Politecnico di Milano - Courses on Photogrammetry
Laboratory report

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

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

1 **Close-Range Photogrammetry Lab Workflow**
2 **Introduction**
3 **Equipment Setup**
4   The initial phase involved setting up the camera. Meticulous selection of camera settings optimized
5   image quality and depth of field.
6 **Image Acquisition**
7   Overlapping images from various angles, enhancing the quality of photogrammetric 3D reconstruction.
8 **Control Points**
9   Identification and marking of control points streamline photogrammetric processes.

10 **Data Processing**
11   Images were imported into PhotoModeler, utilizing a least squares adjustment for accurate
12   reconstruction. Outlier rejection enhanced subsequent precision.
13 **Interior Orientation Parameters (IOP) and Distortion**
14   Capture 27 images of known control points using an Samsung smartphone with a static reference
15   system. Use Open Camera app to mitigate rotation issues.
16 **Calibration Process**
17   Utilize PhotoModeler software to run a bundle block adjustment, extracting points and control points
18   for IOP and distortion estimation.
19 **Outlier Rejection**
20   Delete points with more than 3 residual pixels. Conduct outlier rejection for accurate results,
21   considering a realistic collimation threshold of approximately 5 pixels.
22 **Global Chi-Squared Test**
23   Pass the test, ensuring assumptions align with the software. Conduct parameter significance tests; rerun
24   BBA iteratively for parameters failing the test.
25 **Completion**
26   End the calibration phase with satisfactory IOP and distortion parameters.

27 **Restitution**
28 **Photographing the Object**
29   Capture 13 photos of the JBL cube from various angles.
30 **Software Setup**
31   Import camera calibration settings. Collimate points automatically with a grid, then run BBA to obtain
32   an error close to 1 pixel. The statistical least squares adjustment refined camera calibration parameters,
33   optimizing 3D model fit. Emphasis on accuracy assessment and parameter significance was crucial.
34 **Mesh Generation and Texture Mapping**
35   Use software to reconstruct the connection between images and points. Point cloud generation created
36   a detailed mesh, with texture mapping enhancing visual quality using original images.
37 **Scaling**
38   Define a scale based on the grid's 32 mm spacing between Pt 43, Pt 36. Pick furthest points for accuracy
39   is better than.

40   **Validation**
41   Validate the JBL's cube model with statistical tests. Ensure sides pass standard normal distribution tests
42   at a 95% confidence level.
43   **Calibration Results**
44   A warning indicated a significant number of sub-pixel marked points, with the largest residual (Point
45   89 - 3.97 pixels) exceeding the recommended threshold.
46   Addressing high residual points and ensuring accurate camera station solving is crucial. The total photo
47   area coverage is 79%, slightly below the recommended 80%. Suggestions include optimizing calibration
48   grid photo captures for better coverage.
49   **Extra Tests**
50   Detailed results and calculations can be found in the provided Excel files.

List of attachments