Photogrammetry II

Introduction

Cyrill Stachniss

Module: Photogrammetry

Photogrammetry I (summer term)

- 3h VL + 2h Ü

Photogrammetry II (winter term)

- 2h VL + 1h Ü + 1h T
- **Exam:** at the end of the winter term

Expected Time To Be Invested

- Photo 1+2: 10 ETCS = 300h
- Semester = 13 weeks of teaching
- Photo 1: 3VL + 2Ü = 62.5%
- Photo 2: 2VL + 1Ü = 37.5%

Calculation

- Exam preparation: 60h (240h remain)
- Photo 1: 240h * 62.5% = 150h
- Photo 2: 240h * 37.5% = 90h
- **Photo 2:** 90h/13 weeks = **7h/week**

Tutorials

Louis Wiesmann

Module Exam

- Written exam at the end of the winter term after the Photo II course
- Exam admission (Studienleistung)
  - 50% of the points from the homework assignments of Photo I
  - 50% of the points from the homework assignments of Photo II

Homework Assignments

- Submission in groups of **2 students**
- **Limit** the collaboration between groups
- Assignment and submission via eCampus
- **50%** of the points of the homework assignments for exam admission
- No plagiarism
- No use of GenAI tools (e.g., ChatGPT)

Zero Tolerance on Plagiarism

Photogrammetry II – Topics

Cameras to Measure Directions

An image point in a camera image defines a ray to the object point

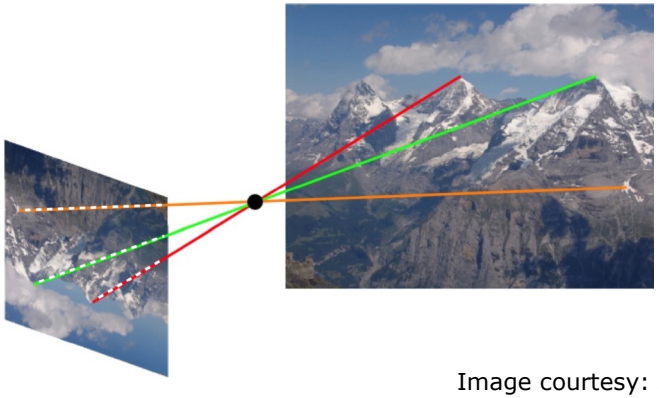


Image courtesy: Schindler

3D Perception

Multiple observations from different directions allows for estimating the 3D location of points via triangulation

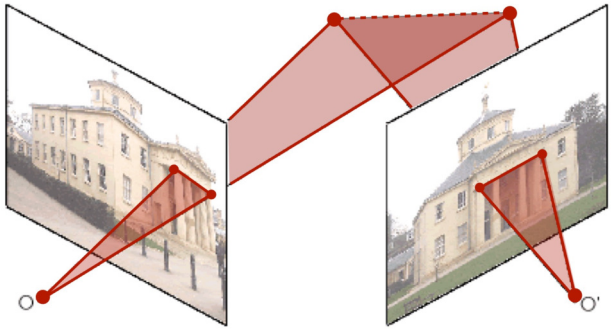
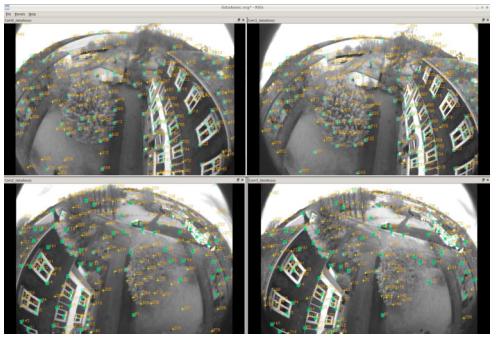


Image courtesy: Schindler

Camera Pose and Point Cloud Estimation



Orthophotos

Image courtesy: SIGPAC

Photo II: Stereo and Multi-Image Photogrammetry

- Relative orientation of two cameras
- Direct and iterative RO methods
- Triangulation
- Bundle Adjustment
- Orthophotos
- Correspondences & RANSAC
- Recursive state estimation (KF, EKF, UKF)
- Simultaneous localization and mapping

Literature

- **Förstner, Photogrammetrie II**
- **Förstner & Wrobel: Photogrammetric Computer Vision, 2015**
- **Thrun, Burgard, Fox: Probabilistic Robotics, 2005**
- Szeliski: Computer Vision: Algorithms and Applications. Springer, 2010
- Hartley & Zisserman: Multiple View Geometry in Computer Vision, 2004

Questions?