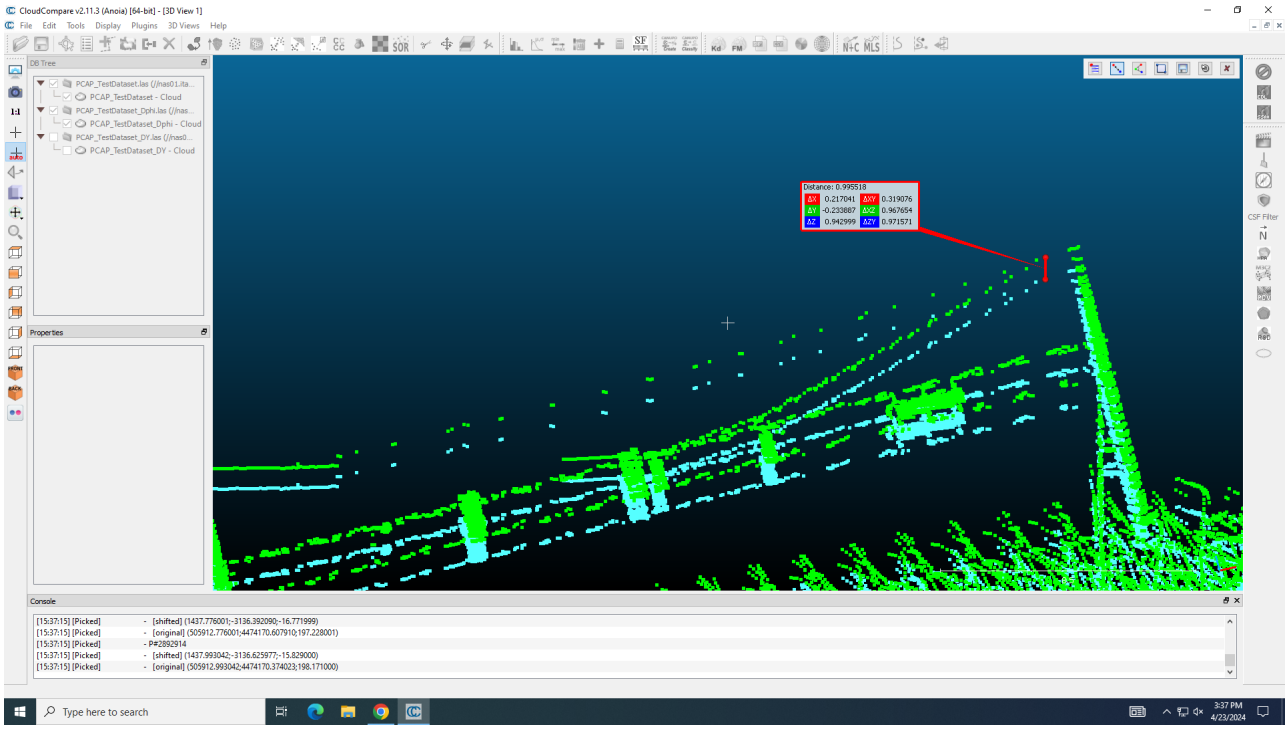

Figure 5: DPHI2

– Inaccuracies in the system's timing or synchronization, affecting the angle at which each point is measured.

– Environmental factors such as temperature fluctuations or vibration affecting the sensor's accuracy.

– Software errors in processing the raw LIDAR data.

– For precise applications like mapping, autonomous navigation, or volumetric analysis, understanding and correcting for such systematic errors is crucial. It requires a combination of recalibrating the hardware, refining the software algorithms, and possibly filtering the data to account for known sources of error. If the trend continues, it may suggest a degradation of sensor performance over time, which would require maintenance or further investigation into the cause of the drift.

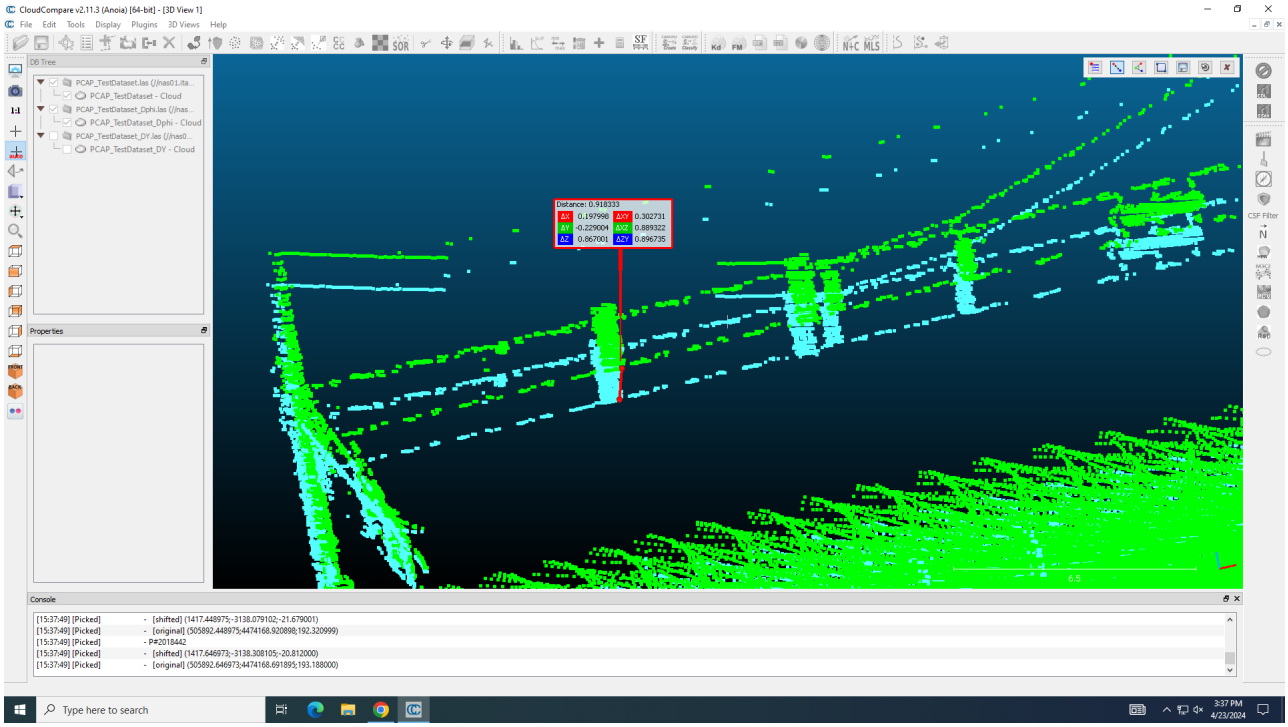

Figure 6: DPHI3