Politecnico di Milano - Courses on Photogrammetry
Laboratory report

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CFU group:	10	Date:	01/01/2024
Lab Topic:	Drone Photogrammetry		

Description of the performed activity *(max 50 lines)*

1   **Drone Photogrammetry Lab Workflow**
2   **Introduction**
3   This report explores the application of drone surveys using Agisoft Metashape for a portion of Milan,
4   emphasizing meticulous processing and analysis in diverse applications.
5   **Survey Data Overview**
6   A total of 222 images were captured during the survey, with a flying altitude of 30.9 meters. These
7   images were meticulously processed to produce valuable spatial data. The camera stations numbered 219,
8   resulting in a dense point cloud with 221,664 tie points and 717,311 projections. The high level of detail
9   achieved is reflected in the reprojection error of 0.992 pixels.
10   **Camera Calibration Insights**
11   The primary instrument utilized, the FC6520 DJI MFT 15mm F1.7 ASPH (15mm) camera, was
12   meticulously calibrated. The camera model boasts a resolution of 5272 x 2962 pixels, a focal length of
13   15mm, and a pixel size of 3.58 x 3.58 μm. The calibration coefficients, including distortion parameters
14   (K1-K3) and principal point coordinates (Cx, Cy), contribute to the precision of the entire photogrammetric
15   process.
16   **Ground Control Points and Accuracy Assessment**
17   Accurate georeferencing is paramount for meaningful spatial analyses. Ground Control Points (GCPs)
18   were established and assessed for accuracy. Control points exhibited a Root Mean Square Error (RMSE)
19   of approximately 1.84 cm in the X direction, 2.79 cm in the Y direction, and 1.91 cm in the Z direction.
20   Similarly, check points demonstrated an RMSE of 2.80 cm, 5.89 cm, and 5.14 cm in the X, Y, and Z
21   directions, respectively.
22   **Digital Elevation Model (DEM) and Point Cloud**
23   The reconstruction process yielded a highly detailed Digital Elevation Model (DEM) with a resolution
24   of 2.67 cm/pixel and a point density of 0.14 points/cm². The point cloud, comprising 27,347,905 points,
25   was classified into distinct categories such as Ground, High Vegetation, Building, Road Surface, Car, and
26   Man-made Object. This detailed classification aids in subsequent analyses and visualizations.
27   **Orthomosaic and Spatial Parameters**
28   The orthomosaic, a composite representation of the survey area, was created with meticulous attention
29   to spatial parameters. The blending mode was set to Mosaic, hole filling was enabled, and the resulting
30   orthomosaic had a size of 17,414 x 24,431 pixels.
31   **Conclusion**
32   Agisoft Metashape facilitated a comprehensive analysis of the drone survey data, offering a rich dataset
33   for further studies. The accuracy of camera calibration, precise georeferencing through GCPs, and the
34   detailed reconstruction of terrain through DEM and point cloud contribute to the robustness of the dataset.
35   This report serves as a testament to the power of drone photogrammetry in acquiring, processing, and
36   analyzing spatial data for a myriad of applications.
37   As part of this project, we demonstrate how drone surveys can be used to calculate length, area, and
38   volume.

One side of the building measures 20.7 meters in length

bridge measures 4.79 meters in length

Area and perimeter of the road

area: 1519.7 m^2 Perimeter: 723.19 m.

Volume of the building

Volume: 929.16 m^3

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List of attachments